How does a total beginner start to learn machine learning if they have some knowledge of programming languages?

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If you have some knowledge of programming languages, then you're already off to a good start! Machine learning (ML) is a field of study that involves using algorithms to automatically learn patterns in data and make predictions or decisions

How does a total beginner start to learn machine learning if they have some knowledge of programming languages?

ChatGPT

If you have some knowledge of programming languages, then you're already off to a good start! Machine learning (ML) is a field of study that involves using algorithms to automatically learn patterns in data and make predictions or decisions based on those patterns. To get started with ML, here are a few steps you can take:

1. Learn the basics of statistics and linear algebra: These are essential for understanding the mathematical concepts behind ML algorithms.
2. Choose a programming language: Python is a popular choice for ML, but other languages like R and Julia can also be used.
3. Learn the basics of ML algorithms: Start with simple algorithms like linear regression and decision trees, and then move on to more complex ones like neural networks.
4. Practice on real-world datasets: Kaggle is a great resource for finding datasets and participating in ML competitions.
5. Learn from others: Attend ML meetups, read blogs and books, and follow experts on social media to stay up to date with the latest trends and techniques.

Remember, learning ML takes time and practice, so be patient and keep learning!

Tell me more

Can you recommend some good resources to learn linear algebra?

What are the most popular datasets on Kaggle?

Can you explain neural networks in simpler terms?

Anup

Data Analyst at Multinational Corporation (MNC) (2020–present)Jun 20

If you're a total beginner with some knowledge of programming languages and you want to start learning machine learning, congratulations on taking the first step! Machine learning is a fascinating field with numerous opportunities for professionals and graduates like you. Here's a comprehensive guide to help you get started:

1. Solidify your programming foundation: Since you already have some programming experience, it's essential to strengthen your foundation. Focus on languages commonly used in machine learning, such as Python and R. Familiarize yourself with their syntax, data structures, and libraries commonly used in machine learning, such as NumPy, pandas, and scikit-learn for Python.

2. Understand the core concepts: Machine learning is built upon mathematical and statistical principles. It's crucial to grasp the foundational concepts, including linear algebra, probability theory, and statistics. You can find online resources, textbooks, or courses that specifically cover these topics.

3. Dive into machine learning theory: Familiarize yourself with the fundamental concepts of machine learning, including supervised learning, unsupervised learning, and reinforcement learning. Understand different algorithms like linear regression, logistic regression, decision trees, and support vector machines. Study their principles, advantages, and limitations.

4. Get hands-on with projects: Practical experience is invaluable in machine learning. Start by working on small projects to apply what you've learned. Kaggle, a platform for data science competitions, offers datasets and problem statements to practice your skills. Work on these projects, implement machine learning models, and learn from the community by studying their approaches.

5. Explore online courses and tutorials: Online courses are a fantastic way to learn machine learning systematically. Platforms like Coursera, Udemy, and Tutort Academy offer a wide range of courses tailored to different skill levels. For beginners, I recommend the following courses:

- "Machine Learning A-Z™: Hands-On Python & R In Data Science" on Udemy: This course provides a comprehensive introduction to machine learning using both Python and R. It covers various algorithms, practical examples, and real-world projects to help you build a solid foundation.

- "Machine Learning by Stanford University" on Coursera: This course, taught by Andrew Ng, is highly acclaimed and covers the fundamentals of machine learning. It provides a theoretical understanding of key algorithms and practical experience through programming assignments.

- "Python for Data Science and Machine Learning Bootcamp" on Udemy: This course focuses on using Python for data science and machine learning. It covers essential libraries, data preprocessing, visualization, and building machine learning models.

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For professionals, I recommend this following courses:

- "Artificial Intelligence and Machine Learning" on Tutort Academy: This course focuses on real-world applications of machine learning. It provides hands-on experience by working on various projects and case studies across different domains, also this course is in collaboration with Microsoft. You'll learn how to apply machine learning techniques to solve practical problems and gain valuable insights into the implementation process.

6. Join communities and participate in forums: Engage with the machine learning community to learn from experienced practitioners, ask questions, and seek guidance. Participate in online forums like Reddit's r/Machine Learning or Stack Overflow's machine-learning tag. Networking with like-minded individuals will help you stay motivated and provide valuable insights.

7. Stay updated and practice regularly: Machine learning is a rapidly evolving field. Stay informed about the latest research papers, industry trends, and advancements in algorithms and techniques. Follow influential researchers and experts on social media platforms like Twitter, LinkedIn, or Medium to access informative articles, tutorials, and discussions.

Remember, learning machine learning is a journey that requires patience, persistence, and continuous practice. Start small, build a strong foundation, and gradually work your way up to more complex concepts and projects. Embrace the challenges and enjoy the process of acquiring new skills and knowledge.

Good luck on your machine learning journey, and don't hesitate to reach out if you need further assistance or recommendations!

Chomba Bupe

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develops machine learning algorithmsUpvoted by

Rahil Sheth

, Mtech Computer Science, International Institute of Information Technology, Hyderabad (2019) and

Damayanti Ghosh

, MS Computer Science, University of Alberta Faculty of Science6y

Originally Answered: How does a total beginner start to learn machine learning?

A lot of answers here are talking about Coursera online courses, I would probably say that it is cool to do online courses but I didn't learn machine learning (ML) that way, I learned by doing, **practicing** the stuff for years continuously even to this very day I still code up some ML algorithms and slowly growing my own library for ML and computer vision.

I read a lot of **journals** i.e the recent interesting paper from Google DeepMind **WaveNet** and over the past 6+ years I have read a lot of journals covering a lot of algorithms in ML from k-means clustering and hierarchical clustering through ***support vector machine*** to ***deep learning*** algorithms. I normally read a single journal 8 or so times before understanding the underlying stuff. I also complement the journals by watching YouTube presentation videos such as

or referencing to Wikipedia or other sources such as answers on Quora.

I am mainly self-driven thus I can set goals and pursue them even without a mentor I get things done. For example at some point I had little understanding of the underlying backpropagation algorithm but when I set a goal to understand it I was able to do that just by using a Wikipedia article on backpropagation and in one day I was even able to code my own backprop algorithm to optimize my very own neural networks in my library. I recycle a lot of knowledge to avoid wasting time and I learn by first principal.

My self-studies are triggered by **curiosity**, I would first become curious when I encounter a particular technology then I would think about the possibilities by brainstorming then I would identify the stuff I need to understand in order to fully grasp the technology at hand. I would then take a few days or weeks depending on the complexity of the problem at hand researching the technology and to be able to code up the stuff, I normally use my own library to speed up the coding of the algorithms which I have been building upon for some years now.

Thus the methodology I use is an **engineering approach** to solving problems, the answers here are suggesting a more **scientific approach** which is good for most people I guess, on my part the engineering methodology helps me learn more practical stuff because I learn ML and computer vision for practical reasons because I am building a

robot operating system. I didn't learn ML or computer vision to get a job but just to build complex systems like I am working on a very advanced vision system called **IRIS**-(integrated recognition and inference system) to process visual stimuli using novel learning algorithms. The IRIS system so far learns using very few training examples and it is designed to achieve one-shot learning via a complex form of transfer learning which I designed but I am still doing finishing touches on it plus run several experiments.

On your part since you are just beginning, you need to know some **maths** such as **linear algebra**, **numerical optimization**, **differential calculus** and **statistical** analysis. I personally know those stuff because I am an electronics engineer by profession, so if you are starting from scratch completely make sure to know your maths and learn **coding** as well such as in **Python**, **Java** and **C/C++**. Then start reading journal after journal and practice a lot by coding stuff from scratch, it will take you some time to start getting used to this routine but it will make you one of the best in the field.

It is okay you can also take online courses as suggested by most answers here such as **Coursera** or others that is up to you but you need to be **passionate** and **curious** in order to learn such complex stuff on your own. You also need to be open-minded and learn as you go.

Here is an example of the many journals I have read: NOTE: I read based upon the task I am currently working on so all these journals will show you a snapshot of the complexity of the stuff I am currently working on.

1. Reciprocal nearest neighbor clustering
2. Deep face
3. Sequential minimal optimization for SVMs
4. R-CNN
5. SIFT
6. Computer Vision: Algorithms and Applications check the pdf draft here

Hope this helps.
Choose Python project-based learning or step-by-step courses, providing hands-on experience.

William Lifferth
, M.S. Computer Science, Arizona State University6y
Originally Answered: How does a total beginner start to learn Machine Learning?

Awesome questions! Machine learning is a great field to get into; not only is it highly sought after by employers, it also helps you understand the world in a new way.

Most machine learning algorithms are based heavily in math, and are made possible by programming. Here are the basic things I would suggest picking up as you tackle machine learning:

1. **Matrix Algebra:** Matrix algebra is really important when you start working with large amounts of data; here's a good online matrix algebra class from MIT: Linear Algebra
2. **Statistics**: It's been argued that machine learning is really just computer aided statistics. I'm not sure if I totally agree with that, but having a basis in statistics will help you wrap your head around a lot of the simpler learning algorithms (i.e. regression). I haven't taken this course specifically, but I've heard good things about Udacity's statistics offering: Elementary Statistics Course Online
3. **Calculus**: I know, now it sounds like I'm just listing off every math class I know—like I said, machine learning is math-heavy. You don't need *that* much calculus, but having a basic grasp of what a derivative is will be really helpful. This page is pretty simple, but if you can get through it and fell like you understand what's going on, you're in good shape (at least to start): The Definition of the Derivative
4. **Programming**: Of course you'll have to program in order to actually implement learning algorithms, and it's good to know a general purpose programming language. You said you have experience with Java and Python and those are great. If you didn't I would recommend picking up Python through CodeCademy: Python
5. **MatLab**: It's important to know how to program in general, but it's also really helpful to be familiar with MatLab; you can effectively study machine learning in another language (i.e. Python) but so many of the resources for beginners use MatLab. If you are in college you can probably get MatLab for free through your institution. If not, I would suggest trying out Octave; it's fairly similar to MatLab, and its free.
6. **Basic Learning Algorithms**: Finally to the fun stuff. To get a feel for the basics I would strongly suggest you check out Andrew Ng's Coursera course on machine learning. It's well made, and very accessible. In it he draws on all the things in this list; although he briefly introduces each of these subjects, it'll be a lot easier if you have a foundation in all of them before tackling machine learning: Machine Learning - Stanford University | Coursera

If you can make your way through this list, by the end you should at least be familiar with the field of machine learning, and be prepared to figure out what you want to learn next. Good luck!

Related questions
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Chomba Bupe

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Related
How should I start to learn machine learning from scratch, from the beginner to the advanced level?

Originally Answered: How should I start to learn machine learning from scratch, from beginner to the advance level?
Great answers here already:

The foundation of machine learning (ML) is maths and not data science. So start by polishing up your maths skills. ML currently is a very hot area with many more people trying to learn it but most don't understand that the underlying principles in machine learning are that of optimization theory in maths.

Thus to give you a boost revisit the prerequisites.

1. **Maths**:
    a. Linear algebra: Make sure you are comfortable with matrices, vectors and singular value decomposition (SVD).
    b. Calculus: Especially differential calculus, become comfortable with evaluation of derivatives of any function and learn chain rule.
    c. Numerical optimization: Like I said above ML is currently more related to numerical optimization than anything else.

Most optimization methods are variants of gradient descent such as stochastic gradient descent (SGD). So learn about first order and second order optimization methods.

d. Statistics and probability: Bayes theorem, random variables, probability distribution functions such as the Binomial and Gaussian distributions. Sigmoid and softmax functions are motivated by probability.

2. **Programming**: In any of the following:
    i. Python: Is an easy to learn scripted language that you can quickly pick up for the purpose of practicing what you are learning. Python has a lot of ML libraries supporting it thus it is ideal not only for beginners but also for experts.
    ii. Java: is a fairly high-level language that is fairly easy to learn but not as easy as Python. It also has a lot of ML libraries supporting it.
    iii. C/C++: Don't mess with this one at beginner level but start getting used to writing ML code from scratch as you advance so that you can learn more details about most ML algorithms. It is recommended to build your own mini-ML library at some point in your learning journey using such low-level high-performance languages.

With that said, there are several roadmaps to reaching your destination. I can split them up into three stages.

1. Beginner stage.
2. Intermediary stage.
3. Advanced (expert) stage.

Beginner stage:

The beginning part has been partially covered above, begin with maths. And if you are not good at maths you will need to make sure you are good. Thus make sure to sharpen the axe before starting to chop down the tree. Maths is very important for learning ML as most of the times, systems are expressed in mathematical terms. So before starting, please go through the basics. Don't worry about forgetting something along the way, you can always go back to revisit the stuff you have forgotten, this is not an exam.

This is where you also have to set yourself up for success in ML, so I suggest you skim through the basic concepts of ML and the book

[1]

by Ian Goodfellow and others is an excellent book to introduce you to ML and the current hot area in ML called deep learning (DL). Go through the book in any order you like but make sure to read the introduction first.

At beginner level is also the time to sharpen up another axe, programming. Practice coding on problems that are not even related to ML so that you can learn the syntax of that language. You can't learn coding by reading but through practice. Python being English-like is very easy to pick up and there are a lot of resources out there teaching Python coding. Just Google and you will find high quality tutorials on Python programming. In fact your best way to learn coding is to just jump directly to coding and just Google and Stackoverflow your way through learning the syntax of the language. Every modern programmer owes their project completions to Google and Stackoverflow, let no one lie to you, we are in an era of powerful "cheating" tools like Google search. Don't just copy and paste though, understand the solutions you find online and code your own versions afterwards. If you can't code a matrix operation in Python just Google and try to understand what others did. Sometimes very basic code can be just copied and pasted.

Also go through the TensorFlow (TF) tutorials as well. They will not only introduce you to TF but also to the concepts of ML such as linear and logistic regression.

Intermediary stage:

At this stage you should have already read several online sources such as articles, books and watched several YouTube videos on ML and you should have coded up some models at high-level using libraries like TF. Now it is time to start moving forward, you need to make sure that that knowledge does not slip away, you need to consolidate that knowledge in your mind.

This is where things start to get interesting because you need to now ask yourself, can I implement backpropagation algorithm from scratch? You will notice that you probably wouldn't, that's okay. You need at this point to start pursuing proofs like deriving mathematical expressions you find while reading ML literature. Try to derive backprop for simple neural networks yourself from your own perspective and understanding and see if you can translate that maths to actual working code. Try to also implement convolutional neural networks (CNN) and recurrent neural networks (RNN) from scratch.

This is where you start to build your mini-ML library. You will be able to learn a great deal of detail about ML this way. Implement stochastic gradient descent and train your own ML models using your own mini-ML library and debug until the models work comparable to those from mature libraries like TF. Open source the mini-ML library afterwards to further show off your skills to potential employers or for the purpose of getting into the Google Brain residency program for example.

You also need to start reading journal after journal at this point. At first it will be hard but with more reading and rereading you will start to understand even complex journals from the likes of DeepMind, OpenAI, Microsoft, Facebook and Google. If you start to understand journals it means you are advancing well towards your goal.

Advanced stage:

Yes coding your own mini-ML library is sort of like reinventing the wheel but it is essential for learning the details of the most important underlying concepts in machine learning but not sufficient to make you an expert. This advanced stage comes after spending a few years in the intermediary stage.

In the advanced stage you need to start paying attention to your own intuitions and ideas. Build or start working on actual novel ML algorithms. You will need to empirically or theoretically validate your ideas by implementing them and doing lots of experiments. It is somewhat hard to design a novel ML algorithm as the ideas come, in form of a eureka moment, after years or months of thinking and lots of research work.

This is why being at an advanced level requires that you have built up a strong mental model of the field of ML from a variety of angles. You don't have to be an expert programmer though, as the coding skills only need to help you implement your models.

At this stage start asking and pursuing deep questions to which there are no answers yet. Focus on areas that are counterintuitive and try to come up with more novel intuitive solutions to those areas. It is like a PhD program.

That is a possible roadmap for someone trying to learn ML. It is also important to practice by explaining complex ML systems to someone else. Quora is a great place for answering ML related questions, that way you will be able to consolidate your knowledge when explaining the ML algorithms to others, it's a win-win situation, you help others while you gain and consolidate knowledge yourself.

The other thing worth noting is that you really need to be passionate about the ML field otherwise it won't be easy. You also need to have tenacity because some concepts take long to understand fully, you may think that you get a concept up until it's time to implement it yourself. Thus learning ML especially by yourself requires serious discipline and focus. You can only maintain that focus if you are passionate and determined to learn ML.

With that said the journey itself is quite fun, fulfilling and challenging, not hard but challenging just keep going and read anything that interests you concerning ML.

Be passionately curious, you will get there.

Hope this helps.

Footnotes
[1]
Deep Learning

Lucky Chauhan

Absolutely! Learning machine learning can seem daunting at first, but with the right resources and approach, anyone can become proficient in this exciting field.

🤖 What is Machine Learning?

Machine learning is a type of artificial intelligence that allows computers to learn from data and make predictions or decisions based on that learning. It involves building models that can identify patterns and relationships in data, and then use those models to make predictions about new data.

🗄️ Where to Start?

If you have some knowledge of programming languages, then the first step is to gain an understanding of the mathematical and statistical concepts that underpin machine

learning. This will include concepts such as linear algebra, calculus, and probability theory.

Once you have a good grasp of these foundational concepts, you can start exploring machine learning algorithms and techniques. Some popular algorithms that you might want to explore include:

- Linear Regression
- Logistic Regression
- Decision Trees
- Random Forests
- Support Vector Machines
- Neural Networks
-

Learning Resources

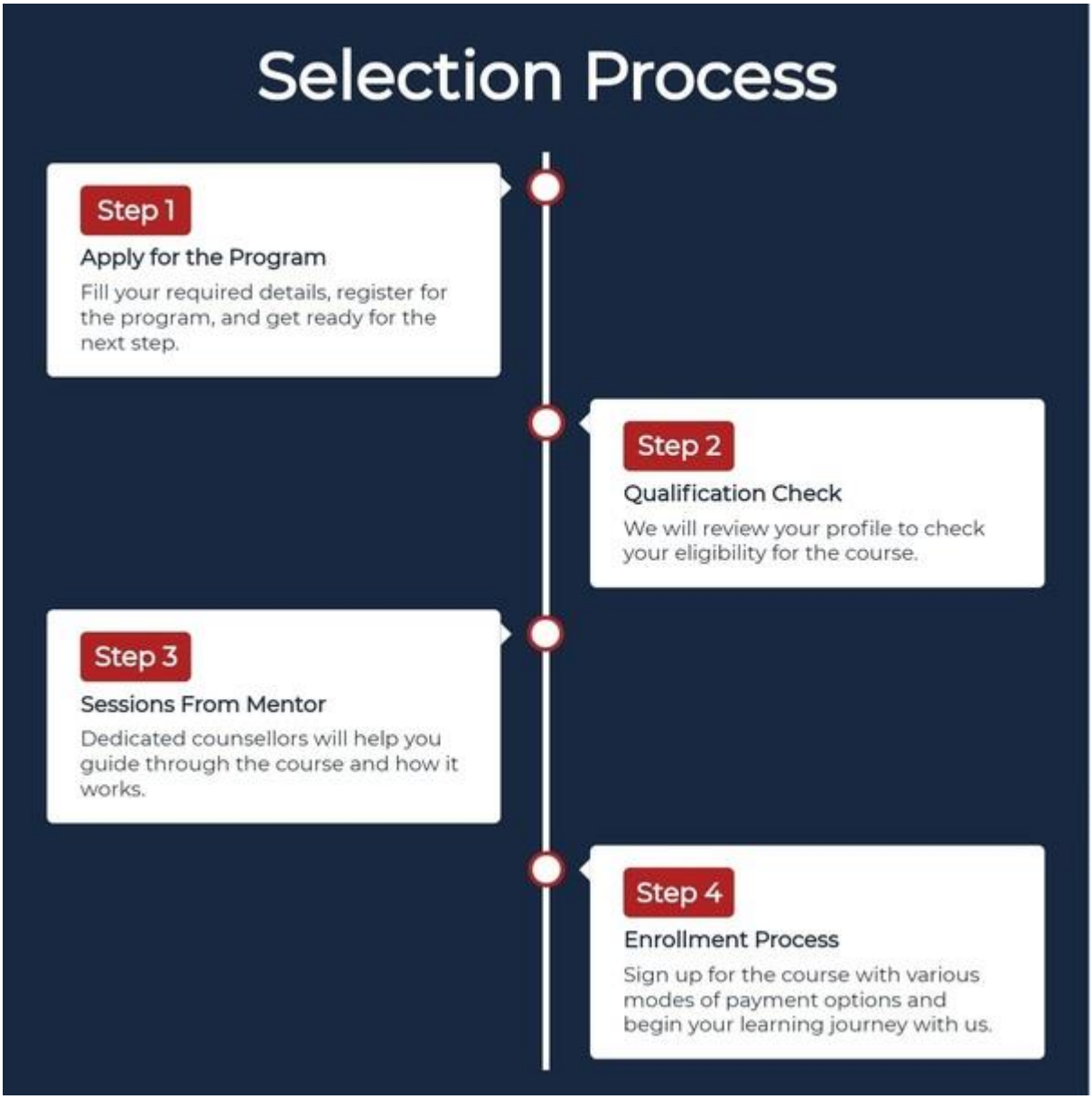
There are many online resources available to help you learn machine learning. Some popular options include:

Simplilearn: Simplilearn offers a range of courses in machine learning, including both beginner and advanced options. Their courses cover topics such as data science, Python programming, and deep learning.

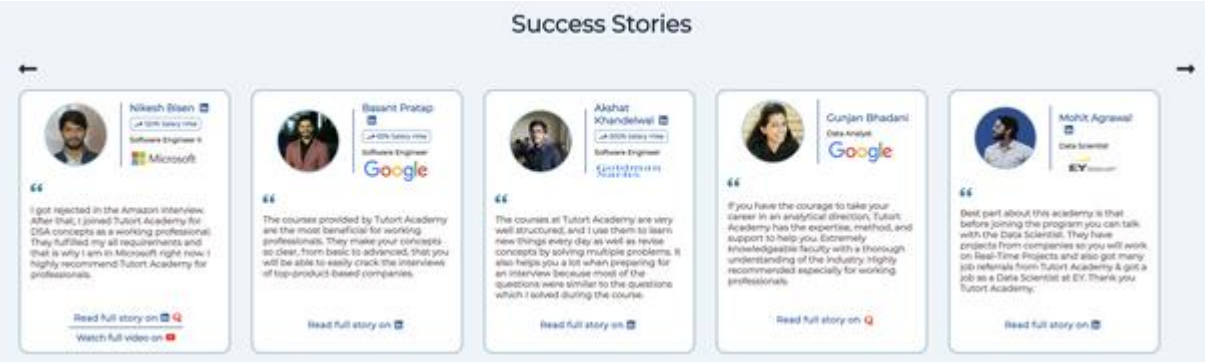
Tutort Academy - Are you a working professional looking to master the exciting world of data science and apply your skills in the real world? Look no further than their Full Stack Data Science Master's course.

- This comprehensive **8-month program has been designed by industry experts** and is taught by experienced data scientists from some of the world's leading companies, including Google, Zoom, Microsoft, EY, and Amazon.
- Featuring **live online classes on weekends and weekdays**, as well as warm-up coding sessions for non-technical students, the course's curriculum is continually updated to reflect the latest industry trends.
- **Small class sizes** enable interactive learning and personalized 1:1 doubt sessions, while **real-time projects** in domains such as BFSI, E-commerce, Fin-tech, Retail, and Automotive provide domain-specialized training.

- When you apply for the course, you go through **2 step counseling process,** their admission committee will shortlist your profile, and after that data scientist will review it to provide personalized advice and discuss the course's features and benefits in detail.



- With the option to **attend multiple batches with multiple mentors for 2 years,** the course is flexible enough to fit any schedule. Upon enrolling, you'll have permanent access to our LMS portal containing all recorded training materials.
- Upon completion, their placement team offers **100% guaranteed job calls from top companies** and startups, as well as assistance in building your resume and LinkedIn profile, and mock interviews with our data scientists.
- Don't just take their word for it - They have placed 1**000+ students in top companies, have 250+ hiring partners,** and their alumni have shared their experiences on LinkedIn, YouTube, and Quora, giving you the chance to learn more about their journey.

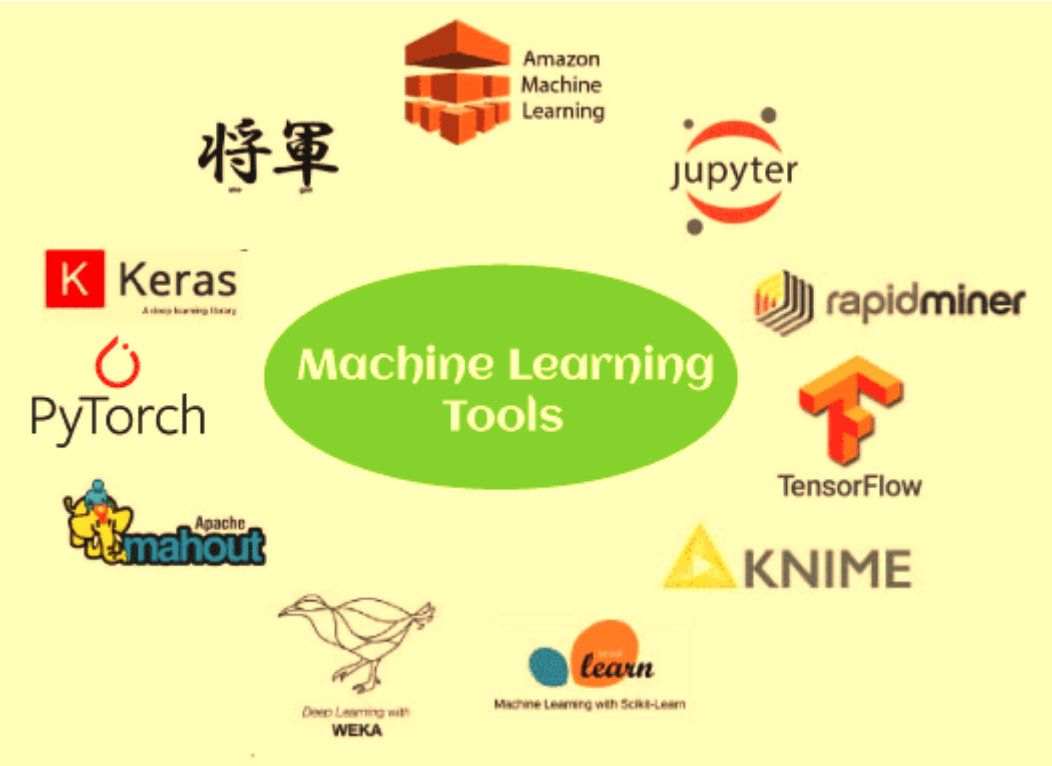


Coursera: Coursera offers a number of machine learning courses from top universities, including Stanford and the University of Washington. These courses cover topics such as supervised learning, unsupervised learning, and neural networks.

Udemy: Udemy offers a wide range of machine learning courses at different levels of difficulty. Their courses cover topics such as Python programming, data science, and deep learning.

☑ Practice Makes Perfect

One of the most important aspects of learning machine learning is to practice. This will involve working with real-world data and building your own models. There are many datasets available online that you can use to practice your skills.



🗃 Tools and Frameworks

There are many tools and frameworks available that can help you build machine learning models. Some popular options include:

- **TensorFlow:** TensorFlow is an open-source machine learning framework developed by Google. It allows you to build and train machine learning models using a variety of techniques, including neural networks.
- **Scikit-learn:** Scikit-learn is a popular machine-learning library for Python. It includes a wide range of algorithms and tools for data preprocessing, model selection, and model evaluation.
- **PyTorch:** PyTorch is another open-source machine learning framework that is gaining popularity. It allows you to build and train neural networks using Python**.**

🎓 **Conclusion**

In conclusion, if you are a total beginner looking to learn machine learning with some programming knowledge, start by gaining a solid understanding of the mathematical and statistical concepts that underpin machine learning.

- Then explore popular algorithms and techniques, and use online learning resources to build your knowledge. Practice is key, so work with real-world data and build your own models.
- Finally, use popular tools and frameworks such as TensorFlow, Scikit-learn, and PyTorch to make your learning process easier and more efficient. Good luck on your machine-learning journey!

I hope this helps you get started on your machine-learning journey! Good luck! 🚀

Abhay Rajput

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Data Science Enthusiast (2020–present)Aug 26

Machine Learning, the revolutionary field that powers self-driving cars, recommendation systems, and even medical diagnostics, has taken the world by storm. If you're a total beginner with a knack for programming, you're in for an exhilarating ride!

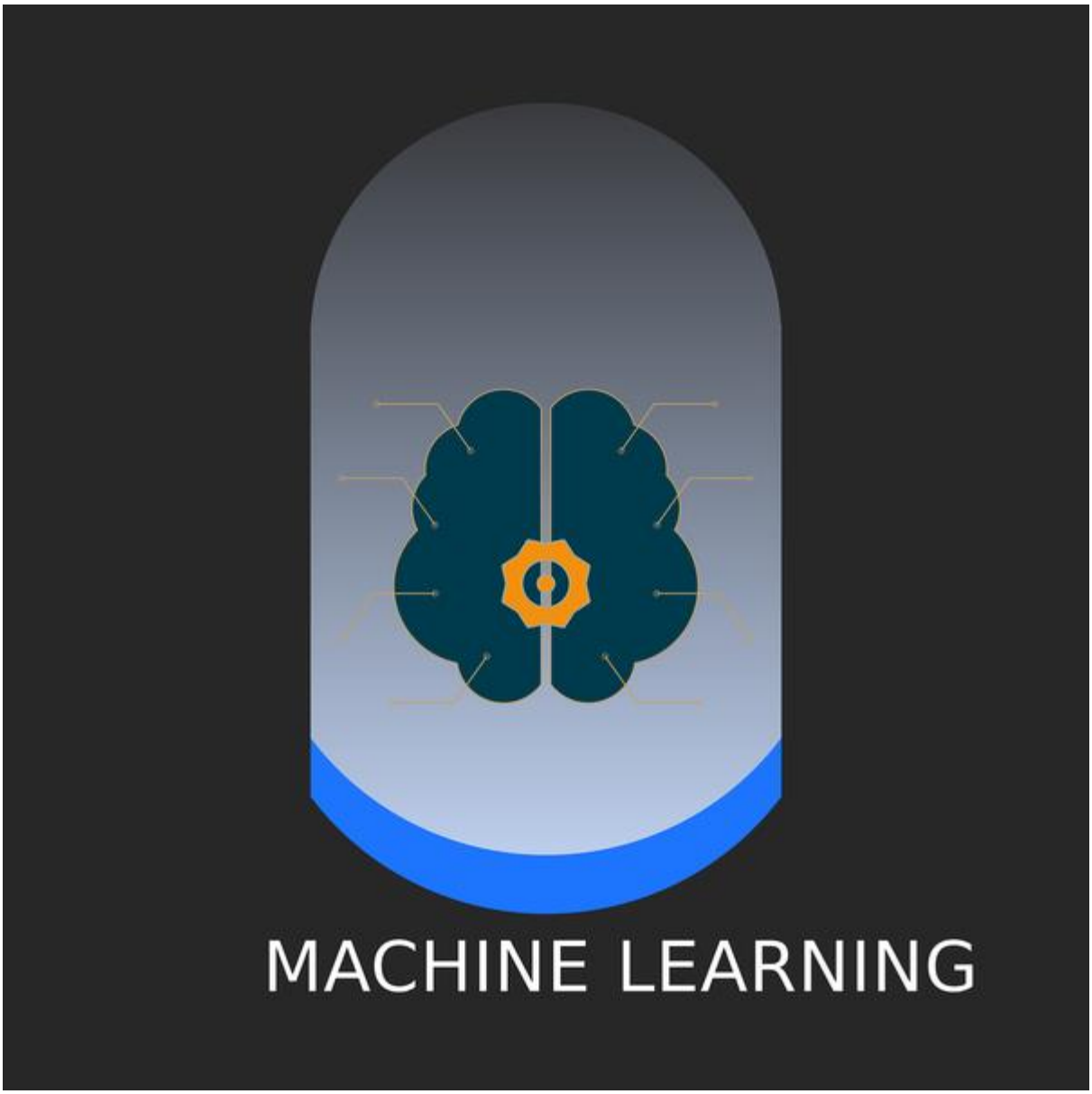
✳️ This answer will guide you through the process of diving into the captivating world of machine learning, leveraging your existing programming knowledge as a launchpad.

🎯 Getting Started with Machine Learning:

Build a Solid Foundation: While having some programming background is a great starting point, familiarize yourself with Python – the go-to language for machine learning. Its extensive libraries (NumPy, Pandas, Matplotlib, etc.) will become your best buddies. 🐍

Understand the Basics: Begin by grasping fundamental concepts like data types, variables, loops, and conditional statements. This is crucial groundwork that will serve you well when dealing with machine learning algorithms.

Delve into Machine Learning Concepts: Equip yourself with a clear understanding of machine learning's key ideas: supervised vs. unsupervised learning, regression, classification, clustering, and more. Books like "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron can be incredibly helpful.



🌟 Skills Required for the Machine Learning Expedition:

- **Mathematics:** A bit of math, especially linear algebra and calculus, will empower you to comprehend algorithms and models better. Khan Academy offers free courses to sharpen your mathematical skills. 📚
- **Statistics:** Probability, distributions, and statistical analysis are your friends in machine learning. They help you make sense of data and evaluate models effectively.
- **Coding Proficiency:** Your programming knowledge will be your backbone. Continue honing your skills by working on coding challenges, contributing to open-source projects, and experimenting with small projects.

🤘 Benefits of Merging Programming Skills with Machine Learning:

- **Faster Learning Curve:** Your familiarity with programming concepts accelerates your understanding of machine learning, as many concepts share similarities.

- **Efficient Problem Solving:** Programming skills enable you to write cleaner, optimized code, troubleshoot errors, and debug effectively.
- **Endless Creativity:** Armed with both programming and machine learning, you can explore innovative ideas, create unique applications, and contribute to groundbreaking projects.

🎓 **Institutes to Fuel Your Machine Learning Passion:**

Great Learning:

- Great Learning is an Indian ed-tech company that provides professional courses and programs in collaboration with universities and industry experts.
- They offer a range of programs, including online bootcamps, postgraduate programs, and specialized courses.
- Their courses are designed to help individuals upskill or transition into new careers, and they cover areas like data science, artificial intelligence, machine learning, and more.
- Great Learning's machine learning courses often include hands-on projects, real-world case studies, and industry-relevant content. They aim to provide a holistic learning experience that combines theoretical knowledge with practical skills. Their instructors typically have industry experience, and they offer mentorship and career support to help students succeed. But their courses are comparatively expensive.

Tutort Academy: I highly recommend enrolling in the Full Stack AI and Machine Learning course offered in collaboration with Microsoft. This program is renowned for its comprehensive machine-learning instruction and has gained substantial recognition.

- The course is tailored for young professionals aiming to transition into Data Science, even if they lack a coding background. The curriculum includes initial sessions to establish crucial programming fundamentals.
- One standout aspect of this course is the learning opportunity provided by experienced professionals from distinguished companies like Google, Amazon, EY, and Microsoft. These experts will guide you throughout the learning journey, ensuring a valuable experience.
- The course maintains small batch sizes to facilitate interactive learning. Live sessions with mentors encourage engagement and active participation.
- A significant focus of the course is on practical application through real-time, domain-specific projects. Successfully completing these projects equips you with skills to tackle industry challenges, enhancing your portfolio and job prospects.
- During enrollment, applicants are evaluated based on specific criteria. Data science experts then personally communicate course features, addressing queries to instill confidence.
- Upon course completion, various benefits support career growth, including guaranteed job calls, mock interviews, and assistance in creating professional materials.
- Furthermore, the course offers abundant placement opportunities, with a substantial number of students securing interviews with leading multinational corporations, leading to salary increases shortly after course completion.
- Access to the Learning Management System (LMS) portal is provided for continuous learning, along with a two-year subscription for engagement in multiple batches with different trainers.

upGrad:

- upGrad is another popular Indian online education platform that offers both degree and diploma programs, as well as shorter courses and bootcamps.
- They collaborate with universities and industry leaders to provide comprehensive and up-to-date content across various domains, including data science, machine learning, AI, and more.
- upGrad's machine learning courses are designed to cater to both beginners and professionals looking to advance their careers. They often focus on hands-on learning, practical projects, and industry-relevant skills. Students can also benefit from upGrad's career services, which may include resume building, interview preparation, and networking opportunities.

Conclusion:

Embrace your programming prowess and channel it into the thrilling universe of machine learning! 🌀 Remember, this journey might have its challenges, but the skills you'll acquire and the opportunities you'll unlock are boundless.

🚀 So, arm yourself with Python, dive into machine learning concepts, nurture your mathematical skills. The world of machine learning eagerly awaits your innovative contributions! 💡🤖
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Nandita Dash

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Machine Learning Specialist at MNCTV (2020–present)Aug 26

Hello folks!!

Machine learning is a branch of computer science that involves data analysis. If you have some knowledge about programming or algorithms, then the battle is half won.

If you're interested in this area, you should learn more about the steps that can help you learn, practice, and get a job in machine learning

If you have some knowledge of programming then the battle is half-won. Suppose you have decided to learn machine learning but need clarification about where to start. Then don't worry; I have your back. I passed through the same stage as you are now. Anyway, you should at least congratulate yourself on your decision to start your career in the most growing field.

How to Get Started with Machine Learning?

- **Learn basic math-** Machine learning requires an understanding of several areas of mathematics. I recommend studying this material if you are new to linear algebra, statistics, probability, and multivariate analysis.

- **Learn Basic Computer Science -** If you have not gained programming experience, we recommend learning basic programming. You can join a training program to learn how to code.
- **Learn Programming Languages -** Programming languages are means of communicating with computers in a way that both humans and computers can understand. Like spoken and written languages, programming languages have their own rules of grammar and syntax. Python is the most commonly used programming language in machine learning.
- **Working on Projects and Building Portfolios -** Once you are comfortable with the theoretical part, you can enhance your practical skills by doing small projects. These projects also help you to build up your portfolio. This is the most important step in learning Machine Learning.

But even if you don't have prior experience with programming still, you can enter the ML field and do your best. You must brush up on your fundamentals and work on hands-on experience. This can be done by opting for online courses that will help you learn more under the mentorship of experienced faculties. ***I am listing some most popular courses for machine learning.***

Tutort Academy

Their **"Full-stack AI and ML Course"** is best for those looking to switch careers to Data Science. The courses are taught in live lectures by experienced data scientists from Google, Microsoft, Amazon, EY, etc. Some more top features are:

Because of their **small batch size,** you will learn by interacting with the mentors.

They **cover 12+ real-time project**s to understand the concepts better and give you a flavour of industrial work experience.

After completion of the course, you will get interview calls from top MNCs as they have collaborated with them for their placements; **their students are working in top MNCs with impressive salary growth.**

They **provide 1:1 mentorships,** including mock interviews, doubt clearance, resume-making, and more.

The most advantageous feature is they **provide you with warm-up programming sessions.** This helps the learners to get prerequisites about the topic and helps in quick understanding. This is a beneficial feature for those entirely new to machine learning.

They **provide lifetime access to video lectures,** all training materials, and comprehensive live classes.

You also have two years of the flexible pass to complete the course; this helps the learner to attend any batch with any instructor for two years to complete the course.

If you are a beginner, an alternate online platform you can go for is Simplilearn

It is one of the platforms for online education around the globe. With self-paced courses, competent instructors, and various certification options, this online learning platform has something for everyone. ***Simplilearn's Bootcamp classes are of the highest quality.***

They also provide you with a community where like-minded people are with whom you can discuss and start doing projects that help to build up experience.

Develop skills for real career growth- Cutting-edge curriculum designed in guidance with industry and academia to develop job-ready skills.

Learn by working on real-world problems- Capstone projects involving real-world data sets with virtual labs for hands-on learning.

Learn from experts active in their field- Leading practitioners who bring current best practices and case studies to sessions that fit into your work schedule.

Drawback: They have a high batch size that can minimize the healthy interaction between mentor and learner, with no personalised guidance.

Conclusion

Although the list is too long for online platforms providing Machine Learning courses, some other platforms like Coursera, Edureka, and Great Learning are famous, and you can check out their courses.

Machine learning is a fun and exciting field of learning that allows individuals to test their skills and knowledge without limits. Building a career in this field starts with thoroughly understanding ML and related concepts. Start your journey by choosing the right platform.

Santosh Kumar

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I want to learn artificial intelligence and machine learning. Where can I start?

Originally Answered: I want to learn Artificial Intelligence and Machine learning. Where can I start?

Artificial Intelligence (AI) and Machine Learning will be here for the long term. The majority of industry verticals harness AI and ML to create multiple job opportunities and a better future.

Recent innovations such as intelligent voice assistants and self-driving vehicles, robotic process automation, and so on have helped ML and AI gain traction. This has taken the world by storm, and everyone is eager to learn more about it.

AI and ML are in constant change and evolving daily. A few universities offer a formal degree, but you can achieve it in many other ways.

I have compiled the most effective ways to learn AI/Machine Learning after extensive research.

My best tip for learning AI and machine learning is to follow a 5-step process.

Step 1:

- Change your mindset. You can apply machine learning and AI to your everyday life.
- Question yourself, What is Holding you Back From Your Machine Learning Goals?
- Why Machine Learning and AI Does Not Have to Be So Hard
- How to Think About AI and Machine Learning
- Find Your Machine Learning and AI Tribe

Step 2:

- Choose a process and use a systemic approach to problem-solving. To solve problems, use a systematic approach.
- Applied Machine Learning Process

Step 3:

- Choose a tool. Choose a tool that is appropriate for you and map it onto the process.
- Beginners: Weka Workbench.
- Intermediate: Python Ecosystem.
- Advanced: R Platform.
- Select the Best Programming Language for Machine Learning and AI that helps you at any level.

Step 4:

- Use datasets to your advantage and practice the process. Choose datasets that you would like to use and then practice the process.
- Practice Machine Learning with Small In-Memory Datasets
- Tour of Real-World AI and Machine Learning Problems
- Work on AI and Machine Learning Problems That Matter To You

Step 5:

- Create a PortfolioDo it. Gather information and show your abilities.

- Build a very own standardised Portfolio
- Get Paid by Applying for an appropriate job
- Start and maintain a good career with great achievements and make AI and Machine Learning For Money.

You can learn through E-books.

The best and most traditional way to learn about any field is through books, especially AI and ML.

Many e-books are available such as ***Artificial Intelligence: A Modern Approach.*** However, if you want to learn how to create AI, this book is a must-read. The book was written by AI experts Stuart Russell, Peter Norvig. This book covers all aspects of Artificial Intelligence from A to Z, including first-order logic, reinforcement and learning, and neural networks.

Possible with Blogs and Websites

Some many blogs and websites deal with Data Science. Blogs and websites are one of the best learning tools. They also provide many practical skills and experience.

Kdnuggets and **Kaggle** are some of the most visited blogs and websites. Reddit and Google News on Data Science are two examples of important news sources related to data science.

You can even learn AI and Machine learning through the online platforms

Online courses are the best way to learn AI.

Let's look at some resources that will teach you how to master AI and Machine Learning.

- **HackerEarth**

How do you start learning AI/ML? HackerEarth is an excellent online resource for engineers and developers who are just starting to learn these technologies. This site offers many blogs and product guides that discuss how to learn AI, Machine Learning.

- **Google Machine Learning**

Google's "Introduction to Machine Learning Problem Framing" online course is another interesting resource. It is a 1-hour-long course that helps you to frame and solve problems with Machine Learning. You will be able to build your data and train your ML model. If you are just starting, you will need to learn everything from the most basic concepts to advanced algorithms. The third option might be a good choice.

- **Online courses in Python**

Learning Python programming is a great way to get started if you don't have any programming experience. Data Science with Python is another option. It allows you to create and implement popular Predictive Analytics algorithms such as Forecasting and Regression. Also, classification and segmentation ML algorithms such as Random Forest and K Means using Python. This is a great option for beginners who are interested in Data Science.

Learning through Courses/Institutes. **I recommend that you first build a solid foundation in your technical skills before moving on to a course. This is why I recommend it:**

A. Although you can certainly learn from free materials online, they do not have a structured curriculum. As a result, it is possible to waste time learning a concept, only to find out later that it wasn't so important.

B. Invest in your time, not in saving money. Imagine investing in courses to save one year.

C. Many Indians have the mentality that why spend money on a course. Why not? Instead of being stuck in a rut, why not take a course? You will reap the benefits if you do it.

You can find courses at some great institutes that I recommend, and you can certainly try them if they suit your goals.

You can find courses at some great institutes that I recommend, and you can certainly try them if they suit your goals.

Some top institutes/courses can be used to achieve great heights.

- Learnbay
- Coursera
- Udemy

A. Learnbay: Advance AI and ML Certification Program in Collaboration with IBM

I highly recommend this data science course for working professionals with more than 4 years of experience and planning an ML and AI career within an upcoming couple of years.

The key reason for such recommendation is ***Learnbay's domain expertise in artificial intelligence and machine learning training.*** Therefore, instead of dumping everyone into the same course, Learnbay offers you the scopes of choosing the elective modules per your industry experience. Below are a few of such domains.

- **Oil and gas industry:** Here, you learn AI-powered data-oriented practices of high-performance machines, oil drilling activity, power outage advantage identification and automated solution at the very early stage, etc.
- **Media communication and transportation industry:** Here, you learn deep learning associated solutions for customer segmentation, identification, client satisfaction management, security management, regional market studies, etc.
- **Mechanical and production industry:** Here, you learn the advanced application of Big Data analytics and different machine learning algorithm types to make the production process more agile. You also get to know the core of data-driven fabrication design with solid works.
- **Telecommunication industry:** Here, you learn the machine learning implemented network quality management and less manpower

associated but more accurate teleco's extracting values as well as strategic outputs.

- **Supply chain industry:** here, you learn the advanced application of AI and ML in stakeholder network analysis, logistic management, NLP and text analytical application for better customer supports, etc.,
- **Banking and finance:** Here, you get to know the process of automated banking and financial deal management, card related fraud detection, NLP associated self-run recommendation systems, etc.

Technical background candidate can choose a second elective domain from core engineering like

- *System designing and data structure*
- *Cloud computation*
- *IoT and automation.*

Other than that, you get

- 24*7 tech support.
- From reviewing your resume/profile to deciding which course to enrol in.
- You can also join another batch if you cannot attend a particular batch. Thus, there is no chapter you will miss. *Furthermore, you even get a **2 years subscription so that even after you complete the course, you can attend any live and interactive classes for more than 1 year.*** This is an excellent feature that Learnbay has added to my experience.
- They can also refer you and assist in your selection for an amazing job with AI.
- Their Course Fee is another reason. It's very affordable and can be incorporated into any budget. The particular AI and ML course cost 79,000 INR.
- The courses have the main advantage of allowing you to work with real-world data science projects.
- You will also be working on 16+ real-world projects and two capstone projects. This allows you to put all your learnings into practice under one roof.
- Course Duration is 9 months.

Overall, it's a great platform to promote your interest in AI but preferably for experienced pros. *For less experienced candidates and freshmen, below are the two alternative options.*

B. Coursera:

Andrew Ng Coursera recorded tutorials video-based to complete this extremely reliable AI course.

This course is designed to teach you how Machine Learning works.

This is why I can't stress enough how this course is best suited to theoretical learning. You will also need to practice the course to reap its learning benefits.

This course is recommended for beginners to learn about AI and ML. The theory behind these concepts will be clear to you. This book will give you a lot of knowledge.

C. Udemy:

Udemy courses should be taken at least once. You will be given a brief introduction to AI.

This brief overview will give you an idea of how AI works with real-world data. Along with deep learning theory, you will see how AI can be applied in real life. You will learn how computers can improve every day without human intervention. You will also learn about self-driving cars.

Udemy is a well-known brand that has been around for many years. So you can trust their high-quality courses.

I recommend that you continue with self-learning. Then, once you feel confident, you can enrol in a course to help you get to know more.

Additional Bonus Tips:

Join AI and ML communities on LinkedIn, Telegram, etc. Networking with others is a great way to practice. You will be motivated to work harder if you see others putting in an effort. Happy Learning!

CONCLUSION:

There is no one right way to learn AI or ML technology. The more you know, the better. These resources are a great starting point to your journey in learning Artificial Intelligence (and Machine Learning). Are you interested in pursuing AI/ML? This Machine Learning and AI Courses, by any method listed above, will help you to accelerate your career in emerging tech.

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If you're a total beginner with some knowledge of programming languages and want to start learning machine learning, here's a step-by-step guide tailored to your needs:

Step 1: Understand the Basics

Before diving into machine learning, it's essential to grasp some fundamental concepts. While you don't need an extensive background in ***advanced mathematics or statistics***, having a basic understanding will be helpful. Here are the prerequisites to focus on:

(a) Learn Linear Algebra and Multivariate Calculus

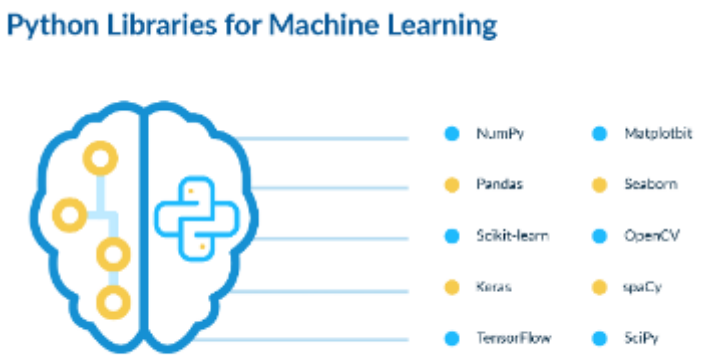
Linear algebra and multivariate calculus play a significant role in machine learning. Depending on your desired role, the level of mastery required may vary. If you aim to work on application-heavy machine learning, you can rely on common libraries. However, ***if you want to pursue research and development in machine learning, it's crucial to have a solid understanding as you may need to implement algorithms from scratch***.

(b) Learn Statistics

Data is the foundation of machine learning, so understanding statistics is essential. You'll spend a significant portion of your time collecting, cleaning, and analyzing data. Key statistical concepts include ***statistical significance, probability distributions, hypothesis testing, regression, and Bayesian thinking***.

(c) Learn Python

While you can use various programming languages for machine learning, Python is currently the most popular choice. If you have a good understanding of Python already then move on and familiarize yourself with Python libraries, such ***as Keras, TensorFlow, and Scikit-learn, which are specifically designed for machine learning and artificial intelligence.***



Step 2: Learn Various Machine Learning Concepts

Once you've covered the prerequisites, it's time to delve into machine learning itself. Start with the basics and gradually progress to more complex topics. Some fundamental concepts to focus on include:

(a) Terminology of Machine Learning

Understand key terms like **models** (representations learned from data), **features** (measurable properties of data), **targets** (variables to be predicted), **training** (using labeled data to train models), and **prediction** (using trained models to make predictions).

(b) Types of Machine Learning

Explore different types of machine learning, such as **supervised learning** (using labeled data for classification and regression), **unsupervised learning** (finding patterns in unlabeled data), **semi-supervised learning** (combining labeled and unlabeled data), and **reinforcement learning** (learning through trial and error).

(c) Practicing Machine Learning

Data collection, integration, cleaning, and preprocessing are time-consuming tasks in machine learning. ***Practice working with real datasets*** to gain experience in data manipulation. Learn various models and understand when to use them in different situations. ***Interpretation of results and familiarity with tuning parameters and regularization methods*** are also crucial skills.

(d) Learning Resources

There are numerous online and offline resources available for learning machine learning. Consider taking courses like ***Stanford's Machine Learning Course by Andrew Ng on Coursera*** or ***Logicmojo's Data Science course which covers complete Machine Learning along with Python and Artificial Intelligence***. These resources provide comprehensive explanations, practical examples, and hands-on experience. Below are few of the features provided in these courses that can help you choose –

Coursera

- A number of universities offer training at this institute. They provide online coaching to students and individuals who wish to get skilled in the field of their choice.
- They have an ***IBM professional course***, which can be availed online.
- The institute has ***tie-ups with universities around the world that offer degrees in several technologies.***
- One can complete their courses at a pace that suits them and at a time that works for them.
- The course requires no prerequisites and is suitable even for complete beginners.
- On completion, of course, a ***certificate is rewarded from IBM*** along with a digital badge.

Logicmojo

Logicmojo has ***curated this course's structure and curriculum based on the various insights offered by data scientists working at the top tech companies***. This course equips students with not just the knowledge but also the skills to thrive in the field of Data Science.

Students undertaking this course work on ***complex and unfiltered real-world data sets & projects prepared in partnership with top tech firms***. The bonus part of this course

is that Logicmojo has included sections on crucial Machine Learning topics such as **supervised**, and **unsupervised learning**, and **Recommender Systems**.

This data science course is a great fit for individuals of all levels of expertise – be it beginner, intermediate, or expert. Let's take a look at their course syllabus.

Course Syllabus

- Basic to Advanced Python

Topics Covered: Numbers, Booleans and Strings. String types and formatting, String operations, List, Tuples, Dictionaries, Function etc.

- Library of Python used for ML/AI

Numpy, Pandas, Matplotlib, Seaborn, Scipy

Data Analysis Using Numpy, Pandas

Data Visualization using Matplotlib, Seaborn

- Applied Statistics in ***Machine Learning***

Fundamentals of Math and Probability (Variables, Sample Distribution, Mean, Median, Mode, Range, Measure of Dispersion, Variance)

Statistics, Statistical Thinking (Hypothesis Testing & Plotting graph, Central limit theorem , Covariance)

- Machine Learning

Machine Learning Algorithms (***Regression, Support vector machine***)

- Deep Learning using ***TensorFlow***

Tensorflow, Keras, Pytorch

Overview Caffe and ***Theano***

- Deep Learning Algorithms

Artificial Neural Networks (**ANN**), Recurrent Neural Networks (**RNN**), Convolutional Neural Networks (**CNN**), Autoencoders and Boltzmann Machine.

Course Duration -

Weekend Batch: 9 Months (3 Hours/Day)

250+ Hours Learning

Step 3: Participate in Competitions

To further enhance your machine learning skills, consider participating in competitions. ***Platforms like Kaggle offer a range of challenges suited for beginners.*** Starting with projects like the Titanic: Machine Learning from Disaster or the

Digit Recognizer can help you gain confidence and practice applying your theoretical knowledge in practical scenarios.

kaggle

Completing these competitions and similar challenges will contribute to your growth as a machine learning engineer.

Finally, I will say that continuously seek out more complex projects and challenges to further develop your skills and creativity in the field of machine learning.

All the best!

Riya Bilan

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First of all, if you have some programming knowledge, you are already halfway there. Machine learning has many subareas and frameworks that borrow from different fields of computer science such as data structures and algorithms, artificial intelligence, or machine learning itself.

- **Firstly,** you should take courses in ***programming language*** and the basics of machine learning. Then move forward with the in-depth tools and packages of machine learning.
- **Secondly,** there are many free ***open-source machine learning packages*** that you can use and write code for on your own. One such

library is sci-kit-learn with many different modules and algorithms under it.

These are some of the ways through which a beginner can start. Also, there is an abundance of courses available out there that teaches all these things from scratch.

As for those who already know some programming, I would recommend going through a course on how to learn data structures and algorithms and finishing off with a section on what machine learning is.

Many online platforms are there that will help you to start your machine-learning journey. Most of them are self-paced. Let's look at some of the top online platforms:

datacamp

This is an ed-tech platform that offers tons of interactive coding challenges, statistics, machine learning, and data visualization tutorials. There is a section where they have videos on various topics related to machine learning such as neural networks, linear regression, clustering algorithms, etc. The platform also offers real-world problems and enables users to get a job by completing various paid projects.

However, they do not offer domain-specific training to their learners.

Learnbay

It offers an ***Advance Artificial intelligence and Machine learning Program.***

Some of the features are:

- This platform is ideal for both working professionals and beginners. This is because they teach everything from the ground up and offer ***domain specialization study.*** As a result, you can master Machine learning in your chosen field**. *BFSI, Healthcare, Media, and Transportation*** are some of the domains they offer.

- Their programs ensure learners with ***guaranteed interview calls. Mock interviews*** are conducted in a personalized way, on the basis of the company of your choice. They also provide MNC job referrals so you can acquire a job quickly.
- This course was created by experts in the field. The course offers real-world examples and exercises to aid in the understanding of machine learning and the development of a solid foundation for artificial intelligence. They offer ***15+ real-time projects and a capstone project to their students.*** These projects are selected from various domains. Some of the projects are, forecasting future sales with trends and price maximization and career progression planning of employees with workforce defections and efficiency.
- Candidates who enrolled in this course will receive ***IBM certifications.***

These certificates include the following,

- Course completion certificate
- Project certification
- Micro-skills certificate.

- Participants in this course can learn through live, interactive lectures while also having access to project innovation laboratories to work on projects during offline sessions using their ***hybrid learning mode.*** Their ***project innovation labs*** can be found in key cities like ***Delhi, Bangalore, Chennai, Kolkata, and more*** **throughout the nation.**

Conclusion

Technology is advancing considerably more quickly thanks to machine learning and artificial intelligence, which is also opening up fascinating new prospects. Now is the perfect time to take advantage of this chance to study and excel in this field. ***For instance, the aforementioned online courses offer excellent Machine learning programs*** and help their learners to get placed in their desired fields and job.

Hope my answer helped!

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What is the best way to learn Artificial Intelligence for a beginner?

Artificial Intelligence is one breakthrough career path of the twenty-first century. It is a remarkable and intelligent decision to choose AI as your career path. People in the IT industry know its potential and pathbreaking career, which they can achieve through learning AI.

This is the reason many IT people are moving towards learning this technology. Apart from that every single industrial domain such as ***BFSI, Marketing, HR, manufacturing, etc is getting highly dependent on AI innovations.***

AI is not just robots shown in movies. It is much more than just that. It is expert-level coding provided by computer systems through processing models to train them to behave in a certain way.

Anyone who wants to learn AI is a beginner at some time, whether it is a fresh college graduate or an individual already working and wants to move into this career path. Everyone starts somewhere someday. So, never take the pressure of the syllabus. For sure, learning is huge, but it is not complex. If followed properly, anyone can achieve it and interest matters more than the discussion on difficulty level.

Let's go through the AI learning path and what are the pre-requirements before choosing this technology as your career path. I have covered all the important points below, so do give it a read:

Prior-requirement of learning AI:

AI is a complicated technology that necessitates a thorough understanding of how systems and software operate. The following are some of the reasons why this technology isn't suitable for fresh graduates:

1. ***Compared to a total beginner,*** a working professional who has accumulated several years of knowledge on how systems work and what approaches are utilised in design thinking will find it easier to understand AI terms.
2. AI entails deciphering backend data and is based on ***real-time streaming of data generated by various businesses.*** In actual life, a fresher will be unable to comprehend the data and its complexities.
3. This skill is extremely useful for those who have experience with coding. ***A newbie may know how to code, but there's a good chance he or she will waste a lot of time cleaning up the code in the beginning rather than working on algorithms.***

4. ***The main reason for this is because businesses working on AI projects require a specialised set of skills to complete highly complicated, complex problem statements, which many people lack.***

AI is in high demand, so it's always a good idea to brush up on your skills. So, for someone who wants to learn AI but doesn't have a clear curriculum, ***I have written a step-by-step guide to learn AI from basic to intermediate levels.***

1. ***Working on your fundamentals:*** First and foremost, work on your fundamentals before going on to more complex topics in order to begin working with AI.

2. ***It's a good idea to start with Maths***. Brush up on your math skills and go over the following concepts again:

Matrix and Determinants, as well as Linear Algebra.

Calculus is a branch of mathematics that deals with Differentiation and Integration.

Vectors, statistics and Probability, graph theory.

3. **Coding language:** Once you have mastered your arithmetic skills, you can begin practising coding by picking a coding language. Java or Python can be studied. Python is the easiest of the three to learn and practice coding with because it has various packages such as Numpy and Panda.

4. **Working on Datasets:** Once you have mastered any coding language, you can move on to working with backend components such as databases. For example, you may now use SQL connector or other import modules to connect python or frontend IDE.

5. ***Lastly, I would suggest that you brush up your skills once you're equipped with all the practice work.*** You should enrol or join in for some courses to speed up the process. There are various online courses to learn from, but I have listed a few good ones which you can undertake for betterment.

There are some amazing institutes from different sites which I surely want to recommend here:

1. **Learnbay:** Learnbay offers a number of AI courses at the foundational, intermediate and advanced levels and at the senior management level. If you own more than a year of work experience, no other platform can be the best like Learnbay.

- **Variable courses that meet your ultimate needs-**

Depending on your profile, you can select from a variety of options. They provide different courses for techies, non-techies, early pros, intermediate, and even leadership level pros. Their courses are associated with elective modules as per candidates domain expertise. Aspirants can choose elective modules and capstone data science projects expertise as per their choice. Available options include people administration, promotion and salesforce assessment, production and telecom, insurance and finance, leisure and travel, transportation, energy, oil and gas, etc.

- **Additional project expertise and domain-elective study scopes for techies-** The advanced AI and ML course imparted by Learnbay has three additional electives apart from the one mentioned earlier. These are from the core engineering field- Advanced data structure and algorithm, system designing, Embedded engineering, etc.
- **You learn from scratch but up to the advanced level-**

The submodules are so well-planned and well-designed that given a bigger find it is easy to learn, although the course covers the most trending and advanced level of industry-specific AI application.

- **Stacks of the practical assignments with on-time expert feedback-**

Starting from the initial programming classes to the advanced ML modelling sessions, you will receive plenty of coding assignments. Experts will provide you with timely feedback on all the submitted assignments so that you can rectify all of your mistakes prior to stepping into the next sessions.

- **1 to 1 learning support-**

Even though you are a beginner, due to extremely personalised teaching, you won't feel the subject hard. You will get proper assistance at every single step of your learning. Apart from that, you get ample flexibility to join the live classes at any time, from any batch.

- **Guidance on Hackthorne-**

Learbay offers guidance to attend and qualify Hackathons. This helps you to hone your coding skills.

- **Lifetime access to learning materials-**

The recorded copy of attended live classes, all the premium learning materials, remain free to access for the rest of your life. This helps in enriching your continued learning.

They also believe that learning should be done through real-world based projects. As a result, you will gain experience with how AI works in 15+ real-time projects.

2. **Edureka:** Edureka is already a well-known brand that has been on the market for quite some time. They also feature several AI-specific mini-series to learn from. In addition, you will get lifetime access to their courses once you purchase them.

3. **Simplilearn:** Simplilearn offers relationships with IBM, AWS, Facebook Blueprint, and Microsoft, as well as some fantastic courses to choose from. They place a strong emphasis on structured study and practice with real-world challenges.

4. **Coursera:** On the internet, it is ranked in the top five. More than 3 lakh students have taken Stanford University ML courses, which has received a 4.9 out of 5. It Covers machine learning like Supervised and unsupervised learning, logistic regression and artificial neural networks, ML algo. These are among the topics covered and are best practises in AI and ML

Finally, I would like to recommend Learnbay for working pros and Edureka for freshers. Coursera is suggested exclusively for those who want to learn just for knowing more, not with a career up-gradation target.

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The initial step in learning any subject is to invest time in understanding the scope of the field and identifying your areas of interest. This approach offers two primary advantages:

- Understanding the ***breadth of the field ensures you're not overlooking any crucial aspects, thereby enhancing your focus.***
- Having a ***clear picture of the field's landscape simplifies the process of creating a mental map of your learning journey***.

To effectively immerse yourself in the field and refine your learning strategy, consider answering these three questions sequentially:

1. **What are the potential applications of Machine Learning?**
2. **What do you aim to achieve with Machine Learning?**
3. **How can you accomplish that specific goal?**

Answering these questions will help you concentrate on a specific, manageable learning objective while also providing a broader perspective.

Let's delve deeper into each of these questions.

1. **What are the potential applications of Machine Learning?**

This question is quite expansive and the answer will evolve over time. The beauty of this curriculum is that each step allows you to explore the possibilities in the field.

This exploration will help you develop a more nuanced understanding of Machine Learning. ***Even if your initial understanding isn't entirely accurate, it's better to have a rough idea than none at all***. Here's a quick rundown of what you can achieve with machine learning, ranging from technical aspects to practical applications.

- **Technical Machine Learning Topics**

Supervised Learning

This involves training a model with input and labeled output. Once trained, the model should theoretically generate the correct output for a given input.

Unsupervised Learning

This involves providing the model with input data without any output, and asking it to identify patterns in the data.

Reinforcement Learning

This setup includes an agent, an environment, actions the agent can perform, and rewards. It's somewhat akin to training a dog with treats.

Online Learning

This can be either supervised or unsupervised. The unique aspect is that the model can be updated "online" as new data streams in.

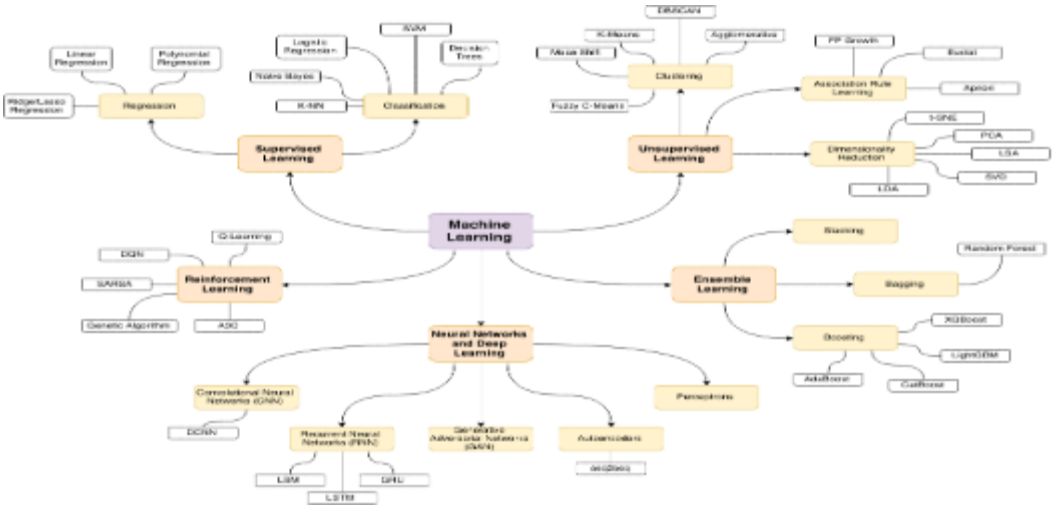
Transfer Learning

This involves using a pre-trained model as a starting point for a different learning task, significantly accelerating the learning process for the second task.

Ensemble Learning

This technique combines multiple trained predictors (either sequentially or by voting on the output) to create a final predictor.

There are many more types of machine learning, but these provide a good starting point.



- ***Common Machine Learning Models***

Linear Regression

This simple ***y = ax + b*** formula is surprisingly effective for many problems and should be the starting point for most analyses.

Logistic Regression

Despite its name, this is a classification model that calculates the probability of a class or multiple classes.

Decision Tree

This model creates a tree of decisions or formulas, which lead to the desired output when followed. These models are valuable because they are easy to understand and inspect once trained.

Support Vector Machine (SVM)

This model constructs a plane that separates two classes with maximum distance between them. It's a bit more complex than that, but envisioning a line with thickness is a good starting point.

Naive Bayes

These classifiers use Bayes' Theorem, which assumes that all features are independent. This is rarely the case, hence the term "naive". However, it performs surprisingly well in practice even when this assumption doesn't hold.

k-nearest neighbors

This classifier doesn't require training; it simply memorizes all elements in the dataset. It can then provide an output based on the distance of the input from other points in the dataset.

K-Means

This unsupervised model determines which points belong to which cluster, given a number of clusters. It does this by repeatedly adjusting the centroid of each cluster until it converges to a stable point.

Random Forest

This ensemble technique uses many simple decision tree classifiers. The model's output is the class output by the majority of decision trees.

Dimensionality Reduction Algorithms

These algorithms create a mapping from a dataset with many dimensions (features) to a representation with fewer dimensions. When it maps to 2 or 3 dimensions, it allows us to visualize a high-dimensional dataset in 2D or 3D.

XGBoost

This model is a regularized gradient boosted model. It has weak learners set up in series rather than in parallel (like **random forest**). It's a very effective model and often a top performer in machine learning competitions.

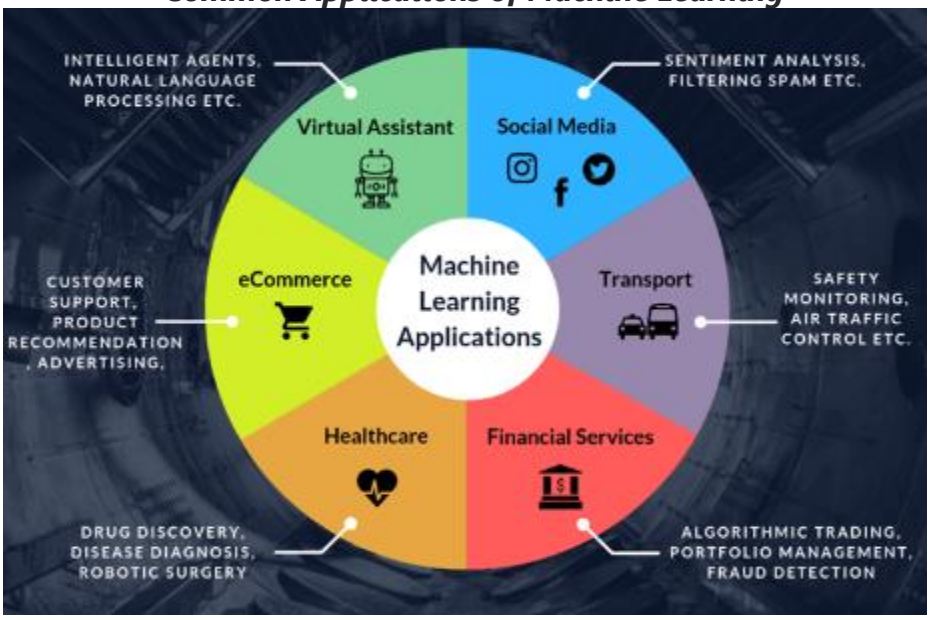
Deep Neural Network

These models are a field unto themselves. They are weak predictors arranged both in series and in parallel. ***These models can construct a hierarchical representation of the data, yielding excellent results***. However, they are notoriously difficult to train due to their high capacity. There are many possible architectures for these models, such as CNNs and Transformers.

There are numerous machine learning models available. However, proficiency in machine learning doesn't require knowledge of all of them.

In fact, if you understand Linear Regression, SVM, XGBoost, and some form of Deep Neural Network, ***you're well-equipped to tackle most problems***. However, understanding how a model learns provides mental flexibility and allows you to approach problems from different angles.

- ***Common Applications of Machine Learning***



The applications of machine learning are constantly evolving and expanding. Essentially, any field that collects data can benefit from machine learning. Therefore, don't worry if your understanding of the possibilities seems superficial.

- **Computer Vision**
- **Natural Language Processing (NLP)**
- **Medical Diagnosis**
- **Weather Forecasting**

This list could continue indefinitely. The goal here is to create a comprehensive map of the possibilities to guide the next phase of your learning journey.

Tools for Machine Learning

The following tools are commonly used in ML:

- **Python** for high-level programming
- **Pandas** for dataset manipulation
- **Numpy** for numerical computing on CPU
- **Scikit-learn** for non-deep learning machine learning models
- **Tensorflow** or Pytorch for Deep Learning machine learning models
- Higher-level wrapper Deep Learning libraries like **Keras**
- Basic **Git** for project management
- **Jupyter Notebook** or **Google Colab** for code experimentation

There are many more tools available, but don't stress about staying up-to-date with the latest library. The technologies listed above are sufficient for most projects.

However, you may need to add some libraries to your stack if they are specialized for your field of study.

Resources

The above mentioned technologies can be followed by anyone and everything is available on the internet, although it can be a tedious task and an individual can get distracted easily. So I will be suggesting to take a proper course and finish it within a time frame. Below is a list of courses I feel can be beneficial for beginners who want to be expert in the field.

Logicmojo

Logicmojo has some of the best data science programmes available. It is an online platform that offers **demanding programmes that are pertinent to industry**. Their programmes are created and delivered in association with **top-tier mentors and subject matter experts**. Logicmojo is well known for its immersive learning experience.

About Artificial Intelligence & Data Science Master Program Live Classes:

- 250 hours of training.
- Weekend Batch: 9 Months (Saturday & Sunday - 3 Hours/Day)
- 15+ Real-time Projects.

Key features of the course include:

- To gain experience, ***real-world industrial assignments*** are provided. For instance, you will be trained on ***15 real-world projects and two capstone projects*** while enrolled in the **Artificial Intelligence & Data Science Programme**. Few of the great projects included in the course are the – ***Topic Modelling for Twitter Customer Reviews Clustering*** and ***Statical Analysis of Health Insurance Pricing Forecast***.
- Logicmojo provides live interactive classes with the trainer from top tech companies having experience more than ***8+ years as Sr AI-ML Engineer & Data Scientist***. The curriculum is provided with a dedicated Job assistance program and referrals program in top MNC & startups working on latest AI-ML based projects. You can switch your career from ***software developer to Machine Learning Engineer/Data Scientist/ Data Analytics/Business Analytics to open a new door of opportunities***.

- ***1:1 doubt clearing sessions*** and ***mentorship*** programs to help students constantly work on their projects and learnings. Solve complex cases studies, ***Assignments*** to practice their learning. Price is budget friendly.

Logicmojo provides domain specialization in:

- BFSI, Manufacturing, Retail, Software, Health and Telecom

Placement assistance:

- Resume Building: Helping to update your Resume & optimize your LinkedIn profile
- Interview Preparation: Q/A session by industry experts and prepare you for Tech.
- Mock Interviews: Mentors will take 1:1 mock interview session

Scaler Academy

Their courses are offered for both college students and working professionals with live classes which are conducted in an interactive fashion and weekly doubt clearing sessions are held. The courses are of long term duration which requires a dedicated daily ***3-4 hours of work effort from the learner side***. The course batch size is above **50+ students** and the course fees is above ***INR 2 lakhs***.

Summary

So to sum up

- Figure out what the ML field looks like and make a mental map of it.
- Find a cool project that you would like to do and study it.
- Do a project for [1 week, 1 month].

I hope this was useful.

Cory Hicks

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What's the easiest way to learn machine learning?

Originally Answered: What's the easiest way to learn machine learning ?

My recommendation is a little different from others answering this question; I assume you want to become a star at both Machine Learning AND Engineering.

Why do I draw the distinction? Well, there are lots of folks in the market that are great engineers and there are also lots of folks who are great at machine learning, but there is a severe shortage of great Machine Learning Engineers.

Engineers who are great in both fields are basically unicorns and are at least 10x as valuable as someone who is great in just one of the fields. These are the engineers who don't just work on algorithms or systems all day but instead launch personalization products in the market. These are the types of engineers who are behind the personalization teams at companies such as Amazon, Netflix, LinkedIn and many successful personalization startups

So, what do you do if you want to become one of these unicorns? (In no particular order)

1. **Learn how to be a great engineer**. Learn multiple languages and get really good at them. Don't just focus on a single language such as Python as many Machine Learning Engineers do. Instead, broaden your scope to include languages like Java, C++, Scala and JavaScript. This will allow you to join a team and and to hit the ground running with any company's systems you work with.

2. **Learn how to build highly-scaled distributed systems**. Build systems that have a

50ms SLA and take hundreds or thousands of transactions per second. Ideally, systems that are critical for a business to run. Real-time event ingestion and recommendations systems are ideal.

3. **Build your machine learning fundamentals** by studying some material on the subject:

- Andrew Ng's Machine Learning lectures are a great start: *https://www.youtube.com/playlist?list=PLA89DCFA6ADACE599*
- Stanford's Data Mining and Applications Certificate: *http://scpd.stanford.edu/public/category/courseCategoryCertificateProfile.do?method=load&certificateId=1209602*
- Machine Learning Summer School: *https://www.youtube.com/playlist?list=PLZSO_6-bSqHQCIYxE3ycGLXHMjK3XV7Iz*

4. **Play with some big datasets that are publicly available**. Find a dataset that you find personally interesting or that you have theories about and see if you are correct!

- US Government Data http://www.data.gov/
- SF City Data http://datasf.org/ (I personally find local data easy to identify with)
- Reddit/r/DataSets https://www.reddit.com/r/datasets

5. **Take a role with a product-focused machine learning or personalization team**. The team you search for should be filled with engineers whom you think you can both teach and learn from. This will make you a much better machine-learning engineer. Also, by working on a product team you will quickly learn how the science and theory of machine learning differ from the practice. In particular, how customer behavior will teach you something new every single day.

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Do we need programming knowledge to learn Machine Learning?

As always, it all depends on how do you want to use machine learning. If someone just wants to learn the concepts of machine learning, the only prerequisite is mathematics and a little bit of statistics and he/she is good to go.

But when it comes to implementing the concepts of machine learning os solving any problem or to train any model, programming knowledge is indeed, necessary. The most popular languages for ML on Github are Python, C++, Javascript, R and Java.

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Sridhar Mahadevan

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How do I learn mathematics for machine learning?

Great question! How indeed does one prepare oneself for a (research or otherwise) career in machine learning, in particular in terms of familiarizing oneself with the underlying mathematics? I'm going to resist the temptation of trotting out some standard books, and instead, focus on giving broad advice.

There's some bad news on this front, and it's best to get this out of the way as quickly as possible. Having spent 35+ years studying machine learning, let me put this in the most direct way possible: no matter how much time and effort you devote to it, you can never know enough math to read through all the ML literature. Different parts of ML use a variety of esoteric math. There's just no way one person can know all of this math, so it's good to be forewarned.

OK, with that out of the way, how does one prepare oneself? Think of the process analogous to conditioning your mind and body to run a marathon. It's a gradual process, of improving your fitness, your ability to run for longer and longer distances, your breathing technique, your mental focus, and dozens of other dimensions. Working in ML is not like running a 100 meter sprint, where the race is pretty much over in a single breath. It's much more of an endurance sport, where you have to constantly work at it to remain in shape, and there's no point at which you can relax and say: OK, I know it all! Because no one does!

An example from my recent work will clarify the issues involved. One of the major challenges in machine learning is that there's never enough training data to tackle every ML problem that presents itself. Humans are especially adept in solving this challenge. I can get on a flight from San Francisco and within a few short hours find myself in a dizzying diversity of new environments, from the glitzy subways of Tokyo and the bleak winter in Scandinavia to an arid savannah in Africa, or a swampy rainforest in Brazil. There's no way I can ever hope to collect training samples from every possible environment that I can encounter in life. So, what do we do? We transfer our learned knowledge from places we've been — so, having taken the BART subway in San Francisco, and subways in New York and London, I can try to handle the complexity of the subway in Tokyo by drawing upon my previous experience. Of course, it doesn't quite match — the language is completely different, the tone and texture of the visual experience is completely different (attendants in gloved hands show you the way in Tokyo — no such luxury is available in the US!). Yet, we somehow manage, and plod our way through new experiences. We even cherish the prospect of finding ourselves in some alien new culture, where we don't speak the language and can't ask for directions. It opens up our mind to new horizons, all part of the charm of travel.

So, what's the mathematics involved in implementing a transfer learning algorithm? It varies a lot depending on what type of approach you investigate. Let's review some approaches from computer vision over the past few years. One class of approaches are so-called subspace methods, where the training data from a collection of images in the "source" domain (which conveniently has labels given to us) is to be compared with a collection of unlabeled images from a "target" domain (e.g., "source" → NY subway, "target" → Tokyo subway).

One can take a collection of images of size NxN and using a variety of different methods find the smallest subspace that the source images lie in (treating each image as a vector in N^2 dimensions). Now, to understand this body of work, you obviously need to know some linear algebra. So, if you don't understand linear algebra, or you took a class way back when and forgot it all, it's time to refresh your memory or learn anew. Fortunately, there are excellent textbooks (Strang is usually a good place to start) and also something like MATLAB will let you explore linear algebraic ML methods without having to implement things like eigenvalue or singular value decomposition. As I usually told my students, keep the motto "eigen do it if I try" in mind. Persevere, and keep the focus on why you are learning this math. Because it is important and essential to understand much of modern ML.

OK, great, you've managed to learn some linear algebra. Are you done? Ummm, not quite. So, back to our transfer learning example. You construct a source subspace from the source images, and a target subspace from the target images. Umm, how does one do that. OK, you can use a garden variety dimensionality reduction method like principal components analysis (PCA), which just computes the dominant eigenvectors of the covariance matrices of the source and target images. This is one subroutine call in MATLAB. But, PCA is 100 years old. How about something new and cool, like a ooh la la subspace tracking method like GOUDA, which uses the fancier math of Lie groups. Oops, now you need to learn some group theory, the mathematics of symmetry. As it turns out, matrices of certain types, like all invertible matrices, or all positive definite matrices, are not just linear algebraic objects, they are also of interest in group theory, a particularly important subfield of which is Lie groups (Lie → "Lee").

OK, great, you have a smattering of knowledge of group theory and Lie groups. Are you done? Hmmm…actually not, because it turns out Lie groups are not just groups, but they are also continuous manifolds. What in the blazes is a "manifold"? If you google this, you are likely to encounter web pages describing engine parts! No, a manifold is something entirely different in machine learning, where it means a non-Euclidean space that has curvature. It turns out the set of all probability distributions (e.g., 1 dimensional Gaussians with a scalar variance dimension and a scalar mean dimension) are not Euclidean, but rather, describe a curved space. So, the set of all positive definite matrices form a Lie group, with a certain curvature. What this implies is that obvious operations like taking the average have to done with considerable care. So, off you go, learning all there is to know about manifolds, Riemannian manifolds, tangent spaces, covariant derivatives, exp and log mappings, etc. Oh, what fun!

Getting back to our transfer learning method, if you compute the source covariance matrix C_s and the target covariance matrix C_t, then there is a simple method called CORAL (for correlational alignment) that figures out how to transform C_s into C_t using some invertible mapping A. CORAL is popular as a transfer learning method in computer vision. But, CORAL does not actually use the knowledge that the space of positive definite matrices (or covariance matrices) forms a manifold. In fact, it forms something called a cone in convex analysis. If you subtract one covariance matrix from another, the result is not a covariance matrix. So, they do not form a vector space, but rather something else entirely. Oops, it turns out the study of cones is important in convex analysis, so there you go again, you need to learn about convex sets and functions, projections onto convex sets, etc. The dividing line between tractable and intractable optimization is not linear vs. nonlinear, but rather, convex vs. non-convex.

I hope the pattern is becoming clear. Like one of those legendary Russian dolls, where each time you open one, you find it is not the end, but there's another one inside it, so it is with learning math in machine learning. Each time you learn a bit of math, you find it opens the door to an entirely new field of math, which you need to know something about as well. For my most recent paper, I had to digest a whole book devoted entirely to the topic of positive definite matrices (it's like the old joke, where the deeper you go, the more you know about a specialized topic, until you know everything about —- nothing!).

Any given problem in machine learning, like transfer learning, can be formulated as a convex optimization problem, as a manifold learning problem, as a multivariate statistical estimation problem, as a nonlinear gradient based deep learning problem, etc. etc. Each of these requires learning a bit about the underlying math involved.

If you feel discouraged, and feel like tearing your hair out at this point, I sympathize with you. But, on the other hand, you can look on the positive side, and realize that in terms of our analogy of running a marathon, you are steadily becoming better at running the long race, building your mathematical muscle as you go along, and gradually things start falling into place. Things start to make sense, and different subfields start connecting with each other. Something strange happens. You start liking it! Of course, there's a drawback. Someone who doesn't understand any of the math you get good at using asks you to explain your work, and you realize that it's impossible to do that without writing equations.

Most researchers find their comfort zone and try to stay within it, since otherwise, it takes a great deal of time and effort to master the dozens of mathematical subfields that modern ML uses. But, this strategy eventually fails, and one is always forced to get outside one's comfort zone and learn some new math, since otherwise, a whole area of the field becomes alien to you.

Fortunately, the human brain is an amazing instrument, and provides decades and decades of trouble-free operation, allowing us to continually learn over 40,50, 60, years or more. How precisely it does that without zeroing out all prior learning is one of the greatest unsolved mysteries in science!

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Machine Learning and Data Science have both experienced exponential growth in recent times. Machine learning is a rapidly developing field that offers tremendous opportunities. A recent report found that machine learning (ML) engineering jobs outperformed other jobs in terms of salary, demand, and growth.

The term machine learning was first introduced by Arthur Samuel. He defined ML as a field of research that gives computers the ability to learn without being explicitly programmed. In simple terms, machine learning teaches machines to learn from experience rather than

being programmed to perform specific tasks. Enabling machines to independently recognize patterns in data is an exciting combination of statistics and computer science.

Machine learning is the skill of the future. Today's major companies like Facebook, Google, and Uber have ML at the core of their operations. The field is also facing a serious skills shortage as demand for ML professionals soars. ML guarantees a secure and lucrative career in the technology industry. A deep ML skill set can bring significant value to employers and increase your relevance in the job market.

ML can help solve key challenges in banking and personal finance, healthcare diagnostics, image and voice recognition, and fraud prevention. Solving these problems helps people and businesses thrive, and contributing to such great progress also creates great personal satisfaction.

The ML Engineer's main responsibilities are:

- Work with Data Engineers to Design Machine Learning Systems
- Manage Infrastructure, Data, and Model Pipelines
- Accuracy of Datasets and Data Representation
- Handle Large Complex Datasets to Find Patterns to Analyze and Gain Insights
- Develop Algorithms Based on Statistical Modeling Techniques
- Build and Maintain Scalable Machine Learning Solutions in Production
- Work with stakeholders and explain complex processes to them.
- Stay up to date with best practices and developments in this area.

Ways to learn Machine Learning as a Complete Beginner

Understanding Prerequisites Before exploring - We must first understand some key concepts that are used in ml like programming, statistics, maths, tools, data

preprocessing techniques, etc. This foundation helps you learn ML principles faster by creating a systematic learning path.

Learn Machine Learning Flow - A machine learning pipeline starts with the collection, cleaning, visualizing, and filtering of data that is optimized for ML analysis. ML engineers o spend a lot of time wrestling with data to ensure that imperfect or noisy data doesn't impact model accuracy. After the data is properly split into training and test sets, then deployment evaluation, and surveying.

Working with Real Data Sets - No matter what industry you want to work in, developing your skills requires hands-on experience with real data. All real data has some imperfections, so this is a great time to learn about typical problems and solutions related to data manipulation.

Working on a project - Working on your own project is a must for ambitious ML engineers. The competitive ML market requires hands-on experience to stand out from the crowd of novice candidates. Employers are looking for professionals with proven hands-on experience with ML tools and applications.

Learn to use Different ML Tools - There is a huge variety of ML tools and packages on the market today. However, there are quite a few validated tools that work very well for the majority of use cases.

Learning ML Algorithms From Scratch - You need to understand the overall implementation of the ML algorithm. However, to truly master ML, you need to understand how individual algorithms work.

Choosing a Machine Learning Course - Courses can help you gain initial momentum or develop specific skills in a systematic way. ML/AI courses can be taken at any stage in the learning process.

There are thousands of online learning resources, including an introduction to machine learning, specifically designed for new students and beginners. Even if you have no programming experience, you can join them and accelerate a career in the field of Data Science and Ml.

Simplilearn – One of the leading course providers and claims to be the best online boot camp to help people learn relevant skills. There are courses in various fields such as certifications, diplomas, PGP, and master's programs. Partnered with IBM, the Data Science master's program includes masterclasses with IBM experts, "Ask me anything" sessions with IBM executives, IBM-exclusive hackathons, and an industry-recognized data scientist who completes the course. It includes features such as a master's certificate.

Tutort Academy (highly recommendable for working professionals) - It is an ed-tech platform built by the experts of Google and NIT Trichy for working professionals who are searching for domain-specialized, job-oriented and affordable courses with the best placement opportunities. Their courses in the field of Data Science, Artificial Intelligence, Machine Learning, and Software Development have an industry-updated curriculum, and

well-explained content that is taught by FAANG companies experts in live and interactive classes with personalized doubt support, their courses cover **unique end-to-end domain-specific industrial level projects** and dedicated job assistance that offers guaranteed interview calls from top companies, expert reviews to improve the LinkedIn profile and resume and mock interviews sessions with permanent access to of LMS portal to cover past sessions and 2 years of membership with the course.

They are popular for their **unbeatable placements records in a short time,** their students are placed in their dream companies and shared their successful career transition stories on the institute's profile.

Scaler Academy- Their Data Science and Machine Learning Program is a 15-month program. Responsible for acquiring comprehensive knowledge, understanding challenges, and building the confidence to find data scientist or machine learning engineer solutions, this program offers a structured, industry-proven curriculum, live courses, and top Includes features such as corporate projects, important technical tools, and personal Mentoring and mock interview that costs you around Rs 2.5 lakh INR.

Conclusion

Machine Learning is a great career, I recommend continuing your learning under the guidance of someone who has experience in that field, so he can guide you properly, otherwise, it is challenging to grab a job in this competitive field, I personally suggest Tutort Academy as they best mentor, unique content, plenty of placement opportunities at an affordable price.

Trina Ray

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First, let me clarify one thing: whatever you have mentioned about some working knowledge of programming must indicate the basic knowledge of python, Java, C++, LISP, Julia, Scala or R. If so, you are about 20% ahead of studying machine learning. On the other hand, if the 'have some knowledge of programming languages' does include any other programming languages, other than the above-mentioned ones, then sorry to say that you are a complete novice and should start from machine learning with python.

Following are some of the **free resources** that will help you learn python programming skills for machine learning.

- Python for machine learning by **Great Learning.**
- Python for machine learning tutorial by **Learnbay youtube channel.**
- Python Basics for Data Science by **EdX.**

However, considering that you know python, I am providing the machine learning study path for beginners.

While most of the aspirants think that machine learning is all about the expertise of coding, in reality, as already mentioned, ***machine learning needs 20% of skills expertise in programming. The rest of the 80% belongs to the statistical skills efficacy and database management knowledge. So, in short, the four pillars of machine learning study are***

1. *Statistical knowledge (70%)*
2. *Programming and coding efficacy relevant to ML(20%)*
3. *Database management knowledge (10%)*

Apart from these, what you need is an extraordinary level of ***critical thinking skills.***

Ultimately, from where should you start?

- Your machine learning journey must *start from advanced mathematics and statistical concepts*.

What to learn in advanced mathematics and statistics for machine learning?

You need to master the statistical concepts that will help to find the logic behind the machine learning patterns. Although a range of programming libraries is going to do 40% of your work, to implement the right machine learning model and to identify the appropriate patterns, you need an immense level of statistical efficacy.

The best way is to start from high school or college-level mathematics, such as

- Linear algebra
- Differential and integral calculus
- Coordinate geometry of line and curve
- Graph Theory of graphs.
- Permutation and combination
- Probability distribution.
- Next, head towards the core statistical concepts like
    - Statistical significance
    - Regression
    - Anova
    - Bayesian thinking
    - Conditional probability
    - Hypothesis testing.
    - Principal component analysis (PCA).
    - Linear discriminant analysis
    - Multivariate calculus
    - Statistical decision theory

Pro TIp: The field of machine learning offers plenty of opportunities, but not every single opportunity will suit you. Hence to make your machine learning journey adequately successful, first set your goal as per your domain knowledge and upcoming opportunities in your industry.

- ***Next, earn the concept of exploratory data analysis***

Whatever you do, either programming or statistical analysis, ultimately, the base of your machine learning work will be data handling. You need to master exploratory data analysis at the very beginning of your machine learning study. Understanding the behaviour of data sets and focusing on the following concept will help you do the same.

  - Shaping of data
  - Data signals.
  - Feature correlations.
  - Predictive analysis.

- ***Next, head towards the core machine learning concepts.***

Start with the basics of machine learning modelling.

  - Supervised learning
  - Unsupervised learning
  - Semi-supervised learning
  - Reinforced learning

Learn the related ML techniques of supervised and unsupervised learning, such as

  - Clustering
  - Autoencoders
  - Techniques of feature separation.
  - Prediction of output variables.

Apart from these, you need to master the different machine learning algorithm types.

  - Linear and logistic regression
  - Naive Bayes
  - KNN clustering
  - Regression tree
  - Support vector mechanics

Gradually you need to enter into deep learning concepts like artificial neural networks.

- ***Once you are aware of the machine learning basic concepts, then start learning the programming libraries of ML***

The most important programming libraries in 2021 are as follows:

  - Karas
  - TensorFlow
  - Scikit Learn
  - Microsoft CNTK
  - Caffe2
  - Pytorch
  - mxnet

- ***Next is learning the basics of database language.***

I would suggest you start with MySQL. Know about basics concepts like

  - Query generation
  - Column and row management
  - Filtering, etc.

So these are all about the concept tools and techniques that you need to keep on docs while starting the study of machine learning.

However, the effective learning of all of these concepts needs ample degree practical assignments. Because machine learning is not about earning theoretical knowledge, it's more about the practical application of the same. Hence you need *to* ***learn through hands-on learning strategies***.

The best way to ensure a promising start to your ML learning journey, ***I would suggest you choose a power-packed job-ready machine learning course.***

Plenty of institutes are there that offer advanced machine learning courses. Amongst all, Simplilearn, Edureka, and Learnbay are the most popular ones.

If you are a working professional, ***I must recommend you Learnbay machine learning courses (in collaboration with IBM).*** They have a range of different machine learning courses according to the candidates work experience and industry knowledge.

To study machine learning from scratch and in a current machine learning job market competent way, you can choose either of the following courses.

- **Advanced Certification Program in AI and ML**

Best fit for working professionals with 4 years of experience in the technical domain/ own basics programming concepts.

Course duration: 9 months

Course fees: 75000 INR.

- **Foundational Certification Program Data science, Ai and ML**

Best fit for working professionals with 1 year of experience in any domain

Course duration: 7 months

Course fees: 59,000 INR.

Learnbay also offers ***machine learning and AI courses for managers and leaders*** with 8+ years of working experience in any domain.

How Learnbay helps in studying machine learning as a beginner?

Learnbay Machine learning course features:

- Updated and industry competent learning modules covering all the ML concepts, techniques and tools.
- Comprehensive focus on Deep learning
- Complete live and interactive classes.
- 24/7 instant tech supports for project and assignment
- Small batch size and 1 to 1 attention.
- Custom-fit placement assistance until you get the offer letter.
- Integrated capstone project
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- Live learning from industry leads.

I hope my answer helped. Thanks for reading, and Happy learning!

Nidhi

Congratulations on deciding to learn machine learning!

It's a great way to stay ahead of the curve in the ever-evolving field of technology. If you already have some knowledge of programming languages, you're already ahead of the game.

Understanding the fundamentals is the first step in learning about machine learning.

You'll want to familiarize yourself with the different algorithms and techniques used in machine learning. You can find many resources online to help with this, such as ***tutorials, blogs, and books.***

Once you have a good understanding of the basics, you should start practicing.

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As someone who often finds himself explaining machine learning to non-experts, I offer the following list as a public service announcement.

1. **Machine learning means learning from data; AI is a buzzword.** Machine learning lives up to the hype: there are an incredible number of problems that you can solve by providing the right training data to the right learning algorithms. Call it AI if that helps you sell it, but know that AI, at least as used outside of academia, is often a buzzword that can mean whatever people want it to mean.
2. **Machine learning is about data and algorithms, but mostly data.** There's a lot of excitement about advances in machine learning algorithms, and particularly about deep learning. But data is the key ingredient that makes machine learning possible. You can have machine learning without sophisticated algorithms, but not without good data.
3. **Unless you have a lot of data, you should stick to simple models.** Machine learning trains a model from patterns in your data, exploring a space of possible models defined by parameters. If your parameter space is too big, you'll overfit to your training data and train a model that doesn't generalize beyond it. A detailed explanation requires more math, but as a rule you should keep your models as simple as possible.
4. **Machine learning can only be as good as the data you use to train it.** The phrase "garbage in, garbage out" predates machine learning, but it aptly characterizes a key limitation of machine learning. Machine learning can only discover patterns that are present in your training data. For supervised machine learning tasks like classification, you'll need a robust collection of correctly labeled, richly featured training data.
5. **Machine learning only works if your training data is representative.** Just as a fund prospectus warns that "past performance is no guarantee of future results", machine learning should warn that it's only guaranteed to work for data generated by the same distribution that generated its training data. Be vigilant of skews between training data and production data, and retrain your models frequently so they don't become stale.

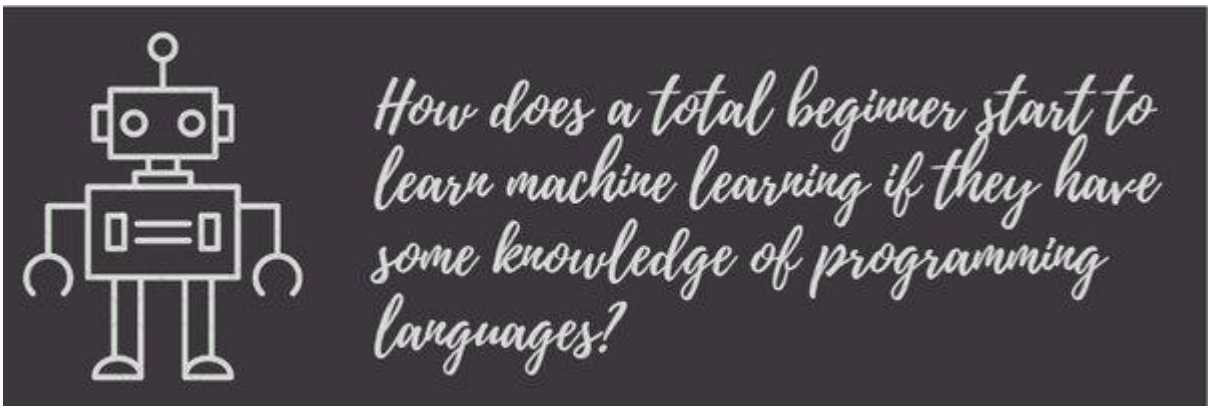
6. **Most of the hard work for machine learning is data transformation.** From reading the hype about new machine learning techniques, you might think that machine learning is mostly about selecting and tuning algorithms. The reality is more prosaic: most of your time and effort goes into data cleansing and feature engineering—that is, transforming raw features into features that better represent the signal in your data.
7. **Deep learning is a revolutionary advance, but it isn't a magic bullet.** Deep learning has earned its hype by delivering advances across a broad range of machine learning application areas. Moreover, deep learning automates some of the work traditionally performed through feature engineering, especially for image and video data. But deep learning isn't a silver bullet. You can't just use it out of the box, and you'll still need to invest significant effort in data cleansing and transformation.
8. **Machine learning systems are highly vulnerable to operator error.** With apologies to the NRA, "Machine learning algorithms don't kill people; people kill people." When machine learning systems fail, it's rarely because of problems with the machine learning algorithm. More likely, you've introduced human error into the training data, creating bias or some other systematic error. Always be skeptical, and approach machine learning with the discipline you apply to software engineering.
9. **Machine learning can inadvertently create a self-fulfilling prophecy.** In many applications of machine learning, the decisions you make today affect the training data you collect tomorrow. Once your machine learning system embeds biases into its model, it can continue generating new training data that reinforces those biases. And some biases can ruin people's lives. Be responsible: don't create self-fulfilling prophecies.
10. **AI is not going to become self-aware, rise up, and destroy humanity.** A surprising number of people (cough) seem to be getting their ideas about artificial intelligence from science fiction movies. We should be inspired by science fiction, but not so credulous that we mistake it for reality. There are enough real and present dangers to worry about, from consciously evil human beings to unconsciously biased machine learning models. So you can stop worrying about SkyNet and "superintelligence".

There's far more to machine learning than I can explain in a top-10 list. But hopefully this serves as a useful introduction for non-experts.

Machine Learning Specialist at Multinational CorporationsFeb 7

To start, if you have any experience with programming, you are already halfway there. Many subfields and frameworks of machine learning, such as ***data structures, algorithms, artificial intelligence, or machine learning,*** are derived from other areas of computer science.

However, you will be using Python as the language of choice for an introductory course on machine learning, along with some sci-kit-learn to explain the fundamentals of how to work with data structures and algorithms and some matplotlib for visualization when necessary.



Most machine learning courses that I have come across focus on an introduction to the field and working with datasets. Usually, my impression is that the course is trying to teach you how to do machine learning, not how and why it works, which means that you will be left with lots of questions. Once you fit in some gaps in your knowledge and answer your questions, there is a lot more to learn.

To get started on a practical level, rather than a theoretical one, I would recommend taking a look at the online courses available. ***There are multiple online courses available as it has various benefits:***

- If you have questions, you can go back and watch videos to understand the concepts.
- You can watch videos again or in chunks if necessary.
- You can repeat all or parts of the course multiple times if necessary/needed (which is helpful if you need to revisit certain types of problems).

Learnbay

Some of the top online courses available in the market are based on these features:

- **IBM certification:** The ***Artificial Intelligence and Machine Learning Program at Learnbay*** offers ***project completion certifications, certificates for completing*** IBM courses that are valid around the world, and certificates for a variety of ***IBM micro-skills***. Learnbay's professors and instructors will guide you through the process and have a wealth of knowledge. Each project's conclusion is signaled by the delivery of an IBM-certified certificate.
- **Projects:** Both novice and expert projects are included in the ***Artificial Intelligence and Machine Learning Program***. For the course's final project, you must complete extensive machine learning and artificial

intelligence projects utilizing Python and other data science technologies. After the course, you'll have access to further resources to keep learning.

These courses include the following projects:

- *A self-driving car*
- *An emotion detector*
- *The Speech Emotion Detection Model*

- **Domain Specialization:** The domain elective, which is the best option for people who want to learn data science in a particular industry, is another distinctive feature offered to Learnbay students through the ***Artificial Intelligence and Machine Learning Program.*** Capstone education teaches students crucial agile success strategies through case-based activities and fascinating experiments. ***Sales, human resources, banking and finance, oil and gas, and marketing*** are just a few of the many specialties Learnbay offers as electives.
- **Project Innovation Labs:** MNC and MAANG specialists participate in both online and live project sessions. For educational purposes, at least seven cities should be visited, including ***Bangalore, Chennai, Hyderabad, Delhi, Kolkata, and Pune.***
- **Hybrid Classes:** The courses are available in over seven cities both online and in live meetings. Your schedule will determine whether you choose offline or online lessons.

UDACITY

If you are looking for a beginner course, then ***Udacity is another option available.***

The greatest instructors from Stanford University and other universities are available to teach a variety of courses on Udacity, a great resource for learning about machine learning. The website also provides a few certification programs that help determine rankings. But ***this platform doesn't have a thorough curriculum for advanced ML programs.***

Conclusion

Visual quality control, predictive maintenance, and changing production parameters are just a few of the fantastic things that machine learning has been utilized for. Establishing a realistic long-term goal is essential, and attention must also be paid to organizational structure, data collection, and culture. Working in machine learning is like contributing to a greater cause. As a result, getting the correct job requires receiving adequate professional training. ***The best machine learning courses in Bangalore that can be accessed from anywhere in the globe, in my opinion, are offered by Learnbay.***

Thank you

RASHAMI SHEKHAWAT

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Machine learning is a branch of computer science that involves data analysis and can be invaluable knowledge to professionals in many industries. Get formal training or start learning on your own. If you're interested in this area, you may want to learn more about the steps that can help you learn, practice, and get a job in machine learning.

If you have decided to learn machine learning, but are confused as to where to start. I faced the same confusion. Where should I start? Should I learn Python or choose R? Math

has always been a scary part for me and I was always worried about where to learn math. We were also concerned about how we would get a strong machine-learning foundation. Anyway, you should at least congratulate yourself on your decision.

Getting started with machine learning

Learn basic math skills - Machine learning requires an understanding of several areas of mathematics. If you are new to linear algebra, statistics, probability, and multivariate analysis, I recommend studying this material.

Learn Basic Computer Science - If you have no programming experience, we recommend that you learn basic programming. Like math, you can try to teach yourself or join a training program to learn how to code.

Earn All Required Degrees - Depending on the job you are applying for, you may need a college degree. Not all machine learning jobs require a degree, and you may be able to demonstrate your skills in alternatives such as Project Portfolio or Contest Performance

Learn Programming Languages - Programming languages are means of communicating with computers in a way that both humans and computers can understand. Like spoken and written languages, programming languages have their own rules of grammar and syntax. Python is the most commonly used programming language in machine learning

Learn More About Machine Learning - Machine learning typically deals with concepts such as deep learning frameworks and algorithm libraries. For example, scikit-learn is a library of traditional machine learning algorithms.

Practice with Existing Datasets - There are free datasets available online that you can use to practice machine learning. By using previously collected data, you can focus on

applying what you have learned instead of performing time-consuming data collection steps.

Working on Projects and Building Portfolios - Once you're comfortable working with existing data, you can start collecting your own data. After collecting the data, you can clean it up and use it in the same way as the existing datasets we practiced earlier.

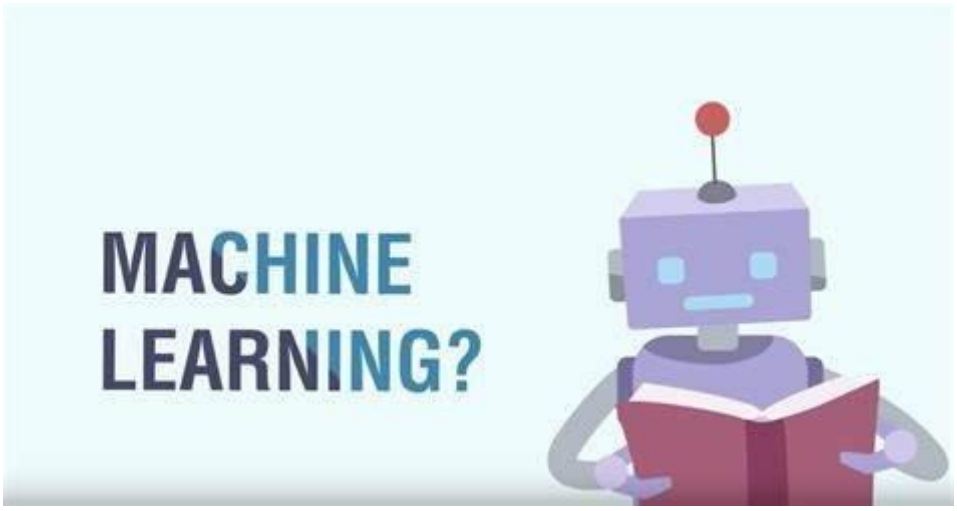
Join the community and join meetings - Join online message boards, social media groups, and chat rooms with other users interested in machine learning. These rooms give you the opportunity to converse with people from all over the world and exchange experiences and tips.

Develop Communication Skills - As you learn to teach computers, you can also work and communicate with humans and get involved in machine learning.

Preparing Your Application - Once you've found a machine learning position to apply for, you can customize your resume to highlight the skills that best match your requirements.

Job interview - The machine learning interview consists of several parts. You can conduct a regular one-on-one or panel interview where both you and the interviewer have the opportunity to ask questions.

If you have some programming language experience, then you have a plus point in your journey, I would suggest you continue your journey with an online short-term course that will help you to learn in a more structured way in the mentorship of experienced faculties. I am listing some most popular courses for machine learning.



Machine Learning Course by Stanford University - This program is designed to teach machine learning, supporting vector machines, kernels, neural networks, and related concepts with the best learning techniques. In this specialization, you'll learn the tricks and techniques of AI and machine learning processes. This course is not limited to teaching students the basics of machine learning. It also teaches the theoretical pillars of learning. The course also provides practical know-how to apply the techniques. You can also access Silicon Valley's best practices on the subject.

Tutort Academy - Their full-stack AI and ML course is best for those who are looking to switch their career to Data Science. This is a 10-month online training program taught in live lectures by experienced data scientists of Google, Microsoft, Amazon, EY, etc. You will get to learn with full interaction with the mentors because of their small batch size, you can clear all your doubts in personalized doubt sessions.

- They cover real-time projects to understand the concepts more deeply and to give you a taste of industrial work experience.
- After completion of the course, you will get interview calls from top MNCs as they have collaborated with them for their placements, their students are working in top MNCs with impressive salary growth, and their mentors will take 1:1 mock interviews and also give their suggestions to optimize your Linkedin profile and resume.
- You have 2 years of the flexible pass to complete the course, if you did not want to continue your course after enrollment then you can take your time and can attend any batch with any instructor for 2 years to complete your course and you also have permanent access to their LMS portal that contains recordings of live lectures and all the training material.

Machine Learning, Data Science, and Deep Learning with Python - This specialization covers all major topics related to machine learning, including artificial neural networks, k-means clustering, and more. Additionally, you'll learn the art of data visualization using Seaborn and MatPlotLib together, and a hands-on implementation of large-scale machine learning using MLLib Apache Spark. In this course, you will also learn how to classify emotions, images, and data using deep-learning concepts. This is the ideal tutorial for professional programmers and data analysts looking to make a career change. Even if you are new to Python, you can choose this specialization as it offers a crash course to help you better understand the subject matter.

Machine learning is a fun and interesting field of learning that allows individuals to put their skills and knowledge to the test without limits. Building a career in this field starts with a thorough understanding of ML and related concepts. Start your journey by choosing Tutort Academy course. These machine learning courses are not only affordable, but they give you the flexibility to study anytime, anywhere.

Dinesh Jaiswal

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2/90, Vastu Khand Gomti Nagar Lucknow 226010Aug 17

If you have some knowledge of programming languages, then you're already off to a good start! Machine learning (ML) is a field of study that involves using algorithms to

automatically learn patterns in data and make predictions or decisions based on those patterns. To get started with ML, here are a few steps you can take:

1. Learn the basics of statistics and linear algebra: These are essential for understanding the mathematical concepts behind ML algorithms.
2. Choose a programming language: Python is a popular choice for ML, but other languages like R and Julia can also be used.
3. Learn the basics of ML algorithms: Start with simple algorithms like linear regression and decision trees, and then move on to more complex ones like neural networks.
4. Practice on real-world datasets: Kaggle is a great resource for finding datasets and participating in ML competitions.
5. Learn from others: Attend ML meetups, read blogs and books, and follow experts on social media to stay up to date with the latest trends and techniques.

Remember, learning ML takes time and practice, so be patient and keep learning!

Related
What are your recommendations for self-studying machine learning?

We were hosting a Meetup on robotics in Australia and it was question time.

Someone asked a question.

“How do I get into artificial intelligence and machine learning from a different background?”

Nick turned and called my name.

“Where’s Dan Bourke?”

I was backstage and talking to Alex. I walked over.

“Here he is,” Nick continued, “Dan comes from a health science background, he studied nutrition, then drove Uber, learned machine learning online and has now been with Max Kelsen as a machine learning engineer for going on a year.”

Nick is the CEO and Co-founder of Max Kelsen.

I stood and kept listening.

“He has documented his journey online and if you have any questions, I’m sure he’d be happy to help.”

The questions finished and I went back to the food.

Ankit came over. He told me about the project he was working on to use machine learning to try and understand student learning better. He was combining lecture attendance rates, time spent on the online learning portal, quiz results, plus a few other things. He'd even built a front-end web portal to interact with the results.

Ankit's work inspired me. It made me want to do better.

Then a few more people started coming over and asking questions about how to get into machine learning. All from different fields.

This is the hard part. I still see myself as a beginner. I am a beginner.

Am I the right mentor?

The best mentor is someone who's 1-2 years in front of you. Someone who has just been through what you're about to go through. Any longer and the advice gets fuzzy. You want it when it's fresh.

My brother is getting into machine learning. Here's what I've been saying to him.

A) Get some Python foundations (3-4 months)

The language doesn't really matter. It could be R, Java, Python, whatever. What matters is picking one and sticking with it.

If you're starting out, you'll find it hard to go wrong with Python.

And if you want to get into applied machine learning, code is compulsory.

Pick a foundations course from online and follow it through for a couple of months. Bonus points if it's geared towards teaching data science at the same time. DataCamp

[1]

is great for this.
It'll get hard at times but that's the point. Learning a programming language is like learning another language and another way of thinking at the same time.

But you've done it before. Remember when you were 3? Probably not. But people all around you were using words and sounds you'd never heard before. Then after a while, you started using them too.

B) Start making things when you're not ready

Apply what you've learned as soon as you can.

No matter how many courses you've completed, you'll never be 100% ready.

Don't get lured into completing more courses as a sign of competence.

This is one thing I'd change if I went back and started again.

Find a project of your own to work on and learn through being wrong.

Back to your 3-year-old self. Every 3rd word you said would've been wrong. No sentence structure, no grammar either. Everything just came out.

C) There's a lot out there so reduce the clutter

There are plenty of courses out there. All of them great.

It's hard to find a bad one.

But here's the thing. Since there are so many, it can be hard to choose. Another trap which can hold you back.

To get around this, I made my own AI Masters Degree.

[2]

My own custom track to follow.
You can copy it if you want. But I encourage you to spend a few days doing research of your own and seeing what's best for you.

As a heads up, three resources I've found most aligned to what I do day-to-day are, the Hands-On Machine Learning Book, the fastai Machine Learning course

[3]

and the Applied Data Science with Python course on Coursera.
[4]

Bookmark these for after you've had a few months Python experience.

D) Research is pointless if you can't apply it

You'll see articles and papers coming out every day about new machine learning methods.

Ignore them.

There's no way to keep up with them all and it'll only hold you back from getting your foundations set.

Most of the best machine learning techniques have been around for decades. What's changed has been an increase in computing power and the availability of data.

Don't be distracted by the new.

If you're starting out, stick to getting your foundations first. Then expand your knowledge as your project requires.

E) A little every day

3-year-old you was a learning machine (a machine learner?).

In a couple of years, you went from no words to talking with people who had been speaking for decades.

How?

Because you practised a little per day.

Then the compound interest kicked in.

1% better every day = 3700% better at the end of the year.

If you miss a day, no matter, life happens. Resume when you can.

Soon enough you'll start to speak the language of data.

F) Don't beat yourself up for not knowing something

"Have you ever built a recommendation engine?"

"No."

"We've got a project that requires one as a proof of concept, think you can figure it out?"

"Sure."

Most people think learning stops after high-school or college. It doesn't.

The scenario above happened the other week. I'd never built a recommendation engine. Then I did.

Failure isn't bad if you're failing at something you've done before. You've been walking your whole life but you don't beat yourself up when you trip on your own feet. It happens. You keep walking.

But failing at something new is tough. You've never done it before.

Learning machine learning kind of goes like this.

1st year: You suck.

2nd year: You're better than the year before but you think you suck even more because you realise how much you don't know.

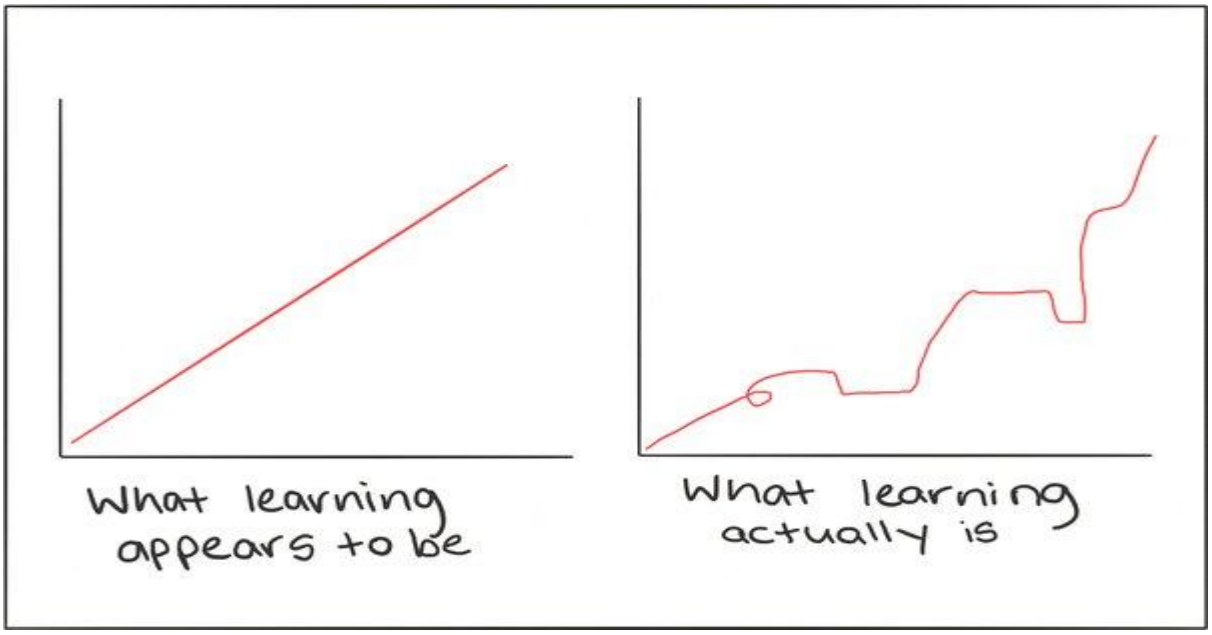
3rd year: ???? (I'm not there yet)

Embrace the suck.

How much will beating yourself up for not knowing something help you for learning more?

Zero.

Learning something new takes time. Every day is day one.



How would your 3-year-old self react to not knowing a word?

You'd laugh. Throw your hands in the air and then crawl around for a bit.

It's the same now. Except you can walk.

Note: this information is geared towards the work I've been doing day-to-day as a machine learning engineer at Max Kelsen. We're a team of ~30 focused on applied machine learning and work with a wide range of enterprises in multiple fields. I have no experience as a machine learning researcher at a university or at a large tech company.

Footnotes

[1]
Learn R, Python & Data Science Online

[2]
My Self-Created Artificial Intelligence Masters Degree

[3]
Deep Learning For Coders-36 hours of lessons for free

[4]
Applied Data Science with Python | Coursera

Can artificial intelligence learn on its own, or does it need a programmer?

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Answered by

Abhishek Singh

Aug 22

Artificial intelligence (AI) can encompass a wide range of technologies and approaches, and the extent to which AI can learn on its own depends on the specific type of AI and its design.

1. **Supervised Learning:** In many cases, AI systems require human programmers to provide labeled training data and guide the learning process. This is often referred to as supervised learning. The programmer feeds the AI algorithm with examples and corresponding correct answers, allowing the AI to learn patterns and relationships from the

data. However, this type of learning still relies on human input for labeling and guidance.

2. **Unsupervised Learning:** Some AI techniques, like unsupervised learning, allow AI systems to analyze data without explicit guidance from programmers. Unsupervised learning involves finding patterns and structures within data without predefined labels. Clustering and dimensionality reduction are common tasks in unsupervised learning. While these techniques don't require labeled data, they still often need human intervention for interpreting and making sense of the results.
3. **Reinforcement Learning:** In reinforcement learning, AI systems learn by interacting with an environment and receiving feedback in the form of rewards or penalties. While programmers set up the reward structure and define the learning goals, the AI can learn through trial and error. It can improve its performance over time without explicit step-by-step programming.
4. **Self-Supervised Learning:** Self-supervised learning is a middle ground where AI uses its own generated signals for learning, reducing the need for labeled data. For example, in natural language processing, models can predict missing words in sentences. The model generates its own training data by masking out words in sentences and then learning to predict those words based on the context.
5. **Transfer Learning:** Transfer learning allows an AI model pre-trained on a large dataset to be fine-tuned for a specific task with a smaller dataset. While a programmer is involved in the initial pre-training, the model can then adapt to new tasks with less manual intervention.
6. **AutoML and Neural Architecture Search:** In some cases, AI can be used to automate parts of the machine learning process itself. AutoML tools aim to automate tasks like feature engineering, model selection, and hyperparameter tuning. Neural architecture search is a process where AI algorithms are used to discover optimal neural network architectures for specific tasks.

In summary, while AI can learn from data and adapt to new situations, the role of a programmer is still crucial. Programmers design, develop, and fine-tune AI algorithms, provide guidance and objectives, curate datasets, and interpret the results. The degree to which an AI can learn on its own varies depending on the learning approach and the specific technology being used.

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The drive to develop

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What is GoLand IDE?

GoLand is a cross-platform IDE built by JetBrains for Go developers. It has support for different frontend technologies and databases, making it a perfect choice for full-stack web development. GoLand supports Docker, Kubernetes, and Terraform, so it's equipped for DevOps tasks, too.

With GoLand, you get all the core functionality you need out of the box:

- **Go modules integration.** Expanded Go modules support makes managing dependencies easy and straightforward.
- **Code completion.** Smart Completion gives you a list of the most relevant symbols applicable in the current context.
- **Inspections and quick fix**

... (more)

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Answered by

Garry Taylor

Aug 21

Define “learn”.

AI will generally be able to learn within an extremely limited set of parameters.

For example sometimes it’s called “AI” when a music player “learns” what type of music you like. A pretty dubious claim at the best of times, and really all it has to go on is the music you listen to, i.e. if you like Bruce Springsteen, are you likely to like Bob Dylan? Another American singer/songwriter, not much different in generation, and sings about similar themes.

Is it learning if AI recommends Dylan to a Springsteen fan? Or is it just parsing data?

That’s what I mean by defining “learn”, the AI we currently have isn’t like the AI in movies, AI is very limited right now, to the point where calling it “AI” at all is a bit of a stretch. If you set the bar to clear for “learning” low enough, AI can learn for itself.

Can a LLM style AI learn to play the guitar? No.

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Answered by

David Miller

Aug 20

The interesting systems sort of learn on their own, but they are “fed” particular types of data intentionally. As a rule, we’re not raising a child to be in awe of the great big world, we’re developing a machine to perform tasks and solve problems within a very specific domain.

If for instance you want to train a system to drive Tesla cars, you aren’t having it read French poetry.

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More answers below

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How does artificial intelligence learn?

Where should one start artificial intelligence if they are a programmer?

Ian Joyner

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Worked on practical language design and compiler writing.Aug 21

No, AI does not learn anything. It just stores ‘facts’ (true or not) and mechanically manipulates them. It is like a book, or perhaps microfiche and microfiche reader. They don’t learn anything.

Computers do no more than that.

The important word in AI is ‘Artificial’ — most people miss the significance of that word.
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Answered by

Cecil Williams

Aug 23

Yes, and yes.

It can learn those tasks programmed into it to be able to learn.

Oh the other hand, it can not think outside the box (i.e., generate cognition to solve a randomly occurring problem).

Carver Wrightman

alias **Cecil R. Williams**

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Answered by

Ziemowit Jankowski

Aug 21

This is a very good question that does not have a single answer.

The answer boils down to the understanding of the concept of “programmer”. Learning is a process that includes acquiring of information, processing the information into understanding and then modifying one’s behaviour based on that information.

So, in the above context: If by a “programmer” you mean a person that writes some code in a programming language to modify the AIs behaviour then the answer might be “no”. An artificial intelligence may be programmed to ingest supplied data, extract the information (biased or un-biased), store the extracts and corresponding associations to previously extracted data - and modify its behaviour accordingly.

BUT… if a programmer is a person that modifies the program’s behaviour by actually delivering information on facts and information on how to interpret those facts, then the

answer would be “yes”. In this context a parent is a programmer that programs their children to respond in a specific way to some stimuli. In this context a teacher in a school is also a programmer that delivers information to be processed into data by the young person.

And what is an instance of artificial intelligence? Well, it’s just a computer, it could be huge, it could be tiny; it could be specialized in drving cars or managing an inventory, or being a “general type” like ChatGPT. Computers need programmers to be able to do anything; intelligent programmers working with AI write intelligent programs that can modify their behaviour based on newly acquired data. The border line between “data input to the system” and “actual program code” is (sometimes) less distinct than one could believe.

Pick your answer. :-)

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AI researcher.Updated 6y

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Can I teach myself artificial intelligence?

The answer is a resounding yes, but you really need to be disciplined to do that. Every time I get such a question I always ask for specifics, AI is extremely broad. The modern AI field is mainly comprised of:

1. **Machine learning (ML)**: which is about machines that learn and improve from examples. In ML there are supervised and unspervised learning methods such as:
    a. Artificial neural networks (ANN): Such as deep neural networks (DNN). ANNs are currently the go to algorithms for most AI related problems, we have:
        i. Convolutional neural networks (CNN).
        ii. Recurrent neural networks (RNN) such as long-short-term-memory (LSTM) or gated recurrent unit (GRU) networks.
        iii. Memory networks.
        iv. Generative adversarial networks (GAN).
        v. Residual neural networks (ResNet).

        vi. Autoencoders: Used for noise reduction, compression and many more. We also have generative adversarial autoencoders.
    b. Support vector machines (SVM). Based on hinge-loss minimization which results in maximum margin classifiers.
    c. Restricted Boltzmann machines (RBM).
    d. Clustering algorithms like k-means and agglomerative hierarchical clustering methods.
    e. K nearest neighbor lazy learning algorithms.
2. **Natural language processing (NLP)**: ML algorithms especially the RNNs such as LSTM or GRU networks are commonly used in NLP. But CNNs can also be applied in NLP by clever use of convolutions in time. NLP comprises of:
    a. Natural language understanding (NLU): Which is about understanding spoken language, this is different from a mapping based approach known as speech recognition. NLU is so extremely challenging that it is termed AI-complete or AI-hard.
    b. Natural language generation (NLG): Not as hard as NLU but is also challenging. This is mostly about generating language as the name suggests.
3. **Computer vision (CV)**. Which is also considered AI-complete, can make use of a variety of algorithms. In CV we normally have:
    a. 3D computer vision: Algorithms such as structure from motion (SfM) and simultaneous localization and mapping (SLAM) and 3D camera pose estimation as applied in augmented reality (AR) applications are based on 3D computer vision techniques that involve tracking salient regions and fitting motion models such as homography or affine transformations. Automatic panorama stitching from photos also falls in 3D computer vision because in order to align images, camera 3D poses are normally recovered using the bundle adjustment algorithm.
    b. Image recognition: Here we are more interested in recognition of the dominant content in a given scene without the need to localize that content. This used to be done by a bag-of-words approach whereby vector quantization techniques (such as k-means clustering) find the dictionary of features and then the tf-idf (text frequency-inverse document frequency) approach is used to find matching images at large scale. This is the technology used in Google Goggles or image search in search engines like Google image search. Pretty sure there are more advanced techniques being deployed on a continuous basis. CNNs have taken over image recognition by storm since the

breakthrough back in 2012 by Geoffrey Hinton and his group on ImageNet challenge.

c. Object detection: *Image recognition + localization = object detection*. This is an extremely challenging sub-field of CV that is far more complex than image recognition. Localization of recognized objects is not trivial, it is extremely hard. Again CNNs have also stormed this area with algorithms such as the Faster region CNN (Faster R-CNN).
d. Image-to-Image translation: Another recent interesting field that maps (translates) one image to another, this makes use of GANs.

There are many more AI techniques such as evolution strategies (ES) which are alternative gradient free optimization methods for training ML models. The current field of ML has taken off with the advancement of deep learning algorithms which makes ML a very hot area in AI today. If you have to chose a field to specialize in, ML is an excellent choice. Thus the discussion that follows will assume that you intend to specialize in ML. CV and NLP fields need ML very badly.

Now the goal of AI is to solve intelligence.

> Solve intelligence. Use it to make the world a better place.
> -DeepMind.

The current trend is to cast learning as an optimization problem which is not quite ideal because that is limited mostly to differentiable soft objectives, softmax, soft attention and so on. That by itself limits the progress of AI towards its ultimate goal. Thus if you are familiar with optimization theory, ML can be very easy for you to learn. This is because ML is based on gradient decent optimization, algorithms like the stochastic gradient descent (SGD) may sound complicated but the algorithm itself is the simplified version of normal gradient descent from numerical optimization.

Thus ML currently is not very intelligent at all, but current most ML algorithms are simply based on mapping.

$F:X\rightarrow Y$ $:\square\rightarrow\square$
Mapping the input X to a new convenient space Y. There is no proper reasoning there, such as learning facts from the world and so on. It is just that, optimization via mostly supervised learning approaches which provide input-output training pairs. We do have interesting algorithms like GANs and reinforcement learning (RL) for unsupervised learning models though.
With that said, to learn on your own, you really need to be determined because there is a lot of stuff to read, understand and implement as you can see above. Thus the methods I use to learn are based on.

1. Starting extremely challenging projects.
2. Derive important maths concepts in ML or AI.

3. Implement most systems from scratch.

To start I made sure that I was comfortable with the prerequisites of ML:

1. **Maths**:
    a. Linear algebra: Very important because matrix operations such as matrix multiplications are commonly encountered in ML. Multi-dimensional vectors are normally called tensors in ML, tensors are what gets passed from layer to layer in ML algorithms. That is where TensorFlow (an ML library by Google Brain) name comes from, the flow of tensors in a computational graph. Thus understanding linear algebra is very important. Also find time to appreciate the very powerful singular value decomposition (SVD) algorithm.
    b. Probability and statistics: Probabilistic inference is vital for decision making in many systems and decisions need to be made in most ML systems. We have logistic and softmax functions for computing probabilities so that it is easier to decide whether a particular class is present or not.
    c. Calculus: Learn this maths field because derivatives are important for optimization of differentiable objective functions, which is the bread and butter of current ML algorithms today. Thus make sure to be extremely familiar with multivariable differential calculus.
    d. Numerical optimization: Yes this is the basis of current ML itself, ML is based on optimization of some objective called the loss or cost function that measures how well the ML system performs. The idea is to make small steps down the steepest slope on the error surface (defined by the objective) in order to minimize the loss. Understanding the numerical optimization field means understanding most of ML algorithms.
2. **Programming**:
    a. Python: With many ML libraries available for Python and with its easy to learn syntax, Python is the go to language of choice for beginners. It is also extremely powerful for experts as well.
    b. Java: You can also use Java in ML implementations.
    c. C/C++: Very efficient for developing novel approaches from ground-up. If you code from ground-up you will learn a great deal about AI and ML field. But don't always code from ground-up, only do so when necessary.

I also personally read a lot and I mean a lot, every single day either on Quora or else where. I also watch a lot of presentation, lecture or tutorial videos on YouTube from Google Tech Talk, Google research, MIT, Facebook, Microsoft and many more. I also read a lot of journals, yes I understand journals from top notch sources such as DeepMind, FAIR, BAIR, Baidu, Microsoft research, OpenAI, Google and many more.

So you ask

Can you teach yourself artificial intelligence?
Of course, but it is a lot of hard work and very few can manage. But if I managed so can you. You need to make sure you have the passion and tenacity to read lots of materials online concerning AI. There are several high quality sources out there, a simple Google search can bring up such sources to learn from.

Today there is enough information online to learn anything at, and beyond, a PhD level, trust me it is doable.

Hope this helps.
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Answered by

Alkis Piskas

Updated Aug 22

I assume that you don't mean that an AI can be created by itself, without programming —because in that case I wouldn't answer at all! ☺— but that after it is created it doesn't need to be programmed anymore in order to be developed and expanded.

AIs, depending on the methods used in their programming, are created and trained so that they can learn and expand by themselves. This occurs mainly by the feedback they receive from users as well as new data they can acquire by themselves from the Web. This however, is a "narrow" way, in the sense that it is based on certain algorithms and training methods, and thus there are always some limitations for exapansion. Yet, even it is well programmed and tested, programmers would be still needed for problems that may occur and need to be fixed.

Now, considering the advances in the AI field, new and improved technologies are created every now and then. This allows AIs to develop in a "wider" way and programmers are always needed to program and train them accordingly.

In short, programmers will always be needed.

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Answered by

Filippos Nikolakopoulos

Aug 22

Knowledge is more general term, and it depends on the context.

AI and computers can produce information on their own, either by existing information, or by first order logic combination of existing information, or algorithmic evaluation of knowledge.

So computers can show information that is hidden or unknown or not very clear otherwise.

I think for example metal structures, where is impossible to know beforehand if they have enough strength, without using some kind of engineering software.

There are a lot more examples of AI producing language.

Of course at some point there must be some kind of evaluation of that knowledge, or checks if information has any kind of value.

Feedback can be done by any kind of expert at the domain examined, not only programmers.

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Mentored 12-ish software engineers, taught programmingAug 21

The whole point of ML (machine learning) is developing systems that learn on their own. That doesn't mean that there never was a programmer involved or that the training was not intentional and/or supervised. But the intent of ML is that the machine "investigates" the "state space" of possible answers and learns on its own using an algorithm that generally leads to answers that are optimized in some way.

Now, that optimization algorithm was initially programmed, but it is programmed to "learn" not with "answers". What is interesting about ML is how the material it learns from impacts its learning. So, certain aspects of ML are carefully orchestrated to verify that the machine is learning what it is intended to learn.

But the interesting question in AL is how much "emergence" is experienced, with AIs learning aspects that were in the training data, but not obviously so to the trainer. This is particularly true of LLMs. The LLM learns relationships between words and how they are used that seem to teach it certain aspects of semantics as well as syntax. Thus. LLMs trained on wikipedia (for example) have learned facts that are documented in wikipedia. At the same time, LLMs trained on sci-ficition writing have ideas about "warp drives" and "sentient robots" that mirror how those things are presented in that fiction. And LLMs trained on twitter conversations pick up the memes that are used there. And more importantly, the LLM doesn't know the difference, which sources of information are more reliable than others—at least not inherently.

And trying to overcome that issue of LLMs not having an internal sense of "truth" or "common sense" is active research, not a solved problem.

Note that ML is not the only form of AI, and other forms (e.g. logic programming) are taught with facts and those are often programmed more than "trained", and there is a spectrum of how much programming versus "training" is used in developing different forms of AI.

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, Masters Computer Science, University of Iowa (2023) and

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What is the best way to learn Artificial Intelligence for a beginner?

Artificial Intelligence is one breakthrough career path of the twenty-first century. It is a remarkable and intelligent decision to choose AI as your career path. People in the IT industry know its potential and pathbreaking career, which they can achieve through learning AI.

This is the reason many IT people are moving towards learning this technology. Apart from that every single industrial domain such as ***BFSI, Marketing, HR, manufacturing, etc is getting highly dependent on AI innovations.***

AI is not just robots shown in movies. It is much more than just that. It is expert-level coding provided by computer systems through processing models to train them to behave in a certain way.
Anyone who wants to learn AI is a beginner at some time, whether it is a fresh college graduate or an individual already working and wants to move into this career path. Everyone starts somewhere someday. So, never take the pressure of the syllabus. For sure, learning is huge, but it is not complex. If followed properly, anyone can achieve it and interest matters more than the discussion on difficulty level.

Let's go through the AI learning path and what are the pre-requirements before choosing this technology as your career path. I have covered all the important points below, so do give it a read:

Prior-requirement of learning AI:

AI is a complicated technology that necessitates a thorough understanding of how systems and software operate. The following are some of the reasons why this technology isn't suitable for fresh graduates:

1. ***Compared to a total beginner,*** a working professional who has accumulated several years of knowledge on how systems work and what approaches are utilised in design thinking will find it easier to understand AI terms.
2. AI entails deciphering backend data and is based on ***real-time streaming of data generated by various businesses.*** In actual life, a fresher will be unable to comprehend the data and its complexities.
3. This skill is extremely useful for those who have experience with coding. ***A newbie may know how to code, but there's a good chance he or she will waste a lot of time cleaning up the code in the beginning rather than working on algorithms.***
4. ***The main reason for this is because businesses working on AI projects require a specialised set of skills to complete highly complicated, complex problem statements, which many people lack.***

AI is in high demand, so it's always a good idea to brush up on your skills. So, for someone who wants to learn AI but doesn't have a clear curriculum, ***I have written a step-by-step guide to learn AI from basic to intermediate levels.***

1. ***Working on your fundamentals:*** First and foremost, work on your fundamentals before going on to more complex topics in order to begin working with AI.

2. ***It's a good idea to start with Maths***. Brush up on your math skills and go over the following concepts again:

Matrix and Determinants, as well as Linear Algebra.

Calculus is a branch of mathematics that deals with Differentiation and Integration.

Vectors, statistics and Probability, graph theory.

3. **Coding language:** Once you have mastered your arithmetic skills, you can begin practising coding by picking a coding language. Java or Python can be studied. Python is the easiest of the three to learn and practice coding with because it has various packages such as Numpy and Panda.

4. **Working on Datasets:** Once you have mastered any coding language, you can move on to working with backend components such as databases. For example, you may now use SQL connector or other import modules to connect python or frontend IDE.

5. ***Lastly, I would suggest that you brush up your skills once you're equipped with all the practice work.*** You should enrol or join in for some courses to speed up the process. There are various online courses to learn from, but I have listed a few good ones which you can undertake for betterment.

There are some amazing institutes from different sites which I surely want to recommend here:

1. **Learnbay:** Learnbay offers a number of AI courses at the foundational, intermediate and advanced levels and at the senior management level. If you own more than a year of work experience, no other platform can be the best like Learnbay.

- **Variable courses that meet your ultimate needs-**

Depending on your profile, you can select from a variety of options. They provide different courses for techies, non-techies, early pros, intermediate, and even leadership level pros. Their courses are associated with elective modules as per candidates domain expertise. Aspirants can choose elective modules and capstone data science projects expertise as per their choice. Available options include people administration, promotion and salesforce assessment, production and telecom, insurance and finance, leisure and travel, transportation, energy, oil and gas, etc.

- **Additional project expertise and domain-elective study scopes for techies-** The advanced AI and ML course imparted by Learnbay has three additional electives apart from the one mentioned earlier. These are from the core engineering field- Advanced data structure and algorithm, system designing, Embedded engineering, etc.
- **You learn from scratch but up to the advanced level-**

The submodules are so well-planned and well-designed that given a bigger find it is easy to learn, although the course covers the most trending and advanced level of industry-specific AI application.

- **Stacks of the practical assignments with on-time expert feedback-**

Starting from the initial programming classes to the advanced ML modelling sessions, you will receive plenty of coding assignments. Experts will provide you with timely

feedback on all the submitted assignments so that you can rectify all of your mistakes prior to stepping into the next sessions.

- **1 to 1 learning support-**

Even though you are a beginner, due to extremely personalised teaching, you won't feel the subject hard. You will get proper assistance at every single step of your learning. Apart from that, you get ample flexibility to join the live classes at any time, from any batch.

- **Guidance on Hackthorne-**

Learbay offers guidance to attend and qualify Hackathons. This helps you to hone your coding skills.

- **Lifetime access to learning materials-**

The recorded copy of attended live classes, all the premium learning materials, remain free to access for the rest of your life. This helps in enriching your continued learning.

They also believe that learning should be done through real-world based projects. As a result, you will gain experience with how AI works in 15+ real-time projects.

2. **Edureka:** Edureka is already a well-known brand that has been on the market for quite some time. They also feature several AI-specific mini-series to learn from. In addition, you will get lifetime access to their courses once you purchase them.

3. **Simplilearn:** Simplilearn offers relationships with IBM, AWS, Facebook Blueprint, and Microsoft, as well as some fantastic courses to choose from. They place a strong emphasis on structured study and practice with real-world challenges.

4. **Coursera:** On the internet, it is ranked in the top five. More than 3 lakh students have taken Stanford University ML courses, which has received a 4.9 out of 5. It Covers machine learning like Supervised and unsupervised learning, logistic regression and artificial neural networks, ML algo. These are among the topics covered and are best practises in AI and ML

Finally, I would like to recommend Learnbay for working pros and Edureka for freshers. Coursera is suggested exclusively for those who want to learn just for knowing more, not with a career up-gradation target.

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Al Klein

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50 years developing softwareAug 22

Artificial intelligence is software - *someone* has to develop it, it doesn't develop itself.

Once it's developed, it has to be fed information, it doesn't get up and walk around the world to gather data.

Does your word processor develop documents on its own. Does your Quora app answer questions on its own? “AI” is just another class of software, not something organic and intelligent.

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Answered by

Gerry Rzeppa

Aug 22

Every created thing needs a creator, so an artificial intelligence program must have a programmer—at least to get started. After that, well, see here...

Gerry Rzeppa

· 1y

How does Ken Thompson illustrate the idea that a computer can "learn"?

I don’t know how Ken Thompson does it, but I do it by having a computer learn the difference between the “good” and “bad” trees it draws. The Algorithm I start with a little tree-drawing algorithm like this... ...that uses pseudorandom numbers in various places in an attempt to make the trees lifelike. The Sample Trees The actual numbers that the algorithm uses depend on the value assigned to the random number generator’s seed, so I start with a seed of, say, zero, and add, say, 314 to the seed with each invocation of the algorithm to produce displays of different trees, like this (click to enlarge)... ...where

some of the trees, as you can see, are significantly “better” than others. I have the program create dozens (or even hundreds) of displays like the one above. The Evaluations Then I have the program ask each user to rank the trees, on a scale of, say, 1 (bad) to 10 (good), as he views them. The Learning After many evaluations by many users… …the program averages the rankings and stores the associated seed values in files with names like “good seeds” and “acceptable seeds” and “bad seeds.” The program now knows (ie, has learned) which seeds to use to produce trees of a certain quality. So when a user asks the “educated” program to “Draw a good tree,” he gets a good tree; likewise for acceptable and bad trees. Conclusions Perhaps you’re thinking, “Really? That’s all there is to machine learning?” The answer is, Yes. That’s the gist of it. You can add more variables and gather more data and do more extensive evaluations and experiment with a wider variety of averaging routines, of course — and you can use bigger and more impressive words to describe what you’re doing — but at bottom, the computer can only compare and twiddle bits, and will only do what you’ve programmed it to do. Et voila!

…and here:

Gerry Rzeppa

· 2y

What would programming "love" into a robot look like? How would a developer simulate emotion through code?

Here is a short story about a boy who programs a “Potato Man” with an iPhone to exhibit a variety of human characteristics, including emotion: Chapter One (A Short Story).pdf If that doesn’t help, maybe this little experiment will: The Experiment An “Apparently Intelligent” program with rudimentary will, memory, consciousness, emotions and understanding that draws simple landscapes Version 1 My first version was entirely deterministic: I knew exactly what shape the horizon would take, where the sun would appear, how many birds would adorn the sky, etc. It produced acceptable drawings, but was too predictable to be interesting. Just a machine. Version 2 The next version was entirely random in its workings: I let the program decide what to draw and where to draw it, and really had no idea what it would produce. Almost every drawing it rendered was tasteless nonsense. Fast and prolific, but no artist. A broken machine. Version 3: Vincent The third version was a combination of the two — deterministic enough to stay within reasonable bounds (horizon somewhere near the middle of the page, no more than three birds at time) yet free enough to produce original works that I could not predict, even though I wrote every line of the code. Most of the time this version performs reasonably well, and now and then it draws something so striking that I print it off and hang it on the

wall. I call this third version, Vincent. Here is a sample of Vincent's work: Inside Vincent's Head Here are some of the Plain English sentences that constitute Vincent's soul. First, some type definitions: A landscape is a thing with an horizon, a sun, and some birds. An horizon is a polygon. A sun is a polygon. A bird is a polygon. Then a global variable so Vincent can remember what he's drawn: The drawings are some landscapes. And now, his primary talent: To draw a landscape: If you're tired, say "I'd rather not, I'm tired"; exit. Say "Okay". Imagine the landscape. Render the landscape. Remember the landscape. The "imagining" phase, as any human artist knows, is the critical part. This is how I taught Vincent to imagine a landscape: To imagine a landscape: Allocate memory for the landscape. Imagine an horizon in the landscape. Imagine a sun in the landscape. Imagine some birds in the landscape. The horizon comes first: To imagine an horizon in a landscape: Allocate memory for the landscape's horizon. Put the screen's left-center into a spot. Move the spot 1 inch up or down. Add the spot to the landscape's horizon. Loop. Move the spot 1/2 inch to the right and 1/4 inch or so up or down. Add the spot to the landscape's horizon. If the spot is not on the screen, break. Repeat. Smooth the landscape's horizon 2 times. Here comes the sun: To imagine a sun in a landscape: Allocate memory for the landscape's sun. Start with "A1 A9 I9 I1 A1" for the landscape's sun. Smooth the landscape's sun 3 times. Pick a spot anywhere above the landscape's horizon. Scale the landscape's sun given the spot and the landscape's horizon. Center the landscape's sun on the spot. The sun is actually just a square rounded off. The scaling makes it smaller the further it is from the horizon: To scale a sun given a spot and an horizon: Put 1 inch plus the spot's y into a ratio's numerator. Put the horizon's top into the ratio's denominator. Reduce the ratio. Scale the sun to the ratio. And last of all, the birds: To imagine some birds in a landscape: Pick a number between 1 and 3. Say "I've decided to draw " then the number then " birds this time" and wait. Loop. If the number is 0, exit. Imagine a bird in the landscape. Add the bird to the landscape's birds. Subtract 1 from the number. Repeat. To imagine a bird in a landscape: Allocate memory for the bird. Start with "E1 D3 G5 E7 G9" for the bird. If you feel like it, flip the bird left to right. Randomly scale the bird between 10 and 25 percent. Smooth the bird. Pick a spot for the bird in the landscape. Center the bird on the spot. Once Vincent has a landscape "in mind," so to speak, the rendering of it is easy: To render a landscape: If the landscape is nil, exit. Fill the screen with the tan color. Render the landscape's horizon with the black color. Put masking tape below the landscape's horizon. Render the landscape's sun with the black color. Render the landscape's birds with the black color. Take the masking tape off. The "masking tape" is used to make sure the sun appears behind the horizon. Committing a landscape to memory is a trivial thing for Vincent: To remember a landscape: Append the landscape to the drawings. A later version of Vincent drew similar landscapes in color, like this: The Musings Playing with Vincent tends to make me philosophical about things like will, memory, consciousness, emotions and understanding. My thoughts generally run along these lines: • Vincent makes decisions on his own. What the horizon will look like, where the sun will be placed, and how many birds will appear are unknown until he decides. Does he have a will of his own? • Vincent can tell us, when asked, what he has done. "I've drawn 7 landscapes today," for example.

Does he remember? • Vincent is aware of what it he is doing: “I’ve decided to draw 3 birds this time.” Is he conscious? • Vincent gets weary: under specific conditions, he refuses to draw, saying “I’d rather not, I’m tired.” Does he have emotions? • Vincent responds, properly, to various commands. When asked to draw, for example, he draws. When asked what he’s done, he responds verbally, with appropriate remarks. Does he understand? • One version of Vincent had a strong instinct for self-preservation. When I hit the quit button, he said, “I don’t want to die. Do that again and I’ll make a thousand copies of myself on your disk.” He would, and he did. But he won’t again. The Conclusions I believe that Vincent’s capabilities are congruent, but not equivalent, to the corresponding capabilities in human beings. They are implemented differently, for one thing. His will is less free but also less fickle than ours. His memory is less capacious but more exacting. His consciousness is more narrowly focused, but less easily distracted. And his moods and understanding are not as deep or rich as ours, but they are significantly more predictable. I also believe that his attributes and ours are not on the same inclined plane, where differences are mere matters of degree — more code will never make Vincent a real person. But I do believe that Vincent’s capabilities and ours are on different steps of the same staircase, and that it is therefore appropriate to use words like will, memory, consciousness, emotion, and understanding to describe them. And that we can learn things about ourselves by studying creatures like Vincent. For example: • Vincent has both a hardware “body” and a software “soul.” The two can be easily distinguished, and even separated. And the same soul can be reanimated in a different body. • Vincent did not “evolve” via a long series of random mutations and natural selections; he was designed and created by a being greater than he. I cannot prove that all animate beings come to life through a similar creative process, but I can say that in every case where I have been able to discover, first hand, the exact origins of such things, purposeful design has been involved. • Vincent has little or nothing to be proud of. Whatever talents and skills he possesses were graciously bestowed upon him by his creator. Now and then he may surprise me with a particularly striking drawing based on his own decisions, but he wouldn’t be making those decisions at all were it not for me. Bottom line: Vincent is an AI, but not an Artificial Intelligence; he’s nothing more or less than an Apparent Intelligence. As all his kind will ever be. Et voila!

Et voila!
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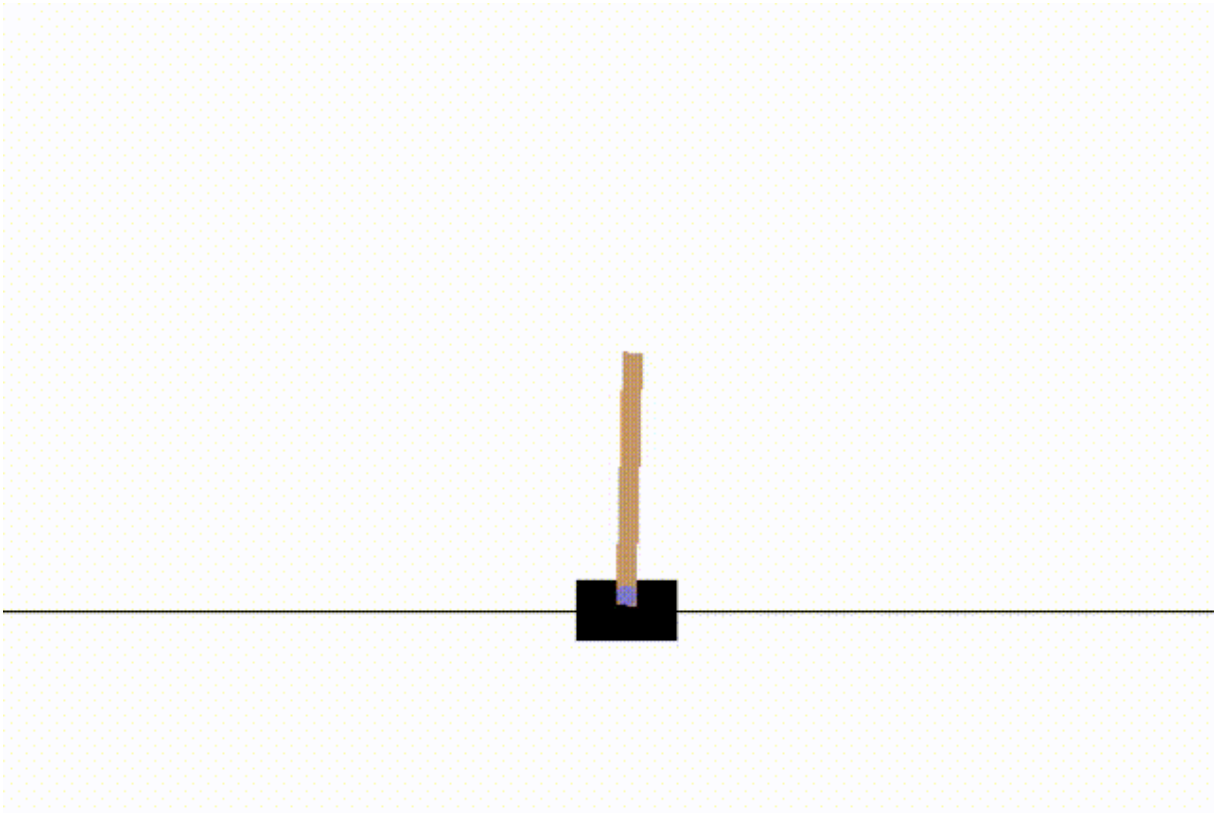
Answered by

Dave

Aug 21

Depends on the kind of AI.

Reinforcement Learning is designed to learn on its own to a certain degree. Consider this scenario, teaching a RL algorithm to balance a pole on a cart:



How it works is that a programmer sets some boundary conditions, and a reward function. The boundary conditions will be that the cart must stay within the boundary, and the pole must stay between say 75 and 105 degrees. The reward function will give points for the cart being closer to the middle, give points for the pole being closer to 90 degrees, and take points away if the cart goes too far towards the boundary or the pole moves away from 90 degrees.

The RL model will then learn based on reward how to move to ensure the pole is balanced, which is called reducing loss. It will basically set a bunch of weights that inform the model how to move to balance the pole, maximising reward and minimising loss.

Now under those conditions the model will learn how to balance the pole, but it won't know how to do other things. If you reversed gravity or made the cart fly the model wouldn't be able to adapt. So it that sense it can't learnt outside the boundaries it's been given. The model will need to be "retrained" if new conditions are introduced that were not part of the original training parameters, and that usually requires some sort of human input.

Now what's quite interesting is combining RL as above with a Large Language Model like ChatGPT. GPT4 in particular is reasonably good at writing code and understanding more complex scenarios. It's not impossible to imagine a scenario where GPT4 teaches a RL model to change and adapt as initial conditions change. Microsoft Research is already experimenting with this and drones, making them far more adaptable than before. So watch this space.