The Best Machine Learning Resources

A compendium of resources for crafting a curriculum on artificial intelligence, machine learning, and deep learning.
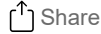
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This article is an addendum to the series <u>Machine Learning for Humans</u> 🤖👶, a guide for getting up-to-speed on machine learning concepts in 2-3 hours.

General advice on crafting a curriculum

Going to school for a formal degree program for isn't always possible or desirable. For those considering an autodidactic alternative, this is for you.

1. Build foundations, and then specialize in areas of interest.

You can't go deeply into every machine learning topic. There's too much to learn, and the field is advancing rapidly. Master foundational concepts and then focus on projects in a specific domain of interest — whether it's natural language understanding, computer vision, deep reinforcement learning, robotics, or whatever else.

2. Design your curriculum around topics that personally excite you.

Motivation is far more important than micro-optimizing a learning strategy for some long-term academic or career goal. If you're having fun, you'll make fast progress. If you're trying to force yourself forward, you'll slow down.

We've included resources that we explored personally or came highly recommended. This list is not meant to be exhaustive. There are endless options, and too much choice is counterproductive. But if we're missing a great resource that belongs here, please <u>reach out</u>!

Foundations

Programming

Syntax and basic concepts: <u>Google's Python Class</u>, <u>Learn Python the Hard Way</u>.

Practice: <u>Coderbyte</u>, <u>Codewars</u>, <u>HackerRank</u>.

Linear algebra

Deep Learning Book, Chapter 2: Linear Algebra. A quick review of the linear algebra concepts relevant to machine learning.

A First Course in Linear Model Theory by Nalini Ravishanker and Dipak Dey. Textbook introducing linear algebra in a statistical context.

Probability & statistics

MIT 18.05, Introduction to Probability and Statistics, taught by Jeremy Orloff and Jonathan Bloom. Provides intuition for probabilistic reasoning & statistical inference, which is invaluable for understanding how machines think, plan, and make decisions.

All of Statistics: A Concise Course in Statistical Inference, by Larry Wasserman. Introductory text on statistics.

Calculus

Khan Academy: Differential Calculus. Or, any introductory calculus course or textbook.

Stanford CS231n: Derivatives, Backpropagation, and Vectorization, prepared by Justin Johnson.

Machine learning

Courses

Andrew Ng's Machine Learning course on Coursera (or, for more rigor, Stanford CS229 - see cheat sheet).

Data science bootcamps: Galvanize (full-time, 3 months, $$$$), Thinkful (flexible schedule, 6 months, $$).

Textbook

An Introduction to Statistical Learning by Gareth James et al. Excellent reference for essential machine learning concepts, available free online.

Deep learning

Courses

Deeplearning.ai, Andrew Ng's introductory deep learning course.

CS231n: Convolutional Neural Networks for Visual Recognition, Stanford's deep learning course. Helpful for building foundations, with engaging lectures and illustrative problem sets.

Projects

Fast.ai, a fun and hands-on project-based course. Projects include classifying images of dogs vs. cats and generating Nietzschean writing.

MNIST handwritten digit classification with TensorFlow. Classify handwritten digits with >99% accuracy in 3 hours with this tutorial by Google.

Try your hand at a Kaggle competition. Implement a deep learning paper that you found interesting, using other versions on GitHub as reference material.

Reading

Deep Learning Book, a.k.a. the Bible of Deep Learning, authored by Ian Goodfellow, Yoshua Bengio, and Aaron Courville.

Neural Networks and Deep Learning, a clear and accessible online deep learning text by Michael Nielsen. Ends with commentary on reaching human-level intelligence.

Deep Learning Papers Reading Roadmap, a compilation of key papers organized by chronology and research area.

Reinforcement learning

Courses

John Schulman's CS 294: Deep Reinforcement Learning at Berkeley.

David Silver's Reinforcement Learning course at University College London.

Deep RL Bootcamp, organized by OpenAI and UC Berkeley. Applications are currently closed, but it's worth keeping an eye out for future sessions.

Projects

Andrej Karpathy's Pong from Pixels. Implement a Pong-playing agent from scratch in 130 lines of code.

Arthur Juliani's Simple Reinforcement Learning with Tensorflow series. Implement Q-learning, policy-learning, actor-critic methods, and strategies for exploration using TensorFlow.

See OpenAI's requests for research for more project ideas.

Reading

Richard Sutton's book, Reinforcement Learning: An Introduction.

Artificial intelligence

Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig.

Sebastian Thrun's Udacity course, Intro to Artificial Intelligence.

Fellowships: Insight AI Fellows Program, Google Brain Residency Program

Artificial intelligence safety

For the short version, read: (1) Johannes Heidecke's Risks of Artificial Intelligence, (2) OpenAI and Google Brain's collaboration on Concrete Problems in AI Safety, and (3) Wait But Why's article on the AI Revolution.

For the longer version, see Nick Bostrom's <u>Superintelligence</u>.

Check out the research published by the <u>Machine Intelligence Research Institute</u> (MIRI) and <u>Future of Humanity Institute</u> (FHI) on AI safety.

Keep up-to-date with <u>/r/ControlProblem</u> on Reddit.

Newsletters

<u>Import AI</u>, weekly AI newsletter covering the latest developments in the industry. Prepared by Jack Clark of OpenAI.

<u>Machine Learnings</u>, prepared by Sam DeBrule. Frequent guest appearances from experts in the field.

<u>Nathan.ai</u>, covering recent news and commenting on AI/ML from a venture capital perspective.

<u>The Wild Week in AI</u> by Denny Britz. The title says it all.

Advice from others

<u>"What is the best way to learn machine learning without taking any online courses?</u> — answered by Eric Jang, Google Brain

<u>What are the best ways to pick up deep learning skills as an engineer?"</u> - answered by Greg Brockman, CTO of OpenAI

A16z's <u>AI Playbook</u>, a more code-based introduction to AI

<u>AI safety syllabus</u>, designed by 80,000 Hours

"You take the blue pill, the story ends. You wake up in your bed and believe whatever you want to believe. You take the red pill, you stay in Wonderland, and I show you how deep the rabbit hole goes." — Morpheus

Good luck!

*More from **Machine Learning for Humans** 🤖 👶*

- *[Part 1: Why Machine Learning Matters](#)* ✅

- *[Part 2.1: Supervised Learning](#)* ✅

- *[Part 2.2: Supervised Learning II](#)* ✅

- *[Part 2.3: Supervised Learning III](#)* ✅

- *[Part 3: Unsupervised Learning](#)* ✅

- *[Part 4: Neural Networks & Deep Learning](#)* ✅

- *[Part 5: Reinforcement Learning](#)* ✅

- ***Appendix: The Best Machine Learning Resources*** ✅

Machine Learning   Artificial Intelligence   Deep Learning   Reinforcement Learning

Tech