



## AtHomeWithAI

### Curated Resource List

A list of educational resources curated by DeepMind Scientists and Engineers for students interested in learning more about artificial intelligence, machine learning and other related topics.

Resource	Link	Type	Description	Topic	Target audience
21 Definitions of Fairness and Their Politics	<a href="https://www.youtube.com/embed/jiXluYdnyvk">https://www.youtube.com/embed/jiXluYdnyvk</a>	Video lecture	Arvind Narayanan discusses the various definitions of fairness and their tradeoffs they present for society	Ethics	Introductory
3Blue1Brown Youtube channel	<a href="https://www.youtube.com/channel/UCYO_jab_esuFRV4b17AJtAw">https://www.youtube.com/channel/UCYO_jab_esuFRV4b17AJtAw</a>	Video series	Great tutorial series. Videos on Linear Algebra and Neural Networks from Ground Up particularly useful	Theory and Foundations	Introductory
A 2020 vision of Linear Algebra (Gilbert Strang, MIT)	<a href="https://www.youtube.com/watch?v=YrHhbtISM0&amp;list=PLUl4U3c3sXqIw01BcUj0WTzYVpZvR7q1">https://www.youtube.com/watch?v=YrHhbtISM0&amp;list=PLUl4U3c3sXqIw01BcUj0WTzYVpZvR7q1</a>	Video lectures	Concisely summarises a whole course of linear algebra, with technical details, through a new lens: how Linear Algebra is being applied to the real world, especially in Machine Learning.	Theory and Foundations	Introductory
A Code-first Introduction to Natural Language Processing	<a href="https://www.fast.ai/2019/07/08/fastai-nlp/">https://www.fast.ai/2019/07/08/fastai-nlp/</a>	Video lectures	An introduction to natural language processing for people with a technical background.	Natural Language Processing	Introductory
A Primer on Neural Network Models for Natural Language Processing	<a href="https://www.jair.org/index.php/jair/article/view/11036">https://www.jair.org/index.php/jair/article/view/11036</a>	Paper	A clear review of how neural networks are used in natural language processing.	Natural Language Processing	Intermediate
AGI Safety Literature Review	<a href="https://arxiv.org/pdf/1805.01109.pdf">https://arxiv.org/pdf/1805.01109.pdf</a>	Paper	Great overview of AGI safety literature up to 2018, with hundreds of references to follow up on.	Safety	Intermediate
AI Alignment newsletter by Rohin Shah	<a href="http://rohinshah.com/alignment-newsletter/">http://rohinshah.com/alignment-newsletter/</a>	Newsletter	Weekly newsletter summarizing recent work in AI safety	Safety	Intermediate
AI safety YouTube channel by Robert Miles	<a href="https://www.youtube.com/channel/UCLB7AzTwc6VFzR8sO2ucBMg/vid">https://www.youtube.com/channel/UCLB7AzTwc6VFzR8sO2ucBMg/vid</a>	Video lectures	Educational and entertaining videos introducing key concepts in AGI safety to a popular audience	Safety	Introductory
Alberta RL 4-course Specialization	<a href="https://www.coursera.org/specializations/reinforcement-learning">https://www.coursera.org/specializations/reinforcement-learning</a>	Online course	A four course sequence on RL, starting from Bandits and ending at RL with function approximation (NNs), Policy Gradient methods, and Average Reward.	Reinforcement Learning	Introductory
Ami's Coursera Machine Learning: Algorithms in the Real World Specialization	<a href="https://www.coursera.org/specializations/machine-learning-algorithms-in-the-real-world">https://www.coursera.org/specializations/machine-learning-algorithms-in-the-real-world</a>	Online course	Excellent view into framing and identifying ML problems and their solutions	Machine Learning	Intermediate
An overview of gradient descent optimization algorithms	<a href="https://ruder.io/optimizing-gradient-descent/">https://ruder.io/optimizing-gradient-descent/</a>	Blog post	A comprehensive blog post that reviews the main variants of gradient descent that are used to optimize neural networks.	Deep Learning	Introductory
Andrei Karpathy blog/hacker guide	<a href="http://karpathy.github.io/neuralnets/">http://karpathy.github.io/neuralnets/</a>	Blog post	Very easily accessible intro to neural nets. Also his blog has very digestible practice advice.	Deep Learning	Introductory
Andrew Ng's Machine Learning course	<a href="https://www.coursera.org/learn/machine-learning">https://www.coursera.org/learn/machine-learning</a>	Online course	Very hands-on and comprehensive first course for machine learning. Since it is on coursera, you can have your assignment "graded" and also have TA's and other peers to help you get through the materials.	Theory and Foundations	Introductory
Ankur Handa's blog on Sim2Real	<a href="https://sim2realai.github.io/">https://sim2realai.github.io/</a>	Blog post	Useful posts about simulators, sim2real transfer learning, physics engines	Control and Robotics	Intermediate
Bayesian Reasoning and Machine Learning	<a href="http://web4.cs.ucl.ac.uk/staff/D.Barber/pmwiki/pmwiki.php/Main/Book">http://web4.cs.ucl.ac.uk/staff/D.Barber/pmwiki/pmwiki.php/Main/Book</a>	Online book	Basics of probabilistic reasoning and modelling	Machine Learning	Intermediate
Brain Inspired Podcast	<a href="https://braininspired.co/">https://braininspired.co/</a>	Podcast	A podcast where neuroscience and AI converge.	Neuroscience	Intermediate
Causal Inference in Statistics: A Primer	<a href="http://bayes.cs.ucla.edu/PRIMER/">http://bayes.cs.ucla.edu/PRIMER/</a>	Online preprint	Excellent introduction into causal inference. This is a preprint but complete version of the final book.	Theory and Foundations	Intermediate
Causal Inference: What If	<a href="https://www.hsph.harvard.edu/miguel-herman/causal-inference-book/">https://www.hsph.harvard.edu/miguel-herman/causal-inference-book/</a>	Online book	New book on causal inference	Theory and Foundations	Intermediate



Dive into Deep Learning	<a href="https://d2l.ai/">https://d2l.ai/</a>	Book	Great format, which makes learning key ML concepts more fun and interactive.	Deep Learning	Introductory
DL + RL course with UCL	<a href="https://www.youtube.com/playlist?list=PLqYmG7hTraZDNJre">https://www.youtube.com/playlist?list=PLqYmG7hTraZDNJre</a>	Video lectures	This course covered a lot of ground on deep learning and reinforcement learning. It consisted of two, mostly separate, tracks: one on DL and one on RL, which can be consumed separately.	RL + DL	Intermediate
EEML (first/second edition) Lab materials	<a href="https://github.com/tmlss2018/PracticalSessions">https://github.com/tmlss2018/PracticalSessions</a> ; <a href="https://github.com/tmlss2018/PracticalSessions">https://github.com/tmlss2018/PracticalSessions</a>	Colab	Lab material for EEML summer school, covering topics like vision, RNN, unsupervised learning and RL. The material come in the form of exercises with solutions supposed to help introduce a lot of basic ideas	RL + DL	Introductory
EEML slides from lectures	<a href="https://www.eeml.eu/previous-editions/eeml19/resource">https://www.eeml.eu/previous-editions/eeml19/resource</a>	Slides	Slides for the lectures from previous year edition of EEML (unfortunately no recordings). This cover great set of material from intro material to more complex presentations.	RL + DL	Intermediate
Elements of Causal Inference: Foundations and Learning Algorithms	<a href="https://mitpress.mit.edu/books/elements-causal-inference">https://mitpress.mit.edu/books/elements-causal-inference</a>	Online book	This books introduces the reader to causal inference in a simple and accessible way.	Theory and Foundations	Intermediate
Emma Brunskill RL Course	<a href="https://www.youtube.com/watch?v=FgzM3zpZ55o&amp;list=PLo">https://www.youtube.com/watch?v=FgzM3zpZ55o&amp;list=PLo</a>	Video lectures	Video lectures on reinforcement learning from Emma Brunskill's course at Stanford.	Reinforcement Learning	Introductory
Ermon's graphical models course at Stanford	<a href="https://ermongroup.github.io/cs228-notes/">https://ermongroup.github.io/cs228-notes/</a>	Lectures notes	Covers a lot of probabilistic methods	Unsupervised Learning and Generative Models	Intermediate
Essence of Linear Algebra (3bluelbrown)	<a href="https://www.youtube.com/playlist?list=PLZHGOBOWTQDPD">https://www.youtube.com/playlist?list=PLZHGOBOWTQDPD</a>	Video series	Provides very good "intuition" into the key ideas of linear algebra, without going too much into the technical details. Accompanies a traditional linear algebra textbook or college course.	Theory and Foundations	Introductory
Fairness and Machine Learning Book	<a href="https://fairmlbook.org/">https://fairmlbook.org/</a>	Book, Video Lectures	Overview of Fairness in Machine Learning Topics	Ethics	Intermediate
Francis Bach's blog	<a href="https://francisbach.com/">https://francisbach.com/</a>	Blog	Useful tricks and tips, insightful analysis of various machine learning concepts	Theory and Foundations	Intermediate
Full Stack Deep Learning	<a href="https://fullstackdeeplearning.com/march2019">https://fullstackdeeplearning.com/march2019</a>	Online Course	Deep learning models do not live in a vacuum. This course highlights the practical aspects of deep learning such as model deployment, infrastructure, debugging, and even preparing for deep learning interviews.	Deep Learning	Intermediate
Getting into machine learning	<a href="http://www.furidamu.org/blog/2018/12/06/getting-into-machine-learning/">http://www.furidamu.org/blog/2018/12/06/getting-into-machine-learning/</a>	Blog	A blog for those looking to get into machine learning	Machine Learning	
Good resource for learning foundations of computer science	<a href="https://code.org/break">https://code.org/break</a>	Online course	Provides high-quality, live, interactive computer science classrooms. Code.org is a nonprofit dedicated to expanding access to computer science in schools and increasing participation by women and underrepresented youth.	Computer Science	Introductory
Goodman (1955). The New Riddle of Induction.	<a href="http://fitelson.org/confirmation/goodman_1955.pdf">http://fitelson.org/confirmation/goodman_1955.pdf</a>	Book chapter	Philosophical background on inductive bias and why inferences and induction is hard.	Philosophy	Intermediate
Harvard University's Justice Course	<a href="http://justiceharvard.org/">http://justiceharvard.org/</a>	Video lectures	In-depth and engaging lecture series on justice and moral philosophy.	Ethics	Intermediate
How to Use t-SNE Effectively	<a href="https://distill.pub/2016/misread-tsne/">https://distill.pub/2016/misread-tsne/</a>	Interactive textbook	It provides an interactive, insightful journey into all the major pitfalls of using tSNE, which has become one of the most commonly use low-dimensional data embeddings. I found it extremely useful to better understand what one can really	Unsupervised Learning and Generative Models	Intermediate
Human Compatible:Artificial Intelligence and the Problem of Control by Stuart Russell	<a href="https://www.amazon.com/Human-Compatible-Artificial-Intelligence-Book/dp/1449319696">https://www.amazon.com/Human-Compatible-Artificial-Intelligence-Book/dp/1449319696</a>	Book	Must-read book on AI safety by an AI pioneer	Safety	Introductory
Human intelligence enterprise course	<a href="https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6.034-human-intelligence/">https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6.034-human-intelligence/</a>	Course materials	History of human intelligence	Theory and Foundations	Intermediate
Intro to machine learning talk at Lviv workshop	<a href="https://youtube.com/NnAvhTs_WJ8">https://youtube.com/NnAvhTs_WJ8</a> ; <a href="https://sites.google.com/view/lviv-workshop">https://sites.google.com/view/lviv-workshop</a>	Video lecture	Introduction to machine learning. It introduces some theory on which one can build the machinery of deep learning	Deep Learning	Intermediate
Is the Abstract Mathematics of Topology Applicable to the Real World?	<a href="https://video.ias.edu/mini-symposium-topology-2015">https://video.ias.edu/mini-symposium-topology-2015</a>	Video series	The introduction is a great description of the basics of topology. The seminar goes on to describe certain applications in a really compelling way	Theory and Foundations	Intermediate
KhanAcademy courses	<a href="https://www.khanacademy.org/math/statistics-probability">https://www.khanacademy.org/math/statistics-probability</a>	Online course	Great introductions for beginners into Statistics, Probability Theory, Calculus, necessary to understand ML.	Theory and Foundations	Introductory
Khipu videos and practicals	<a href="https://khipu.ai/">https://khipu.ai/</a> & <a href="https://github.com/khipu-ai/practicals-2019">https://github.com/khipu-ai/practicals-2019</a>	Videos of lectures, slides and colabs	Resources from Khipu, including videos and practicals that students can go along with.	Deep Learning	Intermediate
Learning from Data course – Caltech	<a href="http://work.caltech.edu/telecourse.html">http://work.caltech.edu/telecourse.html</a>	Video lectures	Gentle introduction to Machine Learning. Topics are explained very clearly.	Theory and Foundations	Introductory



Princeton Companion to Mathematics	<a href="https://isidore.co/calibre/get/pdf/4662">https://isidore.co/calibre/get/pdf/4662</a>	Book	Probably the most amazing maths resource you will ever find. This book provides a thorough overview of the most important concepts in modern mathematics, assuming no background knowledge, and in the self-proclaimed 'bedtime story' format.	Theory and Foundations	Introductory
Probabilistic Models of Cognition	<a href="https://probmods.org/">https://probmods.org/</a>	Interactive textbook	An interactive textbook describing how to use probabilistic models to produce and model human-like behavior.	Neuroscience	Introductory
Probability in high dimensions	<a href="https://web.math.princeton.edu/~rvan/APC550.pdf">https://web.math.princeton.edu/~rvan/APC550.pdf</a>	Lecture Notes	A very readable book "of ideas at the intersection of probability, analysis, and geometry that arise across a broad range of contemporary problems in different areas."	Computer Science	Advanced
Project Euler	<a href="https://projecteuler.net/">https://projecteuler.net/</a>	Problem Solving Community	A series of challenging math + CS problems to stimulate the brain. They are super fun and will lead you to learn things that will help your deep learning career down the road.	Theory and Foundations	Introductory
Ranking of ML online courses	<a href="https://www.freecodecamp.org/news/every-single-">https://www.freecodecamp.org/news/every-single-</a>	Reading list	Quite a comprehensive overview of most of the top online courses on machine learning.	Machine Learning	Introductory
Reinforcement Learning: an Introduction (2018 edition)	<a href="http://incompleteideas.net/book/RLbook2018.pdf">http://incompleteideas.net/book/RLbook2018.pdf</a>	Book	This is "the" introductory book of reinforcement learning. Rich does an amazing job at explaining both the fundamental concepts of RL as well as guiding the reader through all the way to advanced open research problems.	Reinforcement Learning	Introductory
Reproducing kernel Hilbert spaces in Machine Learning	<a href="http://www.gatsby.ucl.ac.uk/~gretton/coursefiles/rkhsourse.html">http://www.gatsby.ucl.ac.uk/~gretton/coursefiles/rkhsourse.html</a>	Course materials		Unsupervised Learning and Generative Models	Intermediate
Speech and Language Processing	<a href="https://web.stanford.edu/~jurafsky/slp3/">https://web.stanford.edu/~jurafsky/slp3/</a>	Book	The authoritative reference on natural language processing, now in its 3rd version and available online.	Natural Language Processing	Introductory
Spinning Up in Deep RL	<a href="https://spinningup.openai.com/en/latest/">https://spinningup.openai.com/en/latest/</a>	Code	This is an educational resource produced by OpenAI that makes it easier to learn about deep reinforcement learning (deep RL).	Reinforcement Learning	Intermediate
Stanford Physics lecture series by Leonard Susskind	<a href="https://www.youtube.com/playlist?list=PL6i6QqDQhQGaG">https://www.youtube.com/playlist?list=PL6i6QqDQhQGaG</a>	Video lectures	Great resource for learning many important areas of modern physics, including classical, statistical and quantum mechanics. These lectures assume very little background knowledge, and Leonard is able to introduce and explain complex	Science	Introductory
Stanford's Machine Learning Course	<a href="https://www.youtube.com/playlist?list=PLoRQMvody4rMiQQ">https://www.youtube.com/playlist?list=PLoRQMvody4rMiQQ</a>	Video lectures	Introduction to machine learning course	Machine Learning	Introductory
Stanford's NLP with Deep Learning Course	<a href="https://www.youtube.com/playlist?list=PLoRQMvody4rOhcu">https://www.youtube.com/playlist?list=PLoRQMvody4rOhcu</a>	Online course	Useful for anyone who wants to get into NLP	Deep Learning	Intermediate
Statistical Learning Theory course	<a href="https://www.edx.org/course/statistical-learning">https://www.edx.org/course/statistical-learning</a>	Online course	A free course, led by professors Hasti and Tibshirani, covering a lot of basics of machine learning, oriented towards people with more mathematical backgrounds.	Theory and Foundations	Introductory
Strang All the Key Ideas of Linear Algebra in 1 Lesson	<a href="https://www.youtube.com/watch?v=O3NvYL_C-5s4&amp;feature=youtu">https://www.youtube.com/watch?v=O3NvYL_C-5s4&amp;feature=youtu</a>	Video lecture	Concise, integrative	Theory and Foundations	Intermediate
Strogatz nonlinear dynamics course	<a href="https://www.youtube.com/playlist?list=PLbN57C5Zdl6j_qJA">https://www.youtube.com/playlist?list=PLbN57C5Zdl6j_qJA</a>	Videos	Video courses on nonlinear dynamics	Control and Robotics	Intermediate
Sunday Classics	<a href="http://blog.shakirm.com/sunday-classic-paper/">http://blog.shakirm.com/sunday-classic-paper/</a>	Reading list	A collection of classical papers on all topics in machine learning, cognitive science, statistics, information theory, neuroscience, artificial intelligence, signal processing, operations research, econometrics, and others.	Machine Learning	
Sutton and Barto's Reinforcement Learning	<a href="http://incompleteideas.net/book/the-book-2nd.html">http://incompleteideas.net/book/the-book-2nd.html</a>	Textbook	This is THE textbook for RL. It builds up from very fundametal concepts to advanced topics. Accompanies David Silver's lectures.	Deep Learning	Intermediate
The Annotated Transformer	<a href="https://nlp.seas.harvard.edu/2018/04/03/attention.html">https://nlp.seas.harvard.edu/2018/04/03/attention.html</a>	Blog post	Excellent introduction to the dominant NLP model	Natural Language Processing	Advanced
The Book of Why	<a href="http://bayes.cs.ucla.edu/WHY/">http://bayes.cs.ucla.edu/WHY/</a>	Book chapers	Light introduction into causal inference and historical excusion on its development	Theory and Foundations	Introductory
The challenge of understanding the brain: where we stand in 2015	<a href="https://www.cell.com/neuron/pdf/S0896-6273(15)00256-1.pdf">https://www.cell.com/neuron/pdf/S0896-6273(15)00256-1.pdf</a>	Paper	Good overview of the more circuit / biology end of neuroscience	Neuroscience	Intermediate
The Trouble with Bias - NeurIPS 2017	<a href="https://www.youtube.com/watch?v=fMym_BKWQzk">https://www.youtube.com/watch?v=fMym_BKWQzk</a>	Video Lecture	Kate Crawford discusses the ethical implications of bias in AI systems	Ethics	Introductory
Theoretical Neuroscience	<a href="http://www.gatsby.ucl.ac.uk/~imate/biblio/dayana/bbott.pdf">http://www.gatsby.ucl.ac.uk/~imate/biblio/dayana/bbott.pdf</a>	Online book	popular introductory text of theoretical neuroscience	Neuroscience	Intermediate
UofA / Amii Coursera RL Specilization by White and White	<a href="https://www.coursera.org/specializations/reinforcement-learning">https://www.coursera.org/specializations/reinforcement-learning</a>	Online courses	Made by UofA / Amii, a heartland of RL research; Adam White is a DeepMinder; comprehensive and well designed course series that will give the most important fundamentals of RL	Reinforcement Learning	Intermediate

Variational inference a review for statisticians by David Blei	<a href="https://arxiv.org/abs/1601.00670">https://arxiv.org/abs/1601.00670</a>	Paper	Provides the best explanation for VI in the context of generative modelling that I have seen.	Unsupervised Learning and Generative Models	Intermediate
WEKA: a workbench for machine learning	<a href="https://www.cs.waikato.ac.nz/ml/weka/">https://www.cs.waikato.ac.nz/ml/weka/</a>	Online resource	A large, free software toolset for getting to know data, data visualization, classification, regression, feature selection, and the foundations of data science; I use this regularly to teach others how to see the patterns in data and appreciate how machine learning can be used to solve problems.	Machine Learning	Introductory