

Meditations on Artificial Intelligence Selected Readings

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On The Philosophy of Thought

1. Descartes, René, 1637, Discourse on the Method of Rightly Conducting One's Reason and of Seeking Truth in the Science, <https://ia801906.us.archive.org/17/items/rmcg0001/Descartes-Discourse-a1.pdf>

Computability and Logic

2. Turing, A.M., 2009. Computing Machinery and Intelligence (pp. 23-65). Springer Netherlands. available at https://link.springer.com/chapter/10.1007/978-1-4020-6710-5_3
3. Turing, A. M., On Computable Numbers, with an Application to the Entscheidungsproblem, 1936, available at https://www.cs.virginia.edu/~robins/Turing_Paper_1936.pdf
4. Gödel, K., On Formally Undecidable Propositions of *Principia Mathematica* and Related Systems, 1930, available at https://homepages.uc.edu/~martinj/History_of_Logic/Godel/Godel%20-%20On%20Formally%20Undecidable%20Propositions%20of%20Principia%20Mathematica%201931.pdf
5. Rosenblatt, F., The Perceptron: A Probabilistic Model for Information Storage and Organization in the Brain, *Psychology Review*, 1958, available at <http://doi:10.1037/h0042519>
6. Sahay, M., Neural Networks and the Universal Approximation Theorem, June 2020, available at <https://towardsdatascience.com/neural-networks-and-the-universal-approximation-theorem-8a389a33d30a> (see also https://en.wikipedia.org/wiki/Universal_approximation_theorem)

Intelligence and Psychology

7. Hofstadter, D. Gödel, Escher, Bach, Basic Books, 1979 (See: https://en.wikipedia.org/wiki/G%C3%B6del,_Escher,_Bach)
8. Chabris, C. and Simons, D., *The Invisible Gorilla: How Our Intuitions Deceive Us*, Crown Publishing, 2010, see <http://www.theinvisiblegorilla.com>
9. Cole, David, "The Chinese Room Argument", *The Stanford Encyclopedia of Philosophy* (Summer 2023 Edition), Edward N. Zalta & Uri Nodelman (eds.). available at <https://plato.stanford.edu/entries/chinese-room/> (see also https://en.wikipedia.org/wiki/Chinese_room)

10. Cardon, D., Cointet, J.P., Mazières, A. and Carey-Libbrecht, L., 2018. Neurons Spike Back. *Réseaux*, 211(5), pp.173-220. available at <https://mazieres.gitlab.io/neurons-spike-back/index.htm>

Computing Hardware History and Evolution

11. Burks, A. W., Goldstine, H. H., and von Neumann, J., Preliminary Discussion of the Logical Design of an Electronic Computing Instrument, 1946, available at https://www.ias.edu/sites/default/files/library/Prelim_Disc_Logical_Design.pdf
12. Markoff, J., From PlayStation to Supercomputer for \$50,000, NY Times, 2003, available at <https://www.nytimes.com/2003/05/26/business/technology-from-playstation-to-supercomputer-for-50000.html>

Hardware AI Acceleration

13. NVIDIA Hopper Architecture In-Depth, May 2022, available at <https://developer.nvidia.com/blog/nvidia-hopper-architecture-in-depth/>
14. Jouppi, N. *et al*, TPU v4: An Optically Reconfigurable Supercomputer for Machine Learning with Hardware Support for Embeddings, Proceedings of the International Symposium on Computer Architecture, June 2023, pp. 1-14, available at <https://doi.org/10.1145/3579371.3589350>
15. AWS Tranium Architecture, available at <https://awsdocs-neuron.readthedocs-hosted.com/en/latest/general/arch/neuron-hardware/trainium.html#trainium-arch>
16. Reed, D., Gannon, D., Dongarra, J., HPC Forecast: Cloudy and Uncertain, Communications of the ACM, February 2023, Vol. 66 No. 2, pp. 82-90, February 2023, available at <https://doi.org/10.1145/3552309>
17. Reed, D., Gannon, D., Dongarra, J., Reinventing High Performance Computing: Challenges and Opportunities, March 2022, available at <https://arxiv.org/abs/2203.02544>
18. Markoff, J., IBM Develops a New Chip that Functions Like the Brain, New York Times, August 7, 2014, available at <https://www.nytimes.com/2014/08/08/science/new-computer-chip-is-designed-to-work-like-the-brain.html>
19. Ambrogio, S. *et al*, An Analog-AI Chip for Energy-efficient Speech Recognition and Transcription, *Nature*, 620, pp. 768–775 (2023), available at <https://www.nature.com/articles/s41586-023-06337-5>

Artificial Intelligence Techniques

20. Parr, T. and Howard, J., The Matrix Calculus You Need For Deep Learning, arXiv preprint, arXiv:1802.01528, July 2018, available at <https://arxiv.org/abs/1802.01528>
21. GPT-4 Technical Report, March 2023, available at <https://arxiv.org/abs/2303.08774>

22. Bommasani, R., Hudson, D.A., Adeli, E., Altman, R., Arora, S., von Arx, S., Bernstein, M.S., Bohg, J., Bosselut, A., Brunskill, E. and Brynjolfsson, E., 2021. On the Opportunities and Risks of Foundation Models. arXiv preprint arXiv:2108.07258. available at <https://arxiv.org/abs/2108.07258>
23. Bubeck, S., Chandrasekaran, V., Eldan, R., Gehrke, J., Horvitz, E., Kamar, E., Lee, P., Lee, Y.T., Li, Y., Lundberg, S. and Nori, H., 2023. Sparks of Artificial General Intelligence: Early Experiments with GPT-4, arXiv preprint arXiv:2303.12712. available at <https://arxiv.org/abs/2303.12712>
24. Wei, J., Tay, Y., Bommasani, R., Raffel, C., Zoph, B., Borgeaud, S., Yogatama, D., Bosma, M., Zhou, D., Metzler, D. and Chi, E.H., 2022. Emergent Abilities of Large Language Models. arXiv preprint arXiv:2206.07682. available at <https://arxiv.org/abs/2206.07682>
25. Narayanan, A., and Kapoor, S., GPT-4 and Professional Benchmarks: The Wrong Answer to the Wrong Question. "AI Snake Oil" blog. March 20, 2023. available at <https://aisnakeoil.substack.com/p/gpt-4-and-professional-benchmarks>
26. Sevilla, J., Heim, L., Ho, A., Besiroglu, Hobbhahn, M., Villalobos, P., Compute Trends Across Three Eras of Machine Learning, arXiv preprint, 2202.05924v2, February 2022, available at <https://arxiv.org/abs/2202.05924>
27. Wei, et al, Emergent Abilities of Large Language Models, arXiv preprint, arXiv:2206.07682v2, October 2022, available at <https://arxiv.org/abs/2206.07682>
28. Goodfellow, I., et al, Generative Adversarial Networks, *Communications of the ACM*, V. 63, No. 11 November 2020, pp 139–144, available at <https://doi.org/10.1145/3422622>
29. Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A.N., Kaiser, Ł. and Polosukhin, I., 2017. Attention Is All You Need. *Advances in Neural Information Processing Systems*, 30. 2017, available at https://proceedings.neurips.cc/paper_files/paper/2017/hash/3f5ee243547dee91fbd053c1c4a845aa-Abstract.html
30. Brown, T., Mann, B., Ryder, N., Subbiah, M., Kaplan, J.D., Dhariwal, P., Neelakantan, A., Shyam, P., Sastry, G., Askell, A. and Agarwal, S., 2020. Language Models are Few-shot Learners. *Advances in Neural Information Processing Systems*, 33, pp.1877-1901. available at <https://arxiv.org/abs/2005.14165>
31. Rombach, R., Blattmann, A., Lorenz, D., Esser, P., Ommer, B., High-Resolution Image Synthesis with Latent Diffusion Models, arXiv preprint, arXiv:2112.10752v2, December 2021, available at <https://doi.org/10.48550/arXiv.2112.10752>
32. Li, Y. et al, Textbooks Are All You Need II: phi-1.5 Technical Report, arXiv preprint, arXiv:2309.05463, September 2023, available at <https://arxiv.org/abs/2309.05463>

Neuroscience Insights for Artificial Intelligence

33. The European Union Human Brain Project, 2023, available at <https://www.humanbrainproject.eu/en/>
34. White, J. G., Southgate, E., Thomson, J. N., and Brenner, S., The Structure of the Nervous System of the Nematode *Caenorhabditis elegans*, *Philosophical Transactions of the Royal Society B*, 314: 1–340, 1986, <https://royalsocietypublishing.org/doi/10.1098/rstb.1986.0056>
35. Winding, M. *et al*, The Connectome of an Insect Brain,” *Science*, Vol 379, No. 6636, 2023, <https://www.science.org/doi/10.1126/science.add9330>

Deep Fakes and Sentiment Analysis

36. This Is Not Morgan Freeman – A Deep Fake Singularity, Diep Nep, 2021, available at <https://www.youtube.com/watch?v=oxXpB9pSETo>
37. Researchers Use Facial Quirks to Unmask ‘Deepfakes,’ *Neurosciencenews.com*, June 2019, available at <https://neurosciencenews.com/deepfakes-facial-quirks-14298/>
38. Netflix Prize, Wikipedia, available at https://en.wikipedia.org/wiki/Netflix_Prize

Artificial Intelligence Policy, Privacy, and Security

39. Office of Science and Technology Policy, U.S. White House, Blueprint for an AI Bill of Rights: Making Automated Systems Work for the American People. October 2022. available at <https://www.whitehouse.gov/ostp/ai-bill-of-rights/>
40. Feingold, S., The European Union’s Artificial Intelligence Act, Explained. World Economic Forum, March 28, 2023. available at <https://www.weforum.org/agenda/2023/03/the-european-union-s-ai-act-explained>
41. Castelvechi, D., Can We Open the Black Box of AI?, *Nature* 538, 20–23 (06 October 2016), available at <https://doi.org/10.1038/538020a>
42. Lawler, R., The US Copyright Office Says You Can’t Copyright Midjourney AI-generated Images, *The Verge*, Feb 22, 2023. available at <https://www.theverge.com/2023/2/22/23611278/midjourney-ai-copyright-office-kristina-kashtanova>
43. Hill, K., The Technology Facebook and Google Didn’t Dare Release, *New York Times*, September 9, 2023, available at <https://www.nytimes.com/2023/09/09/technology/google-facebook-facial-recognition.html>

Explaining AI Decisions

44. Urbina, F., Lentzos, F., Lavernizzi, C., Ekins, S., Dual Use of Artificial-Intelligence-Powered Drug Discovery, *Nature Machine Intelligence*, 4, 198-191, 2022 <https://www.nature.com/articles/s42256-022-00465-9>

45. Senero, A., and Mezzanotte, M., Open Source Data Science: How to Reduce Bias in AI. Oct. 2022. World Economic Forum. available at <https://www.weforum.org/agenda/2022/10/open-source-data-science-bias-more-ethical-ai-technology/>

AI Risks and Opportunities

46. Association for the Advancement of Artificial Intelligence. Working Together on Our Future with AI. April 5, 2023. available at <https://aaai.org/working-together-on-our-future-with-ai/>
47. Bush, V., As We May Think, *Atlantic Monthly*, 1945, available at <https://www.theatlantic.com/magazine/archive/1945/07/as-we-may-think/303881/>

Economics, Education, and National Security

48. McKinsey and Company, The Economic Potential of Generative AI, June 2023, available at <https://www.mckinsey.com/~media/mckinsey/business%20functions/mckinsey%20digital/our%20insights/the%20economic%20potential%20of%20generative%20ai%20the%20next%20productivity%20frontier/the-economic-potential-of-generative-ai-the-next-productivity-frontier-vf.pdf>
49. Vincent, J., The Lawsuit that Could Rewrite the Rules of AI Copyright., The Verge. November 8, 2022. available at <https://www.theverge.com/2022/11/8/23446821/microsoft-openai-github-copilot-class-action-lawsuit-ai-copyright-violation-training-data>
50. Plato History, available at <http://platohistory.org> (see also [https://en.wikipedia.org/wiki/PLATO_\(computer_system\)](https://en.wikipedia.org/wiki/PLATO_(computer_system)))

AI Winters and Research Funding

51. Minsky, M., and Papert, S., Perceptrons: An Introduction to Computational Geometry, 1969. (See also: <https://direct.mit.edu/books/book/3132/PerceptronsAn-Introduction-to-Computational>)
52. Feigenbaum, E. A., McCorduck, P., The Fifth Generation: Artificial Intelligence and Japan's Computer Challenge to the World, 1983

Scientific Discovery and Innovation

53. Jumper, J., Evans, R., Pritzel, A. *et al.* Highly Accurate Protein Structure Prediction with AlphaFold. *Nature* **596**, 583–589 (2021), available at <https://doi.org/10.1038/s41586-021-03819-2>
54. Silver, D., Hubert, T., Schrittwieser, J., Antonoglou, I., Lai, M., Guez, A., Lanctot, M., Sifre, L., Kumaran, D., Graepel, T. and Lillicrap, T., 2018. A General Reinforcement Learning Algorithm that Masters Chess, Shogi, and Go Through Self-play. *Science*, 362(6419), pp.1140-1144. available at <https://www.science.org/doi/10.1126/science.aar6404>
55. Bi, K., Xie, L., Zhang, H. *et al.* Accurate Medium-range Global Weather Forecasting with 3D Neural Networks. *Nature* **619**, 533–538 (2023), available at <https://doi.org/10.1038/s41586-023-06185-3>

56. Kuhn, T. S., The Structure of Scientific Revolutions, University of Chicago Press, 1962, (see also https://en.wikipedia.org/wiki/The_Structure_of_Scientific_Revolutions)
57. Guo, S., An Introduction to Surrogate Modeling, Part I: Fundamentals. "Towards Data Science" October 2020. available at <https://towardsdatascience.com/an-introduction-to-surrogate-modeling-part-i-fundamentals-84697ce4d241>
58. Carter, J., Feddema, J., Kothe, D., Neely, R., Pruet, J., Stevens, R. Advanced Research Directions on AI for Science, Energy, and Security. Eds. Catlett, C. and Dietrich, E., U.S. Department of Energy and National Nuclear Security Administration. May 2023. available at <https://www.anl.gov/ai-for-science-report>

A Crash Course on Deep Learning

59. Zhou, V., Neural Networks from Scratch, February 2020, available at <https://victorzhou.com/series/neural-networks-from-scratch/>
60. Malik, M., Basics of Neural Networks, April 2018, available at <https://becominghuman.ai/basics-of-neural-network-bef2ba97d2cf>
61. Tinker With a Neural Network Right Here in Your Browser, available at <http://playground.tensorflow.org>
62. Boesch, G. "What's the Difference Between Machine Learning and Deep learning?" available at <https://viso.ai/deep-learning/deep-learning-vs-machine-learning/>
63. Boesch, G., Deep Neural Networks: The 3 Popular Types (MLP, CNN and RNN), Viso.io. available at <https://viso.ai/deep-learning/deep-neural-network-three-popular-types/>
64. Brownlee, J., A Gentle Introduction to Pooling Layers for Convolutional Neural Networks, Machine Learning Mastery, April 2019. available at <https://machinelearningmastery.com/pooling-layers-for-convolutional-neural-networks/>
65. Kamali, K. Galaxy Training, Deep Learning (Part 1) - Feedforward Neural Networks (FNN), available at <https://training.galaxyproject.org/training-material/topics/statistics/tutorials/FNN/tutorial.html>
66. Kamali, K. Galaxy Training, Deep Learning (Part 2) - Recurrent Neural Networks (RNN), available at <https://training.galaxyproject.org/training-material/topics/statistics/tutorials/RNN/tutorial.html>
67. Olah, C., and Carter, S. Attention and Augmented Recurrent Neural Networks. Distill.pub, September 2016, available at <https://distill.pub/2016/augmented-rnns/>
68. Zhou, V., Keras for Beginners: Building Your First Neural Network, July 2019, available at <https://victorzhou.com/blog/keras-neural-network-tutorial/>

69. Alammam, J., The Illustrated Transformer, June 2018, available at <http://jalammar.github.io/illustrated-transformer/>