

# AI Related Papers in *Nature & Science*

## 《Nature》 & 《Science》 发表的 AI 相关文章

(2015.01~2021.08; incomplete survey)

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<https://github.com/TOM-ZXian/AI-Related-Papers-Published-in-Nature-or-Science>

0. Hinton G E, Salakhutdinov R R. Reducing the dimensionality of data with neural networks[J]. Science, 2006, 313(5786): 504-507. doi:10.1126/science.1127647

\* 深度学习里程碑之作，掀起 AI 热浪

1. Mnih V, Kavukcuoglu K, Silver D, et al. Human-level control through deep reinforcement learning[J]. Nature, 2015, 518(7540): 529-533. <https://doi.org/10.1038/nature14236>

\* AI 玩游戏达到人类水准 Nature 【Cover】 2015.02.26

\* 深度强化学习(DQN)+Atari 游戏- 【DeepMind】

2. Cully A, Clune J, Tarapore D, et al. Robots that can adapt like animals[J]. Nature, 2015, 521(7553): 503-507. <https://doi.org/10.1038/nature14422>

\* 机器人适应“残障” Nature 【Cover】 -2015.05.28

3. Ghahramani Z. Probabilistic machine learning and artificial intelligence[J]. Nature, 2015, 521(7553): 452-459. doi:10.1038/nature14541

\* 概率机器学习与人工智能 【综述】

4. LeCun Y, Bengio Y, Hinton G. Deep learning[J]. Nature, 2015, 521(7553): 436-444. <https://doi.org/10.1038/nature14539>

\* 深度学习 【综述】

5. Jordan M I, Mitchell T M. Machine learning: Trends, perspectives, and prospects[J]. Science, 2015, 349(6245): 255-260. doi:10.1126/science.aaa8415

\* 机器学习 【综述】

6. Hirschberg J, Manning C D. Advances in natural language processing[J]. Science, 2015, 349(6245): 261-266. doi:10.1126/science.aaa8685

\* 自然语言处理 【综述】

7. Lake B M, Salakhutdinov R, Tenenbaum J B. Human-level concept learning through probabilistic program induction[J]. Science, 2015, 350(6266): 1332-1338. doi:10.1126/science.aab3050

\* Human-level 概念学习 Science 【Cover】 2015.12.11

8. Silver D, Huang A, Maddison C J, et al. Mastering the game of Go with deep neural networks and tree search[J]. Nature, 2016, 529(7587): 484-489. doi:10.1038/nature16961

\* AlphaGo 轰动全球 Nature 【Cover】 2016.01.28

\* AI 击败人类围棋冠军 【DeepMind】

9. Huth A G , Heer W D , Griffiths T L , et al. Natural speech reveals the semantic maps that tile human cerebral cortex[J]. Nature, 2016, 532(7600):453-458. <https://doi.org/10.1038/nature17637>

\* 大脑语义地图 Nature 【Cover】 2016.04.28

10. Raccuglia P, Elbert K C, Adler P D F, et al. Machine-learning-assisted materials discovery using failed experiments[J]. Nature, 2016, 533(7601): 73-76. <https://doi.org/10.1038/nature17439>

\* 利用“废弃”数据成功预测新材料的合成 Nature 【Cover】 2016.05.05

11. Jean N, Burke M, Xie M, et al. Combining satellite imagery and machine learning to predict poverty[J]. Science, 2016, 353(6301): 790-794. doi:10.1126/science.aaf7894

\* AI 贫困预测

12. Graves A, Wayne G, Reynolds M, et al. Hybrid computing using a neural network with dynamic external memory[J]. Nature, 2016, 538(7626): 471-476. doi:10.1038/nature20101

\* 可微分神经计算机(DNC) - 【DeepMind】

13. Capogrosso M, Milekovic T, Borton D, et al. A brain–spine interface alleviating gait deficits after spinal cord injury in primates[J]. Nature, 2016, 539(7628): 284-288. <https://doi.org/10.1038/nature20118>

\* 脑脊柱接口，瘫痪猴子重新行走

14. Esteva A, Kuprel B, Novoa R A, et al. Dermatologist-level classification of skin cancer with deep neural networks[J]. Nature, 2017, 542(7639): 115-118. doi:10.1038/nature21056

\* AI 皮肤癌诊断达专家水平 Nature 【Cover】 2017.02.02

15. Carleo G, Troyer M. Solving the quantum many-body problem with artificial neural networks[J]. Science, 2017, 355(6325): 602-606. doi:10.1126/science.aag2302

\* 神经网络解决量子多体问题

16. Hazlett H C, Gu H, Munsell B C, et al. Early brain development in infants at high risk for autism spectrum disorder[J]. Nature, 2017, 542(7641):348. doi:10.1038/nature21369

\* 深度学习助力自闭症发现

17. Keller A, Gerkin R C, Guan Y, et al. Predicting human olfactory perception from chemical features of odor molecules[J]. Science, 2017, 355(6327): 820-826. doi:10.1126/science.aal2014

\* “AI 鼻子”，从气味分子的化学特征预测人的嗅觉

18. Caliskan A, Bryson J J, Narayanan A. Semantics derived automatically from language corpora contain human-like biases[J]. Science, 2017, 356(6334):183-186. doi:10.1126/science.aal4230

\* 语料库语义偏见发现与研究

19. Moravčík M, Schmid M, Burch N, et al. Deepstack: Expert-level artificial intelligence in heads-up no-limit poker[J]. Science, 2017, 356(6337): 508-513. doi:10.1126/science.aam6960

\* AI 拿下德州扑克 Science 【Cover】 2017.05.05

20. Shirado H, Christakis N A. Locally noisy autonomous agents improve global human coordination in network experiments[J]. Nature, 2017, 545(7654): 370-374. <https://doi.org/10.1038/nature22332>

\* AI 有助于群体控制 Nature 【Cover】 2017.05.18

21. Hezaveh Y D, Levasseur L P, Marshall P J. Fast automated analysis of strong gravitational lenses with convolutional neural networks[J]. Nature, 2017, 548(7669): 555. doi:10.1038/nature23463

\* 强引力透镜的快速分析

22. Biamonte J, Wittek P, Pancotti N, et al. Quantum machine learning[J]. Nature, 2017, 549(7671): 195-202. doi:10.1038/nature23474

\* 量子机器学习 【综述】

23. Silver D, Schrittwieser J, Simonyan K, et al. Mastering the game of go without human knowledge[J]. Nature, 2017, 550(7676): 354. doi:10.1038/nature24270

\* AlphaGo Zero 横空出世，无师自通- 【DeepMind】

24. Dasgupta S, Stevens C F, Navlakha S. A neural algorithm for a fundamental computing problem[J]. Science, 2017, 358(6364):793-796. doi:10.1126/science.aam9868

\* “果蝇哈希”相似性搜索算法

25. D George, Lehrach W, Kansky K, et al. A generative vision model that trains with high data efficiency and breaks text-based CAPTCHAs[J]. Science, 2017, 358(6368):eaag2612. doi:10.1126/science.aag2612

\* 概率生成模型超越 DL，突破验证码测试

26. Brown N, Sandholm T. Superhuman AI for heads-up no-limit poker: Libratus beats top professionals[J]. Science, 2018, 359(6374): 418-424. doi:10.1126/science.aao1733

\* 冷扑大师 Libratus，AI 在德州扑克战胜人类职业玩家

27. Capper D, Jones D, Sill M, et al. DNA methylation-based classification of central nervous system tumours[J]. Nature, 2018, 555(7697):469-474. <https://doi.org/10.1038/nature26000>

\* 超级 AI 精准诊断近 100 种脑癌

28. Banino A , Barry C , Uria B , et al. Vector-based navigation using grid-like representations in artificial agents[J]. Nature, 2018 , 557(7704): 429-433. <https://doi.org/10.1038/s41586-018-0102-6>

\* Agent 导航特征新发现，与人脑“网格细胞”高度一致的空间导航能力-【DeepMind】

29. Ambrogio S, Narayanan P, Tsai H, et al. Equivalent-accuracy accelerated neural-network training using analogue memory[J]. Nature, 2018, 558(7708): 60-67. <https://doi.org/10.1038/s41586-018-0180-5>

\* IBM 新型 AI 芯片

30. Eslami S M A, Rezende D J, Besse F, et al. Neural scene representation and rendering[J]. Science, 2018, 360(6394): 1204-1210. doi:10.1126/science.aar6170

\* 让 AI 具备空间推理能力，自动「脑补」3D 环境-【DeepMind】

31. Cherry K M, Qian L. Scaling up molecular pattern recognition with DNA-based winner-take-all neural networks[J]. Nature, 2018, 559(7714): 370-376. <https://doi.org/10.1038/s41586-018-0289-6>

\* 基于 DNA 的神经网络 Nature【Cover】 2018.07.04

32. Abelson S, Collord G, Ng S W K, et al. Prediction of acute myeloid leukaemia risk in healthy individuals[J]. Nature, 2018, 559(7714): 400-404. <https://doi.org/10.1038/s41586-018-0317-6>

\* 白血病预测

33. DeVries P M R, Viégas F, Wattenberg M, et al. Deep learning of aftershock patterns following large earthquakes[J]. Nature, 2018, 560(7720): 632-634. <https://doi.org/10.1038/s41586-018-0438-y>

\* AI 余震预测。“目标泄露”曾遭质疑

34. Lin X, Rivenson Y, Yardimci N T, et al. All-optical machine learning using diffractive deep neural networks[J]. Science, 2018, 361(6406): 1004-1008. doi:10.1126/science.aat8084

\* 全光学人工神经网络

35. Karásek M, Muijres F T, De Wagter C, et al. A tailless aerial robotic flapper reveals that flies use torque coupling in rapid banked turns[J]. Science, 2018, 361(6407): 1089-1094. doi:10.1126/science.aat0350

\* “果蝇”机器人 Science【Cover】 2018.09.14

36. Awad E , Dsouza S , Kim R , et al. The Moral Machine Experiment[J]. Nature, 2018, 563(7729). <https://doi.org/10.1038/s41586-018-0637-6>

\* 机器道德研究，不同国家的道德偏好存在显著差异

37. Silver D, Hubert T, Schrittwieser J, et al. A general reinforcement learning algorithm that masters chess, shogi, and Go through self-play[J]. Science, 2018, 362(6419): 1140-1144. doi:10.1126/science.aar6404

AlphaZero Science【Cover】 2018.12.07

\* 最强棋类 AI 通杀三大棋-【DeepMind】

38. Gao R , Asano S M , Upadhyayula S , et al. Cortical column and whole-brain imaging with molecular contrast and nanoscale resolution[J]. Science, 2019, 363(6424):eaau8302. doi:10.1126/science.aau8302

\* 果蝇大脑纳米级成像 Science【Cover】 2019.01.18

39. Havlíček V, Córcoles A D, Temme K, et al. Supervised learning with quantum-enhanced feature spaces[J]. Nature, 2019, 567(7747): 209-212. <https://doi.org/10.1038/s41586-019-0980-2>

\* 量子机器学习算法，量子态空间作为特征空间进行数据分类 Nature【Cover】 2019.03.13

40. Li S, Batra R, Brown D, et al. Particle robotics based on statistical mechanics of loosely coupled components[J]. Nature, 2019, 567(7748): 361-365. <https://doi.org/10.1038/s41586-019-1022-9>

\* 仿生群体机器人 Nature【Cover】 2019.03.20

41. Rahwan I, Cebrian M, Obradovich N, et al. Machine behaviour[J]. Nature, 2019, 568(7753): 477-486. <https://doi.org/10.1038/s41586-019-1138-y>

\* 机器行为学【综述】 Nature 2019.04.24

42. Anumanchipalli G K, Chartier J, Chang E F. Speech synthesis from neural decoding of spoken sentences[J]. Nature, 2019, 568(7753): 493-498. <https://doi.org/10.1038/s41586-019-1119-1>

\* 语音合成，脑机接口

43. Bashivan P, Kar K, DiCarlo J J. Neural population control via deep image synthesis[J]. Science, 2019, 364(6439). doi:10.1126/science.aav9436

\* 动物神经元控制，用 AI 控制动物大脑活动

44. Feldmann J , Youngblood N , Wright C D , et al. All-optical spiking neurosynaptic networks with self-learning capabilities[J]. Nature, 2019, 569(7755):208-214. <https://doi.org/10.1038/s41586-019-1157-8>

\* 全光脉冲神经突触网络

45. Fuller E J, Keene S T, Melianas A, et al. Parallel programming of an ionic floating-gate memory array for scalable neuromorphic computing[J]. Science, 2019, 364(6440): 570-574. doi:10.1126/science.aaw5581

\* 类脑“人造突触”实现运算存储同步

46. Jaderberg M , Czarnecki W M , Dunning I , et al. Human-level performance in 3D multiplayer games with population-based reinforcement learning[J]. Science, 2019, 364 (6443): 859-865. doi:10.1126/science.aau6249

\* AI 拿下 3D 多人游戏，AI 在雷神之锤 III 超越人类玩家-【DeepMind】

47. Jafferis N T, Helbling E F, Karpelson M, et al. Untethered flight of an insect-sized flapping-wing

microscale aerial vehicle[J]. Nature, 2019, 570(7762): 491-495. <https://doi.org/10.1038/s41586-019-1322-0>

\* “蜜蜂”机器人，自重仅 259 毫克 Nature 【Cover】 2019.06.26

48. Tshitoyan V, Dagdelen J, Weston L, et al. Unsupervised word embeddings capture latent knowledge from materials science literature[J]. Nature, 2019, 571(7763): 95-98. <https://doi.org/10.1038/s41586-019-1335-8>

\* AI 学会「搞」科研？无监督词嵌入捕获材料科学潜在知识

49. Zhakypov Z, Mori K, Hosoda K, et al. Designing minimal and scalable insect-inspired multi-locomotion millirobots[J]. Nature, 2019, 571(7765): 381-386. <https://doi.org/10.1038/s41586-019-1388-8>

\* 三条腿的“蚂蚁”机器人

50. Pei J, Deng L, Song S, et al. Towards artificial general intelligence with hybrid Tianjic chip architecture[J]. Nature, 2019, 572(7767): 106-111. <https://doi.org/10.1038/s41586-019-1424-8>

\* 清华“天机”芯片 Nature 【Cover】 2019.07.31

51. N Tomaev, Glorot X, Rae J W, et al. A clinically applicable approach to continuous prediction of future acute kidney injury[J]. Nature, 2019, 572(7767): 116-119. <https://doi.org/10.1038/s41586-019-1390-1>

\* AI 预测急性肾损伤，可提前 48 小时向医生发出警告- 【DeepMind】

52. Brown N, Sandholm T. Superhuman AI for multiplayer poker[J]. Science, 2019, 365(6456): 885-890. doi:10.1126/science.aay2400

\* 多人德州 Pluribus 成功战胜五名专家级人类玩家 Science 【Cover】 2019.08.30

53. Ham Y G, Kim J H, Luo J J. Deep learning for multi-year ENSO forecasts[J]. Nature, 2019, 573(7775):568-572. <https://doi.org/10.1038/s41586-019-1559-7>

\* AI 提前预测厄尔尼诺自然灾害

54. Vinyals O, Babuschkin I, Czarnecki W M, et al. Grandmaster level in StarCraft II using multi-agent reinforcement learning[J]. Nature, 2019, 575(7782): 350-354. <https://doi.org/10.1038/s41586-019-1724-z>

\* 星际争霸 AI AlphaStar- 【DeepMind】

55. Motta A, Berning M, Boergens K M, et al. Dense connectomic reconstruction in layer 4 of the somatosensory cortex[J]. Science, 2019, 366(6469): eaay3134. doi:10.1126/science.aay3134

\* 高分辨率重建 89 个神经元 Science 【Cover】 2019.11.29

56. Gidon A, Zolnik T A, Fidzinski P, et al. Dendritic action potentials and computation in human layer 2/3 cortical neurons[J]. Science, 2020, 367(6473): 83-87. doi:10.1126/science.aax6239

\* 人类皮层上层中发现新型电信号，皮层神经元树突臂中的微小区室每个都可以执行数学逻辑上的复杂操作

57. McKinney S M, Sieniek M, Godbole V, et al. International evaluation of an AI system for breast cancer screening[J]. Nature, 2020, 577(7788): 89-94. <https://doi.org/10.1038/s41586-019-1799-6>

\* 乳腺癌诊断 AI 超越人类专家 Google Health+ 【DeepMind】

58. Dabney W , Kurth-Nelson Z , N Uchida, et al. A distributional code for value in dopamine-based reinforcement learning[J]. Nature, 2020, 577(7792):671-675. <https://doi.org/10.1038/s41586-019-1924-6>

\* 大脑也在用分布式强化学习？新发现验证了分布式强化学习的潜力- 【DeepMind】

59. Senior A W, Evans R, Jumper J, et al. Improved protein structure prediction using potentials from deep learning[J]. Nature, 2020, 577(7792): 706-710. <https://doi.org/10.1038/s41586-019-1923-7>

\* AlphaFold 蛋白质结构预测- 【DeepMind】

60. Mennel L , Symonowicz J , Wachter S , et al. Ultrafast machine vision with 2D material neural network image sensors[J]. Nature, 2020, 579(7797):62-66. <https://doi.org/10.1038/s41586-020-2038-x>

\* 为传感器印刻神经网络

61. Miskin M Z , Cortese A J , Dorsey K , et al. Electronically integrated, mass-manufactured, microscopic robots[J]. Nature, 2020, 584(7822): 557-561. <https://doi.org/10.1038/s41586-020-2626-9>

\* “微生物”机器人

62. Haque A, Milstein A, Fei-Fei L. Illuminating the dark spaces of healthcare with ambient intelligence[J]. Nature, 2020, 585(7824): 193-202. <https://doi.org/10.1038/s41586-020-2669-y>

\* 用「环境智能」来改善医疗环境

63. Zhang Y, Qu P, Ji Y, et al. A system hierarchy for brain-inspired computing[J]. Nature, 2020, 586(7829): 378-384. <https://doi.org/10.1038/s41586-020-2782-y>

\* 清华大学首次提出“类脑计算完备性”

64. Bellemare M G, Candido S, Castro P S, et al. Autonomous navigation of stratospheric balloons using reinforcement learning[J]. Nature, 2020, 588(7836): 77-82. <https://doi.org/10.1038/s41586-020-2939-8>

\* AI 助力全自动环境监测

65. Deringer V L, Bernstein N, Csányi G, et al. Origins of structural and electronic transitions in disordered silicon[J]. Nature, 2021, 589(7840): 59-64. <https://doi.org/10.1038/s41586-020-03072-z>

\* AI 助力非晶结构材料研究 Nature 【Cover】 2021.01.06

66. Xu X, Tan M, Corcoran B, et al. 11 TOPS photonic convolutional accelerator for optical neural networks[J]. Nature, 2021, 589(7840): 44-51. <https://doi.org/10.1038/s41586-020-03063-0>

\* 光学卷积加速器

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\* 光张量核

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\* AI 预测病毒变异规则，可助力疫苗研发

69. Li G, Chen X, Zhou F, et al. Self-powered soft robot in the Mariana Trench[J]. Nature, 2021, 591(7848): 66-71. <https://doi.org/10.1038/s41586-021-03828-1>

\* 浙大软体机器人成功挑战马里亚纳海沟 Nature 【Cover】 2021.03.03

70. Slonim N, Bilu Y, Alzate C, et al. An autonomous debating system[J]. Nature, 2021, 591(7850): 379-384. <https://doi.org/10.1038/s41586-021-03828-1>

\* AI 辩手 Nature 【Cover】 2021.03.17

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\* 脑机接口「意念手写」 Nature 【Cover】 2021.05.12

72. Flesher S N, Downey J E, Weiss J M, et al. A brain-computer interface that evokes tactile sensations improves robotic arm control[J]. Science, 2021, 372(6544): 831-836. doi:10.1126/science.abd0380

\* 双向脑机接口改善意念控制

73. Warnat-Herresthal S, Schultze H, Shastry K L, et al. Swarm Learning for decentralized and confidential clinical machine learning[J]. Nature, 2021, 594(7862): 265-270. <https://doi.org/10.1038/s41586-021-03583-3>

\* 新算法 Swarm Learning，利于保护数据隐私 Nature 【Cover】 2021.05.26

74. Eliav T, Maimon S R, Aljadeff J, et al. Multiscale representation of very large environments in the hippocampus of flying bats[J]. Science, 2021, 372(6545). doi:10.1126/science.abg4020

\* 揭秘动物超大环境的多尺度表示，揭示了一种新的感知空间的神经编码

75. Mirhoseini A , Goldie A , Yazgan M , et al. A graph placement methodology for fast chip design[J]. Nature, 2021, 594(7862): 207-212. <https://doi.org/10.1038/s41586-021-03544-w>

\* 深度强化学习设计芯片布局

76. Jumper J, Evans R, Pritzel A, et al. Highly accurate protein structure prediction with AlphaFold[J]. Nature, 2021, 596(7873): 583-589. <https://doi.org/10.1038/s41586-021-03819-2>



\* AlphaFold2 蛋白质结构预测-【DeepMind】

77. Baek M, DiMaio F, Anishchenko I, et al. Accurate prediction of protein structures and interactions using a three-track neural network[J]. Science, 2021, 373(6557): 871-876. doi:10.1126/science.abj8754

\* RoseTTAFold 蛋白质结构预测- Science【Cover】 2021.07.15

78. Tunyasuvunakool K, Adler J, Wu Z, et al. Highly accurate protein structure prediction for the human proteome[J]. Nature, 2021, 596(7873): 590–596. <https://doi.org/10.1038/s41586-021-03828-1>

\* AlphaFold2 人类蛋白质结构预测-【DeepMind】 Nature【Cover】 2021.07.21

79. Townshend R, Eismann S, Watkins A, et al. Geometric deep learning of RNA structure[J]. Science, 2021, 373(6558): 1047-1051. doi: 10.1126/science.abe5650

\* AI 算法准确预测 RNA 三维结构-Science【Cover】 2021.08.27

## ## Others:

0. Rumelhart D E, Hinton G E, Williams R J. Learning representations by back-propagating errors[J]. Nature, 1986, 323(6088): 533-536. <https://doi.org/10.1038/323533a0>

\* 重燃反向传播算法。1974 年，哈佛大学的 Paul Werbos 发明了反向传播算法（Back Propagation, BP），但当时未受到应有的重视。Werbos P. Beyond regression: New tools for prediction and analysis in the behavioral sciences[D]. Harvard University, 1974.

1. Hinton G E, Dayan P, Frey B J, et al. The "wake-sleep" algorithm for unsupervised neural networks[J]. Science, 1995, 268(5214): 1158-1161. doi:10.1126/science.7761831

\* “wake-sleep”算法

2. Machine Intelligence 【Special Issue】

<https://www.nature.com/nature/volumes/521/issues/7553>

\* Nature “专栏”连载多篇 AI 综述 2015.05.28

3. AI 【Special Issue】 <https://science.sciencemag.org/content/349/6245>

\* Science【Cover】 2015.07.17

4. Prediction 【Special Issue】 <https://science.sciencemag.org/content/355/6324>

\* Science【Cover】 2017.02.03

5. AI Transforms Science 【Special Issue】 <https://science.sciencemag.org/content/357/6346>

\* Science【Cover】 2017.07.07

6. Facing facts (NEWS | FEATURE) <https://www.nature.com/nature/volumes/587/issues/7834>

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