从全局到枝干、从经典到前沿、从理论到应用、还有最新的研究...，所有你不需要的需要的，现在不需要的未来需要的，你不需要的周边小伙伴需要的...反正全都在这了。拿走不谢，就在AI科技大本营。

整理 | AI科技大本营（rgznai100）

参考 - https://zhuanlan.zhihu.com/p/23080129

对于大多数想上手深度学习的小伙伴来说，“我应当从那篇论文开始读起？”

这是一个亘古不变的话题。

而对那些已经入门的同学来说，了解一下不同方向的论文，也是不时之需。

有没有一份完整的深度学习论文导引，让所有人都可以在里面找到想要的内容呢？

有！

今天就给大家分享一篇史上最牛的深度学习论文整合合集。它让大家对整个深度学习领域及其个枝干都能有一个相对完整的理解。

这份阅读列表的组织原则是这样的：

- **从全局到枝干：**从综述类、全局性的文章到细分领域的具体论文。
- **从经典到最前沿：**每个话题的文章都是按时间顺序来排的，可以清晰给出每个方向的发展脉络。
- **从通用理论到具体应用：**有些论文是针对深度学习通用理论的，有些论文章则针对具体的应用领域。
- **专注于最先进的研究：**收集有许多最新论文，保证阅读列表的时效性。

当然，这里的每个话题都只选几篇最具代表性的论文，深入研究的话，还需要更进一步的阅读。

基于这些论文的影响力，你会发现很多新近发表的文章也值得一读。此外，这份阅读列表在原文页面会不断更新，值得你时时备查。

https://github.com/songrotek/Deep-Learning-Papers-Reading-Roadmap

想一键打包下载所有的论文？没问题，**AI科技大本营**已经给你准备好了懒人专属通道。请在公众号会话回复“**路径**”，即可获取本文所有论文PDF资料。

1. 深度学习基础及历史

1.0 书

[0] 深度学习圣经 ★★★★★

Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book. (2015).

https://github.com/HFTrader/DeepLearningBook/raw/master/DeepLearningBook.pdf

1.1 报告

[1] 三巨头报告★★★★★

LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton. "Deep learning." Nature 521.7553 (2015): 436-444.
http://www.cs.toronto.edu/%7Ehinton/absps/NatureDeepReview.pdf

1.2 深度信念网络 (DBN)

[2] 深度学习前夜的里程碑 ★★★

Hinton, Geoffrey E., Simon Osindero, and Yee-Whye Teh. "A fast learning algorithm for deep belief nets." Neural computation 18.7 (2006): 1527-1554.

http://www.cs.toronto.edu/%7Ehinton/absps/ncfast.pdf

[3] 展示深度学习前景的里程碑 ★★★

Hinton, Geoffrey E., and Ruslan R. Salakhutdinov. "Reducing the dimensionality of data with neural networks." Science 313.5786 (2006): 504-507.
http://www.cs.toronto.edu/%7Ehinton/science.pdf

1.3 ImageNet革命（深度学习大爆炸）

[4] AlexNet的深度学习突破 ★★★

Krizhevsky, Alex, Ilya Sutskever, and Geoffrey E. Hinton. "Imagenet classification with deep convolutional neural networks." Advances in neural information processing systems. 2012.

http://papers.nips.cc/paper/4824-imagenet-classification-with-deep-convolutional-neural-networks.pdf

[5] VGGNet深度神经网络出现 ★★★

Simonyan, Karen, and Andrew Zisserman. "Very deep convolutional networks for large-scale image recognition." arXiv preprint arXiv:1409.1556 (2014).
https://arxiv.org/pdf/1409.1556.pdf

[6] GoogLeNet ★★★

Szegedy, Christian, et al. "Going deeper with convolutions." Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition. 2015. http://www.cv-foundation.org/openaccess/content_cvpr_2015/papers/Szegedy_Going_Deeper_With_2015_CVPR_paper.pdf

[7] ResNet极深度神经网络，CVPR最佳论文 ★★★★★

He, Kaiming, et al. "Deep residual learning for image recognition." arXiv preprintarXiv:1512.03385 (2015). https://arxiv.org/pdf/1512.03385.pdf

1.4 语音识别革命

[8] 语音识别突破 ★★★★

Hinton, Geoffrey, et al. "Deep neural networks for acoustic modeling in speech recognition: The shared views of four research groups." IEEE Signal Processing Magazine 29.6 (2012): 82-97. http://cs224d.stanford.edu/papers/maas_paper.pdf

[9] RNN论文 ★★★

Graves, Alex, Abdel-rahman Mohamed, and Geoffrey Hinton. "Speech recognition with deep recurrent neural networks." 2013 IEEE international conference on acoustics, speech and signal processing. IEEE, 2013. http://arxiv.org/pdf/1303.5778.pdf

[10] 端对端RNN语音识别 ★★★

Graves, Alex, and Navdeep Jaitly. "Towards End-To-End Speech Recognition with Recurrent Neural Networks." ICML. Vol. 14. 2014. http://www.jmlr.org/proceedings/papers/v32/graves14.pdf

[11] Google语音识别系统论文 ★★★

Sak, Haşim, et al. "Fast and accurate recurrent neural network acoustic models for speech recognition." arXiv preprint arXiv:1507.06947 (2015). http://arxiv.org/pdf/1507.06947

[12] 百度语音识别系统论文 ★★★★

Amodei, Dario, et al. "Deep speech 2: End-to-end speech recognition in english and mandarin." arXiv preprint arXiv:1512.02595 (2015). https://arxiv.org/pdf/1512.02595.pdf

[13] 来自微软的当下最先进的语音识别论文 ★★★★

W. Xiong, J. Droppo, X. Huang, F. Seide, M. Seltzer, A. Stolcke, D. Yu, G. Zweig "Achieving Human Parity in Conversational Speech Recognition." arXiv preprint arXiv:1610.05256 (2016). https://arxiv.org/pdf/1610.05256v1

读完上面这些论文，你将对**深度学习的历史、深度学习模型（CNN、RNN、LSTM等）的基本架构**有一个基本认识，**并能理解深度学习是如何解决图像及语音识别问题的。**接下来的论文将**带你深入理解深度学习方法、深度学习在前沿领域的不同应用。**根据自己的兴趣和研究方向选择阅读即可：

2. 深度学习方法

2.1 模型

[14] Dropout ★★★

Hinton, Geoffrey E., et al. "Improving neural networks by preventing co-adaptation of feature detectors." arXiv preprint arXiv:1207.0580 (2012). https://arxiv.org/pdf/1207.0580.pdf

[15] 过拟合 ★★★

Srivastava, Nitish, et al. "Dropout: a simple way to prevent neural networks from overfitting." Journal of Machine Learning Research 15.1 (2014): 1929-1958. http://www.jmlr.org/papers/volume15/srivastava14a.old/source/srivastava14a.pdf

[16] Batch归一化——2015年杰出成果 ★★★★

Ioffe, Sergey, and Christian Szegedy. "Batch normalization: Accelerating deep network training by reducing internal covariate shift." arXiv preprint arXiv:1502.03167 (2015). http://arxiv.org/pdf/1502.03167

[17] Batch归一化的升级 ★★★★

Ba, Jimmy Lei, Jamie Ryan Kiros, and Geoffrey E. Hinton. "Layer normalization." arXiv preprint arXiv:1607.06450 (2016). https://arxiv.org/pdf/1607.06450.pdf

[18] 快速训练新模型 ★★★

Courbariaux, Matthieu, et al. "Binarized Neural Networks: Training Neural Networks with Weights and Activations Constrained to+ 1 or−1." https://pdfs.semanticscholar.org/f832/b16cb367802609d91d400085eb87d630212a.pdf

[19] 训练方法创新 ★★★★★

Jaderberg, Max, et al. "Decoupled neural interfaces using synthetic gradients." arXiv preprint arXiv:1608.05343 (2016). https://arxiv.org/pdf/1608.05343

[20] 修改预训练网络以降低训练耗时 ★★★

Chen, Tianqi, Ian Goodfellow, and Jonathon Shlens. "Net2net: Accelerating learning via knowledge transfer." arXiv preprint arXiv:1511.05641 (2015). https://arxiv.org/abs/1511.05641

[21] 修改预训练网络以降低训练耗时★★★

Wei, Tao, et al. "Network Morphism." arXiv preprint arXiv:1603.01670 (2016). https://arxiv.org/abs/1603.01670

2.2 优化

[22] 动量优化器 ★★

Sutskever, Ilya, et al. "On the importance of initialization and momentum in deep learning." ICML (3) 28 (2013): 1139-1147.
http://www.jmlr.org/proceedings/papers/v28/sutskever13.pdf

[23] 可能是当前使用最多的随机优化 ★★★

Kingma, Diederik, and Jimmy Ba. "Adam: A method for stochastic optimization." arXiv preprint arXiv:1412.6980 (2014).
http://arxiv.org/pdf/1412.6980

[24] 神经优化器 ★★★★★

Andrychowicz, Marcin, et al. "Learning to learn by gradient descent by gradient descent." arXiv preprint arXiv:1606.04474 (2016).
https://arxiv.org/pdf/1606.04474

[25] ICLR最佳论文，让神经网络运行更快的新方向★★★★★

Han, Song, Huizi Mao, and William J. Dally. "Deep compression: Compressing deep neural network with pruning, trained quantization and huffman coding." CoRR, abs/1510.00149 2 (2015).
https://pdfs.semanticscholar.org/5b6c/9dda1d88095fa4aac1507348e498a1f2e863.pdf

[26] 优化神经网络的另一个新方向 ★★★★

Iandola, Forrest N., et al. "SqueezeNet: AlexNet-level accuracy with 50x fewer parameters and< 1MB model size." arXiv preprint arXiv:1602.07360 (2016).
http://arxiv.org/pdf/1602.07360

2.3 无监督学习 / 深度生成式模型

[27] Google Brain找猫的里程碑论文，吴恩达 ★★★★

Le, Quoc V. "Building high-level features using large scale unsupervised learning." 2013 IEEE international conference on acoustics, speech and signal processing. IEEE, 2013.
http://arxiv.org/pdf/1112.6209.pdf

[28] 变分自编码机 (VAE) ★★★★

Kingma, Diederik P., and Max Welling. "Auto-encoding variational bayes." arXiv preprint arXiv:1312.6114 (2013).
http://arxiv.org/pdf/1312.6114

[29] 生成式对抗网络 (GAN) ★★★★★

Goodfellow, Ian, et al. "Generative adversarial nets." Advances in Neural Information Processing Systems. 2014.
http://papers.nips.cc/paper/5423-generative-adversarial-nets.pdf

[30] 解卷积生成式对抗网络 (DCGAN) ★★★★

Radford, Alec, Luke Metz, and Soumith Chintala. "Unsupervised representation learning with deep convolutional generative adversarial networks." arXiv preprint

arXiv:1511.06434 (2015).
http://arxiv.org/pdf/1511.06434

[31] Attention机制的变分自编码机 ★★★★★

Gregor, Karol, et al. "DRAW: A recurrent neural network for image generation." arXiv preprint arXiv:1502.04623 (2015).
http://jmlr.org/proceedings/papers/v37/gregor15.pdf

[32] PixelRNN ★★★★

Oord, Aaron van den, Nal Kalchbrenner, and Koray Kavukcuoglu. "Pixel recurrent neural networks." arXiv preprint arXiv:1601.06759 (2016).
http://arxiv.org/pdf/1601.06759

[33] PixelCNN ★★★★

Oord, Aaron van den, et al. "Conditional image generation with PixelCNN decoders." arXiv preprint arXiv:1606.05328 (2016).
https://arxiv.org/pdf/1606.05328

2.4 RNN / 序列到序列模型

[34] RNN的生成式序列，LSTM ★★★★

Graves, Alex. "Generating sequences with recurrent neural networks." arXiv preprint arXiv:1308.0850 (2013).
http://arxiv.org/pdf/1308.0850

[35] 第一份序列到序列论文 ★★★★

Cho, Kyunghyun, et al. "Learning phrase representations using RNN encoder-decoder for statistical machine translation." arXiv preprint arXiv:1406.1078 (2014).
http://arxiv.org/pdf/1406.1078

[36] 神经网络的序列到序列学习 ★★★★★

Sutskever, Ilya, Oriol Vinyals, and Quoc V. Le. "Sequence to sequence learning with neural networks." Advances in neural information processing systems. 2014.
http://papers.nips.cc/paper/5346-information-based-learning-by-agents-in-unbounded-state-spaces.pdf

[37] 神经机器翻译 ★★★★

Bahdanau, Dzmitry, KyungHyun Cho, and Yoshua Bengio. "Neural Machine Translation by Jointly Learning to Align and Translate." arXiv preprint arXiv:1409.0473 (2014).
https://arxiv.org/pdf/1409.0473v7.pdf

[38] 序列到序列Chatbot ★★★

Vinyals, Oriol, and Quoc Le. "A neural conversational model." arXiv preprint arXiv:1506.05869 (2015).
http://arxiv.org/pdf/1506.05869.pdf%20(http://arxiv.org/pdf/1506.05869.pdf

2.5 神经网络图灵机

[39] 未来计算机的基本原型 ★★★★★

Graves, Alex, Greg Wayne, and Ivo Danihelka. "Neural turing machines." arXiv preprint arXiv:1410.5401 (2014). http://arxiv.org/pdf/1410.5401.pdf

[40] 强化学习神经图灵机★★★

Zaremba, Wojciech, and Ilya Sutskever. "Reinforcement learning neural Turing machines." arXiv preprint arXiv:1505.00521 362 (2015). https://pdfs.semanticscholar.org/f10e/071292d593fef939e6ef4a59baf0bb3a6c2b.pdf

[41] 记忆网络 ★★★

Weston, Jason, Sumit Chopra, and Antoine Bordes. "Memory networks." arXiv preprint arXiv:1410.3916 (2014). http://arxiv.org/pdf/1410.3916

[42] 端对端记忆网络 ★★★★

Sukhbaatar, Sainbayar, Jason Weston, and Rob Fergus. "End-to-end memory networks." Advances in neural information processing systems. 2015. http://papers.nips.cc/paper/5846-end-to-end-memory-networks.pdf

[43] 指针网络 ★★★★

Vinyals, Oriol, Meire Fortunato, and Navdeep Jaitly. "Pointer networks." Advances in Neural Information Processing Systems. 2015. http://papers.nips.cc/paper/5866-pointer-networks.pdf

[44] 整合神经网络图灵机概念的里程碑论文 ★★★★★

Graves, Alex, et al. "Hybrid computing using a neural network with dynamic external memory." Nature (2016). https://www.dropbox.com/s/0a40xi702grx3dq/2016-graves.pdf

2.6 深度强化学习

[45] 第一篇以深度强化学习为名的论文 ★★★★

Mnih, Volodymyr, et al. "Playing atari with deep reinforcement learning." arXiv preprint arXiv:1312.5602 (2013). http://arxiv.org/pdf/1312.5602.pdf

[46] 里程碑 ★★★★★

Mnih, Volodymyr, et al. "Human-level control through deep reinforcement learning." Nature 518.7540 (2015): 529-533. https://storage.googleapis.com/deepmind-data/assets/papers/DeepMindNature14236Paper.pdf

[47] ICLR最佳论文 ★★★★

Wang, Ziyu, Nando de Freitas, and Marc Lanctot. "Dueling network architectures for deep reinforcement learning." arXiv preprint arXiv:1511.06581 (2015). http://arxiv.org/pdf/1511.06581

[48] 当前最先进的深度强化学习方法 ★★★★★

Mnih, Volodymyr, et al. "Asynchronous methods for deep reinforcement learning." arXiv preprint arXiv:1602.01783 (2016).
http://arxiv.org/pdf/1602.01783

[49] DDPG ★★★★

Lillicrap, Timothy P., et al. "Continuous control with deep reinforcement learning." arXiv preprint arXiv:1509.02971 (2015).
http://arxiv.org/pdf/1509.02971

[50] NAF ★★★★

Gu, Shixiang, et al. "Continuous Deep Q-Learning with Model-based Acceleration." arXiv preprint arXiv:1603.00748 (2016).
http://arxiv.org/pdf/1603.00748

[51] TRPO ★★★★

Schulman, John, et al. "Trust region policy optimization." CoRR, abs/1502.05477 (2015).
http://www.jmlr.org/proceedings/papers/v37/schulman15.pdf

[52] AlphaGo ★★★★★

Silver, David, et al. "Mastering the game of Go with deep neural networks and tree search." Nature 529.7587 (2016): 484-489.
http://willamette.edu/%7Elevenick/cs448/goNature.pdf

2.7 深度迁移学习 / 终生学习 / 强化学习

[53] Bengio教程 ★★★

Bengio, Yoshua. "Deep Learning of Representations for Unsupervised and Transfer Learning." ICML Unsupervised and Transfer Learning 27 (2012): 17-36.
http://www.jmlr.org/proceedings/papers/v27/bengio12a/bengio12a.pdf

[54] 终生学习的简单讨论 ★★★

Silver, Daniel L., Qiang Yang, and Lianghao Li. "Lifelong Machine Learning Systems: Beyond Learning Algorithms." AAAI Spring Symposium: Lifelong Machine Learning. 2013.
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.696.7800&rep=rep1&type=pdf

[55] Hinton、Jeff Dean大神研究 ★★★★

Hinton, Geoffrey, Oriol Vinyals, and Jeff Dean. "Distilling the knowledge in a neural network." arXiv preprint arXiv:1503.02531 (2015).
http://arxiv.org/pdf/1503.02531

[56] 强化学习策略 ★★★

Rusu, Andrei A., et al. "Policy distillation." arXiv preprint arXiv:1511.06295 (2015).
http://arxiv.org/pdf/1511.06295

[57] 多任务深度迁移强化学习 ★★★

Parisotto, Emilio, Jimmy Lei Ba, and Ruslan Salakhutdinov. "Actor-mimic: Deep multitask and transfer reinforcement learning." arXiv preprint arXiv:1511.06342 (2015).
http://arxiv.org/pdf/1511.06342

[58] 累进式神经网络 ★★★★★

Rusu, Andrei A., et al. "Progressive neural networks." arXiv preprint arXiv:1606.04671 (2016).
https://arxiv.org/pdf/1606.04671

2.8 一次性深度学习

[59] 不涉及深度学习，但值得一读 ★★★★★

Lake, Brenden M., Ruslan Salakhutdinov, and Joshua B. Tenenbaum. "Human-level concept learning through probabilistic program induction." Science 350.6266 (2015): 1332-1338.
http://clm.utexas.edu/compjclub/wp-content/uploads/2016/02/lake2015.pdf

[60] 一次性图像识别 ★★★

Koch, Gregory, Richard Zemel, and Ruslan Salakhutdinov. "Siamese Neural Networks for One-shot Image Recognition."(2015)
http://www.cs.utoronto.ca/%7Egkoch/files/msc-thesis.pdf

[61] 一次性学习基础 ★★★★

Santoro, Adam, et al. "One-shot Learning with Memory-Augmented Neural Networks." arXiv preprint arXiv:1605.06065 (2016).
http://arxiv.org/pdf/1605.06065

[62] 一次性学习网络 ★★★

Vinyals, Oriol, et al. "Matching Networks for One Shot Learning." arXiv preprint arXiv:1606.04080 (2016).
https://arxiv.org/pdf/1606.04080

[63] 大型数据 ★★★★

Hariharan, Bharath, and Ross Girshick. "Low-shot visual object recognition." arXiv preprint arXiv:1606.02819 (2016).
http://arxiv.org/pdf/1606.02819

3. 应用

3.1 自然语言处理 (NLP)

[1] ★★★★

Antoine Bordes, et al. "Joint Learning of Words and Meaning Representations for Open-Text Semantic Parsing." AISTATS(2012)
https://www.hds.utc.fr/%7Ebordesan/dokuwiki/lib/exe/fetch.php?

id=en%3Apubli&cache=cache&media=en:bordes12aistats.pdf

[2] ★★★

word2vec
Mikolov, et al. "Distributed representations of words and phrases and their compositionality." ANIPS(2013): 3111-3119
http://papers.nips.cc/paper/5021-distributed-representations-of-words-and-phrases-and-their-compositionality.pdf

[3]★★★

Sutskever, et al. "Sequence to sequence learning with neural networks." ANIPS(2014)
http://papers.nips.cc/paper/5346-sequence-to-sequence-learning-with-neural-networks.pdf

[4] ★★★★

Ankit Kumar, et al. "Ask Me Anything: Dynamic Memory Networks for Natural Language Processing." arXiv preprint arXiv:1506.07285(2015)
https://arxiv.org/abs/1506.07285

[5] ★★★★

Yoon Kim, et al. "Character-Aware Neural Language Models." NIPS(2015) arXiv preprint arXiv:1508.06615(2015)
https://arxiv.org/abs/1508.06615

[6] bAbI任务 ★★★

Jason Weston, et al. "Towards AI-Complete Question Answering: A Set of Prerequisite Toy Tasks." arXiv preprint arXiv:1502.05698(2015)
https://arxiv.org/abs/1502.05698

[7] CNN / DailyMail 风格对比 ★★

Karl Moritz Hermann, et al. "Teaching Machines to Read and Comprehend." arXiv preprint arXiv:1506.03340(2015)
https://arxiv.org/abs/1506.03340

[8] 当前最先进的文本分类 ★★★

Alexis Conneau, et al. "Very Deep Convolutional Networks for Natural Language Processing." arXiv preprint arXiv:1606.01781(2016)
https://arxiv.org/abs/1606.01781

[9] 稍次于最先进方案，但速度快很多 ★★★

Armand Joulin, et al. "Bag of Tricks for Efficient Text Classification." arXiv preprint arXiv:1607.01759(2016)
https://arxiv.org/abs/1607.01759

3.2 目标检测

[1] ★★★

Szegedy, Christian, Alexander Toshev, and Dumitru Erhan. "Deep neural networks

for object detection." Advances in Neural Information Processing Systems. 2013. http://papers.nips.cc/paper/5207-deep-neural-networks-for-object-detection.pdf

[2] RCNN ★★★★★

Girshick, Ross, et al. "Rich feature hierarchies for accurate object detection and semantic segmentation." Proceedings of the IEEE conference on computer vision and pattern recognition. 2014. http://www.cv-foundation.org/openaccess/content_cvpr_2014/papers/Girshick_Rich_Feature_Hierarchies_2014_CVPR_paper.pdf

[3] SPPNet ★★★★

He, Kaiming, et al. "Spatial pyramid pooling in deep convolutional networks for visual recognition." European Conference on Computer Vision. Springer International Publishing, 2014. http://arxiv.org/pdf/1406.4729

[4] ★★★★

Girshick, Ross. "Fast r-cnn." Proceedings of the IEEE International Conference on Computer Vision. 2015. https://pdfs.semanticscholar.org/8f67/64a59f0d17081f2a2a9d06f4ed1cdea1a0ad.pdf

[5] ★★★★

Ren, Shaoqing, et al. "Faster R-CNN: Towards real-time object detection with region proposal networks." Advances in neural information processing systems. 2015. http://papers.nips.cc/paper/5638-analysis-of-variational-bayesian-latent-dirichlet-allocation-weaker-sparsity-than-map.pdf

[6] 相当实用的YOLO项目 ★★★★★

Redmon, Joseph, et al. "You only look once: Unified, real-time object detection." arXiv preprint arXiv:1506.02640 (2015). http://homes.cs.washington.edu/%7Eali/papers/YOLO.pdf

[7] ★★★

Liu, Wei, et al. "SSD: Single Shot MultiBox Detector." arXiv preprint arXiv:1512.02325 (2015). http://arxiv.org/pdf/1512.02325

[8] ★★★★

Dai, Jifeng, et al. "R-FCN: Object Detection via Region-based Fully Convolutional Networks." arXiv preprint arXiv:1605.06409 (2016). https://arxiv.org/abs/1605.06409

[9] ★★★★

He, Gkioxari, et al. "Mask R-CNN" arXiv preprint arXiv:1703.06870 (2017). https://arxiv.org/abs/1703.06870

3.3 视觉追踪

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