1 深度学习历史和基础

1.0 书籍

[0] Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "**Deep learning**." An MIT Press book. (2015). [pdf] (Ian Goodfellow 等大牛所著的教科书，乃深度学习圣经。你可以同时研习这本书以及以下论文) ★★★★★

地址：

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

1.1 调查

[1] LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton. "**Deep learning**." Nature 521.7553 (2015): 436-444. [pdf] (三巨头做的调查) ★★★★★

地址：http://www.cs.toronto.edu/~hinton/absps/NatureDeepReview.pdf

1.2 深度置信网络 (DBN，深度学习前夜的里程碑)

[2] Hinton, Geoffrey E., Simon Osindero, and Yee-Whye Teh. "**A fast learning algorithm for deep belief nets**." Neural computation 18.7 (2006): 1527-1554. [pdf] (深度学习前夜) ★★★

地址：http://www.cs.toronto.edu/~hinton/absps/ncfast.pdf

[3] Hinton, Geoffrey E., and Ruslan R. Salakhutdinov. "**Reducing the dimensionality of data with neural networks.**" Science 313.5786 (2006): 504-507. [pdf] (里程碑，展示了深度学习的前景) ★★★

地址：http://www.cs.toronto.edu/~hinton/science.pdf

1.3 ImageNet 的进化（深度学习从此萌发）

[4] Krizhevsky, Alex, Ilya Sutskever, and Geoffrey E. Hinton. "**Imagenet classification with deep convolutional neural networks.**" Advances in neural information processing systems. 2012. [pdf] (AlexNet, 深度学习突破) ★★★★★

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

[5] Simonyan, Karen, and Andrew Zisserman. "**Very deep convolutional networks for large-scale image recognition.**" arXiv preprint arXiv:1409.1556 (2014). [pdf] (VGGNet，神经网络变得很深层) ★★★

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[6] Szegedy, Christian, et al. "**Going deeper with convolutions.**" Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition. 2015. [pdf] (GoogLeNet) ★★★

地址：http://www.cv-foundation.org/openaccess/content_cvpr_2015/papers/Szegedy_Going_Deeper_With_2015_CVPR_paper.pdf

[7] He, Kaiming, et al. "**Deep residual learning for image recognition.**" arXiv preprint arXiv:1512.03385 (2015). [pdf](ResNet，特别深的神经网络, CVPR 最佳论文) ★★★★★

地址：https://arxiv.org/pdf/1512.03385.pdf

1.4 语音识别的进化

[8] 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. [pdf] (语音识别的突破) ★★★★

地址：http://cs224d.stanford.edu/papers/maas_paper.pdf

[9] 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. [pdf] (RNN) ★★★

地址：http://arxiv.org/pdf/1303.5778.pdf

[10] Graves, Alex, and Navdeep Jaitly. "**Towards End-To-End Speech Recognition with Recurrent Neural Networks.**" ICML. Vol. 14. 2014. [pdf] ★★★

地址：http://www.jmlr.org/proceedings/papers/v32/graves14.pdf

[11] Sak, Haşim, et al. "**Fast and accurate recurrent neural network acoustic models for speech recognition.**" arXiv preprint arXiv:1507.06947 (2015). [pdf] (谷歌语音识别系统) ★★★

地址：http://arxiv.org/pdf/1507.06947

[12] Amodei, Dario, et al. "**Deep speech 2: End-to-end speech recognition in english and mandarin**." arXiv preprint arXiv:1512.02595 (2015). [pdf] (百度语音识别系统) ★★★★

地址：https://arxiv.org/pdf/1512.02595.pdf

[13] 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). [pdf] (最前沿的语音识别, 微软) ★★★★

地址：https://arxiv.org/pdf/1610.05256v1

研读以上论文之后，你将对深度学习历史、模型的基本架构（包括 CNN, RNN, LSTM）有一个基础的了解，并理解深度学习如何应用于图像和语音识别问题。接下来的论文，将

带你深入探索深度学习方法、在不同领域的应用和前沿尖端技术。我建议，你可以根据兴趣和工作/研究方向进行选择性的阅读。

2 深度学习方法

2.1 模型

[14] Hinton, Geoffrey E., et al. "**Improving neural networks by preventing co-adaptation of feature detectors.**" arXiv preprint arXiv:1207.0580 (2012). [pdf] (Dropout) ★★★

地址：https://arxiv.org/pdf/1207.0580.pdf

[15] Srivastava, Nitish, et al. "**Dropout: a simple way to prevent neural networks from overfitting.**" Journal of Machine Learning Research 15.1 (2014): 1929-1958. [pdf] ★★★

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http://www.jmlr.org/papers/volume15/srivastava14a.old/source/srivastava14a.pdf

[16] Ioffe, Sergey, and Christian Szegedy. "**Batch normalization: Accelerating deep network training by reducing internal covariate shift.**" arXiv preprint arXiv:1502.03167 (2015). [pdf] (2015 年的杰出研究) ★★★★

地址：http://arxiv.org/pdf/1502.03167

[17] Ba, Jimmy Lei, Jamie Ryan Kiros, and Geoffrey E. Hinton. "**Layer normalization.**" arXiv preprint arXiv:1607.06450 (2016). [pdf] (Batch Normalization 的更新) ★★★★

地址：

https://arxiv.org/pdf/1607.06450.pdf?utm_source=sciontist.com&utm_medium=refer&utm_campaign=promote

[18] Courbariaux, Matthieu, et al. "**Binarized Neural Networks: Training Neural Networks with Weights and Activations Constrained to+ 1 or−1.**" [pdf] (新模型，快) ★★★

地址：

https://pdfs.semanticscholar.org/f832/b16cb367802609d91d400085eb87d630212a.pdf

[19] Jaderberg, Max, et al. "**Decoupled neural interfaces using synthetic gradients.**" arXiv preprint arXiv:1608.05343 (2016). [pdf] (训练方法的创新，研究相当不错) ★★★★★

地址：https://arxiv.org/pdf/1608.05343

[20] Chen, Tianqi, Ian Goodfellow, and Jonathon Shlens. "**Net2net: Accelerating learning via knowledge transfer.**" arXiv preprint arXiv:1511.05641 (2015). [pdf] (改进此前的训练网络，来缩短训练周期) ★★★

地址：https://arxiv.org/abs/1511.05641

[21] Wei, Tao, et al. "**Network Morphism.**" arXiv preprint arXiv:1603.01670 (2016). [pdf] (改进此前的训练网络，来缩短训练周期) ★★★

地址：https://arxiv.org/abs/1603.01670

2.2 优化 Optimization

[22] Sutskever, Ilya, et al. "**On the importance of initialization and momentum in deep learning.**" ICML (3) 28 (2013): 1139-1147. [pdf] (Momentum optimizer) ★★

地址：http://www.jmlr.org/proceedings/papers/v28/sutskever13.pdf

[23] Kingma, Diederik, and Jimmy Ba. "**Adam: A method for stochastic optimization.**" arXiv preprint arXiv:1412.6980 (2014). [pdf] (Maybe used most often currently) ★★★

地址：http://arxiv.org/pdf/1412.6980

[24] Andrychowicz, Marcin, et al. "**Learning to learn by gradient descent by gradient descent.**" arXiv preprint arXiv:1606.04474 (2016). [pdf] (Neural Optimizer,Amazing Work) ★★★★★

地址：https://arxiv.org/pdf/1606.04474

[25] 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). [pdf] (ICLR best paper, new direction to make NN running fast,DeePhi Tech Startup) ★★★★★

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[26] Iandola, Forrest N., et al. "**SqueezeNet: AlexNet-level accuracy with 50x fewer parameters and< 1MB model size.**" arXiv preprint arXiv:1602.07360 (2016). [pdf] (Also a new direction to optimize NN,DeePhi Tech Startup) ★★★★

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2.3 无监督学习/深度生成模型

[27] Le, Quoc V. "**Building high-level features using large scale unsupervised learning.**" 2013 IEEE international conference on acoustics, speech and signal processing. IEEE, 2013. [pdf] (里程碑, 吴恩达, 谷歌大脑, Cat) ★★★★

地址：http://arxiv.org/pdf/1112.6209.pdf&embed

[28] Kingma, Diederik P., and Max Welling. "**Auto-encoding variational bayes.**" arXiv preprint arXiv:1312.6114 (2013). [pdf](VAE) ★★★★

地址：http://arxiv.org/pdf/1312.6114

[29] Goodfellow, Ian, et al. "**Generative adversarial nets.**" Advances in Neural Information Processing Systems. 2014. [pdf](GAN，很酷的想法) ★★★★★

地址：http://papers.nips.cc/paper/5423-generative-adversarial-nets.pdf

[30] Radford, Alec, Luke Metz, and Soumith Chintala. "**Unsupervised representation learning with deep convolutional generative adversarial networks.**" arXiv preprint arXiv:1511.06434 (2015). [pdf] (DCGAN) ★★★★

地址：http://arxiv.org/pdf/1511.06434

[31] Gregor, Karol, et al. "**DRAW: A recurrent neural network for image generation.**" arXiv preprint arXiv:1502.04623 (2015). [pdf] (VAE with attention, 很出色的研究) ★★★★★

地址：http://jmlr.org/proceedings/papers/v37/gregor15.pdf

[32] Oord, Aaron van den, Nal Kalchbrenner, and Koray Kavukcuoglu. "**Pixel recurrent neural networks.**" arXiv preprint arXiv:1601.06759 (2016). [pdf] (PixelRNN) ★★★★

地址：http://arxiv.org/pdf/1601.06759

[33] Oord, Aaron van den, et al. "**Conditional image generation with PixelCNN decoders.**" arXiv preprint arXiv:1606.05328 (2016). [pdf] (PixelCNN) ★★★★

地址：https://arxiv.org/pdf/1606.05328

2.4 递归神经网络（RNN）/ Sequence-to-Sequence Model

[34] Graves, Alex. "**Generating sequences with recurrent neural networks.**" arXiv preprint arXiv:1308.0850 (2013). [pdf] (LSTM, 效果很好，展示了 RNN 的性能) ★★★★

地址：http://arxiv.org/pdf/1308.0850

[35] Cho, Kyunghyun, et al. "**Learning phrase representations using RNN encoder-decoder for statistical machine translation.**" arXiv preprint arXiv:1406.1078 (2014). [pdf] (第一篇 Sequence-to-Sequence 的论文) ★★★★

地址：http://arxiv.org/pdf/1406.1078

[36] Sutskever, Ilya, Oriol Vinyals, and Quoc V. Le. "**Sequence to sequence learning with neural networks.**" Advances in neural information processing systems. 2014. [pdf] (杰出研究) ★★★★★

地址：http://papers.nips.cc/paper/5346-information-based-learning-by-agents-in-unbounded-state-spaces.pdf

[37] Bahdanau, Dzmitry, KyungHyun Cho, and Yoshua Bengio. "**Neural Machine Translation by Jointly Learning to Align and Translate.**" arXiv preprint arXiv:1409.0473 (2014). [pdf] ★★★★

地址：https://arxiv.org/pdf/1409.0473v7.pdf

[38] Vinyals, Oriol, and Quoc Le. "**A neural conversational model.**" arXiv preprint arXiv:1506.05869 (2015). [pdf] (Seq-to-Seq 聊天机器人) ★★★

地址：

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2.5 神经网络图灵机

[39] Graves, Alex, Greg Wayne, and Ivo Danihelka. "**Neural turing machines.**" arXiv preprint arXiv:1410.5401 (2014). [pdf] (未来计算机的基础原型机) ★★★★★

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[40] Zaremba, Wojciech, and Ilya Sutskever. "**Reinforcement learning neural Turing machines.**" arXiv preprint arXiv:1505.00521 362 (2015). [pdf] ★★★

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地址：http://arxiv.org/pdf/1410.3916

[42] Sukhbaatar, Sainbayar, Jason Weston, and Rob Fergus. "**End-to-end memory networks.**" Advances in neural information processing systems. 2015. [pdf] ★★★★

地址：http://papers.nips.cc/paper/5846-end-to-end-memory-networks.pdf

[43] Vinyals, Oriol, Meire Fortunato, and Navdeep Jaitly. "**Pointer networks.**" Advances in Neural Information Processing Systems. 2015. [pdf] ★★★★

地址：http://papers.nips.cc/paper/5866-pointer-networks.pdf

[44] Graves, Alex, et al. "**Hybrid computing using a neural network with dynamic external memory.**" Nature (2016). [pdf] (里程碑，把以上论文的想法整合了起来) ★★★★★

地址：https://www.dropbox.com/s/0a40xi702grx3dq/2016-graves.pdf

2.6 深度强化学习

[45] Mnih, Volodymyr, et al. "**Playing atari with deep reinforcement learning**." arXiv preprint arXiv:1312.5602 (2013). [pdf]) (第一个以深度强化学习为题的论文) ★★★★

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[46] Mnih, Volodymyr, et al. "**Human-level control through deep reinforcement learning**." Nature 518.7540 (2015): 529-533. [pdf] (里程碑) ★★★★★

地址：https://storage.googleapis.com/deepmind-data/assets/papers/DeepMindNature14236Paper.pdf

[47] Wang, Ziyu, Nando de Freitas, and Marc Lanctot. "**Dueling network architectures for deep reinforcement learning.**" arXiv preprint arXiv:1511.06581 (2015). [pdf] (ICLR 最佳论文，很棒的想法) ★★★★

地址：http://arxiv.org/pdf/1511.06581

[48] Mnih, Volodymyr, et al. "**Asynchronous methods for deep reinforcement learning.**" arXiv preprint arXiv:1602.01783 (2016). [pdf] (前沿方法) ★★★★★

地址：http://arxiv.org/pdf/1602.01783

[49] Lillicrap, Timothy P., et al. "**Continuous control with deep reinforcement learning.**" arXiv preprint arXiv:1509.02971 (2015). [pdf] (DDPG) ★★★★

地址：http://arxiv.org/pdf/1509.02971

[50] Gu, Shixiang, et al. "**Continuous Deep Q-Learning with Model-based Acceleration.**" arXiv preprint arXiv:1603.00748 (2016). [pdf] (NAF) ★★★★

地址：http://arxiv.org/pdf/1603.00748

[51] Schulman, John, et al. "**Trust region policy optimization.**" CoRR, abs/1502.05477 (2015). [pdf] (TRPO) ★★★★

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[52] Silver, David, et al. "**Mastering the game of Go with deep neural networks and tree search.**" Nature 529.7587 (2016): 484-489. [pdf] (AlphaGo) ★★★★★

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2.7 深度迁移学习 /终生学习 / 强化学习

[53] Bengio, Yoshua. "**Deep Learning of Representations for Unsupervised and Transfer Learning**." ICML Unsupervised and Transfer Learning 27 (2012): 17-36. [pdf] (这是一个教程) ★★★

地址：http://www.jmlr.org/proceedings/papers/v27/bengio12a/bengio12a.pdf

[54] Silver, Daniel L., Qiang Yang, and Lianghao Li. "**Lifelong Machine Learning Systems: Beyond Learning Algorithms.**" AAAI Spring Symposium: Lifelong Machine Learning. 2013. [pdf] (对终生学习的简单讨论) ★★★

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[55] Hinton, Geoffrey, Oriol Vinyals, and Jeff Dean. "**Distilling the knowledge in a neural network.**" arXiv preprint arXiv:1503.02531 (2015). [pdf] (大神们的研究) ★★★★

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[56] Rusu, Andrei A., et al. "**Policy distillation.**" arXiv preprint arXiv:1511.06295 (2015). [pdf] (RL 领域) ★★★

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[57] Parisotto, Emilio, Jimmy Lei Ba, and Ruslan Salakhu★★★tdinov. "**Actor-mimic: Deep multitask and transfer reinforcement learning.**" arXiv preprint arXiv:1511.06342 (2015). [pdf] (RL 领域) ★★★

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[58] Rusu, Andrei A., et al. "**Progressive neural networks.**" arXiv preprint arXiv:1606.04671 (2016). [pdf] (杰出研究, 很新奇的想法) ★★★★★

地址：https://arxiv.org/pdf/1606.04671

2.8 One Shot 深度学习

[59] Lake, Brenden M., Ruslan Salakhutdinov, and Joshua B. Tenenbaum. "**Human-level concept learning through probabilistic program induction.**" Science 350.6266 (2015): 1332-1338. [pdf] (不含深度学习但值得一读) ★★★★★

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地址：http://www.cs.utoronto.ca/~gkoch/files/msc-thesis.pdf

[61] Santoro, Adam, et al. "**One-shot Learning with Memory-Augmented Neural Networks.**" arXiv preprint arXiv:1605.06065 (2016). [pdf] (one shot 学习的基础一步) ★★★★

地址：http://arxiv.org/pdf/1605.06065

[62] Vinyals, Oriol, et al. "**Matching Networks for One Shot Learning.**" arXiv preprint arXiv:1606.04080 (2016). [pdf] ★★★

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[63] Hariharan, Bharath, and Ross Girshick. "**Low-shot visual object recognition.**" arXiv preprint arXiv:1606.02819 (2016). [pdf] (通向更大规模数据的一步) ★★★★

地址：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) [pdf] ★★★★

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[2] Mikolov, et al. "**Distributed representations of words and phrases and their compositionality.**" ANIPS(2013): 3111-3119 [pdf] (word2vec) ★★★

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[5] Yoon Kim, et al. "**Character-Aware Neural Language Models.**" NIPS(2015) arXiv preprint arXiv:1508.06615(2015) [pdf] ★★★

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[6] Jason Weston, et al. "**Towards AI-Complete Question Answering: A Set of Prerequisite Toy Tasks.**" arXiv preprint arXiv:1502.05698(2015) [pdf] (bAbI tasks) ★★★

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[8] Alexis Conneau, et al. "**Very Deep Convolutional Networks for Natural Language Processing.**" arXiv preprint arXiv:1606.01781(2016) [pdf] (文本分类的前沿技术) ★★★

地址：https://arxiv.org/abs/1606.01781

[9] Armand Joulin, et al. "**Bag of Tricks for Efficient Text Classification.**" arXiv preprint arXiv:1607.01759(2016) [pdf] (比前沿技术稍落后, 但快很多) ★★★

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3.2 物体检测

[1] Szegedy, Christian, Alexander Toshev, and Dumitru Erhan. "**Deep neural networks for object detection**." Advances in Neural Information Processing Systems. 2013. [pdf] ★★★

地址：http://papers.nips.cc/paper/5207-deep-neural-networks-for-object-detection.pdf

[2] 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. [pdf] (RCNN) ★★★★★

地址：http://www.cv-foundation.org/openaccess/content_cvpr_2014/papers/Girshick_Rich_Feature_Hierarchies_2014_CVPR_paper.pdf

[3] He, Kaiming, et al. "**Spatial pyramid pooling in deep convolutional networks for visual recognition.**" European Conference on Computer Vision. Springer International Publishing, 2014. [pdf] (SPPNet) ★★★★

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[5] Ren, Shaoqing, et al. "**Faster R-CNN: Towards real-time object detection with region proposal networks.**" Advances in neural information processing systems. 2015. [pdf] ★★★★

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3.3 视觉追踪

[1] Wang, Naiyan, and Dit-Yan Yeung. "**Learning a deep compact image representation for visual tracking.**" Advances in neural information processing systems. 2013. [pdf] (第一篇使用深度学习做视觉追踪的论文，DLT Tracker) ★★★

地址：http://papers.nips.cc/paper/5192-learning-a-deep-compact-image-representation-for-visual-tracking.pdf

[2] Wang, Naiyan, et al. "**Transferring rich feature hierarchies for robust visual tracking.**" arXiv preprint arXiv:1501.04587 (2015). [pdf] (SO-DLT) ★★★★

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