## 参考文献

- Abadi, Martín, Agarwal, Ashish, Barham, Paul, Brevdo, Eugene, Chen, Zhifeng, et al. 2015. *TensorFlow: Large-Scale Machine Learning on Heterogeneous Systems*. Software available from tensorflow.org.
- Adamic, Lada A, and Adar, Eytan. 2003. Friends and neighbors on the web. Social networks, 25(3), 211–230.
- Afsar Minhas, Fayyaz ul Amir, Geiss, Brian J, and Ben-Hur, Asa. 2014. PAIR-pred: Partner-specific prediction of interacting residues from sequence and structure. *Proteins: Structure, Function, and Bioinformatics*, 82(7), 1142–1155.
- Aggarwal, Charu C. 2020. Linear Algebra and Optimization for Machine Learning. Springer.
- Aggarwal, Charu C. 2023. Neural Networks and Deep Learning. Springer.
- Allamanis, Miltiadis, Brockschmidt, Marc, and Khademi, Mahmoud. 2017. Learning to represent programs with graphs. *International Conference on Learning Representations*.
- Andersen, Reid, Chung, Fan, and Lang, Kevin. 2006. Local graph partitioning using pagerank vectors. Pages 475–486 of: 2006 47th Annual IEEE Symposium on Foundations of Computer Science (FOCS'06). IEEE.
- Atwood, James, and Towsley, Don. 2016. Diffusion-convolutional neural networks. Pages 1993–2001 of: Advances in Neural Information Processing Systems.
- Babai, László. 2016. Graph isomorphism in quasipolynomial time. Pages 684–697 of: Proceedings of the Forty-Eighth annual ACM symposium on Theory of Computing.
- Bahdanau, Dzmitry, Cho, Kyunghyun, and Bengio, Yoshua. 2014. Neural machine translation by jointly learning to align and translate. 3rd International Conference on Learning Representations, (ICLR) 2015, San Diego, CA, USA, May7-9, 2015, Conference Track Proceedings.
- Bai, Song, Zhang, Feihu, and Torr, Philip HS. 2019. Hypergraph convolution and hypergraph attention. *Pattern Recognition*, **110**, 107637.
- Banarescu, Laura, Bonial, Claire, Cai, Shu, Georgescu, Madalina, Griffitt, Kira, et al. 2013. Abstract meaning representation for sembanking. Pages 178–186 of: Proceedings of the 7th Linguistic Annotation Workshop and Interoperability with Discourse.
- Bastings, Joost, Titov, Ivan, Aziz, Wilker, Marcheggiani, Diego, and Sima'

- an, Khalil. 2017. Graph convolutional encoders for syntax-aware neural machine translation. Pages 1957-1967 of: *Proceedings of the 2017 Conference on Empirical Methods in Natural Language Processing*.
- Battaglia, Peter W, Hamrick, Jessica B, Bapst, Victor, Sanchez-Gonzalez, Alvaro, Zambaldi, et al. 2018. Relational inductive biases, deep learning, and graph networks. arXiv preprint arXiv:1806.01261.
- Battaglia, Peter W, Pascanu, Razvan, Lai, Matthew, Rezende, Danilo Jimenez, et al. 2016. Interaction networks for learning about objects, relations and physics. Pages 4502–4510 of: Advances in Neural Information Processing Systems.
- Baytas, Inci M, Xiao, Cao, Wang, Fei, Jain, Anil K, and Zhou, Jiayu. 2018. Heterogeneous Hyper-Network Embedding. Pages 875–880 of: 2018 IEEE International Conference on Data Mining (ICDM). IEEE.
- Beck, Daniel, Haffari, Gholamreza, and Cohn, Trevor. 2018. Graph-to-Sequence Learning using Gated Graph Neural Networks. Pages 273–283 of: Proceedings of the 56th Annual Meeting of the Association for Computational Linguistics: Vol. 1. Long Papers.
- Belkin, Mikhail, and Niyogi, Partha. 2003. Laplacian eigenmaps for dimensionality reduction and data representation. *Neural computation*, **15**(6), 1373–1396.
- Berg, Rianne van den, Kipf, Thomas N, and Welling, Max. 2017. Graph convolutional matrix completion. arXiv preprint arXiv:1706.02263.
- Berlusconi, Giulia, Calderoni, Francesco, Parolini, Nicola, Verani, Marco, and Piccardi, Carlo. 2016. Link prediction in criminal networks: A tool for criminal intelligence analysis. PLoS one, 11(4), e0154244.
- Bhagat, Smriti, Cormode, Graham, and Muthukrishnan, S. 2011. Node classification in social networks. Pages 115–148 of: *Social network data analytics*. Springer.
- Bishop, Christopher M. 2006. Pattern recognition and machine learning. Springer.
- Bonacich, Phillip. 1972. Factoring and weighting approaches to status scores and clique identification. *Journal of mathematical sociology*, **2**(1), 113–120.
- Bonacich, Phillip. 2007. Some unique properties of eigenvector centrality. *Social Networks*, **29**(4), 555–564.
- Bonchev, Danail. 1991. Chemical Graph Theory: Introduction and Fundamentals. Vol. 1. CRC Press.
- Bondy, John Adrian, et al. 1977. Graph Theory with Applications. Vol. 290.

- Borgatti, Stephen P, Mehra, Ajay, Brass, Daniel J, and Labianca, Giuseppe. 2009. Network analysis in the social sciences. *Science*, **323**(5916), 892–895.
- Bourigault, Simon, Lagnier, Cedric, Lamprier, Sylvain, Denoyer, Ludovic, and Gallinari, Patrick. 2014. Learning social network embeddings for predicting information diffusion. Pages 393–402 of: Proceedings of the 7th ACM International Conference on Web Search and Data Mining.
- Boyd, Stephen, Boyd, Stephen P, and Vandenberghe, Lieven. 2004. Convex optimization. Cambridge University Press.
- Bracewell, Ronald Newbold. 1978. The Fourier Transform and Its Applications. Vol. 31999.
- Bruna, Joan, Zaremba, Wojciech, Szlam, Arthur, and LeCun, Yann. 2013. Spectral networks and locally connected networks on graphs. arXiv preprint arXiv:1312.6203.
- Cai, Hongyun, Zheng, Vincent W, and Chang, Kevin Chen-Chuan. 2018. A comprehensive survey of graph embedding: Problems, techniques, and applications. *IEEE Transactions on Knowledge and Data Engineering*, 30(9), 1616–1637.
- Cai, Jin-Yi, Furer, Martin, and Immerman, Neil. 1992. An optimal lower bound on the number of variables for graph identification. *Combinatorica*, 12(4), 389–410.
- Cao, Shaosheng, Lu, Wei, and Xu, Qiongkai. 2015. Grarep: Learning graph representations with global structural information. Pages 891–900 of: Proceedings of the 24th ACM International on Conference on Information and knowledge Management.
- Cao, Shaosheng, Lu, Wei, and Xu, Qiongkai. 2016. Deep neural networks for learning graph representations. Thirtieth AAAI Conference on Artificial Intelligence.
- Cao, Yu, Fang, Meng, and Tao, Dacheng. 2019. BAG: Bi-directional Attention
   Entity Graph Convolutional Network for Multi-hop Reasoning Question
   Answering. Pages 357-362 of: Proceedings of the 2019 Conference of the
   North American Chapter of the Association for Computational Linguistics:
   Human Language Technologies: Vol. 1. Long and Short Papers.
- Carlini, Nicholas, and Wagner, David. 2017. Towards evaluating the robustness of neural networks. Pages 39-57 of: 2017 IEEE Symposium on Security and Privacy (SP). IEEE.
- Cartwright, Dorwin, and Harary, Frank. 1956. Structural balance: a generalization of Heider's theory. *Psychological Review*, **63**(5), 277.

- Cauchy, Augustin. Méthode générale pour la résolution des systemes d'équations simultanées.
- Chami, Ines, Ying, Zhitao, Ré, Christopher, and Leskovec, Jure. 2019. Hyperbolic graph convolutional neural networks. Pages 4868-4879 of: Advances in Neural Information Processing Systems.
- Chan, T.-H Hubert, and Liang, Zhibin. 2019. Generalizing the hypergraph Laplacian via a diffusion process with mediators. *Theoretical Computer Science*, **806**, 416-428.
- Chan, T.-H Hubert, Louis, Anand, Tang, Zhihao Gavin, and Zhang, Chenzi. 2018. Spectral properties of hypergraph Laplacian and approximation algorithms. *Journal of the ACM*, 65(3), 15.
- Chang, Shiyu, Han, Wei, Tang, Jiliang, Qi, Guo-Jun, Aggarwal, Charu C, and Huang, Thomas S. 2015. Heterogeneous network embedding via deep architectures. Pages 119-128 of: Proceedings of the 21th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining.
- Chaudhary, Anshika, Mittal, Himangi, and Arora, Anuja. 2019. Anomaly Detection Using Graph Neural Networks. Pages 346-350 of: 2019 International Conference on Machine Learning, Big Data, Cloud and Parallel Computing (COMITCon). IEEE.
- Chen, Jianfei, Zhu, Jun, and Song, Le. 2018a. Stochastic training of graph convolutional networks with variance reduction. Pages 941-949 of: International Conference on Machine Learning.
- Chen, Jie, Ma, Tengfei, and Xiao, Cao. 2018b. FastGCN: Fast learning with graph convolutional networks via importance sampling. *International Conference on Learning Representations*.
- Chen, Tianshui, Yu, Weihao, Chen, Riquan, and Lin, Liang. 2019a. Knowledge-embedded routing network for scene graph generation. Pages 6163-6171 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Chen, Ting, and Sun, Yizhou. 2017. Task-guided and path-augmented heterogeneous network embedding for author identification. Pages 295-304 of: Proceedings of the Tenth ACM International Conference on Web Search and Data Mining.
- Chen, Xia, Yu, Guoxian, Wang, Jun, Domeniconi, Carlotta, Li, Zhao, and Zhang, Xiangliang. 2019b. ActiveHNE: Active heterogeneous network embedding. Pages 2123-2129 of: International Joint Conferences on Artificial Intelligence Organization.
- Chen, Zhao-Min, Wei, Xiu-Shen, Wang, Peng, and Guo, Yanwen. 2019c.

- Multi-Label Image Recognition with Graph Convolutional Networks. Pages 5177–5186 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Chen, Zhengdao, Li, Xiang, and Bruna, Joan. 2017. Supervised community detection with line graph neural networks. *International Conference on Learning Representations*.
- Cheng, Kewei, Li, Jundong, and Liu, Huan. 2017. Unsupervised feature selection in signed social networks. Pages 777-786 of: Proceedings of the 23rd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining.
- Chiang, Wei-Lin, Liu, Xuanqing, Si, Si, Li, Yang, Bengio, Samy, et al. 2019. Cluster-GCN: An efficient algorithm for training deep and large graph convolutional networks. Pages 257-266 of: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Cho, Kyunghyun, Van Merriënboer, Bart, Gulcehre, Caglar, Bahdanau, Dzmitry, Bougares, Fethi, et al. 2014a. Learning phrase representations using RNN encoder-decoder for statistical machine translation. Pages 1724-1734 of: Proceedings of the 2014 Conference on Empirical Methods in Natural Language Processing (EMNLP).
- Cho, Minsu, Sun, Jian, Duchenne, Olivier, and Ponce, Jean. 2014b. Finding matches in a haystack: A max-pooling strategy for graph matching in the presence of outliers. Pages 2083-2090 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Choi, Edward, Xu, Zhen, Li, Yujia, Dusenberry, Michael, Flores, Gerardo, Xue, Emily, and Dai, Andrew. 2020. Learning the Graphical Structure of Electronic Health Records with Graph Convolutional Transformer. Pages 606-613 of: Proceedings of the AAAI Conference on Artificial Intelligence. Vol. 34.
- Chung, Fan R.K., and Graham, Fan Chung. 1997. Spectral Graph Theory. American Mathematical Society.
- Cohen, Marco Damonte Shay B. 2019. Structural Neural Encoders for AMR-to-text Generation. Pages 3649-3658 of: *Proceedings of NAACL-HLT*.
- Cui, Peng, Wang, Xiao, Pei, Jian, and Zhu, Wenwu. 2018. A survey on network embedding. IEEE Transactions on Knowledge and Data Engineering, 31(5), 833–852.
- Cygan, Marek, Pilipczuk, Marcin, Pilipczuk, Michał, and Wojtaszczyk, Jakub Onufry. 2012. Sitting closer to friends than enemies, revisited. Pages 296-307 of: International Symposium on Mathematical Foundations of Com-

- puter Science. Springer.
- Dahl, George, Ranzato, Marc'Aurelio, Mohamed, Abdel-rahman, and Hinton, Geoffrey E. 2010. Phone recognition with the mean-covariance restricted Boltzmann machine. Pages 469–477 of: Advances in Neural Information Processing Systems.
- Dai, Hanjun, Li, Hui, Tian, Tian, Huang, Xin, Wang, Lin, et al. 2018. Adversarial attack on graph structured data. Proceedings of the 35th International Conference on Machine Learning, PMLR, Vol. 80.
- Damonte, Marco, and Cohen, Shay B. 2019. Structural neural encoders for AMR-to-text generation. Pages 3649-3658 of: *Proceedings of NAACL-HLT*.
- De Cao, Nicola, and Kipf, Thomas. 2018. MolGAN: An implicit generative model for small molecular graphs. arXiv preprint arXiv:1805.11973.
- De Cao, Nicola, Aziz, Wilker, and Titov, Ivan. 2019. Question answering by reasoning across documents with graph convolutional networks. Pages 2306-2317 of: Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies: Vol. 1. Long and Short Papers.
- Deerwester, Scott, Dumais, Susan T, Furnas, George W, Landauer, Thomas K, and Harshman, Richard. 1990. Indexing by latent semantic analysis.

  Journal of the American Society for Information Science, 41(6), 391–407.
- Defferrard, Michaël, Bresson, Xavier, and Vandergheynst, Pierre. 2016. Convolutional neural networks on graphs with fast localized spectral filtering. Pages 3844–3852 of: Advances in Neural Information Processing Systems.
- Deng, Li, and Liu, Yang. 2018. Deep learning in natural language processing. Springer.
- Deng, Li, Seltzer, Michael L, Yu, Dong, Acero, Alex, Mohamed, Abdelrahman, and Hinton, Geoff. 2010. Binary coding of speech spectrograms using a deep auto-encoder. *Eleventh Annual Conference of the International Speech Communication Association*.
- Derr, Tyler, Ma, Yao, and Tang, Jiliang. 2018. Signed graph convolutional networks. Pages 929-934 of: 2018 IEEE International Conference on Data Mining (ICDM). IEEE.
- Devlin, Jacob, Chang, Ming-Wei, Lee, Kenton, and Toutanova, Kristina. 2018. BERT: Pre-training of deep bidirectional transformers for language understanding. Pages 4171-4186 of: Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, Volume 1 (Long and Short Papers).

- Dhillon, Inderjit S, Guan, Yuqiang, and Kulis, Brian. 2007. Weighted graph cuts without eigenvectors a multilevel approach. *IEEE transactions on* pattern analysis and machine intelligence, 29(11), 1944–1957.
- Di Martino, Adriana, Yan, Chao-Gan, Li, Qingyang, Denio, Erin, Castellanos, Francisco X, Alaerts, Kaat, Anderson, Jeffrey S, Assaf, Michal, Bookheimer, Susan Y, Dapretto, Mirella, et al. 2014. The autism brain imaging data exchange: towards a large-scale evaluation of the intrinsic brain architecture in autism. *Molecular psychiatry*, 19(6), 659–667.
- Dong, Yuxiao, Chawla, Nitesh V, and Swami, Ananthram. 2017. meta-path2vec: Scalable representation learning for heterogeneous networks. Pages 135-144 of: Proceedings of the 23rd ACM SIGKDD international conference on knowledge discovery and data mining. ACM.
- Duchi, John, Hazan, Elad, and Singer, Yoram. 2011. Adaptive subgradient methods for online learning and stochastic optimization. *Journal of Machine Learning Research*, **12**(a), 2121–2159.
- Duvenaud, David K, Maclaurin, Dougal, Iparraguirre, Jorge, Bombarell, Rafael, Hirzel, Timothy, et al. 2015. Convolutional networks on graphs for learning molecular fingerprints. Pages 2224-2232 of: Advances in Neural Information Processing Systems.
- Entezari, Negin, Al-Sayouri, Saba A, Darvishzadeh, Amirali, and Papalexakis, Evangelos E. 2020. All you need is low (rank) defending against adversarial attacks on graphs. Pages 169-177 of: Proceedings of the 13th International Conference on Web Search and Data Mining.
- Fan, Wenqi, Ma, Yao, Li, Qing, He, Yuan, Zhao, Eric, et al. 2019. Graph neural networks for social recommendation. Pages 417-426 of: The World Wide Web Conference. ACM.
- Feller, William. 1957. An Introduction to Probability Theory and Its Applications. Wiley.
- Feng, Fuli, He, Xiangnan, Tang, Jie, and Chua, Tat-Seng. 2019a. Graph adversarial training: Dynamically regularizing based on graph structure. IEEE Transactions on Knowledge and Data Engineering. 1.
- Feng, Yifan, You, Haoxuan, Zhang, Zizhao, Ji, Rongrong, and Gao, Yue. 2019b. Hypergraph neural networks. Pages 3558-3565 of: Proceedings of the AAAI Conference on Artificial Intelligence. Vol. 33.
- Fernandes, Patrick, Allamanis, Miltiadis, and Brockschmidt, Marc. 2018. Structured neural summarization. *International Conference on Learning Representations*.
- Fey, Matthias, and Lenssen, Jan E. 2019. Fast Graph Representation Learning

- with PyTorch Geometric. ICLR Workshop on Representation Learning on Graphs and Manifolds.
- Finn, Chelsea, Abbeel, Pieter, and Levine, Sergey. 2017. Model-agnostic metalearning for fast adaptation of deep networks. Pages 1126-1135 of: Proceedings of the 34th International Conference on Machine Learning. Vol. 70.
- Fouss, Francois, Pirotte, Alain, Renders, Jean-Michel, and Saerens, Marco. 2007. Random-walk computation of similarities between nodes of a graph with application to collaborative recommendation. *IEEE Transactions on Knowledge and Data Engineering*, **19**(3), 355–369.
- Fout, Alex, Byrd, Jonathon, Shariat, Basir, and Ben-Hur, Asa. 2017. Protein interface prediction using graph convolutional networks. Pages 6530-6539 of: *Advances in Neural Information Processing Systems*.
- Frobenius, Georg, Frobenius, Ferdinand Georg, Frobenius, Ferdinand Georg, Frobenius, Ferdinand Georg, and Mathematician, Germany. 1912. Über Matrizen aus nicht negativen Elementen.
- Fu, Tsu-Jui, Li, Peng-Hsuan, and Ma, Wei-Yun. 2019. GraphRel: Modeling text as relational graphs for joint entity and relation extraction. Pages 1409-1418 of: Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics.
- Gao, Hongyang, and Ji, Shuiwang. 2019. Graph U-Nets. Pages 2083-2092 of: Proceedings of the 36th International Conference on Machine Learning, ICML 2019, 9-15 June 2019, Long Beach, California, USA.
- Gao, Hongyang, Wang, Zhengyang, and Ji, Shuiwang. 2018a. Large-scale learnable graph convolutional networks. Pages 1416-1424 of: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Gao, Hongyang, Wang, Zhengyang, and Ji, Shuiwang. 2020. Kronecker Attention Networks. Pages 229-237 of: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Gao, Ming, Chen, Leihui, He, Xiangnan, and Zhou, Aoying. 2018b. BiNE: Bipartite network embedding. Pages 715-724 of: The 41st International ACM SIGIR Conference on Research & Development in Information Retrieval.
- Garey, Michael R, and Johnson, David S. 1974 Computers and Intractability: A Guide to the Theory of Np-Completeness. W.H. Freeman and Company.
- Gidaris, Spyros, and Komodakis, Nikos. 2019. Generating classification weights with gnn denoising autoencoders for few-shot learning. Pages

- 21-30 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Gilmer, Justin, Schoenholz, Samuel S., Riley, Patrick F., Vinyals, Oriol, and Dahl, George E. 2017. Neural message passing for quantum chemistry. Pages 1263-1272 of: Proceedings of the 34th International Conference on Machine Learning, ICML 2017, Sydney, NSW, Australia, 6-11 August 2017.
- Goldberg, David, Nichols, David, Oki, Brian M, and Terry, Douglas. 1992. Using collaborative filtering to weave an information tapestry. *Communications of the ACM*, **35**(12), 61–70.
- Goldberg, Ken, Roeder, Theresa, Gupta, Dhruv, and Perkins, Chris. 2001.
  Eigentaste: A constant time collaborative filtering algorithm. *Information Retrieval*, 4(2), 133–151.
- Goldberg, Yoav. 2016. A primer on neural network models for natural language processing. Journal of Artificial Intelligence Research, 57, 345– 420.
- Goodfellow, Ian, Bengio, Yoshua, and Courville, Aaron. 2016. Deep Learning. *The MIT Press*.
- Goodfellow, Ian, Pouget-Abadie, Jean, Mirza, Mehdi, Xu, Bing, Warde-Farley, David, et al. 2014a. Generative adversarial nets. Pages 2672-2680 of: Advances in Neural Information Processing Systems.
- Goodfellow, Ian J, Shlens, Jonathon, and Szegedy, Christian. 2014b. Explaining and harnessing adversarial examples. *International Conference on Learning Representation*.
- Goyal, Palash, and Ferrara, Emilio. 2018. Graph embedding techniques, applications, and performance: A survey. Knowledge-Based Systems, 151, 78–94.
- Grover, Aditya, and Leskovec, Jure. 2016. node2vec: Scalable feature learning for networks. Pages 855-864 of: Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining. ACM.
- Gu, Quanquan, and Han, Jiawei. 2011. Towards feature selection in network. Pages 1175-1184 of: Proceedings of the 20th ACM International Conference on Information and Knowledge Management.
- Gu, Yupeng, Sun, Yizhou, Li, Yanen, and Yang, Yang. 2018. Rare: Social rank regulated large-scale network embedding. Pages 241-251 of: Proceedings of the 2018 World Wide Web Conference.
- Guo, Zhijiang, Zhang, Yan, and Lu, Wei. 2019. Attention Guided Graph Convolutional Networks for Relation Extraction. Pages 241-251 of: Asso-

- ciation for Computational Linguistics.
- Gutmann, Michael U, and Hyvärinen, Aapo. 2012. Noise-contrastive estimation of unnormalized statistical models, with applications to natural image statistics. *Journal of Machine Learning Research*, **13**, 307–361.
- Hagberg, Aric, Swart, Pieter, and S Chult, Daniel. 2008. Exploring network structure, dynamics, and function using NetworkX. Technical Report, Los Alamos National Laboratory, Los Alamos, NM.
- Hamaguchi, Takuo, Oiwa, Hidekazu, Shimbo, Masashi, and Matsumoto, Yuji. 2017. Knowledge transfer for out-of-knowledge-base entities: a graph neural network approach. Pages 1802-1808 of: Proceedings of the 26th International Joint Conference on Artificial Intelligence. AAAI Press.
- Hamilton, Will, Ying, Zhitao, and Leskovec, Jure. 2017a. Inductive representation learning on large graphs. Pages 1024-1034 of: Advances in Neural Information Processing Systems.
- Hamilton, William L, Ying, Rex, and Leskovec, Jure. 2017b. Representation learning on graphs: Methods and applications. arXiv preprint arXiv:1709.05584.
- Han, Jiangfan, Luo, Ping, and Wang, Xiaogang. 2019. Deep self-learning from noisy labels. Pages 5138-5147 of: Proceedings of the IEEE International Conference on Computer Vision.
- Han, Jiawei, Pei, Jian, and Kamber, Micheline. 2011. Data Mining: Concepts and Techniques. Elsevier.
- He, Chaoyang, Xie, Tian, Rong, Yu, Huang, Wenbing, Li, Yanfang, et al. 2019. Bipartite Graph Neural Networks for Efficient Node Representation Learning. arXiv preprint arXiv:1906.11994.
- He, Kaiming, Zhang, Xiangyu, Ren, Shaoqing, and Sun, Jian. 2016. Deep residual learning for image recognition. Pages 770-778 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Heider, Fritz. 1946. Attitudes and cognitive organization. *The Journal of Psychology*, **21**(1), 107–112.
- Hochreiter, Sepp, and Schmidhuber, Jürgen. 1997. Long short-term memory. Neural Computation, 9(8), 1735–1780.
- Hoffman, Kenneth, and Kunze, Ray. 2015. Linear Algebra. NJ.
- Hu, Weihua, Liu, Bowen, Gomes, Joseph, Zitnik, Marinka, Liang, Percy, Pande, Vijay, and Leskovec, Jure. 2019. Pre-training graph neural networks. International Conference on Learning Representations.
- Hu, Weihua, Liu, Bowen, Gomes, Joseph, Zitnik, Marinka, Liang, Percy, Pande, Vijay, and Leskovec, Jure. 2020b. Strategies for pre-training graph

- neural networks. International Conference on Learning Representations.
- Hu, Ziniu, Dong, Yuxiao, Wang, Kuansan, Chang, Kai-Wei, and Sun, Yizhou. 2020a. GPT-GNN: Generative Pre-Training of Graph Neural Networks. Pages 1857-1867 of: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Huang, Qiang, Xia, Tingyu, Sun, Huiyan, Yamada, Makoto, and Chang, Yi. 2020. Unsupervised nonlinear feature selection from high-dimensional signed Networks. Pages 4182-4189 of: Proceedings of the AAAI Conference on Artificial Intelligence.
- Huang, Wenbing, Zhang, Tong, Rong, Yu, and Huang, Junzhou. 2018. Adaptive sampling towards fast graph representation learning. Pages 4558-4567 of: Advances in Neural Information Processing Systems.
- Ioffe, Sergey, and Szegedy, Christian. 2015. Batch normalization: Accelerating deep network training by reducing internal covariate shift. Pages 448-456 of: Proceedings of the 32nd International Conference on Machine Learning.
- Jeong, Dasaem, Kwon, Taegyun, Kim, Yoojin, and Nam, Juhan. 2019. Graph neural network for music score data and modeling expressive piano performance. Pages 3060-3070 of: International Conference on Machine Learning.
- Jiang, Jianwen, Wei, Yuxuan, Feng, Yifan, Cao, Jingxuan, and Gao, Yue. 2019. Dynamic hypergraph neural networks. Pages 2635-2641 of: International Joint Conferences on Artificial Intelligence Organization.
- Jin, Hongwei, and Zhang, Xinhua. 2019. Latent adversarial training of graph convolution networks. ICML Workshop on Learning and Reasoning with Graph-Structured Representations.
- Jin, Wei, Li, Yaxin, Xu, Han, Wang, Yiqi, and Tang, Jiliang. 2020a. Adversarial attacks and defenses on graphs: A review and empirical study. arXiv preprint arXiv:2003.00653.
- Jin, Wei, Ma, Yao, Liu, Xiaorui, Tang, Xianfeng, Wang, Suhang, et al. 2020b. Graph Structure Learning for Robust Graph Neural Networks. arXiv preprint arXiv:2005.10203.
- Jin, Wei, Derr, Tyler, Liu, Haochen, Wang, Yiqi, Wang, Suhang, Liu, Zitao, and Tang, Jiliang. 2020c. Self-supervised learning on graphs: Deep insights and new direction. arXiv preprint arXiv:2006.10141.
- Jin, Wengong, Barzilay, Regina, and Jaakkola, Tommi. 2018. Junction tree variational autoencoder for molecular graph generation. Pages 2323-2332 of: Proceedings of the 35th International Conference on Machine Learning.
- Joshi, Chaitanya K, Laurent, Thomas, and Bresson, Xavier. 2019. An effi-

- cient graph convolutional network technique for the travelling salesman problem. arXiv preprint arXiv:1906.01227.
- Joyce, James M. 2011. Kullback-Leibler Divergence.
- Jurafsky, Daniel, and Martin, James H. 2000. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition. Prentice Hall.
- Kamath, Uday, Liu, John, and Whitaker, James. 2019. Deep Learning for NLP and Speech Recognition. Vol. 84. Springer.
- Kampffmeyer, Michael, Chen, Yinbo, Liang, Xiaodan, Wang, Hao, Zhang, Yujia, and Xing, Eric P. 2019. Rethinking knowledge graph propagation for zero-shot learning. Pages 11487-11496 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Kana, Rajesh K, Uddin, Lucina Q, Kenet, Tal, Chugani, Diane, and Muller, Ralph-Axel. 2014. Brain connectivity in autism. Frontiers in Human Neuroscience, 8, 349.
- Karypis, George, and Kumar, Vipin. 1998. A fast and high quality multilevel scheme for partitioning irregular graphs. SIAM Journal on scientific Computing, 20(1), 359–392.
- Khademi, Mahmoud, and Schulte, Oliver. 2020. Deep generative probabilistic graph neural networks for scene graph generation. Pages 11237-11245 of: Proceedings of the AAAI Conference on Artificial Intelligence.
- Khalil, Elias, Dai, Hanjun, Zhang, Yuyu, Dilkina, Bistra, and Song, Le. 2017. Learning combinatorial optimization algorithms over graphs. Pages 6348-6358 of: Advances in Neural Information Processing Systems.
- Kingma, Diederik P, and Ba, Jimmy. 2014. Adam: A method for stochastic optimization. arXiv preprint arXiv:1412.6980.
- Kingma, Diederik P, and Welling, Max. 2013. Auto-encoding variational bayes. arXiv preprint arXiv:1312.6114.
- Kipf, Thomas, Fetaya, Ethan, Wang, Kuan-Chieh, Welling, Max, and Zemel, Richard. 2018. Neural relational inference for interacting systems. Pages 2688-2697 of: International Conference on Machine Learning.
- Kipf, Thomas N, and Welling, Max. 2016a. Semi-supervised classification with graph convolutional networks. *International Conference on Learning Representations (ICLR)*.
- Kipf, Thomas N, and Welling, Max. 2016b. Variational graph auto-encoders.  $arXiv\ preprint\ arXiv:1611.07308.$
- Koren, Yehuda, Bell, Robert, and Volinsky, Chris. 2009. Matrix factorization techniques for recommender systems. Computer, 42(8), 30–37.

- Krizhevsky, Alex, Sutskever, Ilya, and Hinton, Geoffrey E. 2012. Imagenet classification with deep convolutional neural networks. Pages 1097-1105 of: Advances in Neural Information Processing Systems.
- Kuhn, Michael, Letunic, Ivica, Jensen, Lars Juhl, and Bork, Peer. 2016. The SIDER database of drugs and side effects. Nucleic Acids Research, 44(D1), D1075-D1079.
- Kunegis, Jérôme, Lommatzsch, Andreas, and Bauckhage, Christian. 2009. The slashdot zoo: Mining a social network with negative edges. Pages 741-750 of: Proceedings of the 18th international conference on World wide web. ACM.
- Lai, Yi-An, Hsu, Chin-Chi, Chen, Wen Hao, Yeh, Mi-Yen, and Lin, Shou-De. 2017. Prune: Preserving proximity and global ranking for network embedding. Pages 5257-5266 of: Advances in Neural Information Processing Systems.
- LeCun, Yann, and Fogelman-Soulié, Françoise. 1987. Modèles connexionnistes de l'apprentissage. *Intellectica*, **2**(1), 114–143.
- Lee, John Boaz, Rossi, Ryan, and Kong, Xiangnan. 2018. Graph classification using structural attention. Pages 1666-1674 of: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Lee, Junhyun, Lee, Inyeop, and Kang, Jaewoo. 2019. Self-attention graph pooling. Pages 3734-3743 of: Proceedings of the 36th International Conference on Machine Learning, ICML 2019, 9-15 June 2019, Long Beach, California, USA.
- Lee, Kenton, He, Luheng, Lewis, Mike, and Zettlemoyer, Luke. 2017. Endto-end neural coreference resolution. Pages 641-650 of: *Proceedings of the* 19th International Conference on World Wide Web. ACM.
- Leskovec, Jure, Huttenlocher, Daniel, and Kleinberg, Jon. 2010. Predicting positive and negative links in online social networks. Pages 641-650 of: Proceedings of the 19th International Conference on World Wide Web. ACM.
- Leskovec, Jure, Huttenlocher, Daniel, and Kleinberg, Jon. 2010. Signed networks in social media. Pages 1361-1370 of: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM.
- Leskovec, Jure, and Krevl, Andrej. 2014. SNAP Datasets: Stanford Large Network Dataset Collection.
- Leskovec, Jure, and Sosič, Rok. 2016. SNAP: A general-purpose network analysis and graph-mining library. ACM Transactions on Intelligent Systems

- and Technology, 8(1).
- Li, Chang, and Goldwasser, Dan. 2019. Encoding Social Information with Graph Convolutional Networks for Political Perspective Detection in News Media. Pages 2594-2604 of: Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics.
- Li, Chaolong, Cui, Zhen, Zheng, Wenming, Xu, Chunyan, and Yang, Jian. 2018. Spatio-temporal graph convolution for skeleton based action recognition. *Thirty-Second AAAI Conference on Artificial Intelligence*.
- Li, Chunyan, Liu, Hongju, Hu, Qian, Que, Jinlong, and Yao, Junfeng. 2019. A novel computational model for predicting microRNA-disease associations based on heterogeneous graph convolutional networks. *Cells*, **8**(9), 977.
- Li, Jundong, Hu, Xia, Jian, Ling, and Liu, Huan. 2016. Toward time-evolving feature selection on dynamic networks. Pages 1003-1008 of: 2016 IEEE 16th International Conference on Data Mining (ICDM). IEEE.
- Li, Jundong, Dani, Harsh, Hu, Xia, Tang, Jiliang, Chang, Yi, and Liu, Huan. 2017a. Attributed network embedding for learning in a dynamic environment. Pages 387-396 of: Proceedings of the 2017 ACM on Conference on Information and Knowledge Management. ACM.
- Li, Jundong, Cheng, Kewei, Wang, Suhang, Morstatter, Fred, Trevino, Robert P, Tang, Jiliang, and Liu, Huan. 2017b. Feature selection: A data perspective. ACM Computing Surveys, 50(6), 1–45.
- Li, Jundong, Guo, Ruocheng, Liu, Chenghao, and Liu, Huan. 2019b. Adaptive unsupervised feature selection on attributed networks. Pages 92-100 of: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Li, Maosen, Chen, Siheng, Chen, Xu, Zhang, Ya, Wang, Yanfeng, and Tian, Qi. 2019c. Actional-structural graph convolutional networks for Skeletonbased action recognition. Pages 3595-3603 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Li, Qimai, Han, Zhichao, and Wu, Xiao-Ming. 2018b. Deeper insights into graph convolutional networks for Semi-supervised learning. Pages 3538-3545 of: McIlraith, Sheila A., and Weinberger, Kilian Q. (eds.), Proceedings of the Thirty-Second AAAI Conference on Artificial Intelligence, (AAAI-18), the 30th innovative Applications of Artificial Intelligence (IAAI-18), and the 8th AAAI symposium on Educational Advances in Artificial Intelligence (EAAI-18), New Orleans, Louisiana, USA, February 2-7, 2018. AAAI Press.
- Li, Ruoyu, Wang, Sheng, Zhu, Feiyun, and Huang, Junzhou. 2018c. Adaptive graph convolutional neural networks. *Thirty-Second AAAI Conference on*

- Artificial Intelligence.
- Li, Yaxin, Jin, Wei, Xu, Han, and Tang, Jiliang. 2020a. DeepRobust: A PyTorch library for adversarial attacks and defenses. arXiv preprint arXiv:2005.06149.
- Li, Ye, Sha, Chaofeng, Huang, Xin, and Zhang, Yanchun. 2018d. Community detection in attributed graphs: An embedding approach. Thirty-Second AAAI Conference on Artificial Intelligence.
- Li, Yu, Tian, Yuan, Zhang, Jiawei, and Chang, Yi. 2020b. Learning Signed Network Embedding via Graph Attention. Proceedings of the Thirty-Fourth AAAI Conference on Artificial Intelligence.
- Li, Yujia, Tarlow, Daniel, Brockschmidt, Marc, and Zemel, Richard. 2015. Gated graph sequence neural networks. arXiv preprint arXiv:1511.05493.
- Li, Zhuwen, Chen, Qifeng, and Koltun, Vladlen. 2018e. Combinatorial optimization with graph convolutional networks and guided tree search. Pages 539-548 of: Advances in Neural Information Processing Systems.
- Liang, Xiaodan, Shen, Xiaohui, Feng, Jiashi, Lin, Liang, and Yan, Shuicheng. 2016. Semantic object parsing with graph lstm. Pages 125-143 of: European Conference on Computer Vision, Springer.
- Liao, Renjie, Li, Yujia, Song, Yang, Wang, Shenlong, Hamilton, Will, Duvenaud, David K, Urtasun, Raquel, and Zemel, Richard. 2019. Efficient graph generation with graph recurrent attention networks. Pages 4255–4265 of: Advances in Neural Information Processing Systems.
- Liben-Nowell, David, and Kleinberg, Jon. 2007. The link-prediction problem for social networks. Journal of the American Society for Information Science and Technology, 58(7), 1019–1031.
- Lin, Yankai, Liu, Zhiyuan, Sun, Maosong, Liu, Yang, and Zhu, Xuan. 2015. Learning entity and relation embeddings for knowledge graph completion. Twenty-Ninth AAAI Conference on Artificial Intelligence.
- Ling, Huan, Gao, Jun, Kar, Amlan, Chen, Wenzheng, and Fidler, Sanja. 2019.
  Fast interactive object annotation with Curve-GCN. Pages 5257-5266 of:
  Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Liu, Huan, and Motoda, Hiroshi. 2007. Computational Methods of Feature Selection. CRC Press.
- Liu, Huan, and Motoda, Hiroshi. 2012. Feature Selection for Knowledge Discovery and Data Mining. Vol. 454. Springer Science & Business Media.
- Liu, Ke, Sun, Xiangyan, Jia, Lei, Ma, Jun, Xing, Haoming, et al. 2018a. Chemi-Net: a graph convolutional network for accurate drug property

- prediction. International Journal of Molecular Sciences, 20(14).
- Liu, Qi, Nickel, Maximilian, and Kiela, Douwe. 2019a. Hyperbolic graph neural networks. Pages 8230–8241 of: Advances in Neural Information Processing Systems.
- Liu, Zhiwei, Dou, Yingtong, Yu, Philip S, Deng, Yutong, and Peng, Hao. 2020. Alleviating the inconsistency problem of applying graph neural network to fraud detection. Pages 1569-1572 of: Proceedings of the 43rd International ACM SIGIR Conference on Research and Development in Information Retrieval.
- Liu, Ziqi, Chen, Chaochao, Yang, Xinxing, Zhou, Jun, Li, Xiaolong, et al. 2018b. Heterogeneous graph neural networks for malicious account detection. Pages 2077–2085 of: Proceedings of the 27th ACM International Conference on Information and Knowledge Management.
- Liu, Ziqi, Chen, Chaochao, Li, Longfei, Zhou, Jun, Li, Xiaolong, et al. 2019b. Geniepath: Graph neural networks with adaptive receptive paths. Pages 4424-4431 of: Proceedings of the AAAI Conference on Artificial Intelligence. Vol. 33.
- Ma, Lingxiao, Yang, Zhi, Miao, Youshan, Xue, Jilong, Wu, Ming, et al. 2018a. Towards efficient large-scale graph neural network computing. arXiv preprint arXiv:1810.08403.
- Ma, Lingxiao, Yang, Zhi, Miao, Youshan, Xue, Jilong, Wu, Ming, et al. 2019a. Neugraph: parallel deep neural network computation on large graphs. Pages 443–458 of: 2019 {USENIX} Annual Technical Conference ({USENIX}{ATC} 19).
- Ma, Tengfei, Chen, Jie, and Xiao, Cao. 2018b. Constrained generation of semantically valid graphs via regularizing variational autoencoders. Pages 7113–7124 of: Advances in Neural Information Processing Systems.
- Ma, Tengfei, Xiao, Cao, Zhou, Jiayu, and Wang, Fei. 2018c. Drug similarity integration through attentive multi-view graph auto-encoders. Pages 3477-3483 of: Proceedings of the 27th International Joint Conference on Artificial Intelligence.
- Ma, Yao, Wang, Suhang, Ren, ZhaoChun, Yin, Dawei, and Tang, Jiliang. 2017. Preserving local and global information for network embedding. arXiv preprint arXiv:1710.07266.
- Ma, Yao, Ren, Zhaochun, Jiang, Ziheng, Tang, Jiliang, and Yin, Dawei. 2018d.
  Multi-dimensional network embedding with hierarchical structure. Pages 387–395 of: Proceedings of the Eleventh ACM International Conference on Web Search and Data Mining.

- Ma, Yao, Wang, Suhang, Aggarwal, Charu C., and Tang, Jiliang. 2019b. Graph convolutional networks with eigenpooling. Pages 723–731 of: Teredesai, Ankur, Kumar, Vipin, Li, Ying, Rosales, Rómer, Terzi, Evimaria, et al. (eds.), Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, KDD 2019, Anchorage, AK, USA, August 4-8, 2019. ACM.
- Ma, Yao, Wang, Suhang, Aggarwal, Chara C, Yin, Dawei, and Tang, Jiliang. 2019c. Multi-dimensional graph convolutional networks. Pages 657–665 of: Proceedings of the 2019 SIAM International Conference on Data Mining. SIAM.
- Ma, Yao, Wang, Suhang, Derr, Tyler, Wu, Lingfei, and Tang, Jiliang. 2020a. Attacking Graph Convolutional Networks via Rewiring.
- Ma, Yao, Guo, Ziyi, Ren, Zhaocun, Tang, Jiliang, and Yin, Dawei. 2020b. Streaming graph neural networks. Pages 719–728 of: Proceedings of the 43rd International ACM SIGIR Conference on Research and Development in Information Retrieval.
- Maas, Andrew L, Hannun, Awni Y, and Ng, Andrew Y. 2013. Rectifier non-linearities improve neural network acoustic models. Proceedings of the International Conference on Machine Learning.
- Marcheggiani, Diego, and Titov, Ivan. 2017. Encoding sentences with graph convolutional networks for semantic role labeling. Pages 1506–1515 of: Proceedings of the 2017 Conference on Empirical Methods in Natural Language Processing.
- Marcheggiani, Diego, Bastings, Joost, and Titov, Ivan. 2018. Exploiting semantics in Neural machine translation with graph convolutional networks. Pages 486–492 of: Proceedings of the 2018 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, Volume 2 (Short Papers).
- McCulloch, Warren S, and Pitts, Walter. 1943. A logical calculus of the ideas immanent in nervous activity. *The Bulletin of Mathematical Biophysics*, **5**(4), Pages 115–133.
- Menon, Aditya Krishna, and Elkan, Charles. 2011. Link prediction via matrix factorization. Pages 437–452 of: *Joint European Conference on Machine Learning and Knowledge Discovery in Databases*. Springer.
- Mikolov, Tomas, Sutskever, Ilya, Chen, Kai, Corrado, Greg S, and Dean, Jeff. 2013. Distributed representations of words and phrases and their compositionality. Pages 3111–3119 of: Advances in Neural Information Processing Systems.
- Miller, George A. 1998. WordNet: An Electronic Lexical Database. MIT press.

- Mishra, Pushkar, Del Tredici, Marco, Yannakoudakis, Helen, and Shutova, Ekaterina. 2019. Abusive language detection with graph convolutional networks. Pages 2145–2150 of: Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, Volumne 1 (Long and Short Papers).
- Miwa, Makoto, and Bansal, Mohit. 2016. End-to-end relation extraction using LSTMs on sequences and tree structures. Pages 1105-1116 of: Association for Computational Linguistics.
- Monti, Federico, Bronstein, Michael, and Bresson, Xavier. 2017. Geometric matrix completion with recurrent multi-graph neural networks. Pages 3697–3707 of: Advances in Neural Information Processing Systems.
- Monti, Federico, Frasca, Fabrizio, Eynard, Davide, Mannion, Damon, and Bronstein, Michael M. 2019. Fake news detection on social media using geometric deep learning. arXiv preprint arXiv:1902.06673.
- Morin, Frederic, and Bengio, Yoshua. 2005. Hierarchical probabilistic neural network language model. Pages 246-252 of: Proceedings of the Tenth International Workshop on Artificial Intelligence and Statistics.
- Morris, Christopher, Ritzert, Martin, Fey, Matthias, Hamilton, William L, Lenssen, Jan Eric, et al. 2019. Weisfeiler and leman go neural: Higher-order graph neural networks. Pages 4602–4609 of: *Proceedings of the AAAI Conference on Artificial Intelligence*, Vol. 33.
- Nastase, Vivi, Mihalcea, Rada, and Radev, Dragomir R. 2015. A survey of graphs in natural language processing. *Natural Language Engineering*, 21(5), 665–698.
- Nathani, Deepak, Chauhan, Jatin, Sharma, Charu, and Kaul, Manohar. 2019. Learning attention-based embeddings for relation prediction in knowledge graphs. Pages 4710–4723 of: Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics.
- Neville, Jennifer, and Jensen, David. 2000. Iterative classification in relational data. Pages 13-20 of: Proc. AAAI-2000 workshop on learning statistical models from relational data.
- Newman, Mark E.J. 2006. Modularity and community structure in networks. *Proceedings of the National Academy of Sciences*, **103**(23), 8577-8582.
- Ng, Andrew, et al. 2011. Sparse autoencoder. **72**(2011), 1-19.
- Ng, Andrew Y., Jordan, Michael I., and Weiss, Yair. 2002. On spectral clustering: Analysis and an algorithm. Pages 849–856 of: *Advances in Neural Information Processing Systems*.
- Nguyen, Giang Hoang, Lee, John Boaz, Rossi, Ryan A., Ahmed, Nesreen K.,

- et al. 2018. Continuous-time dynamic network embeddings. Pages 969-976 of: Companion Proceedings of the Web Conference 2018.
- Nguyen, Thin, Le, Hang, and Venkatesh, Svetha. 2019. GraphDTA: prediction of drug-target binding affinity using graph convolutional networks. *BioRxiv:* 684662.
- Nickel, Maximilian, Murphy, Kevin, Tresp, Volker, and Gabrilovich, Evgeniy. 2015. A review of relational machine learning for knowledge graphs. *Proceedings of the IEEE*, **104**(1), 11–33.
- Niepert, Mathias, Ahmed, Mohamed, and Kutzkov, Konstantin. 2016. Learning convolutional neural networks for graphs. Pages 2014–2023 of: *International Conference on Machine Learning*.
- Norcliffe-Brown, Will, Vafeias, Stathis, and Parisot, Sarah. 2018. Learning conditioned graph structures for interpretable visual question answering. Pages 8334–8343 of: Advances in Neural Information Processing Systems.
- Nwankpa, Chigozie, Ijomah, Winifred, Gachagan, Anthony, and Marshall, Stephen. 2018. Activation functions: Comparison of trends in practice and research for deep learning. arXiv preprint arXiv:1811.03378.
- Olshausen, Bruno A., and Field, David J. 1997. Sparse coding with an over-complete basis set: A strategy employed by V1? Vision Research, 37(23), 3311–3325.
- Oono, Kenta, and Suzuki, Taiji. 2020. Graph neural networks exponentially lose expressive power for node classification. *International Conference on Learning Representations*.
- Ou, Mingdong, Cui, Peng, Pei, Jian, Zhang, Ziwei, and Zhu, Wenwu. 2016. Asymmetric transitivity preserving graph embedding. Pages 1105–1114 of: Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining.
- Owen, Art B. 2013. Monte Carlo Theory, Methods and Examples.
- Pan, Shirui, Hu, Ruiqi, Long, Guodong, Jiang, Jing, Yao, Lina, et al. 2018. Adversarially regularized graph autoencoder for graph embedding. arXiv preprint arXiv:1802.04407.
- Pareja, Aldo, Domeniconi, Giacomo, Chen, Jie, Ma, Tengfei, Suzumura, Toyotaro, et al. 2019. EvolveGCN: Evolving graph convolutional networks for dynamic graphs. Pages 5363-5370 of: Proceedings of the AAAI Conference on Artificial Intelligence.
- Parisot, Sarah, Ktena, Sofia Ira, Ferrante, Enzo, Lee, Matthew, Guerrero, Ricardo, et al. 2018. Disease prediction using graph convolutional networks: Application to autism spectrum disorder and Alzheimer's disease. *Medical*

- image analysis, 48, 117-130.
- Park, Namyong, Kan, Andrey, Dong, Xin Luna, Zhao, Tong, and Faloutsos, Christos. 2019. Estimating node importance in knowledge graphs using graph neural networks. Pages 596–606 of: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Paszke, Adam, Gross, Sam, Chintala, Soumith, Chanan, Gregory, Yang, Edward, et al. 2017. 2019. PyTorch: An imperative style, high-performance deep learning library. Advances in Neural Information Processing Systems. 32, 8024-8035.
- Peixoto, Tiago P. 2014. The graph-tool python library. figshare.
- Peng, Zhen, Dong, Yixiang, Luo, Minnan, Wu, Xiao-Ming, and Zheng, Qinghua. 2020. Self-supervised graph representation learning via global context prediction. arXiv preprint arXiv:2003.01604.
- Perozzi, Bryan, Al-Rfou, Rami, and Skiena, Steven. 2014. DeepWalk: Online learning of social representations. Pages 701–710 of: Proceedings of the 20th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, ACM.
- Perraudin, Nathanael, Paratte, Johan, Shuman, David, Martin, Lionel, Kalofolias, Vassilis, et al. 2014. GSPBOX: A toolbox for signal processing on graphs. arXiv preprint arXiv:1408.5781.
- Perron, Oskar. 1907. Zur theorie der matrices. Mathematische Annalen, 64(2), Pages 248–263.
- Peters, Matthew E, Neumann, Mark, Iyyer, Mohit, Gardner, Matt, Clark, Christopher, et al. 2018. Deep contextualized word representations. Pages 2227-2237 of: Proceedings of the 2018 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, Volume 1 (Long Papers).
- Pillai, S Unnikrishna, Suel, Torsten, and Cha, Seunghun. 2005. The Perron-Frobenius theorem: some of its applications. *IEEE Signal Processing Magazine*, 22(2), 62–75.
- Qi, Yanlin, Li, Qi, Karimian, Hamed, and Liu, Di. 2019. A hybrid model for spatiotemporal forecasting of PM2.5 based on graph convolutional neural network and long short-term memory. Science of the Total Environment, 664, 1–10.
- Qiu, Jiezhong, Tang, Jian, Ma, Hao, Dong, Yuxiao, Wang, Kuansan, et al. 2018a. DeepInf: Social influence prediction with deep learning. Pages 2110–2119 of: Proceedings of the 24th ACM SIGKDD International Con-

- ference on Knowledge Discovery & Data Mining.
- Qiu, Jiezhong, Dong, Yuxiao, Ma, Hao, Li, Jian, Wang, Kuansan, et al. 2018b. Network embedding as matrix factorization: Unifying DeepWalk, LINE, PTE, and node2vec. Pages 459–467 of: Proceedings of the Eleventh ACM International Conference on Web Search and Data Mining. ACM.
- Radford, Alec, Wu, Jeff, Child, Rewon, Luan, David, Amodei, Dario, et al. 2019. Language models are unsupervised multitask learners. OpenAI blog, 1(8), 9.
- Ren, Kui, Zheng, Tianhang, Qin, Zhan, and Liu, Xue. 2020. Adversarial attacks and defenses in deep learning. *Engineering*. **6**(3), 346-360.
- Resnick, Paul, and Varian, Hal R. 1997. Recommender systems. *Communications of the ACM*, **40**(3), 56–58.
- Ribeiro, Leonardo F.R., Saverese, Pedro H.P., and Figueiredo, Daniel R. 2017. struc2vec: Learning node representations from structural identity. Pages 385–394 of: Proceedings of the 23rd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining. ACM.
- Rong, Yu, Huang, Wenbing, Xu, Tingyang, and Huang, Junzhou. 2019. DropEdge: Towards deep graph convolutional networks on node classification. International Conference on Learning Representations.
- Rong, Yu, Huang, Wenbing, Xu, Tingyang, and Huang, Junzhou. 2020. DropEdge: Towards deep graph convolutional networks on node classification. *International Conference on Learning Representations*.
- Rosenblatt, Frank. 1958. The perceptron: A probabilistic model for information storage and organization in the brain. *Psychological Review*, **65**(6), 386.
- Rossi, Ryan A., and Ahmed, Nesreen K. 2015. The network data repository with interactive graph analytics and visualization. *Proceedings of the Twenty-Ninth AAAI Conference on Artificial Intelligence*.
- Rossi, Ryan A, Ahmed, Nesreen K, Koh, Eunyee, Kim, Sungchul, Rao, Anup, et al. 2018. HONE: higher-order network embeddings. Pages 3-4 of: Companion Proceedings of the The Web Conference 2018.
- Roweis, Sam T, and Saul, Lawrence K. 2000. Nonlinear dimensionality reduction by locally linear embedding. *Science*, **290**(5500), 2323–2326.
- Rumelhart, David E, Hinton, Geoffrey E, and Williams, Ronald J. 1986. Learning representations by back-propagating errors. Nature, 323(6088), 533-536.
- Rusek, Krzysztof, Suarez-Varela, Josè, Mestres, Albert, Barlet-Ros, Pere, and Cabellos- Aparicio, Albert. 2019. Unveiling the potential of graph neural

- networks for network modeling and optimization in SDN. Pages 140–151 of: *Proceedings of the 2019 ACM Symposium on SDN Research*.
- Sahu, Sunil Kumar, Christopoulou, Fenia, Miwa, Makoto, and Ananiadou, Sophia. 2019. Inter-sentence relation extraction with document-level graph convolutional neural network. Pages 4309-4316 of: Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics.
- Sailer, Lee Douglas. 1978. Structural equivalence: Meaning and definition, computation and application. *Social Networks*, **1**(1), 73–90.
- Salvador, Stan, and Chan, Philip. 2007. Toward accurate dynamic time warping in linear time and space. *Intelligent Data Analysis*, **11**(5), 561–580.
- Sankar, Aravind, Wu, Yanhong, Gou, Liang, Zhang, Wei, and Yang, Hao. 2018. Dynamic graph representation learning via self-attention networks. Pages 519-527 of: Proceedings of the 13th International Conference on Web Search and Data Mining.
- Scarselli, Franco, Yong, Sweah Liang, Gori, Marco, Hagenbuchner, Markus, Tsoi, Ah Chung, and Maggini, Marco. 2005. Graph neural networks for ranking web pages. Pages 666–672 of: Proceedings of the 2005 IEEE/WIC/ACM International Conference on Web Intelligence. IEEE Computer Society.
- Scarselli, Franco, Gori, Marco, Tsoi, Ah Chung, Hagenbuchner, Markus, and Monfardini, Gabriele. 2008. The graph neural network model. *IEEE Transactions on Neural Networks*, 20(1), 61–80.
- Schlichtkrull, Michael, Kipf, Thomas N, Bloem, Peter, Van Den Berg, Rianne, Titov, Ivan, et al. 2018. Modeling relational data with graph convolutional networks. Pages 593–607 of: European Semantic Web Conference. Springer.
- Seide, Frank, Li, Gang, and Yu, Dong. 2011. Conversational speech transcription using context-dependent deep neural networks. Twelfth Annual Conference of the International Speech Communication Association.
- Sen, Prithviraj, Namata, Galileo, Bilgic, Mustafa, Getoor, Lise, Galligher, Brian, et al. 2008. Collective classification in network data. AI magazine, 29(3), 93.
- Shang, Chao, Tang, Yun, Huang, Jing, Bi, Jinbo, He, Xiaodong, et al. 2019a. End-to-end structure-aware convolutional networks for knowledge base completion. Pages 3060–3067 of: Proceedings of the AAAI Conference on Artificial Intelligence. Vol. 33.
- Shang, Junyuan, Xiao, Cao, Ma, Tengfei, Li, Hongyan, and Sun, Jimeng. 2019b. Gamenet: Graph augmented memory networks for recommending

- medication combination. Pages 1126–1133 of: Proceedings of the AAAI Conference on Artificial Intelligence, Vol. 33.
- Shang, Junyuan, Ma, Tengfei, Xiao, Cao, and Sun, Jimeng. 2019c. Pretraining of graph augmented transformers for medication recommendation. arXiv preprint arXiv:1906.00346.
- Shchur, Oleksandr, and Günnemann, Stephan. 2019. Overlapping community detection with graph neural networks. arXiv preprint arXiv:1909.12201.
- Shi, Chuan, Hu, Binbin, Zhao, Wayne Xin, and Philip, S Yu. 2018a. Heterogeneous information network embedding for recommendation. *IEEE Transactions on Knowledge and Data Engineering*, **31**(2), 357–370.
- Shi, Jianbo, and Malik, Jitendra. 2000. Normalized cuts and image segmentation. IEEE Transactions on pattern analysis and machine intelligence, 22(8), 888–905.
- Shi, Lei, Zhang, Yifan, Cheng, Jian, and Lu, Hanqing. 2019a. Skeleton-based action recognition with directed graph neural networks. Pages 7912–7921 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Shi, Lei, Zhang, Yifan, Cheng, Jian, and Lu, Hanqing. 2019b. Two-stream adaptive graph convolutional networks for skeleton-based action recognition. Pages 12026–12035 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Shi, Yu, Han, Fangqiu, He, Xinwei, He, Xinran, Yang, Carl, et al. 2018b. mvn2vec: Preservation and collaboration in multi-view network embedding. arXiv preprint arXiv:1801.06597.
- Shuman, David I, Narang, Sunil K, Frossard, Pascal, Ortega, Antonio, and Vandergheynst, Pierre. 2013. The emerging field of signal processing on graphs: Extending high-dimensional data analysis to networks and other irregular domains. *IEEE Signal Processing Magazine*, 30(3), 83–98.
- Si, Chenyang, Jing, Ya, Wang, Wei, Wang, Liang, and Tan, Tieniu. 2018. Skeleton-based action recognition with spatial reasoning and temporal stack learning. Pages 103–118 of: Proceedings of the European Conference on Computer Vision (ECCV).
- Si, Chenyang, Chen, Wentao, Wang, Wei, Wang, Liang, and Tan, Tieniu. 2019. An attention enhanced graph convolutional LSTM network for skeleton-based action recognition. Pages 1227–1236 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Simonovsky, Martin, and Komodakis, Nikos. 2017. Dynamic edge-conditioned filters in convolutional neural networks on graphs. Pages 3693–3702 of:

- Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Simonovsky, Martin, and Komodakis, Nikos. 2018. GraphVAE: Towards generation of small graphs using variational autoencoders. Pages 412–422 of: International Conference on Artificial Neural Networks. Springer.
- Simonyan, Karen, and Zisserman, Andrew. 2014. Very deep convolutional networks for large-scale image recognition. *International Conference on Learning Representations*.
- Song, Linfeng, Peng, Xiaochang, Zhang, Yue, Wang, Zhiguo, and Gildea, Daniel. 2017. AMR-to-text generation with synchronous node replacement grammar. Pages 7-13 of: Proceedings of the 55th Annual Meeting of the Association for Computational Linguistics (Volume 2: Short Papers).
- Song, Linfeng, Wang, Zhiguo, Yu, Mo, Zhang, Yue, Florian, Radu, et al. 2018a. Exploring graph-structured passage representation for multihop reading comprehension with graph neural networks. arXiv preprint arXiv:1809.02040.
- Song, Linfeng, Zhang, Yue, Wang, Zhiguo, and Gildea, Daniel. 2018b. A graph-to-sequence model for AMR-to-text generation. Pages 1616-1626 of: Proceedings of the 56th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers).
- Song, Linfeng, Zhang, Yue, Wang, Zhiguo, and Gildea, Daniel. 2018c. N-ary relation extraction using graph state LSTM. Pages 2226-2235 of: Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing.
- Srivastava, Nitish, Hinton, Geoffrey, Krizhevsky, Alex, Sutskever, Ilya, and Salakhutdinov, Ruslan. 2014. Dropout: A simple way to prevent neural networks from overfitting. The Journal of Machine Learning Research, 15(1), 1929–1958.
- Sun, Changzhi, Gong, Yeyun, Wu, Yuanbin, Gong, Ming, Jiang, Daxin, et al. 2019a. Joint type inference on entities and relations via graph convolutional networks. Pages 1361–1370 of: Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics.
- Sun, Fan-Yun, Hoffmann, Jordan, and Tang, Jian. 2019b. InfoGraph: Unsupervised and semi-supervised graph-Level representation learning via mutual information maximization. arXiv preprint arXiv:1908.01000.
- Sun, Ke, Lin, Zhouchen, and Zhu, Zhanxing. 2019c. Multi-Stage self-Supervised learning for graph convolutional networks on graphs with few labels. Pages 5892-5899 of: Proceedings of the AAAI Conference on Artificial Intelligence.

- Sundararajan, Mukund, Taly, Ankur, and Yan, Qiqi. 2017. Axiomatic attribution for deep networks. Pages 3319–3328 of: *Proceedings of the 34th International Conference on Machine Learning*. Vol. 70
- Sutskever, I, Vinyals, O, and Le, QV. 2014. Sequence to sequence learning with neural networks. *Advances in NIPS*. 27.
- Sutton, Richard S, McAllester, David A, Singh, Satinder P, and Mansour, Yishay. 2000. Policy gradient methods for reinforcement learning with function approximation. Pages 1057–1063 of: Advances in Neural Information Processing Systems.
- Szegedy, Christian, Vanhoucke, Vincent, Ioffe, Sergey, Shlens, Jon, and Wojna, Zbigniew. 2016. Rethinking the inception architecture for computer vision. Pages 2818–2826 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Tai, Kai Sheng, Socher, Richard, and Manning, Christopher D. 2015. Improved semantic representations from tree-structured long short-term memory networks. Pages 1556-1566 of: Proceedings of the 53rd Annual Meeting of the Association for Computational Linguistics and the 7th International Joint Conference on Natural Language Processing (Volume 1: Long Papers).
- Tan, Pang-Ning, Steinbach, Michael, and Kumar, Vipin. 2016. Introduction to Data Mining. Pearson Education India.
- Tang, Jian, Qu, Meng, Wang, Mingzhe, Zhang, Ming, Yan, Jun, et al. 2015.
  LINE: Large-scale information network embedding. Pages 1067–1077 of:
  Proceedings of the 24th International Conference on World Wide Web.
  International World Wide Web Conferences Steering Committee.
- Tang, Jiliang, and Liu, Huan. 2012a. Feature selection with linked data in social media. Pages 118–128 of: *Proceedings of the 2012 SIAM International Conference on Data Mining*. SIAM.
- Tang, Jiliang, and Liu, Huan. 2012b. Unsupervised feature selection for linked social media data. Pages 904–912 of: Proceedings of the 18th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining.
- Tang, Jiliang, Hu, Xia, Gao, Huiji, and Liu, Huan. 2013a. Exploiting homophily effect for trust prediction. Pages 53–62 of: Proceedings of the Sixth ACM International Conference on Web Search and Data Mining.
- Tang, Jiliang, Hu, Xia, Gao, Huiji, and Liu, Huan. 2013b. Unsupervised feature selection for multi-view data in social media. Pages 270–278 of: Proceedings of the 2013 SIAM International Conference on Data Mining. SIAM.

- Tang, Jiliang, Alelyani, Salem, and Liu, Huan. 2014a. Feature selection for classification: A review. Data classification: Algorithms and applications, 37.
- Tang, Jiliang, Hu, Xia, and Liu, Huan. 2014b. Is distrust the negation of trust? the value of distrust in social media. Pages 148–157 of: *Proceedings of the 25th ACM Conference on Hypertext and Social Media*.
- Tang, Jiliang, Aggarwal, Charu, and Liu, Huan. 2016a. Node classification in signed social networks. Pages 54–62 of: Proceedings of the 2016 SIAM International Conference on data Mining. SIAM.
- Tang, Jiliang, Chang, Yi, Aggarwal, Charu, and Liu, Huan. 2016b. A survey of signed network mining in social media. ACM Computing Surveys (CSUR), 49(3), 1–37.
- Tang, Lei, and Liu, Huan. 2009. Relational learning via latent social dimensions. Pages 817–826 of: Proceedings of the 15th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining. ACM.
- Tang, Xianfeng, Li, Yandong, Sun, Yiwei, Yao, Huaxiu, Mitra, Prasenjit, and Wang, Suhang. 2019. Robust Graph Neural Network against Poisoning Attacks via Transfer Learning. Pages 600-608 of: Proceedings of the 13th International Conference on Web Search and Data Mining.
- Tang, Xianfeng, Yao, Huaxiu, Sun, Yiwei, Wang, Yiqi, Tang, Jiliang, et al. 2020. Graph convolutional networks against degree-related biases. Pages 1435-1444 of: Proceedings of the 29th ACM International Conference on Information & Knowledge Management.
- Tenenbaum, Joshua B, De Silva, Vin, and Langford, John C. 2000. A global geometric framework for nonlinear dimensionality reduction. *Science*, **290**(5500), 2319–2323.
- Teney, Damien, Liu, Lingqiao, and van den Hengel, Anton. 2017. Graph-structured representations for visual question answering. Pages 1–9 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Trinajstic, Nenad. 2018. Chemical Graph Theory. Routledge.
- Tu, Ke, Cui, Peng, Wang, Xiao, Wang, Fei, and Zhu, Wenwu. 2018. Structural deep embedding for hyper-networks. Thirty-Second AAAI Conference on Artificial Intelligence.
- Tu, Ming, Wang, Guangtao, Huang, Jing, Tang, Yun, He, Xiaodong, et al. 2019. Multi-hop reading comprehension across multiple documents by reasoning over heterogeneous graphs. Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics.

- Vashishth, Shikhar, Sanyal, Soumya, Nitin, Vikram, and Talukdar, Partha. 2019. Composition-based multi-relational graph convolutional networks. *International Conference on Learning Representations*.
- Vaswani, Ashish, Shazeer, Noam, Parmar, Niki, Uszkoreit, Jakob, Jones, Llion, et al. 2017. Attention is all you need. Pages 5998-6008 of: Advances in Neural Information Processing Systems.
- Veličkovič, Petar, Cucurull, Guillem, Casanova, Arantxa, Romero, Adriana, Lio, Pietro, et al. 2017. Graph attention networks. *International Confer*ence on Learning Representations.
- Veličkovič, Petar, Fedus, William, Hamilton, William L, Lio, Pietro, et al. 2019. Deep Graph Infomax. arXiv preprint arXiv:1809.10341.
- Vinyals, Oriol, and Le, Quoc. 2015. A neural conversational model. arXiv preprint arXiv:1506.05869.
- Vosoughi, Soroush, Roy, Deb, and Aral, Sinan. 2018. The spread of true and false news online. *Science*, **359**(6380), 1146–1151.
- Wang, Daixin, Cui, Peng, and Zhu, Wenwu. 2016. Structural deep network embedding. Pages 1225–1234 of: Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining. ACM.
- Wang, Fei, Li, Tao, Wang, Xin, Zhu, Shenghuo, and Ding, Chris. 2011. Community discovery using nonnegative matrix factorization. *Data Mining and Knowledge Discovery*, 22(3), Pages 493–521.
- Wang, Hao, Xu, Tong, Liu, Qi, Lian, Defu, Chen, Enhong, et al. 2019a. MCNE: An end-to-end framework for learning multiple conditional network representations of social network. Pages 1064-1072 of: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Wang, Hongwei, Wang, Jia, Wang, Jialin, Zhao, Miao, Zhang, Weinan, et al. 2018a. GraphGAN: Graph representation learning with generative adversarial nets. Thirty-Second AAAI Conference on Artificial Intelligence.
- Wang, Hongwei, Zhang, Fuzheng, Zhang, Mengdi, Leskovec, Jure, Zhao, Miao, et al. 2019b. Knowledge-aware graph neural networks with label smoothness regularization for recommender systems. Pages 968–977 of: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Wang, Hongwei, Zhao, Miao, Xie, Xing, Li, Wenjie, and Guo, Minyi. 2019c. Knowledge graph convolutional networks for recommender systems. Pages 3307–3313 of: *The World Wide Web Conference*. ACM.
- Wang, Jianyu, Wen, Rui, Wu, Chunming, Huang, Yu, and Xion, Jian. 2019d.

- FdGars: Fraudster detection via graph convolutional networks in online app review system. Pages 310–316 of: Companion Proceedings of The 2019 World Wide Web Conference.
- Wang, Minjie, Yu, Lingfan, Zheng, Da, Gan, Quan, Gai, Yu, et al. 2019e. Deep graph library: Towards efficient and scalable deep learning on graphs. arXiv preprint arXiv:1909.01315.
- Wang, Peifeng, Han, Jialong, Li, Chenliang, and Pan, Rong. 2019f. Logic attention based neighborhood aggregation for inductive knowledge graph embedding. Pages 7152–7159 of: Proceedings of the AAAI Conference on Artificial Intelligence. Vol. 33.
- Wang, Suhang, Aggarwal, Charu, Tang, Jiliang, and Liu, Huan. 2017a. Attributed signed network embedding. Pages 137–146 of: Proceedings of the 2017 ACM on Conference on Information and Knowledge Management.
- Wang, Suhang, Tang, Jiliang, Aggarwal, Charu, Chang, Yi, and Liu, Huan. 2017b. Signed network embedding in social media. Pages 327–335 of: Proceedings of the 2017 SIAM International Conference on Data Mining. SIAM.
- Wang, Xiang, He, Xiangnan, Cao, Yixin, Liu, Meng, and Chua, Tat-Seng. 2019g. KGAT: Knowledge Graph Attention Network for Recommendation. Pages 950-958 of: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Wang, Xiang, He, Xiangnan, Wang, Meng, Feng, Fuli, and Chua, Tat-Seng. 2019h. Neural graph collaborative filtering. Pages 165–174 of: Proceedings of the 42nd international ACM SIGIR conference on Research and development in Information Retrieval.
- Wang, Xiao, Cui, Peng, Wang, Jing, Pei, Jian, Zhu, Wenwu, et al. 2017c. Community preserving network embedding. Thirty-First AAAI Conference on Artificial Intelligence.
- Wang, Xiao, Ji, Houye, Shi, Chuan, Wang, Bai, Ye, Yanfang, et al. 2021. Heterogeneous graph attention network. Pages 2022–2032 of: The World Wide Web Conference.
- Wang, Xiaolong, Ye, Yufei, and Gupta, Abhinav. 2018b. Zero-shot recognition via semantic embeddings and knowledge graphs. Pages 6857–6866 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Wang, Xiaoyang, Ma, Yao, Wang, Yiqi, Jin, Wei, Wang, Xin, Tang, et al. 2020a. Traffic flow prediction via spatial temporal graph neural network. Pages 1082–1092 of: *Proceedings of The Web Conference 2020*.

- Wang, Xuhong, Du, Ying, Cui, Ping, and Yang, Yupu. 2020. OCGNN: One-class classification with graph neural networks. arXiv preprint arXiv:2002.09594.
- Wang, Yaping, Jiao, Pengfei, Wang, Wenjun, Lu, Chunyu, Liu, Hongtao, et al. 2019. Bipartite network embedding via effective integration of explicit and implicit relations. Pages 435–451 of: *International Conference on Database Systems for Advanced Applications*, Springer.
- Wang, Yue, Sun, Yongbin, Liu, Ziwei, Sarma, Sanjay E, Bronstein, Michael M., et al. 2019k. Dynamic graph cnn for learning on point clouds. ACM Transactions on Graphics (TOG), 38(5), 1–12.
- Wang, Zhichun, Lv, Qingsong, Lan, Xiaohan, and Zhang, Yu. 2018. Cross-lingual knowledge graph alignment via graph convolutional networks. Pages 349–357 of: Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing.
- Watkins, Christopher JCH, and Dayan, Peter. 1992. Q-learning. *Machine Learning*, 8(3-4), 279–292.
- Weber, Mark, Domeniconi, Giacomo, Chen, Jie, Weidele, Daniel Karl I, Bellei, Claudio, et al. 2019 Anti-money laundering in bitcoin: Experimenting with graph convolutional networks for financial forensics. arXiv preprint arXiv:1908.02591.
- Wei, Xiaokai, Xie, Sihong, and Yu, Philip S. 2015. Efficient partial order preserving unsupervised feature selection on networks. Pages 82–90 of: Proceedings of the 2015 SIAM International Conference on Data Mining. SIAM.
- Wei, Xiaokai, Cao, Bokai, and Philip, S Yu. 2016. Unsupervised feature selection on networks: a generative view. Thirtieth AAAI Conference on Artificial Intelligence.
- Weisfeiler, B, and Lehman, A. 1968. A reduction of a graph to canonical form and an algebraa rising during this reduction. Nauchno-Technicheskaya Informatsiya, 2(9), 12-16 (in Russian).
- Welbl, Johannes, Stenetorp, Pontus, and Riedel, Sebastian. 2018. Constructing datasets for multi-hop reading comprehension across documents. Transactions of the Association for Computational Linguistics, 6, 287–302.
- Wen, Yu-Hui, Gao, Lin, Fu, Hongbo, Zhang, Fang-Lue, and Xia, Shihong. 2019. Graph CNNs with motif and variable temporal block for skeleton-based action recognition. Pages 8989–8996 of: Proceedings of the AAAI Conference on Artificial Intelligence, Vol. 33.
- Werbos, Paul John. 1994. The roots of Backpropagation: From Ordered

- Derivatives to Neural Networks and Political Forecasting. John Wiley & Sons.
- Werling, Donna M, and Geschwind, Daniel H. 2013. Sex differences in autism spectrum disorders. Current opinion in neurology, 26(2), 146.
- Widder, David Vernon, and Hirschman, Isidore Isaac. 2015. Convolution Transform. Vol. 2153. Princeton University Press.
- Wu, Huijun, Wang, Chen, Tyshetskiy, Yuriy, Docherty, Andrew, Lu, Kai, et al. 2019. Adversarial examples for graph data: Deep insights into attack and defense. Pages 4816–4823 of: Kraus, Sarit (ed.), Proceedings of the Twenty-Eighth International Joint Conference on Artificial Intelligence, IJCAI 2019, Macao, China, August 10-16, 2019.
- Wu, Zonghan, Pan, Shirui, Chen, Fengwen, Long, Guodong, Zhang, Chengqi, et al. 2020. A comprehensive survey on graph neural networks. *IEEE Transactions on Neural Networks and Learning Systems*.
- Xu, Bingbing, Shen, Huawei, Cao, Qi, Qiu, Yunqi, and Cheng, Xueqi. 2019a. Graph wavelet neural network. International Conference on Learning Representations.
- Xu, Han, Ma, Yao, Liu, Haochen, Deb, Debayan, Liu, Hui, et al. 2019b. Adversarial attacks and defenses in images, graphs and text: A review. Pages 151-178 of: International Journal of Automation and Computing.
- Xu, Jian. 2017. Representing big data as Networks: New methods and insights. arXiv preprint arXiv:1712.09648.
- Xu, Kaidi, Chen, Hongge, Liu, Sijia, Chen, Pin-Yu, Weng, Tsui-Wei, et al. 2019c. Topology attack and defense for graph neural networks: An optimization perspective. Pages 3961–3967 of: Kraus, Sarit (ed.), Proceedings of the Twenty-Eighth International Joint Conference on Artificial Intelligence, IJCAI 2019, Macao, China, August 10-16, 2019.
- Xu, Keyulu, Li, Chengtao, Tian, Yonglong, Sonobe, Tomohiro, Kawarabayashi, Ken-ichi, et al. 2018a. Representation learning on graphs with jumping knowledge networks. Pages 5449–5458 of: Dy, Jennifer G., and Krause, Andreas (eds.), Proceedings of the 35th International Conference on Machine Learning, ICML 2018, Stockholmsmässan, Stockholm, Sweden, July 10-15, 2018.
- Xu, Keyulu, Hu, Weihua, Leskovec, Jure, and Jegelka, Stefanie. 2019d. How powerful are graph neural networks? 7th International Conference on Learning Representations, ICLR 2019, New Orleans, LA, USA, May 6-9, 2019.
- Xu, Kun, Wu, Lingfei, Wang, Zhiguo, Feng, Yansong, Witbrock, Michael, et

- al. 2018b. Graph2seq: Graph to sequence learning with attention-based neural networks. arXiv preprint arXiv:1804.00823.
- Xu, Kun, Wang, Liwei, Yu, Mo, Feng, Yansong, Song, Yan, et al. 2019e. Cross-lingual knowledge graph alignment via graph matching neural network. Pages 349-357 of: Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing Computational Linguistics.
- Xuan, Ping, Pan, Shuxiang, Zhang, Tiangang, Liu, Yong, and Sun, Hao. 2019.
  Graph convolutional network and convolutional neural network based method for predicting lncRNA-disease associations. Cells, 8(9), 1012.
- Yadati, Naganand, Nimishakavi, Madhav, Yadav, Prateek, Nitin, Vikram, Louis, Anand, et al. 2019. HyperGCN: A New Method For Training Graph Convolutional Networks on Hypergraphs. Pages 1509–1520 of: Advances in Neural Information Processing Systems.
- Yan, Sijie, Xiong, Yuanjun, and Lin, Dahua. 2018. Spatial temporal graph convolutional networks for skeleton-based action recognition. *Thirty-Second AAAI Conference on Artificial Intelligence*.
- Yanardag, Pinar, and Vishwanathan, SVN. 2015. Deep graph kernels. Pages 1365–1374 of: Proceedings of the 21th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining.
- Yang, Bishan, Yih, Wen-tau, He, Xiaodong, Gao, Jianfeng, and Deng, Li. 2014. Learning multi-relational semantics using neural-embedding models. arXiv preprint arXiv:1411.4072.
- Yang, Jaewon, and Leskovec, Jure. 2015. Defining and evaluating network communities based on ground-truth. *Knowledge and Information Systems*, **42**(1), 181–213.
- Yang, Xu, Tang, Kaihua, Zhang, Hanwang, and Cai, Jianfei. 2019. Autoencoding scene graphs for image captioning. Pages 10685–10694 of: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition.
- Yao, Liang, Mao, Chengsheng, and Luo, Yuan. 2019. Graph convolutional networks for text classification. Pages 7370–7377 of: Proceedings of the AAAI Conference on Artificial Intelligence, Vol. 33.
- Ying, Rex, He, Ruining, Chen, Kaifeng, Eksombatchai, Pong, Hamilton, William L., et al. 2018a. Graph convolutional neural networks for webscale recommender systems. Pages 974–983 of: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining. ACM.
- Ying, Zhitao, You, Jiaxuan, Morris, Christopher, Ren, Xiang, Hamilton, Will,

- et al. 2018b. Hierarchical graph representation learning with differentiable pooling. Pages 4800–4810 of: Advances in Neural Information Processing Systems.
- Ying, Zhitao, Bourgeois, Dylan, You, Jiaxuan, Zitnik, Marinka, and Leskovec, Jure. 2019. GNNExplainer: Generating explanations for graph neural networks. Pages 9244–9255 of: Advances in Neural Information Processing Systems.
- You, Jiaxuan, Liu, Bowen, Ying, Zhitao, Pande, Vijay, and Leskovec, Jure. 2018a. Graph convolutional policy network for goal-directed molecular graph generation. Pages 6410–6421 of: Advances in Neural Information Processing Systems.
- You, Jiaxuan, Ying, Rex, Ren, Xiang, Hamilton, William L., and Leskovec, Jure. 2018b. GraphRNN: Generating realistic graphs with deep autoregressive models. Pages 5708-5717 of: International Conference on Machine Learning.
- You, Yuning, Chen, Tianlong, Wang, Zhangyang, and Shen, Yang. 2020.
  When Does self-supervision help graph convolutional networks? Pages 10871-10880 of: International Conference on Machine Learning.
- Yu, Bing, Yin, Haoteng, and Zhu, Zhanxing. 2017. Spatio-temporal graph convolutional networks: A deep learning framework for traffic forecasting. Pages 3634-3640 of: Proceedings of the Twenty-Seventh International Joint Conference on Artificial Intelligence, (IJCAI-18).
- Yu, Dong, and Deng, Li. 2016. Automatic Speech Recognition. Springer.
- Yuan, Hao, and Ji, Shuiwang. 2019a. StructPool: Structured graph pooling via conditional random fields. International Conference on Learning Representations.
- Yuan, Hao, Tang, Jiliang, Hu, Xia, and Ji, Shuiwang. 2020. XGNN: To-wards model-level explanations of graph neural networks. Pages 430-438 of: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Yuan, Shuhan, Wu, Xintao, and Xiang, Yang. 2017. SNE: Signed network embedding. Pacific-Asia Conference on Knowledge Discovery and Data Mining. Springer.
- Yuan, Xiaoyong, He, Pan, Zhu, Qile, and Li, Xiaolin. 2019b. Adversarial examples: Attacks and defenses for deep learning. *IEEE transactions on neural networks and learning systems*, 30(9), Pages 2805–2824.
- Zeiler, Matthew D. 2012. ADADELTA: An adaptive learning rate method. arXiv preprint arXiv:1212.5701.

- Zeng, Hanqing, Zhou, Hongkuan, Srivastava, Ajitesh, Kannan, Rajgopal, and Prasanna, Viktor. 2019. Graphsaint: Graph sampling based inductive learning method. *International Conference on Learning Representations*.
- Zhang, Chuxu, Song, Dongjin, Huang, Chao, Swami, Ananthram, and Chawla, Nitesh V. 2019a. Heterogeneous graph neural network. Pages 793–803 of: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Zhang, Fanjin, Liu, Xiao, Tang, Jie, Dong, Yuxiao, Yao, Peiran, et al. 2019b.
  OAG: Toward linking large-scale heterogeneous entity graphs. Pages 2585–2595 of: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Zhang, Guo, He, Hao, and Katabi, Dina. 2019c. Circuit-GNN: Graph neural networks for distributed circuit design. Pages 7364–7373 of: International Conference on Machine Learning.
- Zhang, Jiani, Shi, Xingjian, Xie, Junyuan, Ma, Hao, King, Irwin, and Yeung, Dit-Yan. 2018a. GaAN: Gated attention networks for learning on large and spatiotemporal graphs. arXiv preprint arXiv:1803.07294.
- Zhang, Ningyu, Deng, Shumin, Sun, Zhanlin, Wang, Guanying, Chen, Xi, et al. 2019d. Long-tail relation extraction via knowledge graph embeddings and graph convolution networks. Pages 1331-1339 of: Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, Volume 1 (Long and Short Papers).
- Zhang, Wei Emma, Sheng, Quan Z, Alhazmi, Ahoud, and Li, Chenliang. 2020.
  Adversarial attacks on deep-learning models in natural language processing: A survey. ACM Transactions on Intelligent Systems and Technology (TIST), 11(3), 1–41.
- Zhang, Yizhou, Xiong, Yun, Kong, Xiangnan, Li, Shanshan, Mi, Jinhong, et al. 2018b. Deep collective classification in heterogeneous information networks. Pages 399–408 of: Proceedings of the 2018 World Wide Web Conference.
- Zhang, Yuhao, Qi, Peng, and Manning, Christopher D. 2018c. Graph convolution over pruned dependency trees improves relation extraction. Pages 2205–2215 of: Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing.
- Zhao, Lingxiao, and Akoglu, Leman. 2019. PairNorm: Tackling oversmoothing in GNNs. International Conference on Learning Representations.
- Zhou, Jie, Cui, Ganqu, Zhang, Zhengyan, Yang, Cheng, Liu, Zhiyuan, et al. 2018a. Graph neural networks: A review of methods and applications.

- arXiv preprint arXiv:1812.08434.
- Zhou, Lekui, Yang, Yang, Ren, Xiang, Wu, Fei, and Zhuang, Yueting. 2018b.Dynamic network embedding by modeling triadic closure process. Thirty-Second AAAI Conference on Artificial Intelligence.
- Zhou, Yaqin, Liu, Shangqing, Siow, Jingkai, Du, Xiaoning, and Liu, Yang. 2019. Devign: Effective vulnerability identification by learning comprehensive program semantics via graph neural networks. Pages 10197–10207 of: Advances in Neural Information Processing Systems.
- Zhu, Dingyuan, Zhang, Ziwei, Cui, Peng, and Zhu, Wenwu. 2019a. Robust graph convolutional networks against adversarial attacks. Pages 1399–1407 of: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.
- Zhu, Hao, Lin, Yankai, Liu, Zhiyuan, Fu, Jie, Chua, Tat-seng, et al. 2019b. Graph neural networks with generated parameters for relation extraction. Pages 1331-1339 of: Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics.
- Zhu, Rong, Zhao, Kun, Yang, Hongxia, Lin, Wei, Zhou, Chang, et al. 2019c. Aligraph: A comprehensive graph neural network platform. arXiv preprint arXiv:1902.08730.
- Zhu, Shenghuo, Yu, Kai, Chi, Yun, and Gong, Yihong. 2007. Combining content and link for classification using matrix factorization. Pages 487–494 of: Proceedings of the 30th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval.
- Zhu, Xiaojin, Ghahramani, Zoubin, and Lafferty, John D. 2003. Semi-supervised learning using gaussian fields and harmonic functions. Pages 912–919 of: Proceedings of the 20th International conference on Machine learning (ICML-03).
- Zitnik, Marinka, Agrawal, Monica, and Leskovec, Jure. 2018. Modeling polypharmacy side effects with graph convolutional networks. *Bioinfor*matics, 34(13), i457–i466.
- Zugner, Daniel, and Gunnemann, Stephan. 2019. Adversarial attacks on graph neural networks via meta learning. International Conference on Learning Representations.
- Zugner, Daniel, Akbarnejad, Amir, and Gunnemann, Stephan. 2018. Adversarial attacks on neural networks for graph data. Pages 2847–2856 of: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining.