References

Abadi M, Barham P, Chen J, Chen Z, Davis A, Dean J, Devin M, Ghemawat S, Irving G, Isard M, et al (2016) Tensorflow: A system for large-scale machine learning. In: 12th {USENIX} Symposium on Operating Systems Design and Implementation ({OSDI} 16), pp 265–283

Abbe E (2017) Community detection and stochastic block models: recent developments. Journal of Machine Learning Research 18(1):6446–6531

Abbe E, Sandon C (2015) Community detection in general stochastic block models: Fundamental limits and efficient algorithms for recovery. In: IEEE 56th Annual Symposium on Foundations of Computer Science, pp 670–688

Abboud R, Ceylan ii, Grohe M, Lukasiewicz T (2020) The surprising power of graph neural networks with random node initialization. CoRR abs/2010.01179

Abdelaziz I, Dolby J, McCusker JP, Srinivas K (2020) Graph4Code: A machine interpretable knowledge graph for code. arXiv preprint arXiv:200209440

Abdollahpouri H, Adomavicius G, Burke R, Guy I, Jannach D, Kamishima T, Krasnodebski J, Pizzato L (2020) Multistakeholder recommendation: Survey and research directions. User Modeling and User-Adapted Interaction 30(1):127–158

Abid NJ, Dragan N, Collard ML, Maletic JI (2015) Using stereotypes in the automatic generation of natural language summaries for c++ methods. In: 2015 IEEE International Conference on Software Maintenance and Evolution (ICSME), IEEE, pp 561–565

Abney S (2007) Semisupervised learning for computational linguistics. CRC Press

Adamic LA, Adar E (2003) Friends and neighbors on the web. Social networks 25(3):211–230

Adams RP, Zemel RS (2011) Ranking via sinkhorn propagation. arXiv preprint arXiv:11061925

Aghamohammadi A, Izadi M, Heydarnoori A (2020) Generating summaries for methods of event-driven programs: An android case study. Journal of Systems and Software 170:110,800

Ahmad MA, Eckert C, Teredesai A (2018) Interpretable machine learning in healthcare. In: Proceedings of the 2018 ACM international conference on bioinformatics, computational biology, and health informatics, pp 559–560

Ahmad WU, Chakraborty S, Ray B, Chang KW (2020) A transformer-based approach for source code summarization. arXiv preprint arXiv:200500653

Ahmed A, Shervashidze N, Narayanamurthy S, Josifovski V, Smola AJ (2013) Distributed large-scale natural graph factorization. In: Proceedings of the 22nd international conference on World Wide Web, pp 37–48

Aho AV, Lam MS, Sethi R, Ulman JD (2006) Compilers: principles, techniques and tools. Pearson Education

Ain QU, Butt WH, Anwar MW, Azam F, Maqbool B (2019) A systematic review on code clone detection. IEEE Access 7:86,121–86,144

Airoldi EM, Blei DM, Fienberg SE, Xing EP (2008) Mixed membership stochastic blockmodels. Journal of Machine Learning Research 9(Sep):1981–2014

Akoglu L, Tong H, Koutra D (2015) Graph based anomaly detection and description: a survey. Data mining and knowledge discovery 29(3):626–688

Al Hasan M, Zaki MJ (2011) A survey of link prediction in social networks. In: Social network data analytics, Springer, pp 243–275

Albert R, Barabási AL (2002) Statistical mechanics of complex networks. Reviews of modern physics 74(1):47

Albooyeh M, Goel R, Kazemi SM (2020) Out-of-sample representation learning for knowledge graphs. In: Empirical Methods in Natural Language Processing: Findings, pp 2657–2666

Ali H, Tran SN, Benetos E, Garcez ASd (2018) Speaker recognition with hybrid features from a deep belief network. Neural Computing and Applications 29(6):13–19

Allamanis M (2019) The adverse effects of code duplication in machine learning models of code. In: Proceedings of the 2019 ACM SIGPLAN International Symposium on New Ideas, New Paradigms, and Reflections on Programming and Software, pp 143–153

Allamanis M, Barr ET, Devanbu P, Sutton C (2018a) A survey of machine learning for big code and naturalness. ACM Computing Surveys (CSUR) 51(4):1–37

Allamanis M, Brockschmidt M, Khademi M (2018b) Learning to represent programs with graphs. In: International Conference on Learning Representations (ICLR)

Allamanis M, Barr ET, Ducousso S, Gao Z (2020) Typilus: neural type hints. In: Proceedings of the 41st ACM SIGPLAN Conference on Programming Language Design and Implementation, pp 91–105

Alon U, Brody S, Levy O, Yahav E (2019a) code2seq: Generating sequences from structured representations of code. International Conference on Learning Representations

Alon U, Zilberstein M, Levy O, Yahav E (2019b) code2vec: Learning distributed representations of code. Proceedings of the ACM on Programming Languages 3(POPL):1–29

Amidi A, Amidi S, Vlachakis D, et al (2018) EnzyNet: enzyme classification using 3d convolutional neural networks on spatial representation. PeerJ 6:e4750

Amizadeh S, Matusevych S, Weimer M (2018) Learning to solve circuit-sat: An unsupervised differentiable approach. In: International Conference on Learning Representations

Anand N, Huang PS (2018) Generative modeling for protein structures. In: Proceedings of the 32nd International Conference on Neural Information Processing Systems, pp 7505–7516

Arjovsky M, Chintala S, Bottou L (2017) Wasserstein generative adversarial networks. In: International Conference on Machine Learning, pp 214–223

Arora S (2020) A survey on graph neural networks for knowledge graph completion. arXiv preprint arXiv:200712374

Arvind V, Köbler J, Rattan G, Verbitsky O (2015) On the power of color refinement. In: International Symposium on Fundamentals of Computation Theory, pp 339–350

Arvind V, Fuhlbrück F, Köbler J, Verbitsky O (2019) On weisfeiler-leman invariance: subgraph counts and related graph properties. In: International Symposium on Fundamentals of Computation Theory, Springer, pp 111–125

Ashburner M, Ball CA, Blake JA, Botstein D, Butler H, Cherry JM, Davis AP, Dolinski K, Dwight SS, Eppig JT, et al (2000) Gene ontology: tool for the unification of biology. Nature genetics 25(1):25–29

Aynaz Taheri TBW Kevin Gimpel (2018) Learning graph representations with recurrent neural network autoencoders. In: KDD'18 Deep Learning Day

Azizian W, Lelarge M (2020) Characterizing the expressive power of invariant and equivariant graph neural networks. arXiv preprint arXiv:200615646

Babai L (2016) Graph isomorphism in quasipolynomial time. In: Proceedings of the Forty-Eighth Annual ACM Symposium on Theory of Computing, pp 684–697

Babai L, Kucera L (1979) Canonical labelling of graphs in linear average time. In: Foundations of Computer Science, 1979., 20th Annual Symposium on, IEEE, pp 39–46

Bach S, Binder A, Montavon G, Klauschen F, Müller KR, Samek W (2015) On pixel-wise explanations for non-linear classifier decisions by layer-wise relevance propagation. PloS one 10(7):e0130,140

Badihi S, Heydarnoori A (2017) Crowdsummarizer: Automated generation of code summaries for java programs through crowdsourcing. IEEE Software 34(2):71–80

Bahdanau D, Cho K, Bengio Y (2015) Neural machine translation by jointly learning to align and translate. In: 3rd International Conference on Learning Representations

Bai L, Yao L, Kanhere SS, Wang X, Liu W, Yang Z (2019a) Spatio-temporal graph convolutional and recurrent networks for citywide passenger demand prediction. In: Proceedings of the 28th ACM International Conference on Information and Knowledge Management, Association for Computing Machinery, CIKM '19, p 2293–2296, DOI 10.1145/3357384.3358097

Bai X, Zhu L, Liang C, Li J, Nie X, Chang X (2020a) Multi-view feature selection via nonnegative structured graph learning. Neurocomputing 387:110–122

Bai Y, Ding H, Sun Y, Wang W (2018) Convolutional set matching for graph similarity. In: NeurIPS 2018 Relational Representation Learning Workshop

Bai Y, Ding H, Bian S, Chen T, Sun Y, Wang W (2019b) Simgnn: A neural network approach to fast graph similarity computation. In: Proceedings of the Twelfth ACM International Conference on Web Search and Data Mining, pp 384–392

Bai Y, Ding H, Qiao Y, Marinovic A, Gu K, Chen T, Sun Y, Wang W (2019c) Unsupervised inductive graph-level representation learning via graph-graph proximity. arXiv preprint arXiv:190401098

Bai Y, Ding H, Gu K, Sun Y, Wang W (2020b) Learning-based efficient graph similarity computation via multi-scale convolutional set matching. In: Proceedings of the AAAI Conference on Artificial Intelligence, pp 3219–3226

Bai Y, Xu D, Wang A, Gu K, Wu X, Marinovic A, Ro C, Sun Y, Wang W (2020c) Fast detection of maximum common subgraph via deep q-learning. arXiv preprint arXiv:200203129

Bajaj M, Wang L, Sigal L (2019) G3raphground: Graph-based language grounding. In: Proceedings of the IEEE/CVF International Conference on Computer Vision, pp 4281–4290

Baker B, Gupta O, Naik N, Raskar R (2016) Designing neural network architectures using reinforcement learning. arXiv preprint arXiv:161102167

Baker CF, Ellsworth M (2017) Graph methods for multilingual framenets. In: Proceedings of TextGraphs-11: the Workshop on Graph-based Methods for Natural Language Processing, pp 45–50

Balcilar M, Renton G, Héroux P, Gaüzère B, Adam S, Honeine P (2021) Analyzing the expressive power of graph neural networks in a spectral perspective. In: International Conference on Learning Representations

Baldassarre F, Azizpour H (2019) Explainability techniques for graph convolutional networks. arXiv preprint arXiv:190513686

Balinsky H, Balinsky A, Simske S (2011) Document sentences as a small world. In: 2011 IEEE International Conference on Systems, Man, and Cybernetics, IEEE, pp 2583–2588

Banarescu L, Bonial C, Cai S, Georgescu M, Griffitt K, Hermjakob U, Knight K, Koehn P, Palmer M, Schneider N (2013) Abstract meaning representation for sembanking. In: Proceedings of the 7th linguistic annotation workshop and interoperability with discourse, pp 178–186

Bao H, Zhou X, Zhang Y, Li Y, Xie Y (2020) Covid-gan: Estimating human mobility responses to covid-19 pandemic through spatio-temporal conditional generative adversarial networks. In: Proceedings of the 28th International Conference on Advances in Geographic Information Systems, pp 273–282

Barabási AL (2013) Network science. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences 371(1987):20120,375

Barabási AL, Albert R (1999) Emergence of scaling in random networks. science 286(5439):509–512

Barabasi AL, Oltvai ZN (2004) Network biology: Understanding the cell's functional organization. Nature Reviews Genetics 5(2):101–113

Barber D (2004) Probabilistic modelling and reasoning: The junction tree algorithm. Course Notes

Barceló P, Kostylev EV, Monet M, Pérez J, Reutter J, Silva JP (2019) The logical expressiveness of graph neural networks. In: International Conference on Learning Representations

Bastian FB, Roux J, Niknejad A, Comte A, Fonseca Costa SS, De Farias TM, Moretti S, Parmentier G, De Laval VR, Rosikiewicz M, et al (2021) The bgee suite: integrated curated expression atlas and comparative transcriptomics in animals. Nucleic Acids Research 49(D1):D831–D847

Bastings J, Titov I, Aziz W, Marcheggiani D, Sima'an K (2017) Graph convolutional encoders for syntax-aware neural machine translation. arXiv preprint arXiv:170404675

Batagelj V, Zaversnik M (2003) An o(m) algorithm for cores decomposition of networks. arXiv preprint cs/0310049

Battaglia P, Pascanu R, Lai M, Rezende DJ, kavukcuoglu K (2016) Interaction networks for learning about objects, relations and physics. In: Proceedings of the 30th International Conference on Neural Information Processing Systems, pp 4509–4517

Battaglia PW, Hamrick JB, Bapst V, Sanchez-Gonzalez A, Zambaldi V, Malinowski M, Tacchetti A, Raposo D, Santoro A, Faulkner R, et al (2018) Relational inductive biases, deep learning, and graph networks. arXiv preprint arXiv:180601261

Beaini D, Passaro S, Létourneau V, Hamilton WL, Corso G, Liò P (2020) Directional graph networks. CoRR abs/2010.02863

Beck D, Haffari G, Cohn T (2018) Graph-to-sequence learning using gated graph neural networks. arXiv preprint arXiv:180609835

Belghazi MI, Baratin A, Rajeswar S, Ozair S, Bengio Y, Hjelm RD, Courville AC (2018) Mutual information neural estimation. In: Dy JG, Krause A (eds) Proceedings of the 35th International Conference on Machine Learning, ICML 2018, Stockholmsmässan, Stockholm, Sweden, July 10-15, 2018, PMLR, Proceedings of Machine Learning Research, vol 80, pp 530–539

Belkin M, Niyogi P (2002) Laplacian eigenmaps and spectral techniques for embedding and clustering. In: Advances in neural information processing systems, pp 585–591

Bengio Y (2008) Neural net language models. Scholarpedia 3(1):3881

Bengio Y, Senécal JS (2008) Adaptive importance sampling to accelerate training of a neural probabilistic language model. IEEE Transactions on Neural Networks 19(4):713–722

Bennett J, Lanning S, et al (2007) The netflix prize. In: Proceedings of KDD cup and workshop, New York, vol 2007, p 35

van den Berg R, Kipf TN, Welling M (2018) Graph convolutional matrix completion. KDD18 Deep Learning Day

Berg Rvd, Kipf TN, Welling M (2017) Graph convolutional matrix completion. arXiv preprint arXiv:170602263

Berger P, Hannak G, Matz G (2020) Efficient graph learning from noisy and incomplete data. IEEE Trans Signal Inf Process over Networks 6:105–119

Berggård T, Linse S, James P (2007) Methods for the detection and analysis of protein–protein interactions. PROTEOMICS 7(16):2833–2842

Berline N, Getzler E, Vergne M (2003) Heat kernels and Dirac operators. Springer Science & Business Media

Bian R, Koh YS, Dobbie G, Divoli A (2019) Network embedding and change modeling in dynamic heterogeneous networks. In: Proceedings of the 42nd International ACM SIGIR Conference on Research and Development in Information Retrieval, pp 861–864

Bianchi FM, Grattarola D, Alippi C (2020) Spectral clustering with graph neural networks for graph pooling. In: International Conference on Machine Learning, ACM, pp 2729–2738

Bielik P, Raychev V, Vechev M (2017) Learning a static analyzer from data. In: International Conference on Computer Aided Verification, Springer, pp 233–253

Biggs N, Lloyd EK, Wilson RJ (1986) Graph Theory, 1736-1936. Oxford University Press

Bingel J, Søgaard A (2017) Identifying beneficial task relations for multi-task learning in deep neural networks. In: Proceedings of the 15th Conference of the European Chapter of the Association for Computational Linguistics: Volume 2, Short Papers, pp 164–169

Bishop CM (2006) Pattern recognition and machine learning. springer

Bizer C, Lehmann J, Kobilarov G, Auer S, Becker C, Cyganiak R, Hellmann S (2009) Dbpedia-a crystallization point for the web of data. Journal of web semantics 7(3):154–165

Blitzer J, McDonald R, Pereira F (2006) Domain adaptation with structural correspondence learning. In: Proceedings of the 2006 conference on empirical methods in natural language processing, pp 120–128

Bodenreider O (2004) The unified medical language system (umls): integrating biomedical terminology. Nucleic acids research 32(suppl_1):D267–D270

Bojchevski A, Günnemann S (2019) Adversarial attacks on node embeddings via graph poisoning. In: International Conference on Machine Learning, PMLR, pp 695–704

Bojchevski A, Günnemann S (2019) Certifiable robustness to graph perturbations. In: Wallach H, Larochelle H, Beygelzimer A, d'Alché-Buc F, Fox E, Garnett R (eds) Advances in Neural Information Processing Systems, Curran Associates, Inc., vol 32

Bojchevski A, Matkovic Y, Günnemann S (2017) Robust spectral clustering for noisy data: Modeling sparse corruptions improves latent embeddings. In: Proceedings of the 23rd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, pp 737–746

Bojchevski A, Shchur O, Zügner D, Günnemann S (2018) Netgan: Generating graphs via random walks. arXiv preprint arXiv:180300816

Bojchevski A, Klicpera J, Günnemann S (2020a) Efficient robustness certificates for discrete data: Sparsity-aware randomized smoothing for graphs, images and more. In: International Conference on Machine Learning, PMLR, pp 1003–1013

Bojchevski A, Klicpera J, Perozzi B, Kapoor A, Blais M, Rózemberczki B, Lukasik M, Günnemann S (2020b) Scaling graph neural networks with approximate pagerank. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 2464–2473

Bollacker K, Tufts P, Pierce T, Cook R (2007) A platform for scalable, collaborative, structured information integration. In: Intl. Workshop on Information Integration on the Web (IIWeb'07), pp 22–27

Bollobás B (2013) Modern graph theory, vol 184. Springer Science & Business Media

Bollobás B, Béla B (2001) Random graphs. 73, Cambridge university press

Bollobás B, Janson S, Riordan O (2007) The phase transition in inhomogeneous random graphs. Random Structures & Algorithms 31(1):3–122

Bordes A, Usunier N, Garcia-Duran A, Weston J, Yakhnenko O (2013) Translating embeddings for modeling multi-relational data. In: Neural Information Processing Systems, pp 1–9

Bordes A, Glorot X, Weston J, Bengio Y (2014) A semantic matching energy function for learning with multi-relational data. Machine Learning 94(2):233–259

Borgwardt KM, Ong CS, Schönauer S, Vishwanathan SVN, Smola AJ, Kriegel HP (2005) Protein function prediction via graph kernels. Bioinformatics 21(Supplement 1):i47–i56

Borgwardt KM, Ghisu ME, Llinares-López F, O'Bray L, Rieck B (2020) Graph kernels: State-of-the-art and future challenges. Found Trends Mach Learn 13(5-6)

Bose A, Hamilton W (2019) Compositional fairness constraints for graph embeddings. In: International Conference on Machine Learning, PMLR, pp 715–724

Bottou L (1998) Online learning and stochastic approximations. On-line learning in neural networks 17(9):142

Bourgain J (1985) On lipschitz embedding of finite metric spaces in hilbert space. Israel Journal of Mathematics 52(1-2):46–52

Bourigault S, Lagnier C, Lamprier S, Denoyer L, Gallinari P (2014) Learning social network embeddings for predicting information diffusion. In: Proceedings of the 7th ACM international conference on Web search and data mining, pp 393–402

Bouritsas G, Frasca F, Zafeiriou S, Bronstein MM (2020) Improving graph neural network expressivity via subgraph isomorphism counting. CoRR abs/2006.09252, 2006.09252

Boyd S, Boyd SP, Vandenberghe L (2004) Convex optimization. Cambridge university press

Braschi B, Denny P, Gray K, Jones T, Seal R, Tweedie S, Yates B, Bruford E (2017) Genenames. org: the hgnc and vgnc resources in

Brauckmann A, Goens A, Ertel S, Castrillon J (2020) Compiler-based graph representations for deep learning models of code. In: Proceedings of the 29th International Conference on Compiler Construction, pp 201–211

Braude EJ, Bernstein ME (2016) Software engineering: modern approaches. Waveland Press

Brin S, Page L (1998) The anatomy of a large-scale hypertextual web search engine. Computer networks and ISDN systems 30(1-7):107–117

Brin S, Page L (2012) Reprint of: The anatomy of a large-scale hypertextual web search engine. Computer networks 56(18):3825–3833

Brockschmidt M (2020) GNN-FiLM: Graph neural networks with feature-wise linear modulation. In: III HD, Singh A (eds) Proceedings of the 37th International Conference on Machine Learning, PMLR, Virtual, Proceedings of Machine Learning Research, vol 119, pp 1144–1152

Bronstein MM, Bruna J, LeCun Y, Szlam A, Vandergheynst P (2017) Geometric deep learning: going beyond euclidean data. IEEE Signal Processing Magazine 34(4):18–42

Browne F, Wang H, Zheng H, et al (2007) Supervised statistical and machine learning approaches to inferring pairwise and module-based protein interaction networks. In: 2007 IEEE 7th International Symposium on BioInformatics and BioEngineering, pp 1365–1369, DOI 10.1109/BIBE.2007.4375748

Bruna J, Zaremba W, Szlam A, LeCun Y (2014) Spectral networks and deep locally connected networks on graphs. In: 2nd International Conference on Learning Representations, ICLR 2014

Bui TN, Chaudhuri S, Leighton FT, Sipser M (1987) Graph bisection algorithms with good average case behavior. Combinatorica 7(2):171–191

Bunke H (1997) On a relation between graph edit distance and maximum common subgraph. Pattern Recognition Letters 18(8):689–694

Burt RS (2004) Structural holes and good ideas. American journal of sociology 110(2):349–399

Byron O, Vestergaard B (2015) Protein–protein interactions: a supra-structural phenomenon demanding trans-disciplinary biophysical approaches. Current Opinion in Structural Biology 35:76 – 86, catalysis and regulation • Protein-protein interactions

Cai D, Lam W (2020) Graph transformer for graph-to-sequence learning. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 7464–7471

Cai H, Chen T, Zhang W, Yu Y, Wang J (2018a) Efficient architecture search by network transformation. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 32

Cai H, Zheng VW, Chang KCC (2018b) A comprehensive survey of graph embedding: Problems, techniques, and applications. IEEE Transactions on Knowledge and Data Engineering 30(9):1616–1637

Cai H, Gan C, Wang T, Zhang Z, Han S (2020a) Once for all: Train one network and specialize it for efficient deployment. In: ICLR

Cai H, Gan C, Zhu L, Han S (2020b) Tinytl: Reduce memory, not parameters for efficient on-device learning. Advances in Neural Information Processing Systems 33

Cai JY, Fürer M, Immerman N (1992) An optimal lower bound on the number of variables for graph identification. Combinatorica 12(4):389–410

Cai L, Ji S (2020) A multi-scale approach for graph link prediction. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 3308–3315

Cai L, Yan B, Mai G, Janowicz K, Zhu R (2019) Transgcn: Coupling transformation assumptions with graph convolutional networks for link prediction. In: Proceedings of the 10th International Conference on Knowledge Capture, pp 131–138

Cai L, Li J, Wang J, Ji S (2020c) Line graph neural networks for link prediction. arXiv preprint arXiv:201010046

Cai T, Luo S, Xu K, He D, Liu Ty, Wang L (2020d) Graphnorm: A principled approach to accelerating graph neural network training. arXiv preprint arXiv:200903294

Cai X, Han J, Yang L (2018c) Generative adversarial network based heterogeneous bibliographic network representation for personalized citation recommendation. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 32

Cai Z, Wen L, Lei Z, Vasconcelos N, Li SZ (2014) Robust deformable and occluded object tracking with dynamic graph. IEEE Transactions on Image Processing 23(12):5497–5509

Cairong Z, Xinran Z, Cheng Z, Li Z (2016) A novel dbn feature fusion model for cross-corpus speech emotion recognition. Journal of Electrical and Computer Engineering 2016

Cangea C, Velickovic P, Jovanovic N, Kipf T, Liò P (2018) Towards sparse hierarchical graph classifiers. CoRR abs/1811.01287

Cao S, Lu W, Xu Q (2015) Grarep: Learning graph representations with global structural information. In: Proceedings of the 24th ACM international on conference on information and knowledge management, pp 891–900

Cao Y, Peng H, Philip SY (2020) Multi-information source hin for medical concept embedding. In: Pacific-Asia Conference on Knowledge Discovery and Data Mining, Springer, pp 396–408

Cao Z, Simon T, Wei SE, Sheikh Y (2017) Realtime multi-person 2d pose estimation using part affinity fields. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 7291–7299

Cao Z, Hidalgo G, Simon T, Wei SE, Sheikh Y (2019) Openpose: realtime multi-person 2d pose estimation using part affinity fields. IEEE transactions on pattern analysis and machine intelligence 43(1):172–186

Cappart Q, Chételat D, Khalil E, Lodi A, Morris C, Veličković P (2021) Combinatorial optimization and reasoning with graph neural networks. CoRR abs/2102.09544

Carlini N, Wagner D (2017) Towards Evaluating the Robustness of Neural Networks. IEEE Symposium on Security and Privacy pp 39–57, DOI 10.1109/SP.2017.49

Caron M, Bojanowski P, Joulin A, Douze M (2018) Deep clustering for unsupervised learning of visual features. In: Proceedings of the European Conference on Computer Vision (ECCV), pp 132–149

Carreira J, Zisserman A (2017) Quo vadis, action recognition? a new model and the kinetics dataset. In: proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pp 6299–6308

Cartwright D, Harary F (1956) Structural balance: a generalization of heider's theory. Psychological review 63(5):277

Cen Y, Zou X, Zhang J, Yang H, Zhou J, Tang J (2019) Representation learning for attributed multiplex heterogeneous network. In: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 1358–1368

Cetoli A, Bragaglia S, O'Harney A, Sloan M (2017) Graph convolutional networks for named entity recognition. In: Proceedings of the 16th International Workshop on Treebanks and Linguistic Theories, pp 37–45

Chakrabarti D, Faloutsos C (2006) Graph mining: Laws, generators, and algorithms. ACM computing surveys (CSUR) 38(1)

Chami I, Ying Z, Ré C, Leskovec J (2019) Hyperbolic graph convolutional neural networks. In: Advances in neural information processing systems, pp 4868–4879

Chami I, Abu-El-Haija S, Perozzi B, Ré C, Murphy K (2020) Machine learning on graphs: A model and comprehensive taxonomy. CoRR abs/2005.03675

Chang B, Jang G, Kim S, Kang J (2020a) Learning graph-based geographical latent representation for point-of-interest recommendation. In: Proceedings of the 29th ACM International Conference on Information & Knowledge Management, pp 135–144

Chang H, Rong Y, Xu T, Huang W, Zhang H, Cui P, Zhu W, Huang J (2020b) A Restricted Black-Box Adversarial Framework Towards Attacking Graph Embedding Models. In: AAAI Conference on Artificial Intelligence, vol 34, pp 3389–3396, DOI 10.1609/aaai.v34i04.5741

Chang J, Scherer S (2017) Learning representations of emotional speech with deep convolutional generative adversarial networks. In: 2017 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), IEEE, pp 2746–2750

Chang S (2018) Scaling knowledge access and retrieval at airbnb. Airbnb Engineering and Data Science

Chang S, Han W, Tang J, Qi GJ, Aggarwal CC, Huang TS (2015) Heterogeneous network embedding via deep architectures. In: Proceedings of the 21th ACM SIGKDD international conference on knowledge discovery and data mining, pp 119–128

Chao YW, Vijayanarasimhan S, Seybold B, Ross DA, Deng J, Sukthankar R (2018) Rethinking the faster r-cnn architecture for temporal action localization. In: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pp 1130–1139

Chen B, Sun L, Han X (2018a) Sequence-to-action: End-to-end semantic graph generation for semantic parsing. arXiv preprint arXiv:180900773

Chen B, Barzilay R, Jaakkola T (2019a) Path-augmented graph transformer network. ICML 2019 Workshop on Learning and Reasoning with Graph-Structured Data

Chen B, Zhang J, Zhang X, Tang X, Cai L, Chen H, Li C, Zhang P, Tang J (2020a) Coad: Contrastive pre-training with adversarial fine-tuning for zero-shot expert linking. arXiv preprint arXiv:201211336

Chen C, Li K, Teo SG, Zou X, Wang K, Wang J, Zeng Z (2019b) Gated residual recurrent graph neural networks for traffic prediction. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 485–492

Chen D, Lin Y, Li L, Li XR, Zhou J, Sun X, et al (2020b) Distance-wise graph contrastive learning. arXiv preprint arXiv:201207437

Chen D, Lin Y, Li W, Li P, Zhou J, Sun X (2020c) Measuring and relieving the over-smoothing problem for graph neural networks from the topological view. In: The Thirty-Fourth AAAI Conference on Artificial Intelligence, AAAI 2020, The Thirty-Second Innovative Applications of Artificial Intelligence Conference, IAAI 2020, The Tenth AAAI Symposium on Educational Advances in Artificial Intelligence, EAAI 2020, New York, NY, USA, February 7-12, 2020, AAAI Press, pp 3438–3445

Chen H, Yin H, Wang W, Wang H, Nguyen QVH, Li X (2018b) Pme: projected metric embedding on heterogeneous networks for link prediction. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 1177–1186

Chen H, Xu Y, Huang F, Deng Z, Huang W, Wang S, He P, Li Z (2020d) Label-aware graph convolutional networks. In: The 29th ACM International Conference on Information and Knowledge Management, pp 1977–1980

Chen IY, Agrawal M, Horng S, Sontag D (2020e) Robustly extracting medical knowledge from ehrs: A case study of learning a health knowledge graph. In: Pac Symp Biocomput, World Scientific, pp 19–30

Chen J, Ma T, Xiao C (2018c) Fastgcn: Fast learning with graph convolutional networks via importance sampling. In: International Conference on Learning Representations

Chen J, Zhu J, Song L (2018d) Stochastic training of graph convolutional networks with variance reduction. In: International Conference on Machine Learning, PMLR, pp 942–950

Chen J, Chen Y, Zheng H, Shen S, Yu S, Zhang D, Xuan Q (2020f) MGA: Momentum Gradient Attack on Network. IEEE Transactions on Computational Social Systems pp 1–10, DOI 10.1109/TCSS.2020.3031058

Chen J, Lei B, Song Q, Ying H, Chen DZ, Wu J (2020g) A hierarchical graph network for 3d object detection on point clouds. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 392–401

Chen J, Lin X, Shi Z, Liu Y (2020h) Link Prediction Adversarial Attack Via Iterative Gradient Attack. IEEE Transactions on Computational Social Systems 7(4):1081–1094, DOI 10.1109/TCSS.2020.3004059

Chen J, Lin X, Xiong H, Wu Y, Zheng H, Xuan Q (2020i) Smoothing Adversarial Training for GNN. IEEE Transactions on Computational Social Systems pp 1–12, DOI 10.1109/TCSS.2020.3042628

Chen J, Xu H, Wang J, Xuan Q, Zhang X (2020j) Adversarial Detection on Graph Structured Data. In: Workshop on Privacy-Preserving Machine Learning in Practice

Chen L, Tan B, Long S, Yu K (2018e) Structured dialogue policy with graph neural networks. In: Proceedings of the 27th International Conference on Computational Linguistics, pp 1257–1268

Chen L, Chen Z, Bruna J (2020k) On graph neural networks versus graph-augmented mlps. arXiv preprint arXiv:201015116

Chen M, Wei Z, Huang Z, Ding B, Li Y (2020l) Simple and deep graph convolutional networks. In: International Conference on Machine Learning, PMLR, pp 1725–1735

Chen Q, Zhou M (2018) A neural framework for retrieval and summarization of source code. In: 2018 33rd IEEE/ACM International Conference on Automated Software Engineering (ASE), IEEE, pp 826–831

Chen T, Sun Y (2017) Task-guided and path-augmented heterogeneous network embedding for author identification. In: Proceedings of the Tenth ACM International Conference on Web Search and Data Mining, pp 295–304

Chen T, Li M, Li Y, Lin M, Wang N, Wang M, Xiao T, Xu B, Zhang C, Zhang Z (2015) Mxnet: A flexible and efficient machine learning library for heterogeneous distributed systems. arXiv preprint arXiv:151201274

Chen T, Bian S, Sun Y (2019c) Are powerful graph neural nets necessary? a dissection on graph classification. arXiv preprint arXiv:190504579

Chen X, Ma H, Wan J, Li B, Xia T (2017) Multi-view 3d object detection network for autonomous driving. In: Proceedings of the IEEE conference on Computer Vision and Pattern Recognition, pp 1907–1915

Chen XW, Liu M (2005) Prediction of protein–protein interactions using random decision forest framework. Bioinformatics 21(24):4394–4400

Chen Y, Rohrbach M, Yan Z, Shuicheng Y, Feng J, Kalantidis Y (2019d) Graph-based global reasoning networks. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 433–442

Chen Y, Wu L, Zaki M (2020m) Iterative deep graph learning for graph neural networks: Better and robust node embeddings. Advances in Neural Information Processing Systems 33

Chen Y, Wu L, Zaki MJ (2020n) Graphflow: Exploiting conversation flow with graph neural networks for conversational machine comprehension. In: Proceedings of the Twenty-Ninth International Joint Conference on Artificial Intelligence, pp 1230–1236

Chen Y, Wu L, Zaki MJ (2020o) Reinforcement learning based graph-to-sequence model for natural question generation. In: 8th International Conference on Learning Representations

Chen Y, Wu L, Zaki MJ (2020p) Toward subgraph guided knowledge graph question generation with graph neural networks. arXiv preprint arXiv:200406015

Chen YC, Bansal M (2018) Fast abstractive summarization with reinforce-selected sentence rewriting. arXiv preprint arXiv:180511080

Chen YW, Song Q, Hu X (2021) Techniques for automated machine learning. ACM SIGKDD Explorations Newsletter 22(2):35–50

Chen Z, Kommrusch SJ, Tufano M, Pouchet LN, Poshyvanyk D, Monperrus M (2019e) Sequencer: Sequence-to-sequence learning for end-to-end program repair. IEEE Transactions on Software Engineering pp 1–1, DOI 10.1109/TSE.2019.2940179

Chen Z, Villar S, Chen L, Bruna J (2019f) On the equivalence between graph isomorphism testing and function approximation with gnns. In: Advances in Neural Information Processing Systems, pp 15,868–15,876

Chen Z, Chen L, Villar S, Bruna J (2020q) Can graph neural networks count substructures? vol 33

Chenxi Liu FSHAWHAYLFF Liang-Chieh Chen (2019) Auto-deeplab: Hierarchical neural architecture search for semantic image segmentation. arXiv preprint arXiv:190102985

Chiang WL, Liu X, Si S, Li Y, Bengio S, Hsieh CJ (2019) Cluster-gcn: An efficient algorithm for training deep and large graph convolutional networks. In: ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD), pp 257–266

Chibotaru V, Bichsel B, Raychev V, Vechev M (2019) Scalable taint specification inference with big code. In: Proceedings of the 40th ACM SIGPLAN Conference on Programming Language Design and Implementation, pp 760–774

Chidambaram M, Yang Y, Cer D, Yuan S, Sung YH, Strope B, Kurzweil R (2019) Learning cross-lingual sentence representations via a multi-task dual-encoder model. ACL 2019 p 250

Chien E, Peng J, Li P, Milenkovic O (2021) Adaptive universal generalized pagerank graph neural network. In: International Conference on Learning Representations

Chiu PH, Hripcsak G (2017) Ehr-based phenotyping: bulk learning and evaluation. Journal of biomedical informatics 70:35–51

Cho K, van Merriënboer B, Gulcehre C, Bahdanau D, Bougares F, Schwenk H, Bengio Y (2014a) Learning phrase representations using RNN encoder–decoder for statistical machine translation. In: Proceedings of the 2014 Conference on Empirical Methods in Natural Language Processing (EMNLP), Association for Computational Linguistics, Doha, Qatar, pp 1724–1734, DOI 10.3115/v1/D14-1179

Cho M, Lee J, Lee KM (2010) Reweighted random walks for graph matching. In: European conference on Computer vision, Springer, pp 492–505

Cho M, Sun J, Duchenne O, Ponce J (2014b) Finding matches in a haystack: A max-pooling strategy for graph matching in the presence of outliers. In: IEEE Conference on Computer Vision and Pattern Recognition, pp 2083–2090

Choi E, Xu Z, Li Y, Dusenberry M, Flores G, Xue E, Dai AM (2020) Learning the graphical structure of electronic health records with graph convolutional transformer. In: The Thirty-Fourth AAAI Conference on Artificial Intelligence, pp 606–613

Choromanski K, Likhosherstov V, Dohan D, Song X, Gane A, Sarlós T, Hawkins P, Davis J, Mohiuddin A, Kaiser L, Belanger D, Colwell L, Weller A (2021)

Rethinking attention with performers. In: International Conference on Learning Representations
Chorowski J, Weiss RJ, Bengio S, van den Oord A (2019) Unsupervised speech representation learning using wavenet autoencoders. IEEE/ACM transactions on audio, speech, and language processing 27(12):2041–2053
Chung F (2007) The heat kernel as the pagerank of a graph. Proceedings of the National Academy of Sciences 104(50):19,735–19,740
Chung J, Gulcehre C, Cho K, Bengio Y (2014) Empirical evaluation of gated recurrent neural networks on sequence modeling. arXiv preprint arXiv:14123555
Cohen J, Rosenfeld E, Kolter Z (2019) Certified adversarial robustness via randomized smoothing. In: International Conference on Machine Learning, PMLR, pp 1310–1320
Cohen N, Shashua A (2016) Convolutional rectifier networks as generalized tensor decompositions. In: International Conference on Machine Learning, PMLR, pp 955–963
Collard ML, Decker MJ, Maletic JI (2011) Lightweight transformation and fact extraction with the srcml toolkit. In: Source Code Analysis and Manipulation (SCAM), 2011 11th IEEE International Working Conference on, IEEE, pp 173–184
Collobert R, Weston J, Bottou L, Karlen M, Kavukcuoglu K, Kuksa P (2011) Natural language processing (almost) from scratch. Journal of machine learning research 12(ARTICLE):2493–2537
Colson B, Marcotte P, Savard G (2007) An overview of bilevel optimization. Annals of operations research 153(1):235–256
mypy Contributors (2021) mypy - optional static typing for Python. http://mypy-lang.org/, accessed: 2021-01-30
Corso G, Cavalleri L, ini D, Liò P, Velickovic P (2020) Principal neighbourhood aggregation for graph nets. CoRR abs/2004.05718
Cortés-Coy LF, Linares-Vásquez M, Aponte J, Poshyvanyk D (2014) On automatically generating commit messages via summarization of source code changes. In: 2014 IEEE 14th International Working Conference on Source Code Analysis and Manipulation, IEEE, pp 275–284
Cosmo L, Kazi A, Ahmadi SA, Navab N, Bronstein M (2020) Latent patient network learning for automatic diagnosis. arXiv preprint arXiv:200313620
Costa F, De Grave K (2010) Fast neighborhood subgraph pairwise distance kernel. In: International Conference on Machine Learning, Omnipress, pp 255–262
Cotto KC, Wagner AH, Feng YY, Kiwala S, Coffman AC, Spies G, Wollam A, Spies NC, Griffith OL, Griffith M (2018) Dgidb 3.0: a redesign and expansion of the drug–gene interaction database. Nucleic acids research 46(D1):D1068–D1073
Cozzetto D, Minneci F, Currant H, et al (2016) FFPred 3: feature-based function prediction for all gene ontology domains. Scientific Reports 6(1)
Cucurull G, Taslakian P, Vazquez D (2019) Context-aware visual compatibility prediction. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 12,617–12,626

Cui J, Kingsbury B, Ramabhadran B, Sethy A, Audhkhasi K, Cui X, Kislal E, Mangu L, Nussbaum-Thom M, Picheny M, et al (2015) Multilingual representations for low resource speech recognition and keyword search. In: 2015 IEEE Workshop on Automatic Speech Recognition and Understanding (ASRU), IEEE, pp 259–266

Cui P, Wang X, Pei J, Zhu W (2018) A survey on network embedding. IEEE Transactions on Knowledge and Data Engineering 31(5):833–852

Cui Z, Henrickson K, Ke R, Wang Y (2019) Traffic graph convolutional recurrent neural network: A deep learning framework for network-scale traffic learning and forecasting. IEEE Transactions on Intelligent Transportation Systems 21(11):4883–4894

Cummins C, Fisches ZV, Ben-Nun T, Hoefler T, Leather H (2020) Programl: Graph-based deep learning for program optimization and analysis. arXiv preprint arXiv:200310536

Cussens J (2011) Bayesian network learning with cutting planes. In: Proceedings of the Twenty-Seventh Conference on Uncertainty in Artificial Intelligence, pp 153–160

Cvitkovic M, Singh B, Anandkumar A (2018) Deep learning on code with an unbounded vocabulary. In: Machine Learning for Programming

Cybenko G (1989) Approximation by superpositions of a sigmoidal function. Mathematics of control, signals and systems 2(4):303–314

Cygan M, Pilipczuk M, Pilipczuk M, Wojtaszczyk JO (2012) Sitting closer to friends than enemies, revisited. In: International Symposium on Mathematical Foundations of Computer Science, Springer, pp 296–307

Dabkowski P, Gal Y (2017) Real time image saliency for black box classifiers. arXiv preprint arXiv:170507857

Dahl G, Ranzato M, Mohamed Ar, Hinton GE (2010) Phone recognition with the mean-covariance restricted boltzmann machine. Advances in neural information processing systems 23:469–477

Dai B, Zhang Y, Lin D (2017) Detecting visual relationships with deep relational networks. In: Proceedings of the IEEE conference on computer vision and Pattern recognition, pp 3076–3086

Dai H, Dai B, Song L (2016) Discriminative embeddings of latent variable models for structured data. In: International conference on machine learning, PMLR, pp 2702–2711

Dai H, Li H, Tian T, Huang X, Wang L, Zhu J, Song L (2018a) Adversarial attack on graph structured data. In: International conference on machine learning, PMLR, pp 1115–1124

Dai H, Tian Y, Dai B, Skiena S, Song L (2018b) Syntax-directed variational autoencoder for structured data. arXiv preprint arXiv:180208786

Dai Q, Li Q, Tang J, Wang D (2018c) Adversarial network embedding. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 32

Dai R, Xu S, Gu Q, Ji C, Liu K (2020) Hybrid spatio-temporal graph convolutional network: Improving traffic prediction with navigation data. In: Proceedings of the

26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 3074–3082

Daitch SI, Kelner JA, Spielman DA (2009) Fitting a graph to vector data. In: Proceedings of the 26th Annual International Conference on Machine Learning, pp 201–208

Damonte M, Cohen SB (2019) Structural neural encoders for amr-to-text generation. arXiv preprint arXiv:190311410

Dana JM, Gutmanas A, Tyagi N, et al (2018) SIFTS: updated structure integration with function, taxonomy and sequences resource allows 40-fold increase in coverage of structure-based annotations for proteins. Nucleic Acids Research 47(D1):D482–D489

Das S, Lee D, Sillitoe I, et al (2015) Functional classification of CATH superfamilies: a domain-based approach for protein function annotation. Bioinformatics 31(21):3460–3467

Dasgupta SS, Ray SN, Talukdar P (2018) Hyte: Hyperplane-based temporally aware knowledge graph embedding. In: Empirical Methods in Natural Language Processing, pp 2001–2011

Davidson TR, Falorsi L, De Cao N, Kipf T, Tomczak JM (2018) Hyperspherical variational auto-encoders. In: 34th Conference on Uncertainty in Artificial Intelligence 2018, UAI 2018, Association For Uncertainty in Artificial Intelligence (AUAI), pp 856–865

Davis AP, Grondin CJ, Johnson RJ, Sciaky D, McMorran R, Wiegers J, Wiegers TC, Mattingly CJ (2019) The comparative toxicogenomics database: update 2019. Nucleic acids research 47(D1):D948–D954

De Cao N, Kipf T (2018) Molgan: An implicit generative model for small molecular graphs. arXiv preprint arXiv:180511973

De Lucia A, Di Penta M, Oliveto R, Panichella A, Panichella S (2012) Using ir methods for labeling source code artifacts: Is it worthwhile? In: 2012 20th IEEE International Conference on Program Comprehension (ICPC), IEEE, pp 193–202

Dearman D, Cox A, Fisher M (2005) Adding control-flow to a visual data-flow representation. In: 13th International Workshop on Program Comprehension (IWPC'05), IEEE, pp 297–306

Defferrard M, X B, Vandergheynst P (2016) Convolutional neural networks on graphs with fast localized spectral filtering. In: Advances in Neural Information Processing Systems, pp 3844–3852

Delaney JS (2004) Esol: estimating aqueous solubility directly from molecular structure. Journal of chemical information and computer sciences 44(3):1000–1005

Deng C, Zhao Z, Wang Y, Zhang Z, Feng Z (2020) Graphzoom: A multi-level spectral approach for accurate and scalable graph embedding. In: International Conference on Learning Representations

Deng Z, Dong Y, Zhu J (2019) Batch Virtual Adversarial Training for Graph Convolutional Networks. In: ICML 2019 Workshop: Learning and Reasoning with Graph-Structured Representations

Desa U (2018) Revision of world urbanization prospects. UN Department of Economic and Social Affairs 16

Dettmers T, Minervini P, Stenetorp P, Riedel S (2018) Convolutional 2d knowledge graph embeddings. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 32

Devlin J, Chang MW, Lee K, Toutanova K (2019) BERT: Pre-training of deep bidirectional transformers for language understanding. In: 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), Association for Computational Linguistics, Minneapolis, Minnesota, pp 4171–4186, DOI 10.18653/v1/N19-1423

Dhillon IS, Guan Y, Kulis B (2007) Weighted graph cuts without eigenvectors a multilevel approach. IEEE Transactions on Pattern Analysis and Machine Intelligence 29(11):1944–1957

Diao Z, Wang X, Zhang D, Liu Y, Xie K, He S (2019) Dynamic spatial-temporal graph convolutional neural networks for traffic forecasting. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 890–897

Dinella E, Dai H, Li Z, Naik M, Song L, Wang K (2020) Hoppity: Learning graph transformations to detect and fix bugs in programs. In: International Conference on Learning Representations (ICLR)

Ding M, Zhou C, Chen Q, Yang H, Tang J (2019a) Cognitive graph for multi-hop reading comprehension at scale. In: Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics, pp 2694–2703

Ding S, Qu S, Xi Y, Sangaiah AK, Wan S (2019b) Image caption generation with high-level image features. Pattern Recognition Letters 123:89–95

Ding Y, Yao Q, Zhang T (2020a) Propagation model search for graph neural networks. arXiv preprint arXiv:201003250

Ding Y, Zhou X, Bao H, Li Y, Hamann C, Spears S, Yuan Z (2020b) Cycling-net: A deep learning approach to predicting cyclist behaviors from geo-referenced egocentric video data. Association for Computing Machinery, SIGSPATIAL '20, p 337–346, DOI 10.1145/3397536.3422258

Do K, Tran T, Venkatesh S (2019) Graph transformation policy network for chemical reaction prediction. In: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 750–760

Doersch C, Gupta A, Efros AA (2015) Unsupervised visual representation learning by context prediction. In: 2015 IEEE International Conference on Computer Vision, ICCV 2015, Santiago, Chile, December 7-13, 2015, IEEE Computer Society, pp 1422–1430, DOI 10.1109/ICCV.2015.167

Dohkan S, Koike A, Takagi T (2006) Improving the performance of an svm-based method for predicting protein-protein interactions. In Silico Biology 6:515–529, 6

Domingo-Fernández D, Baksi S, Schultz B, Gadiya Y, Karki R, Raschka T, Ebeling C, Hofmann-Apitius M, et al (2020) Covid-19 knowledge graph: a computable, multi-modal, cause-and-effect knowledge model of covid-19 pathophysiology. BioRxiv

Donahue C, McAuley J, Puckette M (2018) Synthesizing audio with generative adversarial networks. arXiv preprint arXiv:180204208 1

Donahue J, Anne Hendricks L, Guadarrama S, Rohrbach M, Venugopalan S, Saenko K, Darrell T (2015) Long-term recurrent convolutional networks for visual recognition and description. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 2625–2634

Doncheva NT, Morris JH, Gorodkin J, Jensen LJ (2018) Cytoscape StringApp: Network analysis and visualization of proteomics data. Journal of Proteome Research 18(2):623–632

Dong X, Gabrilovich E, Heitz G, Horn W, Lao N, Murphy K, Strohmann T, Sun S, Zhang W (2014) Knowledge vault: A web-scale approach to probabilistic knowledge fusion. In: Proceedings of the 20th ACM SIGKDD international conference on Knowledge discovery and data mining, pp 601–610

Dong X, Thanou D, Frossard P, Vandergheynst P (2016) Learning laplacian matrix in smooth graph signal representations. IEEE Transactions on Signal Processing 64(23):6160–6173

Dong X, Thanou D, Rabbat M, Frossard P (2019) Learning graphs from data: A signal representation perspective. IEEE Signal Processing Magazine 36(3):44–63

Dong Y, Chawla NV, Swami A (2017) metapath2vec: Scalable representation learning for heterogeneous networks. In: Proceedings of the 23rd ACM SIGKDD international conference on knowledge discovery and data mining, pp 135–144

Donsker M, Varadhan S (1976) Asymptotic evaluation of certain markov process expectations for large time—iii. Communications on Pure and Applied Mathematics 29(4):389–461, copyright: Copyright 2016 Elsevier B.V., All rights reserved.

Dos Santos C, Gatti M (2014) Deep convolutional neural networks for sentiment analysis of short texts. In: Proceedings of COLING 2014, the 25th International Conference on Computational Linguistics: Technical Papers, pp 69–78

Dosovitskiy A, Springenberg JT, Riedmiller MA, Brox T (2014) Discriminative unsupervised feature learning with convolutional neural networks. In: Ghahramani Z, Welling M, Cortes C, Lawrence ND, Weinberger KQ (eds) Advances in Neural Information Processing Systems 27: Annual Conference on Neural Information Processing Systems 2014, December 8-13 2014, Montreal, Quebec, Canada, pp 766–774

Dosovitskiy A, et al (2021) An image is worth 16x16 words: Transformers for image recognition at scale. ICLR

Dou Y, Liu Z, Sun L, Deng Y, Peng H, Yu PS (2020) Enhancing graph neural network-based fraud detectors against camouflaged fraudsters. In: Proceedings of the 29th ACM International Conference on Information & Knowledge Management, pp 315–324

Du M, Liu N, Yang F, Hu X (2019) Learning credible deep neural networks with rationale regularization. In: 2019 IEEE International Conference on Data Mining (ICDM), IEEE, pp 150–159

Du M, Yang F, Zou N, Hu X (2020) Fairness in deep learning: A computational perspective. IEEE Intelligent Systems

Duvenaud DK, Maclaurin D, Iparraguirre J, Bombarell R, Hirzel T, Aspuru-Guzik A, Adams RP (2015a) Convolutional networks on graphs for learning molecular fingerprints. In: Advances in neural information processing systems, pp 2224–2232

Duvenaud DK, Maclaurin D, Iparraguirre J, Bombarell R, Hirzel T, Aspuru-Guzik A, Adams RP (2015b) Convolutional networks on graphs for learning molecular fingerprints. In: Advances in Neural Information Processing Systems, pp 2224–2232

Dvijotham KD, Hayes J, Balle B, Kolter Z, Qin C, Gyorgy A, Xiao K, Gowal S, Kohli P (2020) A framework for robustness certification of smoothed classifiers using f-divergences. In: International Conference on Learning Representations, ICLR

Dwivedi VP, Joshi CK, Laurent T, Bengio Y, Bresson X (2020) Benchmarking graph neural networks. arXiv preprint arXiv:200300982

Dyer C, Ballesteros M, Ling W, Matthews A, Smith NA (2015) Transition-based dependency parsing with stack long short-term memory. arXiv preprint arXiv:150508075

Easley D, Kleinberg J, et al (2012) Networks, crowds, and markets: Reasoning about a highly connected world. Significance 9(1):43–44

Eksombatchai C, Jindal P, Liu JZ, Liu Y, Sharma R, Sugnet C, Ulrich M, Leskovec J (2018) Pixie: A system for recommending 3+ billion items to 200+ million users in real-time. In: Proceedings of the 2018 world wide web conference, pp 1775–1784

Elinas P, Bonilla EV, Tiao L (2020) Variational inference for graph convolutional networks in the absence of graph data and adversarial settings. In: Advances in Neural Information Processing Systems, vol 33, pp 18,648–18,660

Elkan C, Noto K (2008) Learning classifiers from only positive and unlabeled data. In: Proceedings of the 14th ACM SIGKDD international conference on Knowledge discovery and data mining, pp 213–220

Elman JL (1990) Finding structure in time. Cognitive Science 14(2):179–211

Elmsallati A, Clark C, Kalita J (2016) Global alignment of protein-protein interaction networks: A survey. IEEE/ACM Trans Comput Biol Bioinformatics 13(4):689–705

Entezari N, Al-Sayouri SA, Darvishzadeh A, Papalexakis EE (2020) All you need is low (rank) defending against adversarial attacks on graphs. In: Proceedings of the 13th International Conference on Web Search and Data Mining, pp 169–177

Erdős P, Rényi A (1959) On random graphs i. Publ Math Debrecen 6:290–297

Erdős P, Rényi A (1960) On the evolution of random graphs. Publ Math Inst Hung Acad Sci 5(1):17–60

Erkan G, Radev DR (2004) Lexrank: Graph-based lexical centrality as salience in text summarization. Journal of artificial intelligence research 22:457–479

Ernst MD, Perkins JH, Guo PJ, McCamant S, Pacheco C, Tschantz MS, Xiao C (2007) The Daikon system for dynamic detection of likely invariants. Science of computer programming 69(1-3):35–45

Eykholt K, Evtimov I, Fernandes E, Li B, Rahmati A, Xiao C, Prakash A, Kohno T, Song D (2018) Robust physical-world attacks on deep learning visual classification. In: IEEE Conference on Computer Vision and Pattern Recognition, CVPR, pp 1625–1634

Faghri F, Fleet DJ, Kiros JR, Fidler S (2017) Vse++: Improving visual-semantic embeddings with hard negatives. arXiv preprint arXiv:170705612

Fan Y, Hou S, Zhang Y, Ye Y, Abdulhayoglu M (2018) Gotcha-sly malware! scorpion a metagraph2vec based malware detection system. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 253–262

Fang Y, Sun S, Gan Z, Pillai R, Wang S, Liu J (2020) Hierarchical graph network for multi-hop question answering. In: Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing (EMNLP), pp 8823–8838

Fatemi B, Asri LE, Kazemi SM (2021) Slaps: Self-supervision improves structure learning for graph neural networks. arXiv preprint arXiv:210205034

Feng B, Wang Y, Wang Z, Ding Y (2021) Uncertainty-aware Attention Graph Neural Network for Defending Adversarial Attacks. In: AAAI Conference on Artificial Intelligence

Feng F, He X, Tang J, Chua T (2019a) Graph adversarial training: Dynamically regularizing based on graph structure. TKDE pp 1–1

Feng J, Huang M, Wang M, Zhou M, Hao Y, Zhu X (2016) Knowledge graph embedding by flexible translation. In: Proceedings of the Fifteenth International Conference on Principles of Knowledge Representation and Reasoning, pp 557–560

Feng W, Zhang J, Dong Y, Han Y, Luan H, Xu Q, Yang Q, Kharlamov E, Tang J (2020) Graph random neural networks for semi-supervised learning on graphs. In: Advances in Neural Information Processing Systems, vol 33, pp 22,092–22,103

Feng X, Zhang Y, Glass J (2014) Speech feature denoising and dereverberation via deep autoencoders for noisy reverberant speech recognition. In: 2014 IEEE international conference on acoustics, speech and signal processing (ICASSP), IEEE, pp 1759–1763

Feng Y, Lv F, Shen W, Wang M, Sun F, Zhu Y, Yang K (2019b) Deep session interest network for click-through rate prediction. arXiv preprint arXiv:190506482

Feng Y, You H, Zhang Z, Ji R, Gao Y (2019c) Hypergraph neural networks. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 3558–3565

Feurer M, Hutter F (2019) Hyperparameter optimization. In: Automated Machine Learning, Springer, Cham, pp 3–33

Févotte C, Idier J (2011) Algorithms for nonnegative matrix factorization with the β-divergence. Neural computation 23(9):2421–2456

Fey M, Lenssen JE (2019) Fast graph representation learning with PyTorch Geometric. CoRR abs/1903.02428

Fey M, Lenssen JE, Weichert F, Müller H (2018) Splinecnn: Fast geometric deep learning with continuous b-spline kernels. In: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pp 869–877

Fey M, Lenssen JE, Morris C, Masci J, Kriege NM (2020) Deep graph matching consensus. In: International Conference on Learning Representations

Finn RD, Bateman A, Clements J, et al (2013) Pfam: the protein families database. Nucleic Acids Research 42(D1):D222–D230

Foggia P, Percannella G, Vento M (2014) Graph matching and learning in pattern recognition in the last 10 years. International Journal of Pattern Recognition and Artificial Intelligence 28(01):1450,001

Foltman M, Sanchez-Diaz A (2016) Studying protein–protein interactions in budding yeast using co-immunoprecipitation. In: Yeast Cytokinesis, Springer, pp 239–256, DOI 10.1007/978-1-4939-3145-3_17

Fong RC, Vedaldi A (2017) Interpretable explanations of black boxes by meaningful perturbation. In: Proceedings of the IEEE International Conference on Computer Vision, pp 3429–3437

Fortin S (1996) The graph isomorphism problem

Fortunato S (2010) Community detection in graphs. Physics reports 486(3-5):75–174

Fouss F, Pirotte A, Renders JM, Saerens M (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

Fowkes J, Chanthirasegaran P, Ranca R, Allamanis M, Lapata M, Sutton C (2017) Autofolding for source code summarization. IEEE Transactions on Software Engineering 43(12):1095–1109

Franceschi L, Niepert M, Pontil M, He X (2019) Learning discrete structures for graph neural networks. In: Proceedings of the 36th International Conference on Machine Learning, vol 97, pp 1972–1982

Freeman LA (2003) A refresher in data flow diagramming: an effective aid for analysts. Commun ACM 46(9):147–151, DOI 10.1145/903893.903930

Freeman LC (2000) Visualizing social networks. Journal of social structure 1(1):4

Fröhlich H, Wegner JK, Sieker F, Zell A (2005) Optimal assignment kernels for attributed molecular graphs. In: International Conference on Machine Learning, pp 225–232

Fu R, Zhang Z, Li L (2016) Using lstm and gru neural network methods for traffic flow prediction. In: 2016 31st Youth Academic Annual Conference of Chinese Association of Automation (YAC), IEEE, pp 324–328

Fu Ty, Lee WC, Lei Z (2017) Hin2vec: Explore meta-paths in heterogeneous information networks for representation learning. In: Proceedings of the 2017 ACM on Conference on Information and Knowledge Management, pp 1797–1806

Fu X, Zhang J, Meng Z, King I (2020) Magnn: metapath aggregated graph neural network for heterogeneous graph embedding. In: Proceedings of The Web Conference 2020, pp 2331–2341

Fu Y, Ma Y (2012) Graph embedding for pattern analysis. Springer Science & Business Media

Gabrié M, Manoel A, Luneau C, Barbier J, Macris N, Krzakala F, Zdeborová L (2019) Entropy and mutual information in models of deep neural networks. Journal of Statistical Mechanics: Theory and Experiment 2019(12):124,014

Gao D, Li K, Wang R, Shan S, Chen X (2020a) Multi-modal graph neural network for joint reasoning on vision and scene text. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 12,746–12,756

Gao H, Ji S (2019) Graph u-nets. In: International Conference on Machine Learning, PMLR, pp 2083–2092

Gao H, Wang Z, Ji S (2018a) Large-scale learnable graph convolutional networks. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, ACM, pp 1416–1424

Gao J, Yang Z, Nevatia R (2017) Cascaded boundary regression for temporal action detection. arXiv preprint arXiv:170501180

Gao J, Li X, Xu YE, Sisman B, Dong XL, Yang J (2019a) Efficient knowledge graph accuracy evaluation. arXiv preprint arXiv:190709657

Gao S, Chen C, Xing Z, Ma Y, Song W, Lin SW (2019b) A neural model for method name generation from functional description. In: 2019 IEEE 26th International Conference on Software Analysis, Evolution and Reengineering (SANER), IEEE, pp 414–421

Gao X, Hu W, Qi GJ (2021) Unsupervised learning of topology transformation equivariant representations

Gao Y, Guo X, Zhao L (2018b) Local event forecasting and synthesis using unpaired deep graph translations. In: Proceedings of the 2nd ACM SIGSPATIAL Workshop on Analytics for Local Events and News, pp 1–8

Gao Y, Wu L, Homayoun H, Zhao L (2019c) Dyngraph2seq: Dynamic-graph-to-sequence interpretable learning for health stage prediction in online health forums. In: 2019 IEEE International Conference on Data Mining (ICDM), IEEE, pp 1042–1047

Gao Y, Yang H, Zhang P, Zhou C, Hu Y (2020b) Graph neural architecture search. In: International Joint Conference on Artificial Intelligence, pp 1403–1409

Garcia V, Bruna J (2017) Few-shot learning with graph neural networks. arXiv preprint arXiv:171104043

García-Durán A, Dumančić S, Niepert M (2018) Learning sequence encoders for temporal knowledge graph completion. In: Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing, pp 4816–4821, DOI 10.18653/v1/D18-1516

Garey MR (1979) A guide to the theory of np-completeness. Computers and intractability

Garey MR, Johnson DS (2002) Computers and intractability, vol 29. wh freeman New York

Garg V, Jegelka S, Jaakkola T (2020) Generalization and representational limits of graph neural networks. In: International Conference on Machine Learning, PMLR, pp 3419–3430

Gaudelet T, Day B, Jamasb AR, Soman J, Regep C, Liu G, Hayter JBR, Vickers R, Roberts C, Tang J, Roblin D, Blundell TL, Bronstein MM, Taylor-King JP (2020)

Utilising graph machine learning within drug discovery and development. CoRR abs/2012.05716

Gavin AC, Bösche M, Krause R, et al (2002) Functional organization of the yeast proteome by systematic analysis of protein complexes. Nature 415(6868):141–147

Geisler S, Zügner D, Günnemann S (2020) Reliable graph neural networks via robust aggregation. Advances in Neural Information Processing Systems 33

Geisler S, Zügner D, Bojchevski A, Günnemann S (2021) Attacking Graph Neural Networks at Scale. In: Deep Learning for Graphs at AAAI Conference on Artificial Intelligence

Gema RP, Robles G, Alexander S, Zaidman A, Germán DM, Gonzalez-Barahona JM (2020) How bugs are born: a model to identify how bugs are introduced in software components. Empirical Software Engineering 25(2):1294–1340

Geng X, Li Y, Wang L, Zhang L, Yang Q, Ye J, Liu Y (2019) Spatiotemporal multi-graph convolution network for ride-hailing demand forecasting. In: Proceedings of the AAAI conference on artificial intelligence, vol 33, pp 3656–3663

Ghosal D, Hazarika D, Majumder N, Roy A, Poria S, Mihalcea R (2020) Kingdom: Knowledge-guided domain adaptation for sentiment analysis. arXiv preprint arXiv:200500791

Gidaris S, Singh P, Komodakis N (2018) Unsupervised representation learning by predicting image rotations. In: 6th International Conference on Learning Representations, ICLR 2018, Vancouver, BC, Canada, April 30 - May 3, 2018, Conference Track Proceedings, OpenReview.net

Gilbert EN (1959) Random graphs. The Annals of Mathematical Statistics 30(4):1141–1144

Gilmer J, Schoenholz SS, Riley PF, Vinyals O, Dahl GE (2017) Neural message passing for quantum chemistry. In: Precup D, Teh YW (eds) Proceedings of the 34th International Conference on Machine Learning, ICML 2017, Sydney, NSW, Australia, 6-11 August 2017, PMLR, Proceedings of Machine Learning Research, vol 70, pp 1263–1272

Girvan M, Newman ME (2002) Community structure in social and biological networks. Proceedings of the national academy of sciences 99(12):7821–7826

Gligorijevic V, Renfrew PD, Kosciolek T, Leman JK, Berenberg D, Vatanen T, Chandler C, Taylor BC, Fisk IM, Vlamakis H, et al (2020) Structure-based function prediction using graph convolutional networks. bioRxiv p 786236

Goel R, Kazemi SM, Brubaker M, Poupart P (2020) Diachronic embedding for temporal knowledge graph completion. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 3988–3995

Gold S, Rangarajan A (1996) A graduated assignment algorithm for graph matching. IEEE Transactions on pattern analysis and machine intelligence 18(4):377–388

Goldberg D, Nichols D, Oki BM, Terry D (1992) Using collaborative filtering to weave an information tapestry. Communications of the ACM 35(12):61–70

Gong X, Chang S, Jiang Y, Wang Z (2019) Autogan: Neural architecture search for generative adversarial networks. In: Proceedings of the IEEE/CVF International Conference on Computer Vision, pp 3224–3234

Gong Y, Jiang Z, Feng Y, Hu B, Zhao K, Liu Q, Ou W (2020) Edgerec: Recommender system on edge in mobile taobao. In: Proceedings of the 29th ACM International Conference on Information & Knowledge Management, pp 2477–2484

Goodfellow I, Shlens J, Szegedy C (2015) Explaining and harnessing adversarial examples. In: International Conference on Learning Representations

Goodfellow IJ, Pouget-Abadie J, Mirza M, Bing X, Bengio Y (2014a) Generative adversarial nets. MIT Press

Goodfellow IJ, Pouget-Abadie J, Mirza M, Xu B, Warde-Farley D, Ozair S, Courville A, Bengio Y (2014b) Generative adversarial networks. arXiv preprint arXiv:14062661

Goodwin T, Harabagiu SM (2013) Automatic generation of a qualified medical knowledge graph and its usage for retrieving patient cohorts from electronic medical records. In: 2013 IEEE Seventh International Conference on Semantic Computing, IEEE, pp 363–370

Gori M, Monfardini G, Scarselli F (2005) A new model for learning in graph domains. In: IEEE International Joint Conference on Neural Networks, vol 2, pp 729–734, DOI 10.1109/IJCNN.2005.1555942

Goyal P, Ferrara E (2018) Graph embedding techniques, applications, and performance: A survey. Knowledge-Based Systems 151:78–94

Grattarola D, Alippi C (2020) Graph neural networks in TensorFlow and Keras with Spektral. CoRR abs/2006.12138, 2006.12138

Graves A (2013) Generating sequences with recurrent neural networks. CoRR abs/1308.0850

Graves A, Fernández S, Schmidhuber J (2005) Bidirectional lstm networks for improved phoneme classification and recognition. In: International Conference on Artificial Neural Networks, Springer, pp 799–804

Grbovic M, Cheng H (2018) Real-time personalization using embeddings for search ranking at airbnb. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 311–320

Greff K, Srivastava RK, Koutník J, Steunebrink BR, Schmidhuber J (2016) Lstm: A search space odyssey. IEEE transactions on neural networks and learning systems 28(10):2222–2232

Gremse M, Chang A, Schomburg I, Grote A, Scheer M, Ebeling C, Schomburg D (2010) The brenda tissue ontology (bto): the first all-integrating ontology of all organisms for enzyme sources. Nucleic acids research 39(suppl_1):D507–D513

Grohe M (2017) Descriptive complexity, canonisation, and definable graph structure theory, vol 47. Cambridge University Press

Grohe M, Otto M (2015) Pebble games and linear equations. The Journal of Symbolic Logic pp 797–844

Grover A, Leskovec J (2016) node2vec: Scalable feature learning for networks. In: Proceedings of the 22nd ACM SIGKDD international conference on Knowledge discovery and data mining, pp 855–864

Grover A, Zweig A, Ermon S (2019) Graphite: Iterative generative modeling of graphs. In: International Conference on Machine Learning, pp 2434–2444

Gu J, Cai J, Joty SR, Niu L, Wang G (2018) Look, imagine and match: Improving textual-visual cross-modal retrieval with generative models. In: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pp 7181–7189

Gu S, Lillicrap T, Ghahramani Z, Turner RE, Levine S (2016) Q-prop: Sample-efficient policy gradient with an off-policy critic. arXiv preprint arXiv:161102247

Guan Y, Myers CL, Hess DC, et al (2008) Predicting gene function in a hierarchical context with an ensemble of classifiers. Genome Biology 9(Suppl 1):S3

Gui H, Liu J, Tao F, Jiang M, Norick B, Han J (2016) Large-scale embedding learning in heterogeneous event data. In: 2016 IEEE 16th International Conference on Data Mining (ICDM), IEEE, pp 907–912

Gui T, Zou Y, Zhang Q, Peng M, Fu J, Wei Z, Huang XJ (2019) A lexicon-based graph neural network for chinese ner. In: Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP), pp 1039–1049

Guille A, Hacid H, Favre C, Zighed DA (2013) Information diffusion in online social networks: A survey. ACM Sigmod Record 42(2):17–28

Gulrajani I, Ahmed F, Arjovsky M, Dumoulin V, Courville A (2017) Improved training of wasserstein gans. arXiv preprint arXiv:170400028

Guo G, Ouyang S, He X, Yuan F, Liu X (2019a) Dynamic item block and prediction enhancing block for sequential recommendation. In: Proceedings of the International Joint Conference on Artificial Intelligence, pp 1373–1379

Guo H, Tang R, Ye Y, Li Z, He X (2017) Deepfm: a factorization-machine based neural network for ctr prediction. In: Proceedings of the International Joint Conference on Artificial Intelligence, pp 1725–1731

Guo M, Chou E, Huang DA, Song S, Yeung S, Fei-Fei L (2018a) Neural graph matching networks for fewshot 3d action recognition. In: Proceedings of the European Conference on Computer Vision (ECCV), pp 653–669

Guo S, Lin Y, Feng N, Song C, Wan H (2019b) Attention based spatial-temporal graph convolutional networks for traffic flow forecasting. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 922–929

Guo X, Wu L, Zhao L (2018b) Deep graph translation. arXiv preprint arXiv:180509980

Guo X, Zhao L, Nowzari C, Rafatirad S, Homayoun H, Dinakarrao SMP (2019c) Deep multi-attributed graph translation with node-edge co-evolution. In: 2019 IEEE International Conference on Data Mining (ICDM), IEEE, pp 250–259

Guo Y, Li M, Pu X, et al (2010) Pred_ppi: a server for predicting protein-protein interactions based on sequence data with probability assignment. BMC Research Notes 3(1):145

Guo Z, Zhang Y, Lu W (2019d) Attention guided graph convolutional networks for relation extraction. In: Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics, pp 241–251

Guo Z, Zhang Y, Teng Z, Lu W (2019e) Densely connected graph convolutional networks for graph-to-sequence learning. Transactions of the Association for Computational Linguistics 7:297–312

Gurwitz D (2020) Repurposing current therapeutics for treating covid-19: A vital role of prescription records data mining. Drug development research 81(7):777–781

Gutmann M, Hyvärinen A (2010) Noise-contrastive estimation: A new estimation principle for unnormalized statistical models. In: Proceedings of the International Conference on Artificial Intelligence and Statistics

Ha D, Dai A, Le QV (2017) Hypernetworks. In: Proceedings of the International Conference on Learning Representations (ICLR)

Haghighi A, Ng AY, Manning CD (2005) Robust textual inference via graph matching. In: Proceedings of Human Language Technology Conference and Conference on Empirical Methods in Natural Language Processing, pp 387–394

Haiduc S, Aponte J, Moreno L, Marcus A (2010) On the use of automated text summarization techniques for summarizing source code. In: 2010 17th Working Conference on Reverse Engineering, IEEE, pp 35–44

Haldar R, Wu L, Xiong J, Hockenmaier J (2020) A multi-perspective architecture for semantic code search. arXiv preprint arXiv:200506980

Hamaguchi T, Oiwa H, Shimbo M, Matsumoto Y (2017) Knowledge transfer for out-of-knowledge-base entities: a graph neural network approach. In: Proceedings of the 26th International Joint Conference on Artificial Intelligence, pp 1802–1808

Hamilton W, Ying Z, Leskovec J (2017a) Inductive representation learning on large graphs. In: Advances in Neural Information Processing Systems, vol 30

Hamilton WL (2020) Graph representation learning. Synthesis Lectures on Artificial Intelligence and Machine Learning 14(3):1–159

Hamilton WL, Ying R, Leskovec J (2017b) Inductive representation learning on large graphs. In: Advances in Neural Information Processing Systems, pp 1025–1035

Hamilton WL, Ying R, Leskovec J (2017c) Representation learning on graphs: Methods and applications. IEEE Data Engineering Bulletin 40(3):52–74

Hammond DK, Vandergheynst P, Gribonval R (2011) Wavelets on graphs via spectral graph theory. Applied and Computational Harmonic Analysis 30(2):129–150

Han J, Luo P, Wang X (2019) Deep self-learning from noisy labels. In: 2019 IEEE/CVF International Conference on Computer Vision, ICCV 2019, Seoul, Korea (South), October 27 - November 2, 2019, IEEE, pp 5137–5146, DOI 10.1109/ICCV.2019.00524

Han JDJ, Dupuy D, Bertin N, et al (2005) Effect of sampling on topology predictions of protein-protein interaction networks. Nature Biotechnology 23(7):839–844

Han K, Wang Y, Chen H, Chen X, Guo J, Liu Z, Tang Y, Xiao A, Xu C, Xu Y, et al (2020) A survey on visual transformer. arXiv preprint arXiv:201212556

Han X, Zhu H, Yu P, Wang Z, Yao Y, Liu Z, Sun M (2018) Fewrel: A large-scale supervised few-shot relation classification dataset with state-of-the-art evaluation.

In: Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing, pp 4803–4809
Haque S, LeClair A, Wu L, McMillan C (2020) Improved automatic summarization of subroutines via attention to file context. International Conference on Mining Software Repositories p 300–310
Hart PE, Nilsson NJ, Raphael B (1968) A formal basis for the heuristic determination of minimum cost paths. IEEE transactions on Systems Science and Cybernetics 4(2):100–107
Hashemifar S, Neyshabur B, Khan AA, et al (2018) Predicting protein–protein interactions through sequence-based deep learning. Bioinformatics 34(17):i802–i810
Hasibi R, Michoel T (2020) Predicting gene expression from network topology using graph neural networks. arXiv preprint arXiv:200503961
Hassan AE, Xie T (2010) Software intelligence: the future of mining software engineering data. In: Proceedings of the FSE/SDP workshop on Future of software engineering research, pp 161–166
Hassani K, Khasahmadi AH (2020) Contrastive multi-view representation learning on graphs. In: International Conference on Machine Learning, PMLR, pp 4116–4126
Hastings J, Owen G, Dekker A, Ennis M, Kale N, Muthukrishnan V, Turner S, Swainston N, Mendes P, Steinbeck C (2016) Chebi in 2016: Improved services and an expanding collection of metabolites. Nucleic acids research 44(D1):D1214–D1219
Haveliwala TH (2002) Topic-sensitive pagerank. In: Proceedings of the 11th international conference on World Wide Web, ACM, pp 517–526
He K, Zhang X, Ren S, Sun J (2016a) Deep residual learning for image recognition. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 770–778
He K, Gkioxari G, Dollár P, Girshick R (2017a) Mask r-cnn. In: Proceedings of the IEEE international conference on computer vision, pp 2961–2969
He Q, Chen B, Agarwal D (2016b) Building the linkedin knowledge graph. Engineering linkedin com
He X, Niyogi P (2004) Locality preserving projections. Advances in neural information processing systems 16(16):153–160
He X, Liao L, Zhang H, Nie L, Hu X, Chua TS (2017b) Neural collaborative filtering. In: Proceedings of the 26th international conference on world wide web, pp 173–182
He X, Deng K, Wang X, Li Y, Zhang Y, Wang M (2020) Lightgcn: Simplifying and powering graph convolution network for recommendation. In: Proceedings of the 43rd International ACM SIGIR Conference on Research and Development in Information Retrieval, pp 639–648
He Y, Song Y, Li J, Ji C, Peng J, Peng H (2019) Hetespaceywalk: A heterogeneous spacey random walk for heterogeneous information network embedding. In: Proceedings of the 28th ACM International Conference on Information and Knowledge Management, pp 639–648

Hearst MA, Dumais ST, Osuna E, Platt J, Scholkopf B (1998) Support vector machines. IEEE Intelligent Systems and their applications 13(4):18–28

Heimer RZ, Myrseth KOR, Schoenle RS (2019) Yolo: Mortality beliefs and household finance puzzles. The Journal of Finance 74(6):2957–2996

Helfgott HA, Bajpai J, Dona D (2017) Graph isomorphisms in quasi-polynomial time. arXiv preprint arXiv:171004574

Helgason S (1979) Differential geometry, Lie groups, and symmetric spaces. Academic press

Hellendoorn VJ, Bird C, Barr ET, Allamanis M (2018) Deep learning type inference. In: Proceedings of the 2018 26th ACM joint meeting on european software engineering conference and symposium on the foundations of software engineering, pp 152–162

Hellendoorn VJ, Devanbu PT, Polozov O, Marron M (2019a) Are my invariants valid? a learning approach. arXiv preprint arXiv:190306089

Hellendoorn VJ, Sutton C, Singh R, Maniatis P, Bieber D (2019b) Global relational models of source code. In: International Conference on Learning Representations

Henaff M, Bruna J, LeCun Y (2015) Deep convolutional networks on graph-structured data. arXiv preprint arXiv:150605163

Henderson K, Gallagher B, Eliassi-Rad T, Tong H, Basu S, Akoglu L, Koutra D, Faloutsos C, Li L (2012) Rolx: structural role extraction & mining in large graphs. In: the ACM SIGKDD international conference on Knowledge discovery and data mining, pp 1231–1239

Hensman S (2004) Construction of conceptual graph representation of texts. In: Proceedings of the Student Research Workshop at HLT-NAACL 2004, pp 49–54

Hermann KM, Hill F, Green S, Wang F, Faulkner R, Soyer H, Szepesvari D, Czarnecki WM, Jaderberg M, Teplyashin D, et al (2017) Grounded language learning in a simulated 3d world. arXiv preprint arXiv:170606551

Herzig R, Levi E, Xu H, Gao H, Brosh E, Wang X, Globerson A, Darrell T (2019) Spatio-temporal action graph networks. In: 2019 IEEE/CVF International Conference on Computer Vision Workshop (ICCVW), pp 2347–2356, DOI 10.1109/ICCVW.2019.00288

Hidasi B, Karatzoglou A, Baltrunas L, Tikk D (2015) Session-based recommendations with recurrent neural networks. arXiv preprint arXiv:151106939

Higgins I, Matthey L, Pal A, Burgess C, Glorot X, Botvinick M, Mohamed S, Lerchner A (2017) beta-vae: Learning basic visual concepts with a constrained variational framework. ICLR

Himmelstein DS, Lizee A, Hessler C, Brueggeman L, Chen SL, Hadley D, Green A, Khankhanian P, Baranzini SE (2017) Systematic integration of biomedical knowledge prioritizes drugs for repurposing. Elife 6:e26,726

Hinton GE, Osindero S, Teh YW (2006) A fast learning algorithm for deep belief nets. Neural computation 18(7):1527–1554

Hirsch CN, Hirsch CD, Brohammer AB, et al (2016) Draft assembly of elite inbred line PH207 provides insights into genomic and transcriptome diversity in maize. The Plant Cell 28(11):2700–2714

Hjelm RD, Fedorov A, Lavoie-Marchildon S, Grewal K, Bachman P, Trischler A, Bengio Y (2018) Learning deep representations by mutual information estimation and maximization. arXiv preprint arXiv:180806670

Ho Y, Gruhler A, Heilbut A, et al (2002) Systematic identification of protein complexes in saccharomyces cerevisiae by mass spectrometry. Nature 415(6868):180–183

Hochreiter S, Schmidhuber J (1997) Long short-term memory. Neural computation 9(8):1735–1780

Hoff PD, Raftery AE, Handcock MS (2002) Latent space approaches to social network analysis. Journal of the american Statistical association 97(460):1090–1098

Hoffart J, Suchanek FM, Berberich K, Lewis-Kelham E, De Melo G, Weikum G (2011) Yago2: exploring and querying world knowledge in time, space, context, and many languages. In: Proceedings of the 20th international conference companion on World wide web, pp 229–232

Hoffman MD, Blei DM, Wang C, Paisley J (2013) Stochastic variational inference. The Journal of Machine Learning Research 14(1):1303–1347

Hogan A, Blomqvist E, Cochez M, d'Amato C, de Melo G, Gutierrez C, Gayo JEL, Kirrane S, Neumaier S, Polleres A, et al (2020) Knowledge graphs. arXiv preprint arXiv:200302320

Holland PW, Laskey KB, Leinhardt S (1983) Stochastic blockmodels: First steps. Social networks 5(2):109–137

Holmes R, Murphy GC (2005) Using structural context to recommend source code examples. In: Proceedings. 27th International Conference on Software Engineering, 2005. ICSE 2005., IEEE, pp 117–125

Hong D, Gao L, Yao J, Zhang B, Plaza A, Chanussot J (2020a) Graph convolutional networks for hyperspectral image classification. IEEE Transactions on Geoscience and Remote Sensing pp 1–13, DOI 10.1109/TGRS.2020.3015157

Hong H, Guo H, Lin Y, Yang X, Li Z, Ye J (2020b) An attention-based graph neural network for heterogeneous structural learning. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 4132–4139

Hornik K, Stinchcombe M, White H, et al (1989) Multilayer feedforward networks are universal approximators. Neural Networks 2(5):359–366

Horton T (1992) Object-oriented analysis & design. Englewood Cliffs (New Jersey): Prentice-Hall

Hosseini A, Chen T, Wu W, Sun Y, Sarrafzadeh M (2018) Heteromed: Heterogeneous information network for medical diagnosis. In: Proceedings of the 27th ACM International Conference on Information and Knowledge Management, pp 763–772

Hou S, Ye Y, Song Y, Abdulhayoglu M (2017) Hindroid: An intelligent android malware detection system based on structured heterogeneous information network. In: Proceedings of the 23rd ACM SIGKDD international conference on knowledge discovery and data mining, pp 1507–1515

Houlsby N, Giurgiu A, Jastrzebski S, Morrone B, De Laroussilhe Q, Gesmundo A, Attariyan M, Gelly S (2019) Parameter-efficient transfer learning for nlp. In: International Conference on Machine Learning, PMLR, pp 2790–2799

Hsieh K, Wang Y, Chen L, Zhao Z, Savitz S, Jiang X, Tang J, Kim Y (2020) Drug repurposing for covid-19 using graph neural network with genetic, mechanistic, and epidemiological validation. arXiv preprint arXiv:200910931

Hsu WN, Zhang Y, Glass J (2017) Unsupervised learning of disentangled and interpretable representations from sequential data. In: Proceedings of the 31st International Conference on Neural Information Processing Systems, pp 1876–1887

Hsu WN, Zhang Y, Weiss RJ, Chung YA, Wang Y, Wu Y, Glass J (2019) Disentangling correlated speaker and noise for speech synthesis via data augmentation and adversarial factorization. In: ICASSP 2019-2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), IEEE, pp 5901–5905

Hu B, Shi C, Zhao WX, Yu PS (2018a) Leveraging meta-path based context for top-n recommendation with a neural co-attention model. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 1531–1540

Hu B, Fang Y, Shi C (2019a) Adversarial learning on heterogeneous information networks. In: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 120–129

Hu B, Zhang Z, Shi C, Zhou J, Li X, Qi Y (2019b) Cash-out user detection based on attributed heterogeneous information network with a hierarchical attention mechanism. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 946–953

Hu L, Xu S, Li C, Yang C, Shi C, Duan N, Xie X, Zhou M (2020a) Graph neural news recommendation with unsupervised preference disentanglement. In: Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics, pp 4255–4264

Hu R, Aggarwal CC, Ma S, Huai J (2016) An embedding approach to anomaly detection. In: 2016 IEEE 32nd International Conference on Data Engineering (ICDE), IEEE, pp 385–396

Hu W, Fey M, Zitnik M, Dong Y, Ren H, Liu B, Catasta M, Leskovec J (2020b) Open graph benchmark: Datasets for machine learning on graphs. arXiv preprint arXiv:200500687

Hu W, Liu B, Gomes J, Zitnik M, Liang P, Pande VS, Leskovec J (2020c) Strategies for pre-training graph neural networks. In: 8th International Conference on Learning Representations, ICLR 2020, Addis Ababa, Ethiopia, April 26-30, 2020, OpenReview.net

Hu X, Chiueh Tc, Shin KG (2009) Large-scale malware indexing using function-call graphs. In: Proceedings of the 16th ACM Conference on Computer and Communications Security (CCS), Association for Computing Machinery, New York, NY, USA, p 611–620

Hu X, Li G, Xia X, Lo D, Jin Z (2018b) Deep code comment generation. In: Proceedings of the 26th Conference on Program Comprehension, ACM, pp 200–210

Hu X, Li G, Xia X, Lo D, Lu S, Jin Z (2018c) Summarizing source code with transferred api knowledge. In: Proceedings of the 27th International Joint Conference on Artificial Intelligence, AAAI Press, pp 2269–2275

Hu Z, Fan C, Chen T, Chang KW, Sun Y (2019c) Pre-training graph neural networks for generic structural feature extraction. arXiv preprint arXiv:190513728

Hu Z, Dong Y, Wang K, Chang KW, Sun Y (2020d) Gpt-gnn: Generative pre-training of graph neural networks. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 1857–1867

Hu Z, Dong Y, Wang K, Sun Y (2020e) Heterogeneous graph transformer. In: Proceedings of The Web Conference 2020, pp 2704–2710

Huang D, Chen P, Zeng R, Du Q, Tan M, Gan C (2020a) Location-aware graph convolutional networks for video question answering. In: The Thirty-Fourth AAAI Conference on Artificial Intelligence, AAAI Press, pp 11,021–11,028

Huang G, Liu Z, Van Der Maaten L, Weinberger KQ (2017a) Densely connected convolutional networks. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 4700–4708

Huang H, Wang X, Yi Z, Ma X (2000) A character recognition based on feature extraction. Journal of Chongqing University (Natural Science Edition) 23:66–69

Huang H, Alvarez S, Nusinow DA (2016a) Data on the identification of protein interactors with the evening complex and PCH1 in arabidopsis using tandem affinity purification and mass spectrometry (TAP–MS). Data in Brief 8:56–60

Huang J, Li Z, Li N, Liu S, Li G (2019) Attpool: Towards hierarchical feature representation in graph convolutional networks via attention mechanism. In: IEEE/CVF International Conference on Computer Vision, pp 6479–6488

Huang JT, Sharma A, Sun S, Xia L, Zhang D, Pronin P, Padmanabhan J, Ottaviano G, Yang L (2020b) Embedding-based retrieval in facebook search. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 2553–2561

Huang L, Ma D, Li S, Zhang X, Houfeng W (2019a) Text level graph neural network for text classification. In: Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP), pp 3435–3441

Huang Q, Yamada M, Tian Y, Singh D, Yin D, Chang Y (2020c) Graphlime: Local interpretable model explanations for graph neural networks. arXiv preprint arXiv:200106216

Huang S, Kang Z, Tsang IW, Xu Z (2019b) Auto-weighted multi-view clustering via kernelized graph learning. Pattern Recognition 88:174–184

Huang W, Zhang T, Rong Y, Huang J (2018) Adaptive sampling towards fast graph representation learning. Advances in Neural Information Processing Systems 31:4558–4567

Huang X, Alzantot M, Srivastava M (2019c) Neuroninspect: Detecting backdoors in neural networks via output explanations. arXiv preprint arXiv:191107399

Huang X, Song Q, Li Y, Hu X (2019d) Graph recurrent networks with attributed random walks. In: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 732–740

Huang Y, Wang W, Wang L (2017b) Instance-aware image and sentence matching with selective multimodal lstm. In: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pp 2310–2318

Huang Z, Mamoulis N (2017) Heterogeneous information network embedding for meta path based proximity. arXiv preprint arXiv:170105291

Huang Z, Xu W, Yu K (2015) Bidirectional lstm-crf models for sequence tagging. arXiv preprint arXiv:150801991

Huang Z, Zheng Y, Cheng R, Sun Y, Mamoulis N, Li X (2016b) Meta structure: Computing relevance in large heterogeneous information networks. In: Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, pp 1595–1604

Hurle M, Yang L, Xie Q, Rajpal D, Sanseau P, Agarwal P (2013) Computational drug repositioning: from data to therapeutics. Clinical Pharmacology & Therapeutics 93(4):335–341

Hussein R, Yang D, Cudré-Mauroux P (2018) Are meta-paths necessary? revisiting heterogeneous graph embeddings. In: Proceedings of the 27th ACM International Conference on Information and Knowledge Management, pp 437–446

Hutchins WJ (1995) Machine translation: A brief history. In: Concise history of the language sciences, Elsevier, pp 431–445

Ioannidis VN, Marques AG, Giannakis GB (2019) Graph neural networks for predicting protein functions. In: 2019 IEEE 8th International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP), pp 221–225, DOI 10.1109/CAMSAP45676.2019.9022646

Ioannidis VN, Song X, Manchanda S, Li M, Pan X, Zheng D, Ning X, Zeng X, Karypis G (2020) Drkg - drug repurposing knowledge graph for covid-19. https://github.com/gnn4dr/DRKG/

Ioffe S, Szegedy C (2015) Batch normalization: Accelerating deep network training by reducing internal covariate shift. In: International Conference on Machine Learning, pp 448–456

Irving G, Szegedy C, Alemi AA, Eén N, Chollet F, Urban J (2016) DeepMath - deep sequence models for premise selection. Advances in neural information processing systems 29:2235–2243

Irwin JJ, Sterling T, Mysinger MM, Bolstad ES, Coleman RG (2012) Zinc: a free tool to discover chemistry for biology. Journal of Chemical Information and Modeling 52(7):1757–1768

Issa NT, Stathias V, Schürer S, Dakshanamurthy S (2020) Machine and deep learning approaches for cancer drug repurposing. In: Seminars in cancer biology, Elsevier

Ito T, Chiba T, Ozawa R, et al (2001) A comprehensive two-hybrid analysis to explore the yeast protein interactome. Proceedings of the National Academy of Sciences of the United States of America 98(8):4569–4574

Iyer S, Konstas I, Cheung A, Zettlemoyer L (2016) Summarizing source code using a neural attention model. In: Proceedings of the 54th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers), pp 2073–2083

Jaakkola T, Sontag D, Globerson A, Meila M (2010) Learning bayesian network structure using lp relaxations. In: Proceedings of the Thirteenth International Conference on Artificial Intelligence and Statistics, JMLR Workshop and Conference Proceedings, pp 358–365

Jabri A, Owens A, Efros AA (2020) Space-time correspondence as a contrastive random walk. arXiv preprint arXiv:200614613

Jacob Y, Denoyer L, Gallinari P (2014) Learning latent representations of nodes for classifying in heterogeneous social networks. In: Proceedings of the 7th ACM international conference on Web search and data mining, pp 373–382

Jain A, Zamir AR, Savarese S, Saxena A (2016a) Structural-RNN: Deep learning on spatio-temporal graphs. In: IEEE Conference on Computer Vision and Pattern Recognition, pp 5308–5317

Jain A, Zamir AR, Savarese S, Saxena A (2016b) Structural-rnn: Deep learning on spatio-temporal graphs. In: Proceedings of the ieee conference on computer vision and pattern recognition, pp 5308–5317

Jaitly N, Hinton G (2011) Learning a better representation of speech soundwaves using restricted boltzmann machines. In: 2011 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), IEEE, pp 5884–5887

Jang E, Gu S, Poole B (2017) Categorical reparameterization with gumbel-softmax. In: 5th International Conference on Learning Representations

Jang S, Moon SE, Lee JS (2019) Brain signal classification via learning connectivity structure. arXiv preprint arXiv:190511678

Jassal B, Matthews L, Viteri G, Gong C, Lorente P, Fabregat A, Sidiropoulos K, Cook J, Gillespie M, Haw R, et al (2020) The reactome pathway knowledgebase. Nucleic acids research 48(D1):D498–D503

Jean S, Cho K, Memisevic R, Bengio Y (2014) On using very large target vocabulary for neural machine translation. arXiv preprint arXiv:14122007

Jebara T, Wang J, Chang SF (2009) Graph construction and b-matching for semi-supervised learning. In: Proceedings of the 26th annual international conference on machine learning, pp 441–448

Jeh G, Widom J (2002) Simrank: a measure of structural-context similarity. In: Proceedings of the eighth ACM SIGKDD international conference on Knowledge discovery and data mining, ACM, pp 538–543

Jeh G, Widom J (2003) Scaling personalized web search. In: the International Conference on World Wide Web, pp 271–279

Jenatton R, Le Roux N, Bordes A, Obozinski G (2012) A latent factor model for highly multi-relational data. In: Advances in Neural Information Processing Systems 25 (NIPS 2012), pp 3176–3184

Ji G, He S, Xu L, Liu K, Zhao J (2015) Knowledge graph embedding via dynamic mapping matrix. In: Proceedings of the 53rd annual meeting of the association for computational linguistics and the 7th international joint conference on natural language processing, pp 687–696

Ji G, Liu K, He S, Zhao J (2016) Knowledge graph completion with adaptive sparse transfer matrix. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 30

Jia J, Wang B, Cao X, Gong NZ (2020) Certified robustness of community detection against adversarial structural perturbation via randomized smoothing. In: The Web Conference, pp 2718–2724

Jia X, De Brabandere B, Tuytelaars T, Gool LV (2016) Dynamic filter networks. Advances in neural information processing systems 29:667–675

Jiang B, Sun P, Tang J, Luo B (2019a) GLMNet: Graph learning-matching networks for feature matching. arXiv preprint arXiv:191107681

Jiang B, Zhang Z, Lin D, Tang J, Luo B (2019b) Semi-supervised learning with graph learning-convolutional networks. In: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pp 11,313–11,320

Jiang C, Coenen F, Sanderson R, Zito M (2010) Text classification using graph mining-based feature extraction. In: Research and Development in Intelligent Systems XXVI, Springer, pp 21–34

Jiang S, Balaprakash P (2020) Graph neural network architecture search for molecular property prediction. arXiv preprint arXiv:200812187

Jiang S, McMillan C, Santelices R (2016) Do programmers do change impact analysis in debugging? Empirical Software Engineering pp 1–39

Jiang S, Armaly A, McMillan C (2017) Automatically generating commit messages from diffs using neural machine translation. In: Proceedings of the 32nd IEEE/ACM International Conference on Automated Software Engineering, IEEE Press, pp 135–146

Jiménez J, Doerr S, Martínez-Rosell G, et al (2017) DeepSite: protein-binding site predictor using 3d-convolutional neural networks. Bioinformatics 33(19):3036–3042

Jin H, Zhang X (2019) Latent Adversarial Training of Graph Convolution Networks. In: ICML 2019 Workshop: Learning and Reasoning with Graph-Structured Representations

Jin H, Song Q, Hu X (2019a) Auto-keras: An efficient neural architecture search system. In: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 1946–1956

Jin H, Shi Z, Peruri VJSA, Zhang X (2020a) Certified robustness of graph convolution networks for graph classification under topological attacks. Advances in Neural Information Processing Systems 33

Jin J, Qin J, Fang Y, Du K, Zhang W, Yu Y, Zhang Z, Smola AJ (2020b) An efficient neighborhood-based interaction model for recommendation on heterogeneous graph. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 75–84

Jin L, Gildea D (2020) Generalized shortest-paths encoders for amr-to-text generation. In: Proceedings of the 28th International Conference on Computational Linguistics, pp 2004–2013

Jin M, Chang H, Zhu W, Sojoudi S (2019b) Power up! robust graph convolutional network against evasion attacks based on graph powering. CoRR abs/1905.10029, 1905.10029

Jin W, Barzilay R, Jaakkola T (2018a) Junction tree variational autoencoder for molecular graph generation. In: Proceedings of the 35th International Conference on Machine Learning, pp 2323–2332

Jin W, Barzilay R, Jaakkola TS (2018b) Junction tree variational autoencoder for molecular graph generation. In: International Conference on Machine Learning, pp 2328–2337

Jin W, Yang K, Barzilay R, Jaakkola T (2018c) Learning multimodal graph-to-graph translation for molecular optimization. arXiv preprint arXiv:181201070

Jin W, Barzilay R, Jaakkola T (2020c) Composing molecules with multiple property constraints. arXiv preprint arXiv:200203244

Jin W, Derr T, Liu H, Wang Y, Wang S, Liu Z, Tang J (2020d) Self-supervised learning on graphs: Deep insights and new direction. arXiv preprint arXiv:200610141

Jin W, Ma Y, Liu X, Tang X, Wang S, Tang J (2020e) Graph structure learning for robust graph neural networks. In: The 26th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, pp 66–74

Jin W, Derr T, Wang Y, Ma Y, Liu Z, Tang J (2021) Node similarity preserving graph convolutional networks. In: Proceedings of the 14th ACM International Conference on Web Search and Data Mining, pp 148–156

Johansson FD, Dubhashi D (2015) Learning with similarity functions on graphs using matchings of geometric embeddings. In: ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, pp 467–476

Johnson D, Larochelle H, Tarlow D (2020) Learning graph structure with a finite-state automaton layer. In: Larochelle H, Ranzato M, Hadsell R, Balcan MF, Lin H (eds) Advances in Neural Information Processing Systems, Curran Associates, Inc., vol 33, pp 3082–3093

Jonas E (2019) Deep imitation learning for molecular inverse problems. Advances in Neural Information Processing Systems 32:4990–5000

Jurafsky D (2000) Speech & language processing. Pearson Education India

Kagdi H, Collard ML, Maletic JI (2007) A survey and taxonomy of approaches for mining software repositories in the context of software evolution. Journal of software maintenance and evolution: Research and practice 19(2):77–131

Kahneman D (2011) Thinking, fast and slow. Macmillan

Kalchbrenner N, Grefenstette E, Blunsom P (2014) A convolutional neural network for modelling sentences. In: Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics, Association for Computational Linguistics, pp 655–665, DOI 10.3115/v1/P14-1062

Kalliamvakou E, Gousios G, Blincoe K, Singer L, German DM, Damian D (2014) The promises and perils of mining github. In: Proceedings of the 11th working conference on mining software repositories, pp 92–101

Kalofolias V (2016) How to learn a graph from smooth signals. In: Artificial Intelligence and Statistics, PMLR, pp 920–929

Kalofolias V, Perraudin N (2019) Large scale graph learning from smooth signals. In: 7th International Conference on Learning Representations

Kaluza MCDP, Amizadeh S, Yu R (2018) A neural framework for learning dag to dag translation. In: NeurIPS'2018 Workshop

Kampffmeyer M, Chen Y, Liang X, Wang H, Zhang Y, Xing EP (2019) Rethinking knowledge graph propagation for zero-shot learning. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 11,487–11,496

Kandasamy K, Neiswanger W, Schneider J, Poczos B, Xing E (2018) Neural architecture search with bayesian optimisation and optimal transport. In: Advances in Neural Information Processing Systems

Kanehisa M, Goto S (2000) Kegg: kyoto encyclopedia of genes and genomes. Nucleic acids research 28(1):27–30

Kanehisa M, Araki M, Goto S, Hattori M, Hirakawa M, Itoh M, Katayama T, Kawashima S, Okuda S, Tokimatsu T, et al (2007) Kegg for linking genomes to life and the environment. Nucleic acids research 36(suppl_1):D480–D484

Kang U, Tong H, Sun J (2012) Fast random walk graph kernel. In: SIAM International Conference on Data Mining, pp 828–838

Kang WC, McAuley J (2018) Self-attentive sequential recommendation. In: 2018 IEEE International Conference on Data Mining (ICDM), IEEE, pp 197–206

Kang Z, Pan H, Hoi SC, Xu Z (2019) Robust graph learning from noisy data. IEEE transactions on cybernetics 50(5):1833–1843

Karampatsis RM, Sutton C (2020) How often do single-statement bugs occur? the ManySStuBs4J dataset. In: Proceedings of the 17th International Conference on Mining Software Repositories, pp 573–577

Karamshuk D, Noulas A, Scellato S, Nicosia V, Mascolo C (2013) Geo-spotting: mining online location-based services for optimal retail store placement. In: Proceedings of the 19th ACM SIGKDD international conference on Knowledge discovery and data mining, pp 793–801

Karita S, Watanabe S, Iwata T, Ogawa A, Delcroix M (2018) Semi-supervised end-to-end speech recognition. In: Interspeech, pp 2–6

Karpathy A, Fei-Fei L (2015) Deep visual-semantic alignments for generating image descriptions. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 3128–3137

Karypis G, Kumar V (1995) Multilevel graph partitioning schemes. In: ICPP (3), pp 113–122

Karypis G, Kumar V (1998) A fast and high quality multilevel scheme for partitioning irregular graphs. SIAM Journal on scientific Computing 20(1):359–392

Katharopoulos A, Vyas A, Pappas N, Fleuret F (2020) Transformers are rnns: Fast autoregressive transformers with linear attention. In: International Conference on Machine Learning, PMLR, pp 5156–5165

Katz L (1953) A new status index derived from sociometric analysis. Psychometrika 18(1):39–43

Kawahara J, Brown CJ, Miller SP, Booth BG, Chau V, Grunau RE, Zwicker JG, Hamarneh G (2017) Brainnetcnn: Convolutional neural networks for brain networks; towards predicting neurodevelopment. NeuroImage 146:1038–1049

Kazemi E, Hassani SH, Grossglauser M (2015) Growing a graph matching from a handful of seeds. Proc VLDB Endow 8(10):1010–1021

Kazemi SM, Poole D (2018) Simple embedding for link prediction in knowledge graphs. In: Neural Information Processing Systems, p 4289–4300

Kazemi SM, Goel R, Eghbali S, Ramanan J, Sahota J, Thakur S, Wu S, Smyth C, Poupart P, Brubaker M (2019) Time2vec: Learning a vector representation of time. arXiv preprint arXiv:190705321

Kazemi SM, Goel R, Jain K, Kobyzev I, Sethi A, Forsyth P, Poupart P (2020) Representation learning for dynamic graphs: A survey. Journal of Machine Learning Research 21(70):1–73

Kazi A, Cosmo L, Navab N, Bronstein M (2020) Differentiable graph module (dgm) graph convolutional networks. arXiv preprint arXiv:200204999

Kearnes S, McCloskey K, Berndl M, Pande V, Riley P (2016) Molecular graph convolutions: moving beyond fingerprints. Journal of computer-aided molecular design 30(8):595–608

Keriven N, Peyré G (2019) Universal invariant and equivariant graph neural networks. In: Advances in Neural Information Processing Systems, pp 7090–7099

Kersting K, Kriege NM, Morris C, Mutzel P, Neumann M (2016) Benchmark data sets for graph kernels

Khezerlou AV, Zhou X, Li L, Shafiq Z, Liu AX, Zhang F (2017) A traffic flow approach to early detection of gathering events: Comprehensive results. ACM Transactions on Intelligent Systems and Technology (TIST) 8(6):1–24

Khezerlou AV, Zhou X, Tong L, Li Y, Luo J (2021) Forecasting gathering events through trajectory destination prediction: A dynamic hybrid model. IEEE Transactions on Knowledge and Data Engineering 33(3):991–1004, DOI 10.1109/TKDE.2019.2937082

Khrulkov V, Novikov A, Oseledets I (2018) Expressive power of recurrent neural networks. In: International Conference on Learning Representations

Kiefer S, Schweitzer P, Selman E (2015) Graphs identified by logics with counting. In: International Symposium on Mathematical Foundations of Computer Science, pp 319–330

Kilicoglu H, Shin D, Fiszman M, Rosemblat G, Rindflesch TC (2012) Semmeddb: a pubmed-scale repository of biomedical semantic predications. Bioinformatics 28(23):3158–3160

Kim B, Koyejo O, Khanna R, et al (2016) Examples are not enough, learn to criticize! criticism for interpretability. In: NIPS, pp 2280–2288

Kim D, Oh A (2021) How to find your friendly neighborhood: Graph attention design with self-supervision. In: International Conference on Learning Representations

Kim J, Kim T, Kim S, Yoo CD (2019) Edge-labeling graph neural network for few-shot learning. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 11–20

Kingma DP, Welling M (2013) Auto-encoding variational bayes. arXiv preprint arXiv:13126114

Kingma DP, Welling M (2014) Auto-encoding variational bayes. In: 2nd International Conference on Learning Representations

Kingma DP, Rezende DJ, Mohamed S, Welling M (2014) Semi-supervised learning with deep generative models. In: Proceedings of the 27th International Conference on Neural Information Processing Systems-Volume 2, pp 3581–3589

Kingsbury PR, Palmer M (2002) From treebank to propbank. In: LREC, Citeseer, pp 1989–1993

Kipf T, Fetaya E, Wang KC, Welling M, Zemel R (2018) Neural relational inference for interacting systems. In: International Conference on Machine Learning, pp 2688–2697

Kipf TN, Welling M (2016) Variational graph auto-encoders. arXiv preprint arXiv:161107308

Kipf TN, Welling M (2017a) Semi-supervised classification with graph convolutional networks. In: International Conference on Learning Representations

Kipf TN, Welling M (2017b) Semi-supervised classification with graph convolutional networks. In: 5th International Conference on Learning Representations, ICLR 2017, Toulon, France, April 24-26, 2017, Conference Track Proceedings, OpenReview.net

Kireev DB (1995) ChemNet: A novel neural network based method for graph/property mapping. Journal of Chemical Information and Computer Sciences 35(2):175–180

Klicpera J, Bojchevski A, Günnemann S (2019a) Predict then propagate: Graph neural networks meet personalized pagerank. In: International Conference on Learning Representations

Klicpera J, Weißenberger S, Günnemann S (2019b) Diffusion improves graph learning. In: Advances in Neural Information Processing Systems, pp 13,333–13,345

Klicpera J, Groß J, Günnemann S (2020) Directional message passing for molecular graphs. In: International Conference on Learning Representations

Ko AJ, Myers BA, Coblenz MJ, Aung HH (2006) An exploratory study of how developers seek, relate, and collect relevant information during software maintenance tasks. IEEE Transactions on software engineering 32(12):971–987

Koch O, Kriege NM, Humbeck L (2019) Chemical similarity and substructure searches. In: Encyclopedia of Bioinformatics and Computational Biology, Academic Press, Oxford, pp 640–649

Kohavi R, John GH (1995) Automatic parameter selection by minimizing estimated error. In: Machine Learning Proceedings 1995, Elsevier, pp 304–312

Koivisto M, Sood K (2004) Exact bayesian structure discovery in bayesian networks. The Journal of Machine Learning Research 5:549–573

Koncel-Kedziorski R, Bekal D, Luan Y, Lapata M, Hajishirzi H (2019) Text generation from knowledge graphs with graph transformers. In: 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), pp 2284–2293

Koo DCE, Bonneau R (2018) Towards region-specific propagation of protein functions. Bioinformatics 35(10):1737–1744

Kool W, Van Hoof H, Welling M (2019) Stochastic beams and where to find them: The gumbel-top-k trick for sampling sequences without replacement. In: International Conference on Machine Learning, PMLR, pp 3499–3508

Koren Y (2008) Factorization meets the neighborhood: a multifaceted collaborative filtering model. In: Proceedings of the 14th ACM SIGKDD international conference on Knowledge discovery and data mining, ACM, pp 426–434

Koren Y (2009) Collaborative filtering with temporal dynamics. In: Proceedings of the 15th ACM SIGKDD international conference on Knowledge discovery and data mining, pp 447–456

Koren Y, Bell R, Volinsky C (2009) Matrix factorization techniques for recommender systems. Computer 42(8):30–37

Korte BH, Vygen J, Korte B, Vygen J (2011) Combinatorial optimization, vol 1. Springer

Kosugi S, Yamasaki T (2020) Unpaired image enhancement featuring reinforcement-learning-controlled image editing software. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 11,296–11,303

Kovács IA, Luck K, Spirohn K, et al (2019) Network-based prediction of protein interactions. Nature Communications 10(1)

Kremenek T, Ng AY, Engler DR (2007) A factor graph model for software bug finding. In: IJCAI, pp 2510–2516

Kriege N, Mutzel P (2012) Subgraph matching kernels for attributed graphs. In: Proceedings of the 29th International Coference on International Conference on Machine Learning, Omnipress, Madison, WI, USA, ICML'12, p 291–298

Kriege NM, P-L G, Wilson RC (2016) On valid optimal assignment kernels and applications to graph classification. In: Advances in Neural Information Processing Systems, pp 1615–1623

Kriege NM, Johansson FD, Morris C (2020) A survey on graph kernels. Applied Network Science 5(1):6

Krishnan A (2018) Making search easier: How amazon's product graph is helping customers find products more easily. ed Amazon Blog

Krishnapuram R, Medasani S, Jung SH, Choi YS, Balasubramaniam R (2004) Content-based image retrieval based on a fuzzy approach. IEEE transactions on knowledge and data engineering 16(10):1185–1199

Krizhevsky A, Sutskever I, Hinton GE (2012) Imagenet classification with deep convolutional neural networks. Advances in neural information processing systems 25:1097–1105

Kuhn M, Letunic I, Jensen LJ, Bork P (2016) The sider database of drugs and side effects. Nucleic acids research 44(D1):D1075–D1079

Kulmanov M, Hoehndorf R (2019) DeepGOPlus: improved protein function prediction from sequence. Bioinformatics

Kumar S, Spezzano F, Subrahmanian V, Faloutsos C (2016) Edge weight prediction in weighted signed networks. In: 2016 IEEE 16th International Conference on Data Mining (ICDM), IEEE, pp 221–230

Kumar S, Ying J, de Miranda Cardoso JV, Palomar D (2019a) Structured graph learning via laplacian spectral constraints. In: Advances in Neural Information Processing Systems, pp 11,651–11,663

Kumar S, Zhang X, Leskovec J (2019b) Predicting dynamic embedding trajectory in temporal interaction networks. In: ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 1269–1278

Kumar S, Ying J, de Miranda Cardoso JV, Palomar DP (2020) A unified framework for structured graph learning via spectral constraints. Journal of Machine Learning Research 21(22):1–60

Kusner MJ, Paige B, Hernández-Lobato JM (2017) Grammar variational autoencoder. In: International Conference on Machine Learning, pp 1945–1954

Lacroix T, Obozinski G, Usunier N (2020) Tensor decompositions for temporal knowledge base completion. In: International Conference on Learning Representations

Lake B, Tenenbaum J (2010) Discovering structure by learning sparse graphs. In: Proceedings of the Annual Meeting of the Cognitive Science Society, vol 32

Lamb LC, Garcez A, Gori M, Prates M, Avelar P, Vardi M (2020) Graph neural networks meet neural-symbolic computing: A survey and perspective. In: Proceedings of IJCAI-PRICAI 2020

Lan Z, Chen M, Goodman S, Gimpel K, Sharma P, Soricut R (2020) ALBERT: A lite BERT for self-supervised learning of language representations. In: 8th International Conference on Learning Representations, ICLR 2020, Addis Ababa, Ethiopia, April 26-30, 2020, OpenReview.net

Lanczos C (1950) An iteration method for the solution of the eigenvalue problem of linear differential and integral operators. United States Governm. Press Office Los Angeles, CA

Landrieu L, Simonovsky M (2018) Large-scale point cloud semantic segmentation with superpoint graphs. In: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pp 4558–4567

Latif S, Rana R, Khalifa S, Jurdak R, Epps J (2019) Direct modelling of speech emotion from raw speech. In: Proceedings of the 20th Annual Conference of the International Speech Communication Association (INTERSPEECH 2019), International Speech Communication Association (ISCA), pp 3920–3924

Lawler EL (1963) The quadratic assignment problem. Management science 9(4):586–599

Le Cun Y, Boser B, Denker JS, Henderson D, Howard RE, Hubbard W, Jackel LD (1989) Handwritten digit recognition with a back-propagation network. In: Neural Information Processing Systems, pp 396–404

Le-Khac PH, Healy G, Smeaton AF (2020) Contrastive representation learning: a framework and review. IEEE Access 8:1–28

Leblay J, Chekol MW (2018) Deriving validity time in knowledge graph. In: Companion Proceedings of the The Web Conference 2018, pp 1771–1776

LeClair A, McMillan C (2019) Recommendations for datasets for source code summarization. In: Proceedings of the 2019 Conference of the North American Chap-

ter of the Association for Computational Linguistics: Human Language Technologies, Volume 1 (Long and Short Papers), pp 3931–3937

LeClair A, Jiang S, McMillan C (2019) A neural model for generating natural language summaries of program subroutines. In: Proceedings of the 41st International Conference on Software Engineering, IEEE Press, pp 795–806

LeClair A, Haque S, Wu L, McMillan C (2020) Improved code summarization via a graph neural network. In: 28th ACM/IEEE International Conference on Program Comprehension (ICPC'20)

LeCun Y, Boser B, Denker JS, Henderson D, Howard RE, Hubbard W, Jackel LD (1989) Backpropagation applied to handwritten zip code recognition. Neural computation 1(4):541–551

Lecuyer M, Atlidakis V, Geambasu R, Hsu D, Jana S (2019) Certified robustness to adversarial examples with differential privacy. In: IEEE Symposium on Security and Privacy, DOI 10.1109/SP.2019.00044

Lee G, Yuan Y, Chang S, Jaakkola TS (2019a) Tight certificates of adversarial robustness for randomly smoothed classifiers. In: Wallach HM, Larochelle H, Beygelzimer A, d'Alché-Buc F, Fox EB, Garnett R (eds) Advances in Neural Information Processing Systems 32: Annual Conference on Neural Information Processing Systems 2019, NeurIPS 2019, December 8-14, 2019, Vancouver, BC, Canada, pp 4911–4922

Lee J, Lee I, Kang J (2019b) Self-attention graph pooling. In: International Conference on Machine Learning, PMLR, pp 3734–3743

Lee JB, Rossi RA, Kim S, Ahmed NK, Koh E (2019c) Attention models in graphs: A survey. ACM Transactions on Knowledge Discovery from Data (TKDD) 13(6):1–25

Lee JB, Rossi RA, Kong X, Kim S, Koh E, Rao A (2019d) Graph convolutional networks with motif-based attention. In: 28th ACM International Conference on Information, pp 499–508

Lee S, Park C, Yu H (2019e) Bhin2vec: Balancing the type of relation in heterogeneous information network. In: Proceedings of the 28th ACM International Conference on Information and Knowledge Management, pp 619–628

Lei T, Jin W, Barzilay R, Jaakkola T (2017a) Deriving neural architectures from sequence and graph kernels. In: Proceedings of the 34th International Conference on Machine Learning-Volume 70, pp 2024–2033

Lei T, Zhang Y, Wang SI, Dai H, Artzi Y (2017b) Simple recurrent units for highly parallelizable recurrence. arXiv preprint arXiv:170902755

Leordeanu M, Hebert M (2005) A spectral technique for correspondence problems using pairwise constraints. In: IEEE International Conference on Computer Vision, pp 1482–1489

Leskovec J, Grobelnik M, Milic-Frayling N (2004) Learning sub-structures of document semantic graphs for document summarization. In: LinkKDD Workshop, pp 133–138

Leskovec J, Chakrabarti D, Kleinberg J, Faloutsos C, Ghahramani Z (2010) Kronecker graphs: an approach to modeling networks. Journal of Machine Learning Research 11(2)

Letovsky S (1987) Cognitive processes in program comprehension. Journal of Systems and software 7(4):325–339

Levi FW (1942) Finite geometrical systems: six public lectues delivered in February, 1940, at the University of Calcutta. University of Calcutta

Levie R, Monti F, Bresson X, Bronstein MM (2019) Cayleynets: Graph convolutional neural networks with complex rational spectral filters. IEEE Trans Signal Process 67(1):97–109

Levin E, Pieraccini R, Eckert W (2000) A stochastic model of human-machine interaction for learning dialog strategies. IEEE Transactions on speech and audio processing 8(1):11–23

Levy O, Goldberg Y (2014) Neural word embedding as implicit matrix factorization. In: Advances in neural information processing systems, pp 2177–2185

Lewis HR, et al (1983) Michael r. garey, david s. johnson, computers and intractability. a guide to the theory of np-completeness. Journal of Symbolic Logic 48(2):498–500

Lewis M, Liu Y, Goyal N, Ghazvininejad M, Mohamed A, Levy O, Stoyanov V, Zettlemoyer L (2020) BART: Denoising sequence-to-sequence pre-training for natural language generation, translation, and comprehension. In: Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics, p 7871, DOI 10.18653/v1/2020.acl-main.703

Li A, Qin Z, Liu R, Yang Y, Li D (2019a) Spam review detection with graph convolutional networks. In: Proceedings of the 28th ACM International Conference on Information and Knowledge Management, pp 2703–2711

Li C, Ma J, Guo X, Mei Q (2017a) Deepcas: An end-to-end predictor of information cascades. In: Proceedings of the 26th international conference on World Wide Web, pp 577–586

Li C, Liu Z, Wu M, Xu Y, Zhao H, Huang P, Kang G, Chen Q, Li W, Lee DL (2019b) Multi-interest network with dynamic routing for recommendation at tmall. In: Proceedings of the 28th ACM International Conference on Information and Knowledge Management, pp 2615–2623

Li F, Gan C, Liu X, Bian Y, Long X, Li Y, Li Z, Zhou J, Wen S (2017b) Temporal modeling approaches for large-scale youtube-8m video understanding. arXiv preprint arXiv:170704555

Li G, Muller M, Thabet A, Ghanem B (2019c) Deepgcns: Can gcns go as deep as cnns? In: Proceedings of the IEEE/CVF International Conference on Computer Vision, pp 9267–9276

Li J, Wang Y, Lyu MR, King I (2018a) Code completion with neural attention and pointer networks. In: Proceedings of the 27th International Joint Conference on Artificial Intelligence, pp 4159–25

Li J, Yang F, Tomizuka M, Choi C (2020a) Evolvegraph: Multi-agent trajectory prediction with dynamic relational reasoning. Advances in Neural Information Processing Systems 33

Li L, Feng H, Zhuang W, Meng N, Ryder B (2017c) Cclearner: A deep learning-based clone detection approach. In: 2017 IEEE International Conference on Software Maintenance and Evolution (ICSME), IEEE, pp 249–260

Li L, Tang S, Deng L, Zhang Y, Tian Q (2017d) Image caption with global-local attention. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 31

Li L, Gan Z, Cheng Y, Liu J (2019d) Relation-aware graph attention network for visual question answering. In: Proceedings of the IEEE/CVF International Conference on Computer Vision, pp 10,313–10,322

Li L, Wang P, Yan J, Wang Y, Li S, Jiang J, Sun Z, Tang B, Chang TH, Wang S, et al (2020b) Real-world data medical knowledge graph: construction and applications. Artificial intelligence in medicine 103:101,817

Li L, Zhang Y, Chen L (2020c) Generate neural template explanations for recommendation. In: Proceedings of the 29th ACM International Conference on Information & Knowledge Management, pp 755–764

Li M, Chen S, Chen X, Zhang Y, Wang Y, Tian Q (2019e) Actional-structural graph convolutional networks for skeleton-based action recognition. In: IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 3595–3603

Li N, Yang Z, Luo L, Wang L, Zhang Y, Lin H, Wang J (2020d) Kghc: a knowledge graph for hepatocellular carcinoma. BMC Medical Informatics and Decision Making 20(3):1–11

Li P, Chien I, Milenkovic O (2019f) Optimizing generalized pagerank methods for seed-expansion community detection. In: Advances in Neural Information Processing Systems, pp 11,705–11,716

Li P, Wang Y, Wang H, Leskovec J (2020e) Distance encoding: Design provably more powerful neural networks for graph representation learning. Advances in Neural Information Processing Systems 33

Li Q, Zheng Y, Xie X, Chen Y, Liu W, Ma WY (2008) Mining user similarity based on location history. In: Proceedings of the 16th ACM SIGSPATIAL international conference on Advances in geographic information systems, pp 1–10

Li Q, Han Z, Wu XM (2018b) Deeper insights into graph convolutional networks for semi-supervised learning. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 32

Li R, Tapaswi M, Liao R, Jia J, Urtasun R, Fidler S (2017e) Situation recognition with graph neural networks. In: Proceedings of the IEEE International Conference on Computer Vision, pp 4173–4182

Li R, Wang S, Zhu F, Huang J (2018c) Adaptive graph convolutional neural networks. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 32

Li S, Wu L, Feng S, Xu F, Xu F, Zhong S (2020f) Graph-to-tree neural networks for learning structured input-output translation with applications to semantic parsing and math word problem. In: Findings of the Association for Computational Linguistics: EMNLP 2020, Association for Computational Linguistics, Online, pp 2841–2852, DOI 10.18653/v1/2020.findings-emnlp.255, URL https://www.aclweb.org/anthology/2020.findings-emnlp.255

Li X, Cheng Y, Cong G, Chen L (2017f) Discovering pollution sources and propagation patterns in urban area. In: Proceedings of the 23rd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, pp 1863–1872

Li X, Kao B, Ren Z, Yin D (2019g) Spectral clustering in heterogeneous information networks. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 4221–4228

Li X, Wang C, Tong B, Tan J, Zeng X, Zhuang T (2020g) Deep time-aware item evolution network for click-through rate prediction. In: Proceedings of the 29th ACM International CIKM, pp 785–794

Li Y, Gupta A (2018) Beyond grids: Learning graph representations for visual recognition. In: Proceedings of the 32nd International Conference on Neural Information Processing Systems, pp 9245–9255

Li Y, King I (2020) Autograph: Automated graph neural network. In: International Conference on Neural Information Processing, Springer, pp 189–201

Li Y, Tarlow D, Brockschmidt M, Zemel R (2016a) Gated graph seqrlence neural networks. In: International Conference on Learning Representations

Li Y, Tarlow D, Brockschmidt M, Zemel R (2016b) Gated graph sequence neural networks. In: International Conference on Learning Representations (ICLR)

Li Y, Vinyals O, Dyer C, Pascanu R, Battaglia P (2018d) Learning deep generative models of graphs. arXiv preprint arXiv:180303324

Li Y, Yu R, Shahabi C, Liu Y (2018e) Diffusion convolutional recurrent neural network: Data-driven traffic forecasting. In: International Conference on Learning Representations

Li Y, Zhang L, Liu Z (2018f) Multi-objective de novo drug design with conditional graph generative model. Journal of cheminformatics 10(1):1–24

Li Y, Gu C, Dullien T, Vinyals O, Kohli P (2019h) Graph matching networks for learning the similarity of graph structured objects. In: International Conference on Machine Learning, PMLR, pp 3835–3845

Li Y, Liu M, Yin J, Cui C, Xu XS, Nie L (2019i) Routing micro-videos via a temporal graph-guided recommendation system. In: Proceedings of the 27th ACM International Conference on Multimedia, pp 1464–1472

Li Y, Lin Y, Madhusudan M, Sharma A, Xu W, Sapatnekar SS, Harjani R, Hu J (2020h) A customized graph neural network model for guiding analog ic placement. In: International Conference On Computer Aided Design, IEEE, pp 1–9

Liang S, Srikant R (2017) Why deep neural networks for function approximation? In: 5th International Conference on Learning Representations, ICLR 2017

Liang Y, Zhu KQ (2018) Automatic generation of text descriptive comments for code blocks. In: McIlraith SA, Weinberger KQ (eds) Proceedings of the Thirty-Second AAAI Conference on Artificial Intelligence (AAAI-18), AAAI Press, pp 5229–5236

Liao L, He X, Zhang H, Chua TS (2018) Attributed social network embedding. IEEE Transactions on Knowledge and Data Engineering 30(12):2257–2270

Liao R, Li Y, Song Y, Wang S, Nash C, Hamilton WL, Duvenaud D, Urtasun R, Zemel RS (2019a) Efficient graph generation with graph recurrent attention networks. arXiv preprint arXiv:191000760

Liao R, Zhao Z, Urtasun R, Zemel RS (2019b) Lanczosnet: Multi-scale deep graph convolutional networks. arXiv preprint arXiv:190101484

Liao R, Urtasun R, Zemel R (2021) A pac-bayesian approach to generalization bounds for graph neural networks. In: International Conference on Learning Representations

Liben-Nowell D, Kleinberg J (2007) The link-prediction problem for social networks. Journal of the American society for information science and technology 58(7):1019–1031

Licata L, Lo Surdo P, Iannuccelli M, Palma A, Micarelli E, Perfetto L, Peluso D, Calderone A, Castagnoli L, Cesareni G (2020) Signor 2.0, the signaling network open resource 2.0: 2019 update. Nucleic acids research 48(D1):D504–D510

Lillicrap TP, Hunt JJ, Pritzel A, Heess N, Erez T, Tassa Y, Silver D, Wierstra D (2015) Continuous control with deep reinforcement learning. arXiv preprint arXiv:150902971

Lin C, Sun GJ, Bulusu KC, Dry JR, Hernandez M (2020a) Graph neural networks including sparse interpretability. arXiv preprint arXiv:200700119

Lin G, Wen S, Han QL, Zhang J, Xiang Y (2020b) Software vulnerability detection using deep neural networks: a survey. Proceedings of the IEEE 108(10):1825–1848

Lin P, Sun P, Cheng G, Xie S, Li X, Shi J (2020c) Graph-guided architecture search for real-time semantic segmentation. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 4203–4212

Lin T, Zhao X, Shou Z (2017) Single shot temporal action detection. In: Proceedings of the 25th ACM international conference on Multimedia, pp 988–996

Lin W, Ji S, Li B (2020d) Adversarial Attacks on Link Prediction Algorithms Based on Graph Neural Networks. In: ACM Asia Conference on Computer and Communications Security

Lin X, Chen X (2012) Heterogeneous data integration by tree-augmented naïve bayes for protein-protein interactions prediction. PROTEOMICS 13(2):261–268

Lin Y, Liu Z, Sun M, Liu Y, Zhu X (2015) Learning entity and relation embeddings for knowledge graph completion. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 29

Lin Y, Ren P, Chen Z, Ren Z, Yu D, Ma J, Rijke Md, Cheng X (2020e) Meta matrix factorization for federated rating predictions. In: Proceedings of the 43rd International ACM SIGIR Conference on Research and Development in Information Retrieval, pp 981–990

Lin ZH, Huang SY, Wang YCF (2020f) Convolution in the cloud: Learning deformable kernels in 3d graph convolution networks for point cloud analysis. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 1800–1809

Ling X, Ji S, Zou J, Wang J, Wu C, Li B, Wang T (2019) DEEPSEC: A uniform platform for security analysis of deep learning model. In: 2019 IEEE Symposium on Security and Privacy (S&P), IEEE, pp 673–690

Ling X, Wu L, Wang S, Ma T, Xu F, Liu AX, Wu C, Ji S (2020) Multi-level graph matching networks for deep graph similarity learning. arXiv preprint arXiv:200704395

Ling X, Wu L, Wang S, Pan G, Ma T, Xu F, Liu AX, Wu C, Ji S (2021) Deep graph matching and searching for semantic code retrieval. ACM Transactions on Knowledge Discovery from Data (TKDD)

Linial N, London E, Rabinovich Y (1995) The geometry of graphs and some of its algorithmic applications. Combinatorica 15(2):215–245

Linmei H, Yang T, Shi C, Ji H, Li X (2019) Heterogeneous graph attention networks for semi-supervised short text classification. In: Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP), pp 4823–4832

Liu A, Xu N, Zhang H, Nie W, Su Y, Zhang Y (2018a) Multi-level policy and reward reinforcement learning for image captioning. In: IJCAI, pp 821–827

Liu B, Niu D, Lai K, Kong L, Xu Y (2017a) Growing story forest online from massive breaking news. In: Proceedings of the 2017 ACM on Conference on Information and Knowledge Management, pp 777–785

Liu B, Niu D, Wei H, Lin J, He Y, Lai K, Xu Y (2019a) Matching article pairs with graphical decomposition and convolutions. In: Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics, pp 6284–6294

Liu B, Han FX, Niu D, Kong L, Lai K, Xu Y (2020a) Story forest: Extracting events and telling stories from breaking news. ACM Transactions on Knowledge Discovery from Data (TKDD) 14(3):1–28

Liu C, Zoph B, Neumann M, Shlens J, Hua W, Li LJ, Fei-Fei L, Yuille A, Huang J, Murphy K (2018b) Progressive neural architecture search. In: Proceedings of the European conference on computer vision, pp 19–34

Liu H, Simonyan K, Vinyals O, Fernando C, Kavukcuoglu K (2017b) Hierarchical representations for efficient architecture search. arXiv preprint arXiv:171100436

Liu H, Simonyan K, Yang Y (2018c) Darts: Differentiable architecture search. arXiv preprint arXiv:180609055

Liu J, Chi Y, Zhu C (2015) A dynamic multiagent genetic algorithm for gene regulatory network reconstruction based on fuzzy cognitive maps. IEEE Transactions on Fuzzy Systems 24(2):419–431

Liu J, Kumar A, Ba J, Kiros J, Swersky K (2019b) Graph normalizing flows. arXiv preprint arXiv:190513177

Liu L, Ma Y, Zhu X, et al (2019) Integrating sequence and network information to enhance protein-protein interaction prediction using graph convolutional networks. In: 2019 IEEE International Conference on Bioinformatics and Biomedicine (BIBM), pp 1762–1768, DOI 10.1109/BIBM47256.2019.8983330

Liu L, Ouyang W, Wang X, Fieguth P, Chen J, Liu X, Pietikäinen M (2020b) Deep learning for generic object detection: A survey. International journal of computer vision 128(2):261–318

Liu M, Gao H, Ji S (2020c) Towards deeper graph neural networks. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 338–348

Liu N, Tan Q, Li Y, Yang H, Zhou J, Hu X (2019a) Is a single vector enough? exploring node polysemy for network embedding. In: Proceedings of the 25th ACM

SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 932–940

Liu N, Du M, Hu X (2020d) Adversarial machine learning: An interpretation perspective. arXiv preprint arXiv:200411488

Liu P, Chang S, Huang X, Tang J, Cheung JCK (2019b) Contextualized non-local neural networks for sequence learning. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 6762–6769

Liu Q, Allamanis M, Brockschmidt M, Gaunt AL (2018d) Constrained graph variational autoencoders for molecule design. arXiv preprint arXiv:180509076

Liu S, Yang N, Li M, Zhou M (2014) A recursive recurrent neural network for statistical machine translation. In: Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics, ACL 2014, June 22-27, 2014, Baltimore, MD, USA, Volume 1: Long Papers, The Association for Computer Linguistics, pp 1491–1500

Liu S, Chen Y, Xie X, Siow JK, Liu Y (2021) Retrieval-augmented generation for code summarization via hybrid gnn. In: 9th International Conference on Learning Representations

Liu X, Si S, Zhu X, Li Y, Hsieh CJ (2019c) A Unified Framework for Data Poisoning Attack to Graph-based Semi-supervised Learning. In: Neural Information Processing Systems, NeurIPS

Liu X, Pan H, He M, Song Y, Jiang X, Shang L (2020e) Neural subgraph isomorphism counting. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 1959–1969

Liu X, Zhang F, Hou Z, Wang Z, Mian L, Zhang J, Tang J (2020f) Self-supervised learning: Generative or contrastive. arXiv preprint arXiv:200608218 1(2)

Liu Y, Lee J, Park M, Kim S, Yang E, Hwang SJ, Yang Y (2018e) Learning to propagate labels: Transductive propagation network for few-shot learning. arXiv preprint arXiv:180510002

Liu Y, Wan B, Zhu X, He X (2020g) Learning cross-modal context graph for visual grounding. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 11,645–11,652

Liu Y, Zhang F, Zhang Q, Wang S, Wang Y, Yu Y (2020h) Cross-view correspondence reasoning based on bipartite graph convolutional network for mammogram mass detection. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 3812–3822

Liu Z, Chen C, Yang X, Zhou J, Li X, Song L (2018f) Heterogeneous graph neural networks for malicious account detection. In: Proceedings of the 27th ACM International Conference on Information and Knowledge Management, pp 2077–2085

Livshits B, Nori AV, Rajamani SK, Banerjee A (2009) Merlin: specification inference for explicit information flow problems. ACM Sigplan Notices 44(6):75–86

Locatelli A, Sieniutycz S (2002) Optimal control: An introduction. Appl Mech Rev 55(3):B48–B49

Loiola EM, de Abreu NMM, Boaventura-Netto PO, Hahn P, Querido T (2007) A survey for the quadratic assignment problem. European journal of operational research 176(2):657–690

Lops P, De Gemmis M, Semeraro G (2011) Content-based recommender systems: State of the art and trends. In: Recommender systems handbook, Springer, pp 73–105

Loukas A (2020) What graph neural networks cannot learn: depth vs width. In: International Conference on Learning Representations

Lovász L, et al (1993) Random walks on graphs: A survey. Combinatorics, Paul erdos is eighty 2(1):1–46

Lovell SC, Davis IW, Arendall WB, et al (2003) Structure validation by c geometry: , and c deviation. Proteins: Structure, Function, and Bioinformatics 50(3):437–450

Loyola P, Marrese-Taylor E, Matsuo Y (2017) A neural architecture for generating natural language descriptions from source code changes. In: Proceedings of the 55th Annual Meeting of the Association for Computational Linguistics (Volume 2: Short Papers), pp 287–292

Lü L, Zhou T (2011) Link prediction in complex networks: A survey. Physica A: statistical mechanics and its applications 390(6):1150–1170

Lu X, Wang B, Zheng X, Li X (2017a) Exploring models and data for remote sensing image caption generation. IEEE Transactions on Geoscience and Remote Sensing 56(4):2183–2195

Lu Y, Zhao Z, Li G, Jin Z (2017b) Learning to generate comments for api-based code snippets. In: Software Engineering and Methodology for Emerging Domains, Springer, pp 3–14

Lucic A, ter Hoeve M, Tolomei G, de Rijke M, Silvestri F (2021) Cf-gnnexplainer: Counterfactual explanations for graph neural networks. arXiv preprint arXiv:210203322

Luo D, Cheng W, Xu D, Yu W, Zong B, Chen H, Zhang X (2020) Parameterized explainer for graph neural network. arXiv preprint arXiv:201104573

Luo D, Cheng W, Yu W, Zong B, Ni J, Chen H, Zhang X (2021) Learning to Drop: Robust Graph Neural Network via Topological Denoising. In: International Conference on Web Search and Data Mining, WSDM

Luo R, Liao W, Huang X, Pi Y, Philips W (2016) Feature extraction of hyperspectral images with semisupervised graph learning. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing 9(9):4389–4399

Luo R, Tian F, Qin T, Chen EH, Liu TY (2018) Neural architecture optimization. In: Advances in neural information processing systems

Luo X, You Z, Zhou M, et al (2015) A highly efficient approach to protein interactome mapping based on collaborative filtering framework. Scientific Reports 5(1):7702

Luong T, Pham H, Manning CD (2015) Effective approaches to attention-based neural machine translation. In: Proceedings of the 2015 Conference on Empirical Methods in Natural Language Processing, Association for Computational Linguistics, Lisbon, Portugal, pp 1412–1421, DOI 10.18653/v1/D15-1166

Ma G, Ahmed NK, Willke TL, Yu PS (2019a) Deep graph similarity learning: A survey. arXiv preprint arXiv:191211615

Ma H, Bian Y, Rong Y, Huang W, Xu T, Xie W, Ye G, Huang J (2020a) Multi-view graph neural networks for molecular property prediction. arXiv e-prints pp arXiv–2005

Ma J, Tang W, Zhu J, Mei Q (2019b) A flexible generative framework for graph-based semi-supervised learning. In: Advances in Neural Information Processing Systems, pp 3281–3290

Ma J, Zhou C, Cui P, Yang H, Zhu W (2019c) Learning disentangled representations for recommendation. In: Wallach HM, Larochelle H, Beygelzimer A, d'Alché-Buc F, Fox EB, Garnett R (eds) Advances in Neural Information Processing Systems 32: Annual Conference on Neural Information Processing Systems 2019, NeurIPS 2019, December 8-14, 2019, Vancouver, BC, Canada, pp 5712–5723

Ma J, Ding S, Mei Q (2020b) Towards more practical adversarial attacks on graph neural networks. In: Larochelle H, Ranzato M, Hadsell R, Balcan M, Lin H (eds) Advances in Neural Information Processing Systems 33: Annual Conference on Neural Information Processing Systems 2020, NeurIPS 2020, December 6-12, 2020, virtual

Ma T, Chen J, Xiao C (2018) Constrained generation of semantically valid graphs via regularizing variational autoencoders. In: Advances in Neural Information Processing Systems, pp 7113–7124

Ma Y, Wang S, Aggarwal CC, Tang J (2019d) Graph convolutional networks with eigenpooling. In: ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, ACM, pp 723–731

Maalej W, Tiarks R, Roehm T, Koschke R (2014) On the comprehension of program comprehension. ACM Transactions on Software Engineering and Methodology (TOSEM) 23(4):1–37

Maddison C, Mnih A, Teh Y (2017) The concrete distribution: A continuous relaxation of discrete random variables. International Conference on Learning Representations

Madry A, Makelov A, Schmidt L, Tsipras D, Vladu A (2017) Towards deep learning models resistant to adversarial attacks. arXiv preprint arXiv:170606083

Maglott D, Ostell J, Pruitt KD, Tatusova T (2010) Entrez gene: gene-centered information at ncbi. Nucleic acids research 39(suppl_1):D52–D57

Malewicz G, Austern MH, Bik AJ, Dehnert JC, Horn I, Leiser N, Czajkowski G (2010) Pregel: a system for large-scale graph processing. In: Proceedings of the 2010 ACM SIGMOD International Conference on Management of data, pp 135–146

Malliaros FD, Vazirgiannis M (2013) Clustering and community detection in directed networks: A survey. Physics reports 533(4):95–142

Man T, Shen H, Liu S, Jin X, Cheng X (2016) Predict anchor links across social networks via an embedding approach. In: Ijcai, vol 16, pp 1823–1829

Manessi F, Rozza A (2020) Graph-based neural network models with multiple self-supervised auxiliary tasks. arXiv preprint arXiv:
201107267

Manessi F, Rozza A, Manzo M (2020) Dynamic graph convolutional networks. Pattern Recognition 97:107,000

Mangal R, Zhang X, Nori AV, Naik M (2015) A user-guided approach to program analysis. In: Proceedings of the 2015 10th Joint Meeting on Foundations of Software Engineering, pp 462–473

Manning C, Schutze H (1999) Foundations of statistical natural language processing. MIT press

Marcheggiani D, Titov I (2017) Encoding sentences with graph convolutional networks for semantic role labeling. In: EMNLP 2017-Conference on Empirical Methods in Natural Language Processing, Proceedings, pp 1506–1515

Marcheggiani D, Bastings J, Titov I (2018) Exploiting semantics in neural machine translation with graph convolutional networks. arXiv preprint arXiv:180408313

Maretic HP, Thanou D, Frossard P (2017) Graph learning under sparsity priors. In: 2017 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Ieee, pp 6523–6527

Markovitz A, Sharir G, Friedman I, Zelnik-Manor L, Avidan S (2020) Graph embedded pose clustering for anomaly detection. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 10,539–10,547

Maron H, Ben-Hamu H, Shamir N, Lipman Y (2018) Invariant and equivariant graph networks. In: International Conference on Learning Representations

Maron H, Ben-Hamu H, Serviansky H, Lipman Y (2019a) Provably powerful graph networks. In: Advances in Neural Information Processing Systems, pp 2153–2164

Maron H, Fetaya E, Segol N, Lipman Y (2019b) On the universality of invariant networks. In: International Conference on Machine Learning, pp 4363–4371

Mathew B, Sikdar S, Lemmerich F, Strohmaier M (2020) The polar framework: Polar opposites enable interpretability of pre-trained word embeddings. In: Proceedings of The Web Conference 2020, pp 1548–1558

Matsuno R, Murata T (2018) Mell: effective embedding method for multiplex networks. In: Companion Proceedings of the The Web Conference 2018, pp 1261–1268

Matuszek C (2018) Grounded language learning: Where robotics and nlp meet (invited talk). In: Proceedings of the 27th International Joint Conference on Artificial Intelligence, pp 5687–5691

Maziarka Ł, Danel T, Mucha S, Rataj K, Tabor J, Jastrzebski S (2020a) Molecule attention transformer. arXiv preprint arXiv:200208264

Maziarka Ł, Pocha A, Kaczmarczyk J, Rataj K, Danel T, Warchoł M (2020b) Molcyclegan: a generative model for molecular optimization. Journal of Cheminformatics 12(1):1–18

McBurney PW, McMillan C (2014) Automatic documentation generation via source code summarization of method context. In: Proceedings of the 22nd International Conference on Program Comprehension, ACM, pp 279–290

McBurney PW, McMillan C (2016) Automatic source code summarization of context for java methods. IEEE Transactions on Software Engineering 42(2):103–119

McBurney PW, Liu C, McMillan C (2016) Automated feature discovery via sentence selection and source code summarization. Journal of Software: Evolution and Process 28(2):120–145

McMillan C, Grechanik M, Poshyvanyk D, Xie Q, Fu C (2011) Portfolio: finding relevant functions and their usage. In: Proceedings of the 33rd International Conference on Software Engineering, pp 111–120

Mcmillan C, Poshyvanyk D, Grechanik M, Xie Q, Fu C (2013) Portfolio: Searching for relevant functions and their usages in millions of lines of code. ACM Transactions on Software Engineering and Methodology (TOSEM) 22(4):1–30

McNee SM, Riedl J, Konstan JA (2006) Being accurate is not enough: how accuracy metrics have hurt recommender systems. In: CHI'06 extended abstracts on Human factors in computing systems, pp 1097–1101

Mendez D, Gaulton A, Bento AP, Chambers J, De Veij M, Félix E, Magariños MP, Mosquera JF, Mutowo P, Nowotka M, et al (2019) Chembl: towards direct deposition of bioassay data. Nucleic acids research 47(D1):D930–D940

Merkwirth C, Lengauer T (2005) Automatic generation of complementary descriptors with molecular graph networks. Journal of Chemical Information and Modeling 45(5):1159–1168

Mesquita DPP, Jr AHS, Kaski S (2020) Rethinking pooling in graph neural networks. In: Advances in Neural Information Processing Systems

Mihalcea R, Tarau P (2004) Textrank: Bringing order into text. In: Proceedings of the 2004 conference on empirical methods in natural language processing, pp 404–411

Miikkulainen R, Liang J, Meyerson E, Rawal A, Fink D, Francon O, Raju B, Shahrzad H, Navruzyan A, Duffy N, et al (2019) Evolving deep neural networks. In: Artificial Intelligence in the Age of Neural Networks and Brain Computing, Elsevier, pp 293–312

Mikolov T, Karafiát M, Burget L, Cernocký J, Khudanpur S (2010) Recurrent neural network based language model. In: Kobayashi T, Hirose K, Nakamura S (eds) INTERSPEECH 2010, 11th Annual Conference of the International Speech Communication Association, Makuhari, Chiba, Japan, September 26-30, 2010, ISCA, pp 1045–1048

Mikolov T, Deoras A, Kombrink S, Burget L, Cernocký J (2011a) Empirical evaluation and combination of advanced language modeling techniques. In: INTERSPEECH 2011, 12th Annual Conference of the International Speech Communication Association, Florence, Italy, August 27-31, 2011, ISCA, pp 605–608

Mikolov T, Kombrink S, Burget L, Černockỳ J, Khudanpur S (2011b) Extensions of recurrent neural network language model. In: 2011 IEEE international conference on acoustics, speech and signal processing (ICASSP), IEEE, pp 5528–5531

Mikolov T, Chen K, Corrado G, Dean J (2013a) Efficient estimation of word representations in vector space. arXiv preprint arXiv:13013781

Mikolov T, Sutskever I, Chen K, Corrado GS, Dean J (2013b) Distributed representations of words and phrases and their compositionality. In: Advances in neural information processing systems, pp 3111–3119

Mikolov T CGDJ Chen K (2013) Efficient estimation of word representations in vector space. In: International Conference on Learning Representations

Miller BA, Çamurcu M, Gomez AJ, Chan K, Eliassi-Rad T (2019) Improving Robustness to Attacks Against Vertex Classification. In: Deep Learning for Graphs at AAAI Conference on Artificial Intelligence

Miller GA (1995) Wordnet: a lexical database for english. Communications of the ACM 38(11):39–41

Miller T (2019) Explanation in artificial intelligence: Insights from the social sciences. Artificial intelligence 267:1–38

Milo R, Shen-Orr S, Itzkovitz S, Kashtan N, Chklovskii D, Alon U (2002) Network motifs: simple building blocks of complex networks. Science 298(5594):824–827

Min S, Gao Z, Peng J, Wang L, Qin K, Fang B (????) Stgsn-a spatial-temporal graph neural network framework for time-evolving social networks. Knowledge-Based Systems p 106746

Mir AM, Latoskinas E, Proksch S, Gousios G (2021) Type4Py: Deep similarity learning-based type inference for Python. arXiv preprint arXiv:210104470

Mirza M, Osindero S (2014) Conditional generative adversarial nets. arXiv preprint arXiv:14111784

Mnih A, Salakhutdinov RR (2008) Probabilistic matrix factorization. In: Advances in neural information processing systems, pp 1257–1264

Mnih V, Kavukcuoglu K, Silver D, Rusu AA, Veness J, Bellemare MG, Graves A, Riedmiller M, Fidjeland AK, Ostrovski G, et al (2015) Human-level control through deep reinforcement learning. Nature 518(7540):529–533

Mokou M, Lygirou V, Angelioudaki I, Paschalidis N, Stroggilos R, Frantzi M, Latosinska A, Bamias A, Hoffmann MJ, Mischak H, et al (2020) A novel pipeline for drug repurposing for bladder cancer based on patients' omics signatures. Cancers 12(12):3519

Momtazpour M, Butler P, Hossain MS, Bozchalui MC, Ramakrishnan N, Sharma R (2012) Coordinated clustering algorithms to support charging infrastructure design for electric vehicles. In: Proceedings of the ACM SIGKDD International Workshop on Urban Computing, pp 126–133

Montavon G, Samek W, Müller KR (2018) Methods for interpreting and understanding deep neural networks. Digital Signal Processing 73:1–15

Monti F, Bronstein M, Bresson X (2017) Geometric matrix completion with recurrent multi-graph neural networks. In: Advances in Neural Information Processing Systems, pp 3700–3710

Monti F, Frasca F, Eynard D, Mannion D, Bronstein MM (2019) Fake news detection on social media using geometric deep learning. In: Workshop on Representation Learning on Graphs and Manifolds

Moreno L, Aponte J, Sridhara G, Marcus A, Pollock L, Vijay-Shanker K (2013) Automatic generation of natural language summaries for java classes. In: 2013 21st International Conference on Program Comprehension (ICPC), IEEE, pp 23–32

Moreno L, Bavota G, Di Penta M, Oliveto R, Marcus A, Canfora G (2014) Automatic generation of release notes. In: Proceedings of the 22nd ACM SIGSOFT In-

ternational Symposium on Foundations of Software Engineering, ACM, pp 484–495

Morris C, Kersting K, Mutzel P (2017) Glocalized Weisfeiler-Lehman kernels: Global-local feature maps of graphs. In: IEEE International Conference on Data Mining, IEEE, pp 327–336

Morris C, Ritzert M, Fey M, Hamilton WL, Lenssen JE, Rattan G, Grohe M (2019) Weisfeiler and leman go neural: Higher-order graph neural networks. In: the AAAI Conference on Artificial Intelligence, vol 33, pp 4602–4609

Morris C, Kriege NM, Bause F, Kersting K, Mutzel P, Neumann M (2020a) TU-Dataset: A collection of benchmark datasets for learning with graphs. CoRR abs/2007.08663

Morris C, Rattan G, Mutzel P (2020b) Weisfeiler and leman go sparse: Towards scalable higher-order graph embeddings. Advances in Neural Information Processing Systems 33

Mueller J, Thyagarajan A (2016) Siamese recurrent architectures for learning sentence similarity. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 30

Mungall CJ, Torniai C, Gkoutos GV, Lewis SE, Haendel MA (2012) Uberon, an integrative multi-species anatomy ontology. Genome biology 13(1):1–20

Murphy R, Srinivasan B, Rao V, Ribeiro B (2019a) Relational pooling for graph representations. In: International Conference on Machine Learning, pp 4663–4673

Murphy RL, Srinivasan B, Rao VA, Ribeiro B (2019b) Janossy pooling: Learning deep permutation-invariant functions for variable-size inputs. In: International Conference on Learning Representations

Murphy RL, Srinivasan B, Rao VA, Ribeiro B (2019c) Relational pooling for graph representations. In: International Conference on Machine Learning, pp 4663–4673

Nair V, Hinton GE (2010) Rectified linear units improve restricted boltzmann machines. In: Fürnkranz J, Joachims T (eds) Proceedings of the 27th International Conference on Machine Learning (ICML-10), June 21-24, 2010, Haifa, Israel, Omnipress, pp 807–814

Nathani D, Chauhan J, Sharma C, Kaul M (2019) Learning attention-based embeddings for relation prediction in knowledge graphs. arXiv preprint arXiv:190601195

Nelson CA, Butte AJ, Baranzini SE (2019) Integrating biomedical research and electronic health records to create knowledge-based biologically meaningful machine-readable embeddings. Nature communications 10(1):1–10

Neville J, Jensen D (2000) Iterative classification in relational data. In: Proc. AAAI-2000 workshop on learning statistical models from relational data, pp 13–20

Newman M (2010) Networks: an introduction. Oxford university press

Newman M (2018) Networks. Oxford university press

Newman ME (2006a) Finding community structure in networks using the eigenvectors of matrices. Physical review E 74(3):036,104

Newman ME (2006b) Modularity and community structure in networks. Proceedings of the national academy of sciences 103(23):8577–8582

Ng A (2011) Machine learning

Nguyen DQ, Nguyen TD, Nguyen DQ, Phung D (2017) A novel embedding model for knowledge base completion based on convolutional neural network. arXiv preprint arXiv:171202121

Nguyen HV, Bai L (2010) Cosine similarity metric learning for face verification. In: Asian conference on computer vision, Springer, pp 709–720

Nickel M, Tresp V (2013) Tensor factorization for multi-relational learning. In: Joint European Conference on Machine Learning and Knowledge Discovery in Databases, Springer, pp 617–621

Nickel M, Tresp V, Kriegel HP (2011) A three-way model for collective learning on multi-relational data. In: Proceedings of the 28th International Conference on International Conference on Machine Learning, Omnipress, Madison, WI, USA, ICML'11, p 809–816

Nickel M, Jiang X, Tresp V (2014) Reducing the rank in relational factorization models by including observable patterns. In: Advances in Neural Information Processing Systems, pp 1179–1187

Nickel M, Murphy K, Tresp V, Gabrilovich E (2016a) A review of relational machine learning for knowledge graphs. Proceedings of the IEEE 104(1):11–33

Nickel M, Rosasco L, Poggio T (2016b) Holographic embeddings of knowledge graphs. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 30

Nicora G, Vitali F, Dagliati A, Geifman N, Bellazzi R (2020) Integrated multi-omics analyses in oncology: a review of machine learning methods and tools. Frontiers in oncology 10:1030

Nie P, Rai R, Li JJ, Khurshid S, Mooney RJ, Gligoric M (2019) A framework for writing trigger-action todo comments in executable format. In: Proceedings of the 2019 27th ACM Joint Meeting on European Software Engineering Conference and Symposium on the Foundations of Software Engineering, ACM, pp 385–396

Nielson F, Nielson HR, Hankin C (2015) Principles of program analysis. Springer

Niepert M, Ahmed M, Kutzkov K (2016) Learning convolutional neural networks for graphs. In: International Conference on Machine Learning, pp 2014–2023

Nikolentzos G, Meladianos P, Vazirgiannis M (2017) Matching node embeddings for graph similarity. In: AAAI Conference on Artificial Intelligence, pp 2429–2435

Ning X, Karypis G (2011) Slim: Sparse linear methods for top-n recommender systems. In: 2011 IEEE 11th International Conference on Data Mining, IEEE, pp 497–506

Niu C, Wu F, Tang S, Hua L, Jia R, Lv C, Wu Z, Chen G (2020) Billion-scale federated learning on mobile clients: A submodel design with tunable privacy. In: Proceedings of the 26th Annual International Conference on Mobile Computing and Networking, pp 1–14

Norcliffe-Brown W, Vafeias S, Parisot S (2018) Learning conditioned graph structures for interpretable visual question answering. In: Advances in neural information processing systems, pp 8334–8343

Noroozi M, Favaro P (2016) Unsupervised learning of visual representations by solving jigsaw puzzles. In: European conference on computer vision, Springer, pp 69–84

Nowozin S, Cseke B, Tomioka R (2016) f-gan: Training generative neural samplers using variational divergence minimization. In: Advances in Neural Information Processing Systems, vol 29

Noy N, Gao Y, Jain A, Narayanan A, Patterson A, Taylor J (2019) Industry-scale knowledge graphs: lessons and challenges. Communications of the ACM 62(8):36–43

NT H, Maehara T (2019) Revisiting graph neural networks: All we have is low-pass filters. arXiv preprint arXiv:190509550

Nunes M, Pappa GL (2020) Neural architecture search in graph neural networks. In: Brazilian Conference on Intelligent Systems, Springer, pp 302–317

Oda Y, Fudaba H, Neubig G, Hata H, Sakti S, Toda T, Nakamura S (2015) Learning to generate pseudo-code from source code using statistical machine translation (t). In: 2015 30th IEEE/ACM International Conference on Automated Software Engineering (ASE), IEEE, pp 574–584

Ok S (2020) A graph similarity for deep learning. In: Larochelle H, Ranzato M, Hadsell R, Balcan MF, Lin H (eds) Advances in Neural Information Processing Systems, Curran Associates, Inc., vol 33, pp 1–12

Olah C, Satyanarayan A, Johnson I, Carter S, Schubert L, Ye K, Mordvintsev A (2018) The building blocks of interpretability. Distill DOI 10.23915/distill.00010, https://distill.pub/2018/building-blocks

On K, Kim E, Heo Y, Zhang B (2020) Cut-based graph learning networks to discover compositional structure of sequential video data. In: The Thirty-Fourth AAAI Conference on Artificial Intelligence, pp 5315–5322

Oono K, Suzuki T (2020) Graph neural networks exponentially lose expressive power for node classification. In: International Conference on Learning Representations

Oord Avd, Kalchbrenner N, Vinyals O, Espeholt L, Graves A, Kavukcuoglu K (2016) Conditional image generation with pixelcnn decoders. In: Proceedings of the 30th International Conference on Neural Information Processing Systems, pp 4797–4805

Oord Avd, Li Y, Vinyals O (2018) Representation learning with contrastive predictive coding. arXiv preprint arXiv:180703748

Orchard S, Ammari M, Aranda B, Breuza L, Briganti L, Broackes-Carter F, Campbell NH, Chavali G, Chen C, Del-Toro N, et al (2014) The mintact project—intact as a common curation platform for 11 molecular interaction databases. Nucleic acids research 42(D1):D358–D363

Ottenstein KJ, Ottenstein LM (1984) The program dependence graph in a software development environment. ACM Sigplan Notices 19(5):177–184

Ou M, Cui P, Wang F, Wang J, Zhu W (2015) Non-transitive hashing with latent similarity components. In: Proceedings of the 21th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, pp 895–904

Ou M, Cui P, Pei J, Zhang Z, Zhu W (2016) Asymmetric transitivity preserving graph embedding. In: Proceedings of the 22nd ACM SIGKDD international conference on Knowledge discovery and data mining, pp 1105–1114

Oyetunde T, Zhang M, Chen Y, Tang YJ, Lo C (2017) Boostgapfill: improving the fidelity of metabolic network reconstructions through integrated constraint and pattern-based methods. Bioinformatics 33(4):608–611

Page L, Brin S, Motwani R, Winograd T (1999) The pagerank citation ranking: Bringing order to the web. Tech. rep., Stanford InfoLab

Paige CC, Saunders MA (1981) Towards a generalized singular value decomposition. SIAM Journal on Numerical Analysis 18(3):398–405

Pal S, Malekmohammadi S, Regol F, Zhang Y, Xu Y, Coates M (2020) Non-parametric graph learning for bayesian graph neural networks. In: Conference on Uncertainty in Artificial Intelligence, PMLR, pp 1318–1327

Palasca O, Santos A, Stolte C, Gorodkin J, Jensen LJ (2018) Tissues 2.0: an integrative web resource on mammalian tissue expression. Database 2018

Palaz D, Collobert R, et al (2015a) Analysis of cnn-based speech recognition system using raw speech as input. Tech. rep., Idiap

Palaz D, Doss MM, Collobert R (2015b) Convolutional neural networks-based continuous speech recognition using raw speech signal. In: 2015 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), IEEE, pp 4295–4299

Paliwal A, Gimeno F, Nair V, Li Y, Lubin M, Kohli P, Vinyals O (2020) Reinforced genetic algorithm learning for optimizing computation graphs. In: International Conference on Learning Representations

Pan M, Li Y, Zhou X, Liu Z, Song R, Lu H, Luo J (2019) Dissecting the learning curve of taxi drivers: A data-driven approach. In: Proceedings of the 2019 SIAM International Conference on Data Mining, SIAM, pp 783–791

Pan M, Huang W, Li Y, Zhou X, Liu Z, Song R, Lu H, Tian Z, Luo J (2020a) Dhpa: Dynamic human preference analytics framework: A case study on taxi drivers' learning curve analysis. ACM Trans Intell Syst Technol 11(1), DOI 10.1145/3360312

Pan M, Huang W, Li Y, Zhou X, Luo J (2020b) Xgail: Explainable generative adversarial imitation learning for explainable human decision analysis. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery amp; Data Mining, Association for Computing Machinery, KDD '20, p 1334–1343, DOI 10.1145/3394486.3403186

Pan S, Wu J, Zhu X, Zhang C, Wang Y (2016) Tri-party deep network representation. In: Proceedings of the Twenty-Fifth International Joint Conference on Artificial Intelligence, pp 1895–1901

Pan S, Hu R, Long G, Jiang J, Yao L, Zhang C (2018) Adversarially regularized graph autoencoder for graph embedding. In: Proceedings of the 27th International Joint Conference on Artificial Intelligence, pp 2609–2615

Pan W, Su C, Chen K, Henchcliffe C, Wang F (2020c) Learning phenotypic associations for parkinson's disease with longitudinal clinical records. medRxiv

Pandi IV, Barr ET, Gordon AD, Sutton C (2020) OptTyper: Probabilistic type inference by optimising logical and natural constraints. arXiv preprint arXiv:200400348

Pang L, Lan Y, Guo J, Xu J, Wan S, Cheng X (2016) Text matching as image recognition. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 30

Pang LX, Chawla S, Liu W, Zheng Y (2011) On mining anomalous patterns in road traffic streams. In: International conference on advanced data mining and applications, Springer, pp 237–251

Panichella S, Aponte J, Di Penta M, Marcus A, Canfora G (2012) Mining source code descriptions from developer communications. In: 2012 20th IEEE International Conference on Program Comprehension (ICPC), IEEE, pp 63–72

Paninski L (2003) Estimation of entropy and mutual information. Neural computation 15(6):1191–1253

Pantziarka P, Meheus L (2018) Omics-driven drug repurposing as a source of innovative therapies in rare cancers. Expert Opinion on Orphan Drugs 6(9):513–517

Park C, Kim D, Zhu Q, Han J, Yu H (2019) Task-guided pair embedding in heterogeneous network. In: Proceedings of the 28th ACM International Conference on Information and Knowledge Management, pp 489–498

Parthasarathy S, Busso C (2017) Jointly predicting arousal, valence and dominance with multi-task learning. In: Interspeech, vol 2017, pp 1103–1107

Pascanu R, Mikolov T, Bengio Y (2013) On the difficulty of training recurrent neural networks. In: International conference on machine learning, PMLR, pp 1310–1318

Paszke A, Gross S, Massa F, Lerer A, Bradbury J, Chanan G, Killeen T, Lin Z, Gimelshein N, Antiga L, Desmaison A, Kopf A, Yang E, DeVito Z, Raison M, Tejani A, Chilamkurthy S, Steiner B, Fang L, Bai J, Chintala S (2019) Pytorch: An imperative style, high-performance deep learning library. In: Advances in Neural Information Processing Systems, vol 32

Pathak D, Krahenbuhl P, Donahue J, Darrell T, Efros AA (2016) Context encoders: Feature learning by inpainting. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 2536–2544

Peña-Castillo L, Tasan M, Myers CL, et al (2008) A critical assessment of mus musculus gene function prediction using integrated genomic evidence. Genome Biology 9(Suppl 1):S2, DOI 10.1186/gb-2008-9-s1-s2

Peng H, Li J, He Y, Liu Y, Bao M, Wang L, Song Y, Yang Q (2018) Large-scale hierarchical text classification with recursively regularized deep graph-cnn. In: Proceedings of the 2018 world wide web conference, pp 1063–1072

Peng H, Pappas N, Yogatama D, Schwartz R, Smith N, Kong L (2021) Random feature attention. In: International Conference on Learning Representations

Peng Z, Dong Y, Luo M, Wu XM, Zheng Q (2020) Self-supervised graph representation learning via global context prediction. arXiv preprint arXiv:200301604

Pennington J, Socher R, Manning CD (2014) Glove: Global vectors for word representation. In: Proceedings of the 2014 conference on empirical methods in natural language processing (EMNLP), pp 1532–1543

Percha B, Altman RB (2018) A global network of biomedical relationships derived from text. Bioinformatics 34(15):2614–2624

Perez E, Strub F, De Vries H, Dumoulin V, Courville A (2018) Film: Visual reasoning with a general conditioning layer. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 32

Perozzi B, Al-Rfou R, Skiena S (2014) Deepwalk: Online learning of social representations. In: Proceedings of the 20th ACM SIGKDD international conference on Knowledge discovery and data mining, pp 701–710

Petar V, Guillem C, Arantxa C, Adriana R, Pietro L, Yoshua B (2018) Graph attention networks. In: International Conference on Learning Representations

Pham H, Guan M, Zoph B, Le Q, Dean J (2018) Efficient neural architecture search via parameter sharing. In: International Conference on Machine Learning, pp 4092–4101

Pham T, Tran T, Phung D, Venkatesh S (2017) Column networks for collective classification. In: Proceedings of the Thirty-First AAAI Conference on Artificial Intelligence, AAAI Press, AAAI'17, p 2485–2491

Piñero J, Ramírez-Anguita JM, Saüch-Pitarch J, Ronzano F, Centeno E, Sanz F, Furlong LI (2020) The disgenet knowledge platform for disease genomics: 2019 update. Nucleic acids research 48(D1):D845–D855

Pires DE, Blundell TL, Ascher DB (2015) pkcsm: predicting small-molecule pharmacokinetic and toxicity properties using graph-based signatures. Journal of medicinal chemistry 58(9):4066–4072

Pletscher-Frankild S, Pallejà A, Tsafou K, Binder JX, Jensen LJ (2015) Diseases: Text mining and data integration of disease–gene associations. Methods 74:83–89

Pogancic MV, Paulus A, Musil V, Martius G, Rolinek M (2020) Differentiation of blackbox combinatorial solvers. In: International Conference on Learning Representations, OpenReview.net

Pope PE, Kolouri S, Rostami M, Martin CE, Hoffmann H (2019) Explainability methods for graph convolutional neural networks. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 10,772–10,781

Pradel M, Sen K (2018) Deepbugs: A learning approach to name-based bug detection. Proceedings of the ACM on Programming Languages 2(OOPSLA):1–25

Pradel M, Gousios G, Liu J, Chandra S (2020) TypeWriter: Neural type prediction with search-based validation. In: Proceedings of the 28th ACM Joint Meeting on European Software Engineering Conference and Symposium on the Foundations of Software Engineering, pp 209–220

Pushpakom S, Iorio F, Eyers PA, Escott KJ, Hopper S, Wells A, Doig A, Guilliams T, Latimer J, McNamee C, et al (2019) Drug repurposing: progress, challenges and recommendations. Nature reviews Drug discovery 18(1):41–58

Putra JWG, Tokunaga T (2017) Evaluating text coherence based on semantic similarity graph. In: Proceedings of TextGraphs-11: the Workshop on Graph-based Methods for Natural Language Processing, pp 76–85

Qi Y, Bar-Joseph Z, Klein-Seetharaman J (2006) Evaluation of different biological data and computational classification methods for use in protein interaction prediction. Proteins: Structure, Function, and Bioinformatics 63(3):490–500

Qiu J, Dong Y, Ma H, Li J, Wang K, Tang J (2018) Network embedding as matrix factorization: Unifying deepwalk, line, pte, and node2vec. In: Proceedings of the eleventh ACM international conference on web search and data mining, pp 459–467

Qiu J, Chen Q, Dong Y, Zhang J, Yang H, Ding M, Wang K, Tang J (2020a) Gcc: Graph contrastive coding for graph neural network pre-training. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 1150–1160

Qiu J, Cen Y, Chen Q, Zhou C, Zhou J, Yang H, Tang J (2021) Local clustering graph neural networks. OpenReview

Qiu X, Sun T, Xu Y, Shao Y, Dai N, Huang X (2020b) Pre-trained models for natural language processing: A survey. Science China Technological Sciences pp 1–26

Qu Y, Cai H, Ren K, Zhang W, Yu Y, Wen Y, Wang J (2016) Product-based neural networks for user response prediction. In: 2016 IEEE 16th International Conference on Data Mining (ICDM), IEEE, pp 1149–1154

Radford A, Narasimhan K, Salimans T, Sutskever I (2018) Improving language understanding with unsupervised learning. Tech. rep., OpenAI

Radivojac P, Clark WT, Oron TR, et al (2013) A large-scale evaluation of computational protein function prediction. Nature Methods 10(3):221–227

Raghothaman M, Kulkarni S, Heo K, Naik M (2018) User-guided program reasoning using Bayesian inference. In: Proceedings of the 39th ACM SIGPLAN Conference on Programming Language Design and Implementation, pp 722–735

Rahman TA, Surma B, Backes M, Zhang Y (2019) Fairwalk: Towards fair graph embedding. In: IJCAI, pp 3289–3295

Ramakrishnan R, Dral PO, Rupp M, Von Lilienfeld OA (2014) Quantum chemistry structures and properties of 134 kilo molecules. Scientific data 1(1):1–7

Ramos PIP, Arge LWP, Lima NCB, Fukutani KF, de Queiroz ATL (2019) Leveraging user-friendly network approaches to extract knowledge from high-throughput omics datasets. Frontiers in genetics 10:1120

Rastkar S, Murphy GC (2013) Why did this code change? In: Proceedings of the 2013 International Conference on Software Engineering, IEEE Press, pp 1193–1196

Rastkar S, Murphy GC, Bradley AW (2011) Generating natural language summaries for crosscutting source code concerns. In: 2011 27th IEEE International Conference on Software Maintenance (ICSM), IEEE, pp 103–112

Rastkar S, Murphy GC, Murray G (2014) Automatic summarization of bug reports. IEEE Transactions on Software Engineering 40(4):366–380

Ratti C, Sobolevsky S, Calabrese F, Andris C, Reades J, Martino M, Claxton R, Strogatz SH (2010) Redrawing the map of great britain from a network of human interactions. PloS one 5(12)

Raychev V, Vechev M, Yahav E (2014) Code completion with statistical language models. In: Proceedings of the 35th ACM SIGPLAN Conference on Programming Language Design and Implementation, pp 419–428

Raychev V, Vechev M, Krause A (2015) Predicting program properties from Big Code. In: Principles of Programming Languages (POPL)

Real E, Moore S, Selle A, Saxena S, Suematsu YL, Tan J, Le Q, Kurakin A (2017) Large-scale evolution of image classifiers. arXiv preprint arXiv:170301041

Real E, Aggarwal A, Huang Y, Le QV (2019) Regularized evolution for image classifier architecture search. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 4780–4789

Ren H, Hu W, Leskovec J (2020) Query2box: Reasoning over knowledge graphs in vector space using box embeddings. In: International Conference on Learning Representations

Ren S, He K, Girshick R, Sun J (2015) Faster r-cnn: towards real-time object detection with region proposal networks. In: Proceedings of the 28th International Conference on Neural Information Processing Systems-Volume 1, pp 91–99

Ren Z, Wang X, Zhang N, Lv X, Li LJ (2017) Deep reinforcement learning-based image captioning with embedding reward. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 290–298

Rendle S (2010) Factorization machines. In: 10th IEEE International Conference on Data Mining (ICDM), IEEE, pp 995–1000

Rezende DJ, Mohamed S, Wierstra D (2014) Stochastic backpropagation and approximate inference in deep generative models. In: International conference on machine learning, PMLR, pp 1278–1286

Rhodes G (2010) Crystallography made crystal clear: a guide for users of macromolecular models. Elsevier

Ribeiro LF, Saverese PH, Figueiredo DR (2017) struc2vec: Learning node representations from structural identity. In: the ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, pp 385–394

Ribeiro MT, Ziviani N, Moura ESD, Hata I, Lacerda A, Veloso A (2014) Multiobjective pareto-efficient approaches for recommender systems. ACM Transactions on Intelligent Systems and Technology (TIST) 5(4):1–20

Ribeiro MT, Singh S, Guestrin C (2016) " why should i trust you?" explaining the predictions of any classifier. In: Proceedings of the 22nd ACM SIGKDD international conference on knowledge discovery and data mining, pp 1135–1144

Richiardi J, Achard S, Bunke H, Van De Ville D (2013) Machine learning with brain graphs: predictive modeling approaches for functional imaging in systems neuroscience. IEEE Signal Processing Magazine 30(3):58–70

Riesen K (2015) Structural Pattern Recognition with Graph Edit Distance Approximation Algorithms and Applications. Springer

Riesen K, Fankhauser S, Bunke H (2007) Speeding up graph edit distance computation with a bipartite heuristic. In: MLG, Citeseer, pp 21–24

Riloff E (1996) Automatically generating extraction patterns from untagged text. In: Proceedings of the national conference on artificial intelligence, pp 1044–1049

Rink B, Bejan CA, Harabagiu SM (2010) Learning textual graph patterns to detect causal event relations. In: FLAIRS Conference

Rizvi RF, Vasilakes JA, Adam TJ, Melton GB, Bishop JR, Bian J, Tao C, Zhang R (2019) Integrated dietary supplement knowledge base (idisk)

Robinson PN, Köhler S, Bauer S, et al (2008) The human phenotype ontology: A tool for annotating and analyzing human hereditary disease. The American Journal of Human Genetics 83(5):610–615

Rocco I, Cimpoi M, Arandjelović R, Torii A, Pajdla T, Sivic J (2018) Neighbourhood consensus networks. In: Advances in Neural Information Processing Systems, vol 31

Rodeghero P, McMillan C, McBurney PW, Bosch N, D'Mello S (2014) Improving automated source code summarization via an eye-tracking study of programmers. In: Proceedings of the 36th international conference on Software engineering, ACM, pp 390–401

Rodeghero P, Jiang S, Armaly A, McMillan C (2017) Detecting user story information in developer-client conversations to generate extractive summaries. In: 2017 IEEE/ACM 39th International Conference on Software Engineering (ICSE), IEEE, pp 49–59

Roehm T, Tiarks R, Koschke R, Maalej W (2012) How do professional developers comprehend software? In: 2012 34th International Conference on Software Engineering (ICSE), IEEE, pp 255–265

Rogers D, Hahn M (2010) Extended-connectivity fingerprints. Journal of Chemical Information and Modeling 50(5):742–754

Rolínek M, Swoboda P, Zietlow D, Paulus A, Musil V, Martius G (2020) Deep graph matching via blackbox differentiation of combinatorial solvers. In: European Conference on Computer Vision, Springer, pp 407–424

Rong Y, Bian Y, Xu T, Xie W, Wei Y, Huang W, Huang J (2020a) Self-supervised graph transformer on large-scale molecular data. Advances in Neural Information Processing Systems 33

Rong Y, Huang W, Xu T, Huang J (2020b) Dropedge: Towards deep graph convolutional networks on node classification. In: International Conference on Learning Representations

Rong Y, Xu T, Huang J, Huang W, Cheng H, Ma Y, Wang Y, Derr T, Wu L, Ma T (2020c) Deep graph learning: Foundations, advances and applications. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, ACM, Virtual Event, pp 3555–3556

Rossi A, Barbosa D, Firmani D, Matinata A, Merialdo P (2021) Knowledge graph embedding for link prediction: A comparative analysis. ACM Transactions on Knowledge Discovery from Data (TKDD) 15(2):1–49

Rossi E, Chamberlain B, Frasca F, Eynard D, Monti F, Bronstein M (2020) Temporal graph networks for deep learning on dynamic graphs. arXiv preprint arXiv:200610637

Rotmensch M, Halpern Y, Tlimat A, Horng S, Sontag D (2017) Learning a health knowledge graph from electronic medical records. Scientific reports 7(1):5994

Rousseau F, Vazirgiannis M (2013) Graph-of-word and tw-idf: new approach to ad hoc ir. In: Proceedings of the 22nd ACM international conference on Information & Knowledge Management, pp 59–68

Rousseau F, Kiagias E, Vazirgiannis M (2015) Text categorization as a graph classification problem. In: 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), pp 1702–1712

Roweis ST, Saul LK (2000) Nonlinear dimensionality reduction by locally linear embedding. science 290(5500):2323–2326

Rubner Y, Tomasi C, Guibas LJ (1998) A metric for distributions with applications to image databases. In: Sixth International Conference on Computer Vision (IEEE Cat. No. 98CH36271), IEEE, pp 59–66

Rue H, Held L (2005) Gaussian Markov random fields: theory and applications. CRC press

Rui SCLDJZJL T (2005) A character recognition based on feature extraction. Journal of Chinese Computer Systems, 26(2), 289-292 26(2):289–292

Sabour S, Frosst N, Hinton GE (2017) Dynamic routing between capsules. In: Proceedings of the 31st International Conference on Neural Information Processing Systems, pp 3859–3869

Sachdev S, Li H, Luan S, Kim S, Sen K, Chandra S (2018) Retrieval on source code: a neural code search. In: Proceedings of the 2nd ACM SIGPLAN International Workshop on Machine Learning and Programming Languages, pp 31–41

Sahu S, Gupta R, Sivaraman G, AbdAlmageed W, Espy-Wilson C (2017) Adversarial auto-encoders for speech based emotion recognition. Proc Interspeech 2017 pp 1243–1247

Sahu SK, Anand A (2018) Drug-drug interaction extraction from biomedical texts using long short-term memory network. Journal of biomedical informatics 86:15–24

Saire D, Ramírez Rivera A (2019) Graph learning network: A structure learning algorithm. In: Workshop on Learning and Reasoning with Graph-Structured Data (ICMLW 2019)

Samanta B, Abir D, Jana G, Chattaraj PK, Ganguly N, Rodriguez MG (2019) Nevae: A deep generative model for molecular graphs. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 1110–1117

Sanchez-Lengeling B, Wei J, Lee B, Reif E, Wang P, Qian W, McCloskey K, Colwell L, Wiltschko A (2020) Evaluating attribution for graph neural networks. In: Larochelle H, Ranzato M, Hadsell R, Balcan MF, Lin H (eds) Advances in Neural Information Processing Systems, Curran Associates, Inc., vol 33, pp 5898–5910

Sandryhaila A, Moura JF (2013) Discrete signal processing on graphs. IEEE Trans Signal Process 61(7):1644–1656

Sangeetha J, Jayasankar T (2019) Emotion speech recognition based on adaptive fractional deep belief network and reinforcement learning. In: Cognitive Informatics and Soft Computing, Springer, pp 165–174

Santini S, Ostermaier B, Vitaletti A (2008) First experiences using wireless sensor networks for noise pollution monitoring. In: Proceedings of the workshop on Real-world wireless sensor networks, pp 61–65

Santos A, Colaço AR, Nielsen AB, Niu L, Geyer PE, Coscia F, Albrechtsen NJW, Mundt F, Jensen LJ, Mann M (2020) Clinical knowledge graph integrates proteomics data into clinical decision-making. bioRxiv

Sato R (2020) A survey on the expressive power of graph neural networks. arXiv preprint arXiv:200304078

Sato R, Yamada M, Kashima H (2021) Random features strengthen graph neural networks. In: Proceedings of the 2021 SIAM International Conference on Data Mining (SDM), SIAM, pp 333–341

Satorras VG, Estrach JB (2018) Few-shot learning with graph neural networks. In: International Conference on Learning Representations

Scarselli F, Gori M, Tsoi AC, Hagenbuchner M, Monfardini G (2008) The graph neural network model. IEEE transactions on neural networks 20(1):61–80

Schenker A, Last M, Bunke H, Kandel A (2003) Clustering of web documents using a graph model. In: Web Document Analysis: Challenges and Opportunities, World Scientific, pp 3–18

Schlichtkrull M, Kipf TN, Bloem P, Van Den Berg R, Titov I, Welling M (2018) Modeling relational data with graph convolutional networks. In: European semantic web conference, Springer, pp 593–607

Schlichtkrull MS, De Cao N, Titov I (2021) Interpreting graph neural networks for nlp with differentiable edge masking. In: International Conference on Learning Representations

Schnake T, Eberle O, Lederer J, Nakajima S, Schütt KT, Müller KR, Montavon G (2020) Xai for graphs: Explaining graph neural network predictions by identifying relevant walks. arXiv preprint arXiv:200603589

Schneider N, Flanigan J, O'Gorman T (2015) The logic of amr: Practical, unified, graph-based sentence semantics for nlp. In: Proceedings of the 2015 Conference of the North American Chapter of the Association for Computational Linguistics: Tutorial Abstracts, pp 4–5

Schriml LM, Mitraka E, Munro J, Tauber B, Schor M, Nickle L, Felix V, Jeng L, Bearer C, Lichenstein R, et al (2019) Human disease ontology 2018 update: classification, content and workflow expansion. Nucleic acids research 47(D1):D955–D962

Schuchardt J, Bojchevski A, Klicpera J, Günnemann S (2021) Collective robustness certificates. In: International Conference on Learning Representations, ICLR

Schug J (2002) Predicting gene ontology functions from ProDom and CDD protein domains. Genome Research 12(4):648–655

Schulman J, Wolski F, Dhariwal P, Radford A, Klimov O (2017) Proximal policy optimization algorithms. arXiv preprint arXiv:170706347

Schuster M, Paliwal KK (1997) Bidirectional recurrent neural networks. IEEE Transactions on Signal Processing 45(11):2673–2681

Schwarzenberg R, Hübner M, Harbecke D, Alt C, Hennig L (2019) Layerwise relevance visualization in convolutional text graph classifiers. In: Proceedings of the EMNLP 2019 Workshop on Graph-Based Natural Language Processing

Schweidtmann AM, Rittig JG, König A, Grohe M, Mitsos A, Dahmen M (2020) Graph neural networks for prediction of fuel ignition quality. Energy & Fuels 34(9):11,395–11,407

Schwikowski B, Uetz P, Fields S (2000) A network of protein–protein interactions in yeast. Nature Biotechnology 18(12):1257–1261

Seide F, Li G, Yu D (2011) Conversational speech transcription using context-dependent deep neural networks. In: Twelfth annual conference of the international speech communication association

Seidman SB (1983) Network structure and minimum degree. Social Networks 5(3):269–287

Selsam D, Bjørner N (2019) Guiding high-performance SAT solvers with unsat-core predictions. In: International Conference on Theory and Applications of Satisfiability Testing, Springer, pp 336–353

Semasaba AOA, Zheng W, Wu X, Agyemang SA (2020) Literature survey of deep learning-based vulnerability analysis on source code. IET Software

Seo Y, Defferrard M, Vandergheynst P, Bresson X (2018) Structured sequence modeling with graph convolutional recurrent networks. In: Neural Information Processing, Springer, pp 362–373

Shah M, Chen X, Rohrbach M, Parikh D (2019) Cycle-consistency for robust visual question answering. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 6649–6658

Shang C, Tang Y, Huang J, Bi J, He X, Zhou B (2019) End-to-end structure-aware convolutional networks for knowledge base completion. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 3060–3067

Shang J, Zheng Y, Tong W, Chang E, Yu Y (2014) Inferring gas consumption and pollution emission of vehicles throughout a city. In: Proceedings of the 20th ACM SIGKDD international conference on Knowledge discovery and data mining, pp 1027–1036

Shanthamallu US, Thiagarajan JJ, Spanias A (2021) Uncertainty-Matching Graph Neural Networks to Defend Against Poisoning Attacks. In: AAAI Conference on Artificial Intelligence

Sharp ME (2017) Toward a comprehensive drug ontology: extraction of drug-indication relations from diverse information sources. Journal of biomedical semantics 8(1):1–10

Shehu A, Barbará D, Molloy K (2016) A survey of computational methods for protein function prediction. In: Wong KC (ed) Big Data Analytics in Genomics, Springer Verlag, pp 225–298

Shen J, Zhang J, Luo X, et al (2007) Predicting protein-protein interactions based only on sequences information. Proceedings of the National Academy of Sciences 104(11):4337–4341

Shen K, Wu L, Xu F, Tang S, Xiao J, Zhuang Y (2020) Hierarchical attention based spatial-temporal graph-to-sequence learning for grounded video description. In:

Bessiere C (ed) Proceedings of the Twenty-Ninth International Joint Conference on Artificial Intelligence, IJCAI-20, International Joint Conferences on Artificial Intelligence Organization, pp 941–947, main track

Shen YL, Huang CY, Wang SS, Tsao Y, Wang HM, Chi TS (2019) Reinforcement learning based speech enhancement for robust speech recognition. In: ICASSP 2019-2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), IEEE, pp 6750–6754

Shen Z, Zhang M, Zhao H, Yi S, Li H (2021) Efficient attention: Attention with linear complexities. In: Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision, pp 3531–3539

Shervashidze N, Schweitzer P, van Leeuwen EJ, Mehlhorn K, Borgwardt KM (2011a) Weisfeiler-Lehman graph kernels. Journal of Machine Learning Research 12:2539–2561

Shervashidze N, Schweitzer P, Leeuwen EJv, Mehlhorn K, Borgwardt KM (2011b) Weisfeiler-lehman graph kernels. Journal of Machine Learning Research 12(Sep):2539–2561

Shi C, Li Y, Zhang J, Sun Y, Philip SY (2016) A survey of heterogeneous information network analysis. IEEE Transactions on Knowledge and Data Engineering 29(1):17–37

Shi C, Hu B, Zhao WX, Philip SY (2018a) Heterogeneous information network embedding for recommendation. IEEE Transactions on Knowledge and Data Engineering 31(2):357–370

Shi C, Xu M, Zhu Z, Zhang W, Zhang M, Tang J (2019a) Graphaf: a flow-based autoregressive model for molecular graph generation. In: International Conference on Learning Representations

Shi J, Malik J (2000) Normalized cuts and image segmentation. IEEE Transactions on Pattern Analysis and Machine Intelligence 22(8):888–905, DOI 10.1109/34.868688

Shi L, Zhang Y, Cheng J, Lu H (2019b) Skeleton-based action recognition with directed graph neural networks. In: IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 7912–7921

Shi M, Wilson DA, Zhu X, Huang Y, Zhuang Y, Liu J, Tang Y (2020) Evolutionary architecture search for graph neural networks. arXiv preprint arXiv:200910199

Shi W, Rajkumar R (2020) Point-gnn: Graph neural network for 3d object detection in a point cloud. In: Proceedings of the IEEE/CVF conference on computer vision and pattern recognition, pp 1711–1719

Shi Y, Gui H, Zhu Q, Kaplan L, Han J (2018b) Aspem: Embedding learning by aspects in heterogeneous information networks. In: Proceedings of the 2018 SIAM International Conference on Data Mining, SIAM, pp 144–152

Shi Y, Zhu Q, Guo F, Zhang C, Han J (2018c) Easing embedding learning by comprehensive transcription of heterogeneous information networks. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 2190–2199

Shibata N, Kajikawa Y, Sakata I (2012) Link prediction in citation networks. Journal of the American society for information science and technology 63(1):78–85

Shorten C, Khoshgoftaar TM (2019) A survey on image data augmentation for deep learning. Journal of Big Data 6(1):1–48

Shou Z, Wang D, Chang SF (2016) Temporal action localization in untrimmed videos via multi-stage cnns. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 1049–1058

Shou Z, Chan J, Zareian A, Miyazawa K, Chang SF (2017) Cdc: Convolutional-de-convolutional networks for precise temporal action localization in untrimmed videos. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 5734–5743

Shrivastava S (2017) Bring rich knowledge of people places things and local businesses to your apps. Bing Blogs

Shu DW, Park SW, Kwon J (2019) 3d point cloud generative adversarial network based on tree structured graph convolutions. In: Proceedings of the IEEE/CVF International Conference on Computer Vision, pp 3859–3868

Shu K, Mahudeswaran D, Wang S, Liu H (2020) Hierarchical propagation networks for fake news detection: Investigation and exploitation. In: International AAAI Conference on Web and Social Media

Shuman DI, Narang SK, Frossard P, Ortega A, Vandergheynst P (2013) The emerging field of signal processing on graphs: Extending high-dimensional data analysis to networks and other irregular domains. IEEE Signal Process Mag 30(3):83–98

Si X, Dai H, Raghothaman M, Naik M, Song L (2018) Learning loop invariants for program verification. Advances in Neural Information Processing Systems 31:7751–7762

Si Y, Du J, Li Z, Jiang X, Miller T, Wang F, Zheng J, Roberts K (2020) Deep representation learning of patient data from electronic health records (ehr): A systematic review. Journal of Biomedical Informatics pp 103,671–103,671

Siddharth N, Paige B, van de Meent JW, Desmaison A, Goodman ND, Kohli P, Wood F, Torr PH (2017) Learning disentangled representations with semi-supervised deep generative models. In: Proceedings of the 31st International Conference on Neural Information Processing Systems, pp 5927–5937

Siegelmann HT, Sontag ED (1995) On the computational power of neural nets. Journal of computer and system sciences 50(1):132–150

Silander T, Myllymäki P (2006) A simple approach for finding the globally optimal bayesian network structure. In: Proceedings of the Twenty-Second Conference on Uncertainty in Artificial Intelligence, pp 445–452

Sillito J, Murphy GC, De Volder K (2008) Asking and answering questions during a programming change task. IEEE Transactions on Software Engineering 34(4):434–451

Silva J (2012) A vocabulary of program slicing-based techniques. ACM computing surveys (CSUR) 44(3):1–41

Silver D, Lever G, Heess N, Degris T, Wierstra D, Riedmiller M (2014) Deterministic policy gradient algorithms. In: International conference on machine learning, PMLR, pp 387–395

Simonovsky M, Komodakis N (2017) Dynamic edge-conditioned filters in convolutional neural networks on graphs. In: IEEE Conference on Computer Vision and Pattern Recognition, pp 29–38

Simonovsky M, Komodakis N (2018) Graphvae: Towards generation of small graphs using variational autoencoders. arXiv preprint arXiv:180203480

Simonyan K, Zisserman A (2014a) Two-stream convolutional networks for action recognition in videos. In: Proceedings of the 27th International Conference on Neural Information Processing Systems, pp 568–576

Simonyan K, Zisserman A (2014b) Very deep convolutional networks for large-scale image recognition. arXiv preprint arXiv:14091556

Simonyan K, Vedaldi A, Zisserman A (2013) Deep inside convolutional networks: Visualising image classification models and saliency maps. arXiv preprint arXiv:13126034

Singhal A (2012) Introducing the knowledge graph: things, not strings. Official google blog 5:16

Skarding J, Gabrys B, Musial K (2020) Foundations and modelling of dynamic networks using dynamic graph neural networks: A survey. arXiv preprint arXiv:200507496

Smilkov D, Thorat N, Kim B, Viégas F, Wattenberg M (2017) Smoothgrad: removing noise by adding noise. Workshop on Visualization for Deep Learning, ICML

Socher R, Huang EH, Pennington J, Ng AY, Manning CD (2011) Dynamic pooling and unfolding recursive autoencoders for paraphrase detection. In: NIPS, vol 24, pp 801–809

Socher R, Chen D, Manning CD, Ng A (2013) Reasoning with neural tensor networks for knowledge base completion. In: Advances in neural information processing systems, Citeseer, pp 926–934

Sohn K, Lee H, Yan X (2015) Learning structured output representation using deep conditional generative models. Advances in neural information processing systems 28:3483–3491

Song C, Lin Y, Guo S, Wan H (2020a) Spatial-temporal synchronous graph convolutional networks: A new framework for spatial-temporal network data forecasting. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 914–921

Song L, Zhang Y, Wang Z, Gildea D (2018) A graph-to-sequence model for amr-to-text generation. In: Proceedings of the 56th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers), pp 1616–1626

Song L, Wang A, Su J, Zhang Y, Xu K, Ge Y, Yu D (2020b) Structural information preserving for graph-to-text generation. In: Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics, pp 7987–7998

Song W, Xiao Z, Wang Y, Charlin L, Zhang M, Tang J (2019a) Session-based social recommendation via dynamic graph attention networks. In: ACM International Conference on Web Search and Data Mining, pp 555–563

Song X, Sun H, Wang X, Yan J (2019b) A survey of automatic generation of source code comments: Algorithms and techniques. IEEE Access 7:111,411–111,428

Sridhara G, Pollock L, Vijay-Shanker K (2011) Automatically detecting and describing high level actions within methods. In: Proceedings of the 33rd International Conference on Software Engineering, ACM, pp 101–110

Srinivasan B, Ribeiro B (2020a) On the equivalence between node embeddings and structural graph representations. In: International Conference on Learning Representations

Srinivasan B, Ribeiro B (2020b) On the equivalence between positional node embeddings and structural graph representations. In: 8th International Conference on Learning Representations, ICLR 2020, Addis Ababa, Ethiopia, April 26-30, 2020, OpenReview.net

Srivastava N, Hinton G, Krizhevsky A, Sutskever I, Salakhutdinov R (2014) Dropout: a simple way to prevent neural networks from overfitting. The journal of machine learning research 15(1):1929–1958

Stanfield Z, Coşkun M, Koyutürk M (2017) Drug response prediction as a link prediction problem. Scientific reports 7(1):1–13

Stanic A, van Steenkiste S, Schmidhuber J (2021) Hierarchical relational inference. In: Proceedings of the AAAI Conference on Artificial Intelligence

Stark C (2006) BioGRID: a general repository for interaction datasets. Nucleic Acids Research 34(90001):D535–D539

van Steenkiste S, Chang M, Greff K, Schmidhuber J (2018) Relational neural expectation maximization: Unsupervised discovery of objects and their interactions. In: International Conference on Learning Representations

Sterling T, Irwin JJ (2015) ZINC 15 – ligand discovery for everyone. Journal of Chemical Information and Modeling 55(11):2324–2337

Stokes J, Yang K, Swanson K, Jin W, Cubillos-Ruiz A, Donghia N, MacNair C, French S, Carfrae L, Bloom-Ackerman Z, Tran V, Chiappino-Pepe A, Badran A, Andrews I, Chory E, Church G, Brown E, Jaakkola T, Barzilay R, Collins J (2020) A deep learning approach to antibiotic discovery. Cell 180:688–702.e13

Su C, Aseltine R, Doshi R, Chen K, Rogers SC, Wang F (2020a) Machine learning for suicide risk prediction in children and adolescents with electronic health records. Translational psychiatry 10(1):1–10

Su C, Tong J, Wang F (2020b) Mining genetic and transcriptomic data using machine learning approaches in parkinson's disease. npj Parkinson's Disease 6(1):1–10

Su C, Tong J, Zhu Y, Cui P, Wang F (2020c) Network embedding in biomedical data science. Briefings in bioinformatics 21(1):182–197

Su C, Xu Z, Hoffman K, Goyal P, Safford MM, Lee J, Alvarez-Mulett S, Gomez-Escobar L, Price DR, Harrington JS, et al (2020d) Identifying organ dysfunction trajectory-based subphenotypes in critically ill patients with covid-19. medRxiv

Su C, Xu Z, Pathak J, Wang F (2020e) Deep learning in mental health outcome research: a scoping review. Translational Psychiatry 10(1):1–26

Su C, Zhang Y, Flory JH, Weiner MG, Kaushal R, Schenck EJ, Wang F (2021) Novel clinical subphenotypes in covid-19: derivation, validation, prediction, temporal patterns, and interaction with social determinants of health. medRxiv

Subramanian I, Verma S, Kumar S, Jere A, Anamika K (2020) Multi-omics data integration, interpretation, and its application. Bioinformatics and biology insights 14:1177932219899,051

Sugiyama M, Borgwardt KM (2015) Halting in random walk kernels. In: Advances in Neural Information Processing Systems, pp 1639–1647

Sukhbaatar S, Fergus R, et al (2016) Learning multiagent communication with backpropagation. Advances in neural information processing systems 29:2244–2252

Sun C, Gong Y, Wu Y, Gong M, Jiang D, Lan M, Sun S, Duan N (2019) Joint type inference on entities and relations via graph convolutional networks. In: Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics, pp 1361–1370

Sun H, Xiao J, Zhu W, He Y, Zhang S, Xu X, Hou L, Li J, Ni Y, Xie G (2020a) Medical knowledge graph to enhance fraud, waste, and abuse detection on claim data: Model development and performance evaluation. JMIR Medical Informatics 8(7):e17,653

Sun J, Jiang Q, Lu C (2020b) Recursive social behavior graph for trajectory prediction. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 660–669

Sun K, Lin Z, Zhu Z (2020c) Multi-stage self-supervised learning for graph convolutional networks on graphs with few labeled nodes. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 5892–5899

Sun M, Li P (2019) Graph to graph: a topology aware approach for graph structures learning and generation. In: The 22nd International Conference on Artificial Intelligence and Statistics, PMLR, pp 2946–2955

Sun S, Zhang B, Xie L, Zhang Y (2017) An unsupervised deep domain adaptation approach for robust speech recognition. Neurocomputing 257:79–87

Sun Y, Han J (2013) Mining heterogeneous information networks: a structural analysis approach. Acm Sigkdd Explorations Newsletter 14(2):20–28

Sun Y, Han J, Yan X, Yu PS, Wu T (2011) Pathsim: Meta path-based top-k similarity search in heterogeneous information networks. Proceedings of the VLDB Endowment 4(11):992–1003

Sun Y, Wang S, Tang X, Hsieh TY, Honavar V (2020d) Adversarial attacks on graph neural networks via node injections: A hierarchical reinforcement learning approach. In: Proceedings of The Web Conference 2020, Association for Computing Machinery, WWW '20, p 673–683, DOI 10.1145/3366423.3380149

Sun Y, Yuan F, Yang M, Wei G, Zhao Z, Liu D (2020e) A generic network compression framework for sequential recommender systems. In: Proceedings of the 43rd International ACM SIGIR Conference on Research and Development in Information Retrieval, pp 1299–1308

Sundararajan M, Taly A, Yan Q (2017) Axiomatic attribution for deep networks. In: International Conference on Machine Learning, PMLR, pp 3319–3328

Sutskever I, Vinyals O, Le QV (2014) Sequence to sequence learning with neural networks. Advances in Neural Information Processing Systems 27:3104–3112

Sutton RS, Barto AG (2018) Reinforcement learning: An introduction. MIT press

Sutton RS, McAllester DA, Singh SP, Mansour Y (2000) Policy gradient methods for reinforcement learning with function approximation. In: Advances in Neural Information Processing Systems, pp 1057–1063

Swietojanski P, Li J, Renals S (2016) Learning hidden unit contributions for unsupervised acoustic model adaptation. IEEE/ACM Transactions on Audio, Speech, and Language Processing 24(8):1450–1463

Szegedy C, Liu W, Jia Y, Sermanet P, Reed S, Anguelov D, Erhan D, Vanhoucke V, Rabinovich A (2015) Going deeper with convolutions. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 1–9

Szklarczyk D, Gable AL, Lyon D, Junge A, Wyder S, Huerta-Cepas J, Simonovic M, Doncheva NT, Morris JH, Bork P, et al (2019) String v11: protein–protein association networks with increased coverage, supporting functional discovery in genome-wide experimental datasets. Nucleic acids research 47(D1):D607–D613

Takahashi T (2019) Indirect adversarial attacks via poisoning neighbors for graph convolutional networks. In: 2019 IEEE International Conference on Big Data (Big Data), IEEE, pp 1395–1400

Tang J, Wang K (2018) Personalized top-n sequential recommendation via convolutional sequence embedding. In: Proceedings of the Eleventh ACM International Conference on Web Search and Data Mining, pp 565–573

Tang J, Qu M, Mei Q (2015a) Pte: Predictive text embedding through large-scale heterogeneous text networks. In: Proceedings of the 21th ACM SIGKDD international conference on knowledge discovery and data mining, pp 1165–1174

Tang J, Qu M, Wang M, Zhang M, Yan J, Mei Q (2015b) Line: Large-scale information network embedding. In: Proceedings of the 24th international conference on world wide web, pp 1067–1077

Tang R, Du M, Liu N, Yang F, Hu X (2020a) An embarrassingly simple approach for trojan attack in deep neural networks. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 218–228

Tang X, Li Y, Sun Y, Yao H, Mitra P, Wang S (2020b) Transferring robustness for graph neural network against poisoning attacks. In: Proceedings of the 13th International Conference on Web Search and Data Mining, pp 600–608

Tao J, Lin J, Zhang S, Zhao S, Wu R, Fan C, Cui P (2019) Mvan: Multi-view attention networks for real money trading detection in online games. In: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 2536–2546

Tarlow D, Moitra S, Rice A, Chen Z, Manzagol PA, Sutton C, Aftandilian E (2020) Learning to fix build errors with Graph2Diff neural networks. In: Proceedings of the IEEE/ACM 42nd International Conference on Software Engineering Workshops, pp 19–20

Tate JG, Bamford S, Jubb HC, Sondka Z, Beare DM, Bindal N, Boutselakis H, Cole CG, Creatore C, Dawson E, et al (2019) Cosmic: the catalogue of somatic mutations in cancer. Nucleic acids research 47(D1):D941–D947

Te G, Hu W, Zheng A, Guo Z (2018) Rgcnn: Regularized graph cnn for point cloud segmentation. In: Proceedings of the 26th ACM international conference on Multimedia, pp 746–754

Tenenbaum JB, De Silva V, Langford JC (2000) A global geometric framework for nonlinear dimensionality reduction. science 290(5500):2319–2323

Teru K, Denis E, Hamilton W (2020) Inductive relation prediction by subgraph reasoning. In: International Conference on Machine Learning, PMLR, pp 9448–9457

Thomas S, Seltzer ML, Church K, Hermansky H (2013) Deep neural network features and semi-supervised training for low resource speech recognition. In: 2013 IEEE international conference on acoustics, speech and signal processing, IEEE, pp 6704–6708

Tian Z, Guo M, Wang C, Liu X, Wang S (2017) Refine gene functional similarity network based on interaction networks. BMC bioinformatics (16)

Torng W, Altman RB (2018) High precision protein functional site detection using 3d convolutional neural networks. Bioinformatics 35(9):1503–1512

Train K (1986) Qualitative choice analysis: Theory, econometrics, and an application to automobile demand, vol 10. MIT press

Tramer F, Carlini N, Brendel W, Madry A (2020) On adaptive attacks to adversarial example defenses. In: Larochelle H, Ranzato M, Hadsell R, Balcan MF, Lin H (eds) Advances in Neural Information Processing Systems, Curran Associates, Inc., vol 33, pp 1633–1645

Tran D, Bourdev L, Fergus R, Torresani L, Paluri M (2015) Learning spatiotemporal features with 3d convolutional networks. In: Proceedings of the IEEE international conference on computer vision, pp 4489–4497

Trivedi R, Dai H, Wang Y, Song L (2017) Know-evolve: Deep temporal reasoning for dynamic knowledge graphs. In: International Conference on Machine Learning, PMLR, pp 3462–3471

Trivedi R, Farajtabar M, Biswal P, Zha H (2019) Dyrep: Learning representations over dynamic graphs. In: International Conference on Learning Representations

Trouillon T, Welbl J, Riedel S, Gaussier É, Bouchard G (2016) Complex embeddings for simple link prediction. In: International Conference on Machine Learning, pp 2071–2080

Tsai YHH, Bai S, Yamada M, Morency LP, Salakhutdinov R (2019) Transformer dissection: An unified understanding for transformer's attention via the lens of kernel. In: Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP), pp 4335–4344

Tsuyuzaki K, Nikaido I (2017) Biological systems as heterogeneous information networks: a mini-review and perspectives. WSDM HeteroNAM 18 - International Workshop on Heterogeneous Networks Analysis and Mining

Tu C, Zhang W, Liu Z, Sun M, et al (2016) Max-margin deepwalk: Discriminative learning of network representation. In: IJCAI, vol 2016, pp 3889–3895

Tu K, Cui P, Wang X, Wang F, Zhu W (2018) Structural deep embedding for hyper-networks. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 32

Tu M, Wang G, Huang J, Tang Y, He X, Zhou B (2019) Multi-hop reading comprehension across multiple documents by reasoning over heterogeneous graphs. In:

Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics, pp 2704–2713

Tufano M, Drain D, Svyatkovskiy A, Sundaresan N (2020) Generating accurate assert statements for unit test cases using pretrained transformers. arXiv preprint arXiv:200905634

Tzirakis P, Zhang J, Schuller BW (2018) End-to-end speech emotion recognition using deep neural networks. In: 2018 IEEE international conference on acoustics, speech and signal processing (ICASSP), IEEE, pp 5089–5093

Ulutan O, Iftekhar A, Manjunath BS (2020) Vsgnet: Spatial attention network for detecting human object interactions using graph convolutions. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 13,617–13,626

Vahedian A, Zhou X, Tong L, Li Y, Luo J (2017) Forecasting gathering events through continuous destination prediction on big trajectory data. In: Proceedings of the 25th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems, pp 1–10

Vahedian A, Zhou X, Tong L, Street WN, Li Y (2019) Predicting urban dispersal events: A two-stage framework through deep survival analysis on mobility data. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 5199–5206

Van Hasselt H, Guez A, Silver D (2016) Deep reinforcement learning with double q-learning. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 30

Van Oord A, Kalchbrenner N, Kavukcuoglu K (2016) Pixel recurrent neural networks. In: International Conference on Machine Learning, pp 1747–1756

Vashishth S, Yadati N, Talukdar P (2019) Graph-based deep learning in natural language processing. In: Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP): Tutorial Abstracts

Vashishth S, Sanyal S, Nitin V, Talukdar P (2020) Composition-based multi-relational graph convolutional networks. In: International Conference on Learning Representations

Vasic M, Kanade A, Maniatis P, Bieber D, Singh R (2018) Neural program repair by jointly learning to localize and repair. In: International Conference on Learning Representations

Vaswani A, Shazeer N, Parmar N, Uszkoreit J, Jones L, Gomez AN, Kaiser u, Polosukhin I (2017) Attention is all you need. In: Proceedings of the 31st International Conference on Neural Information Processing Systems, Curran Associates Inc., Red Hook, NY, USA, NIPS'17, p 6000–6010

Veličković P, Cucurull G, Casanova A, Romero A, Lio P, Bengio Y (2018) Graph attention networks. In: International Conference on Learning Representations

Velickovic P, Fedus W, Hamilton WL, Liò P, Bengio Y, Hjelm RD (2019) Deep graph infomax. In: ICLR (Poster)

Veličković P, Ying R, Padovano M, Hadsell R, Blundell C (2019) Neural execution of graph algorithms. In: International Conference on Learning Representations

Velickovic P, Buesing L, Overlan M, Pascanu R, Vinyals O, Blundell C (2020) Pointer graph networks. In: Larochelle H, Ranzato M, Hadsell R, Balcan MF, Lin H (eds) Advances in Neural Information Processing Systems, Curran Associates, Inc., vol 33, pp 2232–2244

Veličković P, Fedus W, Hamilton WL, Liò P, Bengio Y, Hjelm RD (2019) Deep graph infomax. In: International Conference on Learning Representations

Vento M, Foggia P (2013) Graph matching techniques for computer vision. In: Image Processing: Concepts, Methodologies, Tools, and Applications, IGI Global, chap 21, pp 381–421

Vignac C, Loukas A, Frossard P (2020a) Building powerful and equivariant graph neural networks with structural message-passing. arXiv e-prints pp arXiv–2006

Vignac C, Loukas A, Frossard P (2020b) Building powerful and equivariant graph neural networks with structural message-passing. In: Larochelle H, Ranzato M, Hadsell R, Balcan MF, Lin H (eds) Advances in Neural Information Processing Systems, Curran Associates, Inc., vol 33, pp 14,143–14,155

Vincent P, Larochelle H, Bengio Y, Manzagol P (2008) Extracting and composing robust features with denoising autoencoders. In: Cohen WW, McCallum A, Roweis ST (eds) Machine Learning, Proceedings of the Twenty-Fifth International Conference (ICML 2008), Helsinki, Finland, June 5-9, 2008, ACM, ACM International Conference Proceeding Series, vol 307, pp 1096–1103, DOI 10.1145/1390156.1390294

Vinyals O, Fortunato M, Jaitly N (2015) Pointer networks. In: Neural Information Processing Systems (NeurIPS), pp 2692–2700

Vinyals O, Bengio S, Kudlur M (2016) Order matters: Sequence to sequence for sets. In: International Conference on Learning Representations

Vishwanathan SVN, Schraudolph NN, Kondor R, Borgwardt KM (2010) Graph kernels. Journal of Machine Learning Research 11(Apr):1201–1242

VONLUXBURG U (2007) A tutorial on spectral clustering. Statistics and Computing 17:395–416

Vrandečić D, Krötzsch M (2014) Wikidata: a free collaborative knowledgebase. Communications of the ACM 57(10):78–85

Vu MN, Thai MT (2020) Pgm-explainer: Probabilistic graphical model explanations for graph neural networks. arXiv preprint arXiv:201005788

Wald J, Dhamo H, Navab N, Tombari F (2020) Learning 3d semantic scene graphs from 3d indoor reconstructions. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 3961–3970

Wan S, Lan Y, Guo J, Xu J, Pang L, Cheng X (2016) A deep architecture for semantic matching with multiple positional sentence representations. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 30

Wan Y, Zhao Z, Yang M, Xu G, Ying H, Wu J, Yu PS (2018) Improving automatic source code summarization via deep reinforcement learning. In: Proceedings of the 33rd ACM/IEEE International Conference on Automated Software Engineering, ACM, pp 397–407

Wang B, Gong NZ (2019) Attacking graph-based classification via manipulating the graph structure. In: Proceedings of the 2019 ACM SIGSAC Conference on Computer and Communications Security, pp 2023–2040

Wang C, Pan S, Long G, Zhu X, Jiang J (2017a) Mgae: Marginalized graph autoencoder for graph clustering. In: Proceedings of the 2017 ACM on Conference on Information and Knowledge Management, pp 889–898

Wang D, Cui P, Zhu W (2016) Structural deep network embedding. In: Proceedings of the 22nd ACM SIGKDD international conference on Knowledge discovery and data mining, pp 1225–1234

Wang D, Jamnik M, Lio P (2019a) Abstract diagrammatic reasoning with multiplex graph networks. In: International Conference on Learning Representations

Wang D, Lin J, Cui P, Jia Q, Wang Z, Fang Y, Yu Q, Zhou J, Yang S, Qi Y (2019b) A semi-supervised graph attentive network for financial fraud detection. In: 2019 IEEE International Conference on Data Mining (ICDM), IEEE, pp 598–607

Wang D, Jiang M, Syed M, Conway O, Juneja V, Subramanian S, Chawla NV (2020a) Calendar graph neural networks for modeling time structures in spatiotemporal user behaviors. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 2581–2589

Wang F, Preininger A (2019) Ai in health: State of the art, challenges, and future directions. Yearbook of medical informatics 28(1):16–26

Wang F, Zhang C (2007) Label propagation through linear neighborhoods. IEEE Transactions on Knowledge and Data Engineering 20(1):55–67

Wang G, Dunbrack RL (2003) PISCES: a protein sequence culling server. Bioinformatics 19(12):1589–1591, DOI 10.1093/bioinformatics/btg224

Wang H, Huan J (2019) Agan: Towards automated design of generative adversarial networks. arXiv preprint arXiv:190611080

Wang H, Schmid C (2013) Action recognition with improved trajectories. In: Proceedings of the IEEE international conference on computer vision, pp 3551–3558

Wang H, Wang J, Wang J, Zhao M, Zhang W, Zhang F, Xie X, Guo M (2018a) Graphgan: Graph representation learning with generative adversarial nets. In: Proceedings of the AAAI conference on artificial intelligence, vol 32

Wang H, Zhang F, Zhang M, Leskovec J, Zhao M, Li W, Wang Z (2019c) Knowledge-aware graph neural networks with label smoothness regularization for recommender systems. In: KDD'19, pp 968–977

Wang H, Zhao M, Xie X, Li W, Guo M (2019d) Knowledge graph convolutional networks for recommender systems. In: The world wide web conference, pp 3307–3313

Wang H, Zhao M, Xie X, Li W, Guo M (2019e) Knowledge graph convolutional networks for recommender systems. In: WWW'19, pp 3307–3313

Wang H, Wang K, Yang J, Shen L, Sun N, Lee HS, Han S (2020b) Gcn-rl circuit designer: Transferable transistor sizing with graph neural networks and reinforcement learning. In: Design Automation Conference, IEEE, pp 1–6

Wang J, Zheng VW, Liu Z, Chang KCC (2017b) Topological recurrent neural network for diffusion prediction. In: 2017 IEEE International Conference on Data Mining (ICDM), IEEE, pp 475–484

Wang J, Huang P, Zhao H, Zhang Z, Zhao B, Lee DL (2018b) Billion-scale commodity embedding for e-commerce recommendation in alibaba. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 839–848

Wang J, Oh J, Wang H, Wiens J (2018c) Learning credible models. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 2417–2426

Wang J, Luo M, Suya F, Li J, Yang Z, Zheng Q (2020c) Scalable attack on graph data by injecting vicious nodes. Data Mining and Knowledge Discovery 34(5):1363–1389

Wang K, Singh R, Su Z (2018d) Dynamic neural program embeddings for program repair. In: International Conference on Learning Representations

Wang M, Liu M, Liu J, Wang S, Long G, Qian B (2017c) Safe medicine recommendation via medical knowledge graph embedding. arXiv preprint arXiv:171005980

Wang M, Yu L, Zheng D, Gan Q, Gai Y, Ye Z, Li M, Zhou J, Huang Q, Ma C, Huang Z, Guo Q, Zhang H, Lin H, Zhao J, Li J, Smola AJ, Zhang Z (2019f) Deep graph library: Towards efficient and scalable deep learning on graphs. International Conference on Learning Representations Workshop on Representation Learning on Graphs and Manifolds

Wang M, Lin Y, Lin G, Yang K, Wu Xm (2020d) M2grl: A multi-task multi-view graph representation learning framework for web-scale recommender systems. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 2349–2358

Wang Q, Mao Z, Wang B, Guo L (2017d) Knowledge graph embedding: A survey of approaches and applications. IEEE Transactions on Knowledge and Data Engineering 29(12):2724–2743

Wang Q, Li M, Wang X, Parulian N, Han G, Ma J, Tu J, Lin Y, Zhang H, Liu W, et al (2020e) Covid-19 literature knowledge graph construction and drug repurposing report generation. arXiv preprint arXiv:200700576

Wang R, Yan J, Yang X (2019g) Learning combinatorial embedding networks for deep graph matching. In: Proceedings of the IEEE/CVF International Conference on Computer Vision, pp 3056–3065

Wang R, Zhang T, Yu T, Yan J, Yang X (2020f) Combinatorial learning of graph edit distance via dynamic embedding. arXiv preprint arXiv:201115039

Wang S, He L, Cao B, Lu CT, Yu PS, Ragin AB (2017e) Structural deep brain network mining. In: Proceedings of the 23rd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, pp 475–484

Wang S, Tang J, Aggarwal C, Chang Y, Liu H (2017f) Signed network embedding in social media. In: Proceedings of the 2017 SIAM international conference on data mining, SIAM, pp 327–335

Wang S, Chen Z, Li D, Li Z, Tang LA, Ni J, Rhee J, Chen H, Yu PS (2019h) Attentional heterogeneous graph neural network: Application to program reidentification. In: Proceedings of the 2019 SIAM International Conference on Data Mining, SIAM, pp 693–701

Wang S, Chen Z, Yu X, Li D, Ni J, Tang L, Gui J, Li Z, Chen H, Yu PS (2019i) Heterogeneous graph matching networks for unknown malware detection. In: Proceedings of the Twenty-Eighth International Joint Conference on Artificial Intelligence, IJCAI, pp 3762–3770

Wang S, Li BZ, Khabsa M, Fang H, Ma H (2020g) Linformer: Self-attention with linear complexity. CoRR abs/2006.04768

Wang S, Li Y, Zhang J, Meng Q, Meng L, Gao F (2020h) Pm2. 5-gnn: A domain knowledge enhanced graph neural network for pm2. 5 forecasting. In: Proceedings of the 28th International Conference on Advances in Geographic Information Systems, pp 163–166

Wang S, Wang R, Yao Z, Shan S, Chen X (2020i) Cross-modal scene graph matching for relationship-aware image-text retrieval. In: Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision, pp 1508–1517

Wang T, Ling H (2017) Gracker: A graph-based planar object tracker. IEEE transactions on pattern analysis and machine intelligence 40(6):1494–1501

Wang T, Liu H, Li Y, Jin Y, Hou X, Ling H (2020j) Learning combinatorial solver for graph matching. In: Proceedings of the IEEE/CVF conference on computer vision and pattern recognition, pp 7568–7577

Wang T, Wan X, Jin H (2020k) Amr-to-text generation with graph transformer. Transactions of the Association for Computational Linguistics 8:19–33

Wang X, Gupta A (2018) Videos as space-time region graphs. In: Proceedings of the European conference on computer vision (ECCV), pp 399–417

Wang X, Cui P, Wang J, Pei J, Zhu W, Yang S (2017g) Community preserving network embedding. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 31

Wang X, Girshick R, Gupta A, He K (2018e) Non-local neural networks. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 7794–7803

Wang X, Ye Y, Gupta A (2018f) Zero-shot recognition via semantic embeddings and knowledge graphs. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 6857–6866

Wang X, He X, Cao Y, Liu M, Chua TS (2019j) Kgat: Knowledge graph attention network for recommendation. In: KDD'19, pp 950–958

Wang X, He X, Wang M, Feng F, Chua TS (2019k) Neural graph collaborative filtering. In: Proceedings of the 42nd international ACM SIGIR conference on Research and development in Information Retrieval, pp 165–174

Wang X, Ji H, Shi C, Wang B, Ye Y, Cui P, Yu PS (2019l) Heterogeneous graph attention network. In: The World Wide Web Conference, pp 2022–2032

Wang X, Ji H, Shi C, Wang B, Ye Y, Cui P, Yu PS (2019m) Heterogeneous graph attention network. In: The World Wide Web Conference, pp 2022–2032

Wang X, Zhang Y, Shi C (2019n) Hyperbolic heterogeneous information network embedding. In: Proceedings of the AAAI conference on artificial intelligence, vol 33, pp 5337–5344

Wang X, Bo D, Shi C, Fan S, Ye Y, Yu PS (2020l) A survey on heterogeneous graph embedding: Methods, techniques, applications and sources. arXiv preprint arXiv:201114867

Wang X, Lu Y, Shi C, Wang R, Cui P, Mou S (2020m) Dynamic heterogeneous information network embedding with meta-path based proximity. IEEE Transactions on Knowledge and Data Engineering pp 1–1, DOI 10.1109/TKDE.2020.2993870

Wang X, Wang R, Shi C, Song G, Li Q (2020n) Multi-component graph convolutional collaborative filtering. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 6267–6274

Wang X, Wu Y, Zhang A, He X, seng Chua T (2021) Causal screening to interpret graph neural networks

Wang Y, Ni X, Sun JT, Tong Y, Chen Z (2011) Representing document as dependency graph for document clustering. In: Proceedings of the 20th ACM international conference on Information and knowledge management, pp 2177–2180

Wang Y, Shen H, Liu S, Gao J, Cheng X (2017h) Cascade dynamics modeling with attention-based recurrent neural network. In: Proceedings of the 26th International Joint Conference on Artificial Intelligence, pp 2985–2991

Wang Y, Che W, Guo J, Liu T (2018g) A neural transition-based approach for semantic dependency graph parsing. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 32

Wang Y, Yin H, Chen H, Wo T, Xu J, Zheng K (2019o) Origin-destination matrix prediction via graph convolution: a new perspective of passenger demand modeling. In: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 1227–1235

Wang Y, Liu S, Yoon M, Lamba H, Wang W, Faloutsos C, Hooi B (2020o) Provably robust node classification via low-pass message passing. In: 2020 IEEE International Conference on Data Mining (ICDM), pp 621–630, DOI 10.1109/ICDM50108.2020.00071

Wang Z, Zhang J, Feng J, Chen Z (2014) Knowledge graph embedding by translating on hyperplanes. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 28

Wang Z, Zheng L, Li Y, Wang S (2019p) Linkage based face clustering via graph convolution network. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 1117–1125

Wass MN, Barton G, Sternberg MJE (2012) CombFunc: predicting protein function using heterogeneous data sources. Nucleic Acids Research 40(W1):W466–W470

Watkins KE, Ferris B, Borning A, Rutherford GS, Layton D (2011) Where is my bus? impact of mobile real-time information on the perceived and actual wait time of transit riders. Transportation Research Part A: Policy and Practice 45(8):839–848

Watts DJ, Strogatz SH (1998) Collective dynamics of 'small-world'networks. nature 393(6684):440–442

Wei J, Goyal M, Durrett G, Dillig I (2019) LambdaNet: Probabilistic type inference using graph neural networks. In: International Conference on Learning Representations

Wei X, Yu R, Sun J (2020) View-gcn: View-based graph convolutional network for 3d shape analysis. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 1850–1859

Weihua Hu MZYDHRBLMCJL Matthias Fey (2020) Open graph benchmark: Datasets for machine learning on graphs. arXiv preprint arXiv:200500687

Weininger D (1988) Smiles, a chemical language and information system. 1. introduction to methodology and encoding rules. Journal of chemical information and computer sciences 28(1):31–36

Weisfeiler B (1976) On Construction and Identification of Graphs. Lecture Notes in Mathematics, Vol. 558, Springer

Weisfeiler B, Leman A (1968) The reduction of a graph to canonical form and the algebra which appears therein. Nauchno-Technicheskaya Informatsia 2(9):12–16

Weisfeiler B, Leman A (1968) The reduction of a graph to canonical form and the algebra which appears therein. NTI, Series 2(9):12–16

Weng C, Shah NH, Hripcsak G (2020) Deep phenotyping: embracing complexity and temporality—towards scalability, portability, and interoperability. Journal of biomedical informatics 105:103,433

Weston J, Bengio S, Usunier N (2010) Large scale image annotation: learning to rank with joint word-image embeddings. Machine learning 81(1):21–35

Whirl-Carrillo M, McDonagh EM, Hebert J, Gong L, Sangkuhl K, Thorn C, Altman RB, Klein TE (2012) Pharmacogenomics knowledge for personalized medicine. Clinical Pharmacology & Therapeutics 92(4):414–417

White M, Tufano M, Vendome C, Poshyvanyk D (2016) Deep learning code fragments for code clone detection. In: 2016 31st IEEE/ACM International Conference on Automated Software Engineering (ASE), IEEE, pp 87–98

Williams RJ (1992) Simple statistical gradient-following algorithms for connectionist reinforcement learning. Machine learning 8(3-4):229–256

Wishart DS, Feunang YD, Guo AC, Lo EJ, Marcu A, Grant JR, Sajed T, Johnson D, Li C, Sayeeda Z, et al (2018) Drugbank 5.0: a major update to the drugbank database for 2018. Nucleic acids research 46(D1):D1074–D1082

Wold S, Esbensen K, Geladi P (1987) Principal component analysis. Chemometrics and intelligent laboratory systems 2(1-3):37–52

Woźnica A, Kalousis A, Hilario M (2010) Adaptive matching based kernels for labelled graphs. In: Advances in Knowledge Discovery and Data Mining, Springer, Lecture Notes in Computer Science, vol 6119, pp 374–385

Wu B, Xu C, Dai X, Wan A, Zhang P, Tomizuka M, Keutzer K, Vajda P (2020a) Visual transformers: Token-based image representation and processing for computer vision. arXiv preprint arXiv:200603677

Wu F, Souza A, Zhang T, Fifty C, Yu T, Weinberger K (2019a) Simplifying graph convolutional networks. In: International conference on machine learning, PMLR, pp 6861–6871

Wu H, Wang C, Tyshetskiy Y, Docherty A, Lu K, Zhu L (2019b) Adversarial examples for graph data: Deep insights into attack and defense. In: Proceedings of the Twenty-Eighth International Joint Conference on Artificial Intelligence,

IJCAI-19, International Joint Conferences on Artificial Intelligence Organization, pp 4816–4823

Wu H, Ma Y, Xiang Z, Yang C, He K (2021a) A spatial-temporal graph neural network framework for automated software bug triaging. arXiv preprint arXiv:210111846

Wu J, Cao M, Cheung JCK, Hamilton WL (2020b) Temp: Temporal message passing for temporal knowledge graph completion. In: Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing (EMNLP), pp 5730–5746

Wu L, Chen Y, Ji H, Li Y (2021b) Deep learning on graphs for natural language processing. In: Proceedings of the 2021 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies: Tutorials, pp 11–14

Wu L, Chen Y, Shen K, Guo X, Gao H, Li S, Pei J, Long B (2021c) Graph neural networks for natural language processing: A survey. arXiv preprint arXiv:210606090

Wu N, Zhao XW, Wang J, Pan D (2020c) Learning effective road network representation with hierarchical graph neural networks. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 6–14

Wu S, Tang Y, Zhu Y, Wang L, Xie X, Tan T (2019c) Session-based recommendation with graph neural networks. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 346–353

Wu T, Ren H, Li P, Leskovec J (2020d) Graph information bottleneck. In: Larochelle H, Ranzato M, Hadsell R, Balcan MF, Lin H (eds) Advances in Neural Information Processing Systems, Curran Associates, Inc., vol 33, pp 20,437–20,448

Wu Y, Warner JL, Wang L, Jiang M, Xu J, Chen Q, Nian H, Dai Q, Du X, Yang P, et al (2019d) Discovery of noncancer drug effects on survival in electronic health records of patients with cancer: a new paradigm for drug repurposing. JCO clinical cancer informatics 3:1–9

Wu Z, Ramsundar B, Feinberg EN, Gomes J, Geniesse C, Pappu AS, Leswing K, Pande V (2018) MoleculeNet: A benchmark for molecular machine learning. Chemical Science 9:513–530

Wu Z, Pan S, Chen F, Long G, Zhang C, Yu PS (2019e) A comprehensive survey on graph neural networks. CoRR abs/1901.00596

Wu Z, Pan S, Chen F, Long G, Zhang C, Philip SY (2021d) A comprehensive survey on graph neural networks. IEEE Transactions on Neural Networks and Learning Systems 32(1):4–24

Xhonneux LP, Qu M, Tang J (2020) Continuous graph neural networks. In: Proceedings of the International Conference on Machine Learning

Xia R, Liu Y (2015) A multi-task learning framework for emotion recognition using 2d continuous space. IEEE Transactions on Affective Computing 8(1):3–14

Xiao C, Choi E, Sun J (2018) Opportunities and challenges in developing deep learning models using electronic health records data: a systematic review. Journal of the American Medical Informatics Association 25(10):1419–1428

Xie L, Yuille A (2017) Genetic cnn. In: Proceedings of the IEEE International Conference on Computer Vision, pp 1379–1388

Xie M, Yin H, Wang H, Xu F, Chen W, Wang S (2016) Learning graph-based poi embedding for location-based recommendation. In: Proceedings of the 25th ACM International on Conference on Information and Knowledge Management, Association for Computing Machinery, CIKM '16, p 15–24, DOI 10.1145/2983323.2983711

Xie S, Kirillov A, Girshick R, He K (2019a) Exploring randomly wired neural networks for image recognition. In: Proceedings of the IEEE/CVF International Conference on Computer Vision, pp 1284–1293

Xie T, Grossman JC (201f8) Crystal graph convolutional neural networks for an accurate and interpretable prediction of material properties. Physical Review Letters 120:145,301

Xie Y, Xu Z, Wang Z, Ji S (2021) Self-supervised learning of graph neural networks: A unified review. arXiv preprint arXiv:210210757

Xie Z, Lv W, Huang S, Lu Z, Du B, Huang R (2019b) Sequential graph neural network for urban road traffic speed prediction. IEEE Access 8:63,349–63,358

Xiu H, Yan X, Wang X, Cheng J, Cao L (2020) Hierarchical graph matching network for graph similarity computation. arXiv preprint arXiv:200616551

Xu D, Zhu Y, Choy CB, Fei-Fei L (2017a) Scene graph generation by iterative message passing. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 5410–5419

Xu D, Cheng W, Luo D, Liu X, Zhang X (2019a) Spatio-temporal attentive rnn for node classification in temporal attributed graphs. In: International Joint Conference on Artificial Intelligence, pp 3947–3953

Xu D, Ruan C, Korpeoglu E, Kumar S, Achan K (2020a) Inductive representation learning on temporal graphs. In: International Conference on Learning Representations

Xu H, Jiang C, Liang X, Li Z (2019b) Spatial-aware graph relation network for large-scale object detection. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 9298–9307

Xu J, Gan Z, Cheng Y, Liu J (2020b) Discourse-aware neural extractive text summarization. In: Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics, pp 5021–5031

Xu K, Ba J, Kiros R, Cho K, Courville A, Salakhudinov R, Zemel R, Bengio Y (2015) Show, attend and tell: Neural image caption generation with visual attention. In: International conference on machine learning, PMLR, pp 2048–2057

Xu K, Li C, Tian Y, Sonobe T, Kawarabayashi K, Jegelka S (2018a) Representation learning on graphs with jumping knowledge networks. In: International Conference on Machine Learning, pp 5453–5462

Xu K, Wu L, Wang Z, Feng Y, Sheinin V (2018b) Sql-to-text generation with graph-to-sequence model. arXiv preprint arXiv:180905255

Xu K, Wu L, Wang Z, Feng Y, Witbrock M, Sheinin V (2018c) Graph2seq: Graph to sequence learning with attention-based neural networks. arXiv preprint arXiv:180400823

Xu K, Wu L, Wang Z, Yu M, Chen L, Sheinin V (2018d) Exploiting rich syntactic information for semantic parsing with graph-to-sequence model. In: Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing, Association for Computational Linguistics, Brussels, Belgium, pp 918–924

Xu K, Chen H, Liu S, Chen PY, Weng TW, Hong M, Lin X (2019c) Topology attack and defense for graph neural networks: An optimization perspective. In: Proceedings of the Twenty-Eighth International Joint Conference on Artificial Intelligence, IJCAI-19, International Joint Conferences on Artificial Intelligence Organization, pp 3961–3967, DOI 10.24963/ijcai.2019/550

Xu K, Hu W, Leskovec J, Jegelka S (2019d) How powerful are graph neural networks? In: International Conference on Learning Representations

Xu K, Hu W, Leskovec J, Jegelka S (2019e) How powerful are graph neural networks? In: International Conference on Learning Representations

Xu K, Wang L, Yu M, Feng Y, Song Y, Wang Z, Yu D (2019f) Cross-lingual knowledge graph alignment via graph matching neural network. In: Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics, pp 3156–3161

Xu K, Li J, Zhang M, Du SS, Kawarabayashi Ki, Jegelka S (2020c) What can neural networks reason about? In: International Conference on Learning Representations

Xu L, Wei X, Cao J, Yu PS (2017b) Embedding of embedding (eoe) joint embedding for coupled heterogeneous networks. In: Proceedings of the Tenth ACM International Conference on Web Search and Data Mining, pp 741–749

Xu M, Li L, Wai D, Liu Q, Chao LS, et al (2020d) Document graph for neural machine translation. arXiv preprint arXiv:201203477

Xu Q, Sun X, Wu CY, Wang P, Neumann U (2020e) Grid-gcn for fast and scalable point cloud learning. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 5661–5670

Xu R, Li L, Wang Q (2013) Towards building a disease-phenotype knowledge base: extracting disease-manifestation relationship from literature. Bioinformatics 29(17):2186–2194

Yamaguchi F, Golde N, Arp D, Rieck K (2014) Modeling and discovering vulnerabilities with code property graphs. In: 2014 IEEE Symposium on Security and Privacy, IEEE, pp 590–604

Yan J, Yin XC, Lin W, Deng C, Zha H, Yang X (2016) A short survey of recent advances in graph matching. In: Proceedings of the 2016 ACM on International Conference on Multimedia Retrieval, pp 167–174

Yan J, Yang S, Hancock E (2020a) Learning for graph matching and related combinatorial optimization problems. In: Bessiere C (ed) Proceedings of the Twenty-Ninth International Joint Conference on Artificial Intelligence, IJCAI-20, International Joint Conferences on Artificial Intelligence Organization, pp 4988–4996

Yan S, Xiong Y, Lin D (2018a) Spatial temporal graph convolutional networks for skeleton-based action recognition. In: AAAI Conference on Artificial Intelligence, vol 32

Yan X, Han J (2002) gspan: Graph-based substructure pattern mining. In: Proceedings of IEEE International Conference on Data Mining, IEEE, pp 721–724

Yan Y, Mao Y, Li B (2018b) Second: Sparsely embedded convolutional detection. Sensors 18(10):3337

Yan Y, Zhang Q, Ni B, Zhang W, Xu M, Yang X (2019) Learning context graph for person search. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 2158–2167

Yan Y, Qin J, Chen J, Liu L, Zhu F, Tai Y, Shao L (2020b) Learning multi-granular hypergraphs for video-based person re-identification. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 2899–2908

Yanardag P, Vishwanathan S (2015) Deep graph kernels. In: Proceedings of the 21th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, ACM, pp 1365–1374

Yang B, Yih W, He X, Gao J, Deng L (2015a) Embedding entities and relations for learning and inference in knowledge bases. In: Bengio Y, LeCun Y (eds) 3rd International Conference on Learning Representations, ICLR 2015, San Diego, CA, USA, May 7-9, 2015, Conference Track Proceedings

Yang B, Luo W, Urtasun R (2018a) Pixor: Real-time 3d object detection from point clouds. In: Proceedings of the IEEE conference on Computer Vision and Pattern Recognition, pp 7652–7660

Yang C, Liu Z, Zhao D, Sun M, Chang EY (2015b) Network representation learning with rich text information. In: IJCAI, vol 2015, pp 2111–2117

Yang C, Zhuang P, Shi W, Luu A, Li P (2019a) Conditional structure generation through graph variational generative adversarial nets. In: NeurIPS, pp 1338–1349

Yang F, Fan K, Song D, et al (2020a) Graph-based prediction of protein-protein interactions with attributed signed graph embedding. BMC Bioinformatics 21(1):323

Yang H, Qin C, Li YH, Tao L, Zhou J, Yu CY, Xu F, Chen Z, Zhu F, Chen YZ (2016a) Therapeutic target database update 2016: enriched resource for bench to clinical drug target and targeted pathway information. Nucleic acids research 44(D1):D1069–D1074

Yang J, Zheng WS, Yang Q, Chen YC, Tian Q (2020b) Spatial-temporal graph convolutional network for video-based person re-identification. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 3289–3299

Yang K, Swanson K, Jin W, Coley C, Eiden P, Gao H, Guzman-Perez A, Hopper T, Kelley B, Mathea M, et al (2019b) Analyzing learned molecular representations for property prediction. Journal of chemical information and modeling 59(8):3370–3388

Yang L, Kang Z, Cao X, Jin D, Yang B, Guo Y (2019c) Topology optimization based graph convolutional network. In: Proceedings of the Twenty-Eighth International Joint Conference on Artificial Intelligence, pp 4054–4061

Yang L, Zhan X, Chen D, Yan J, Loy CC, Lin D (2019d) Learning to cluster faces on an affinity graph. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 2298–2306

Yang Q, Liu Y, Chen T, Tong Y (2019e) Federated machine learning: Concept and applications. ACM Transactions on Intelligent Systems and Technology (TIST) 10(2):1–19

Yang S, Li G, Yu Y (2019f) Dynamic graph attention for referring expression comprehension. In: Proceedings of the IEEE/CVF International Conference on Computer Vision, pp 4644–4653

Yang S, Liu J, Wu K, Li M (2020c) Learn to generate time series conditioned graphs with generative adversarial nets. arXiv preprint arXiv:200301436

Yang X, Tang K, Zhang H, Cai J (2019g) Auto-encoding scene graphs for image captioning. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 10,685–10,694

Yang Y, Abrego GH, Yuan S, Guo M, Shen Q, Cer D, Sung YH, Strope B, Kurzweil R (2019h) Improving multilingual sentence embedding using bi-directional dual encoder with additive margin softmax. In: Proceedings of the 28th International Joint Conference on Artificial Intelligence, AAAI Press, pp 5370–5378

Yang Z, Cohen W, Salakhudinov R (2016b) Revisiting semi-supervised learning with graph embeddings. In: International conference on machine learning, PMLR, pp 40–48

Yang Z, Qi P, Zhang S, Bengio Y, Cohen W, Salakhutdinov R, Manning CD (2018b) Hotpotqa: A dataset for diverse, explainable multi-hop question answering. In: Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing, pp 2369–2380

Yang Z, Zhao J, Dhingra B, He K, Cohen WW, Salakhutdinov RR, LeCun Y (2018c) Glomo: Unsupervised learning of transferable relational graphs. In: Advances in Neural Information Processing Systems, pp 8950–8961

Yang Z, Ding M, Zhou C, Yang H, Zhou J, Tang J (2020d) Understanding negative sampling in graph representation learning. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 1666–1676

Yao L, Wang L, Pan L, Yao K (2016) Link prediction based on common-neighbors for dynamic social network. Procedia Computer Science 83:82–89

Yao L, Mao C, Luo Y (2019) Graph convolutional networks for text classification. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 7370–7377

Yao S, Wang T, Wan X (2020) Heterogeneous graph transformer for graph-to-sequence learning. In: Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics, pp 7145–7154

Yao T, Pan Y, Li Y, Mei T (2018) Exploring visual relationship for image captioning. In: Proceedings of the European conference on computer vision (ECCV), pp 684–699

Yarotsky D (2017) Error bounds for approximations with deep relu networks. Neural Networks 94:103–114

Yasunaga M, Liang P (2020) Graph-based, self-supervised program repair from diagnostic feedback. In: International Conference on Machine Learning, PMLR, pp 10,799–10,808

Ye Y, Hou S, Chen L, Lei J, Wan W, Wang J, Xiong Q, Shao F (2019a) Out-of-sample node representation learning for heterogeneous graph in real-time android malware detection. In: Proceedings of the Twenty-Eighth International Joint Conference on Artificial Intelligence, IJCAI-19, International Joint Conferences on Artificial Intelligence Organization, pp 4150–4156

Ye Y, Wang X, Yao J, Jia K, Zhou J, Xiao Y, Yang H (2019b) Bayes embedding (bem): Refining representation by integrating knowledge graphs and behavior-specific networks. In: Proceedings of the 28th ACM International Conference on Information and Knowledge Management, Association for Computing Machinery, CIKM '19, p 679–688, DOI 10.1145/3357384.3358014

Yefet N, Alon U, Yahav E (2020) Adversarial examples for models of code. Proceedings of the ACM on Programming Languages 4(OOPSLA):1–30

Yeung DY, Chang H (2007) A kernel approach for semisupervised metric learning. IEEE Transactions on Neural Networks 18(1):141–149

Yi J, Park J (2020) Hypergraph convolutional recurrent neural network. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 3366–3376

YILMAZ B, Genc H, Agriman M, Demirdover BK, Erdemir M, Simsek G, Karagoz P (2020) Recent trends in the use of graph neural network models for natural language processing. In: Deep Learning Techniques and Optimization Strategies in Big Data Analytics, IGI Global, pp 274–289

Ying J, de Miranda Cardoso JV, Palomar D (2020a) Nonconvex sparse graph learning under laplacian constrained graphical model. Advances in Neural Information Processing Systems 33

Ying R, He R, Chen K, Eksombatchai P, Hamilton WL, Leskovec J (2018a) Graph convolutional neural networks for web-scale recommender systems. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 974–983

Ying R, He R, Chen K, Eksombatchai P, Hamilton WL, Leskovec J (2018b) Graph convolutional neural networks for web-scale recommender systems. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 974–983

Ying R, Bourgeois D, You J, Zitnik M, Leskovec J (2019) Gnnexplainer: Generating explanations for graph neural networks. Advances in neural information processing systems 32:9240

Ying R, Lou Z, You J, Wen C, Canedo A, Leskovec J, et al (2020b) Neural subgraph matching. arXiv preprint arXiv:200703092

Ying Z, You J, Morris C, Ren X, Hamilton W, Leskovec J (2018c) Hierarchical graph representation learning with differentiable pooling. In: Advances in Neural Information Processing Systems, pp 4800–4810

YLow, JGonzalez, AKyrola, DBickson, CGuestrin, JHellerstein (2012) Distributed graphlab: A framework for machine learning in the cloud. PVLDB 5(8):716–727

You J, Liu B, Ying Z, Pande V, Leskovec J (2018a) Graph convolutional policy network for goal-directed molecular graph generation. In: Advances in Neural Information Processing Systems, pp 6412–6422

You J, Ying R, Ren X, Hamilton W, Leskovec J (2018b) Graphrnn: Generating realistic graphs with deep auto-regressive models. In: International Conference on Machine Learning, PMLR, pp 5708–5717

You J, Ying R, Leskovec J (2019) Position-aware graph neural networks. In: International Conference on Machine Learning, PMLR, pp 7134–7143

You J, Ying Z, Leskovec J (2020a) Design space for graph neural networks. Advances in Neural Information Processing Systems 33

You J, Gomes-Selman J, Ying R, Leskovec J (2021) Identity-aware graph neural networks. CoRR abs/2101.10320, 2101.10320

You Y, Chen T, Sui Y, Chen T, Wang Z, Shen Y (2020b) Graph contrastive learning with augmentations. In: Larochelle H, Ranzato M, Hadsell R, Balcan MF, Lin H (eds) Advances in Neural Information Processing Systems, Curran Associates, Inc., vol 33, pp 5812–5823

You Y, Chen T, Wang Z, Shen Y (2020c) When does self-supervision help graph convolutional networks? In: International Conference on Machine Learning, PMLR, pp 10,871–10,880

You ZH, Chan KCC, Hu P (2015a) Predicting protein-protein interactions from primary protein sequences using a novel multi-scale local feature representation scheme and the random forest. PLOS ONE 10:1–19

You ZH, Li J, Gao X, et al (2015b) Detecting protein-protein interactions with a novel matrix-based protein sequence representation and support vector machines. BioMed Research International 2015:1–9

Yu B, Yin H, Zhu Z (2018a) Spatio-temporal graph convolutional networks: a deep learning framework for traffic forecasting. In: Proceedings of the 27th International Joint Conference on Artificial Intelligence, pp 3634–3640

Yu D, Fu J, Mei T, Rui Y (2017a) Multi-level attention networks for visual question answering. In: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pp 4709–4717

Yu D, Zhang R, Jiang Z, Wu Y, Yang Y (2021a) Graph-revised convolutional network. In: Hutter F, Kersting K, Lijffijt J, Valera I (eds) Machine Learning and Knowledge Discovery in Databases, Springer International Publishing, Cham, pp 378–393

Yu H, Wu Z, Wang S, Wang Y, Ma X (2017b) Spatiotemporal recurrent convolutional networks for traffic prediction in transportation networks. Sensors 17(7):1501

Yu J, Lu Y, Qin Z, Zhang W, Liu Y, Tan J, Guo L (2018b) Modeling text with graph convolutional network for cross-modal information retrieval. In: Pacific Rim Conference on Multimedia, Springer, pp 223–234

Yu L, Du B, Hu X, Sun L, Han L, Lv W (2021b) Deep spatio-temporal graph convolutional network for traffic accident prediction. Neurocomputing 423:135–147

Yu T, Wang R, Yan J, Li B (2020) Learning deep graph matching with channel-independent embedding and hungarian attention. In: International conference on learning representations

Yu Y, Chen J, Gao T, Yu M (2019a) Dag-gnn: Dag structure learning with graph neural networks. In: International Conference on Machine Learning, pp 7154–7163

Yu Y, Wang Y, Xia Z, Zhang X, Jin K, Yang J, Ren L, Zhou Z, Yu D, Qing T, et al (2019b) Premedkb: an integrated precision medicine knowledgebase for interpreting relationships between diseases, genes, variants and drugs. Nucleic acids research 47(D1):D1090–D1101

Yuan F, He X, Karatzoglou A, Zhang L (2020a) Parameter-efficient transfer from sequential behaviors for user modeling and recommendation. In: Proceedings of the 43rd International ACM SIGIR Conference on Research and Development in Information Retrieval, pp 1469–1478

Yuan H, Tang J, Hu X, Ji S (2020b) Xgnn: Towards model-level explanations of graph neural networks. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 430–438

Yuan J, Zheng Y, Zhang C, Xie W, Xie X, Sun G, Huang Y (2010) T-drive: driving directions based on taxi trajectories. In: Proceedings of the 18th SIGSPATIAL International conference on advances in geographic information systems, pp 99–108

Yuan J, Zheng Y, Xie X (2012) Discovering regions of different functions in a city using human mobility and pois. In: Proceedings of the 18th ACM SIGKDD international conference on Knowledge discovery and data mining, pp 186–194

Yuan Y, Liang X, Wang X, Yeung DY, Gupta A (2017) Temporal dynamic graph lstm for action-driven video object detection. In: Proceedings of the IEEE international conference on computer vision, pp 1801–1810

Yuan Z, Zhou X, Yang T (2018) Hetero-convlstm: A deep learning approach to traffic accident prediction on heterogeneous spatio-temporal data. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 984–992

Yue-Hei Ng J, Hausknecht M, Vijayanarasimhan S, Vinyals O, Monga R, Toderici G (2015) Beyond short snippets: Deep networks for video classification. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 4694–4702

Yun S, Jeong M, Kim R, Kang J, Kim HJ (2019) Graph transformer networks. Advances in Neural Information Processing Systems 32:11,983–11,993

Zaheer M, Kottur S, Ravanbakhsh S, Poczos B, Salakhutdinov RR, Smola AJ (2017) Deep sets. In: Advances in Neural Information Processing Systems, pp 3391–3401

Zanfir A, Sminchisescu C (2018) Deep learning of graph matching. In: Proceedings of the IEEE conference on computer vision and pattern recognition, pp 2684–2693

Zelnik-Manor L, Perona P (2004) Self-tuning spectral clustering. Advances in neural information processing systems 17:1601–1608

Zeng H, Zhou H, Srivastava A, Kannan R, Prasanna V (2020a) Graphsaint: Graph sampling based inductive learning method. In: International Conference on Learning Representations

Zeng R, Huang W, Tan M, Rong Y, Zhao P, Huang J, Gan C (2019) Graph convolutional networks for temporal action localization. In: Proceedings of the IEEE/CVF International Conference on Computer Vision, pp 7094–7103

Zeng X, Song X, Ma T, Pan X, Zhou Y, Hou Y, Zhang Z, Li K, Karypis G, Cheng F (2020b) Repurpose open data to discover therapeutics for covid-19 using deep learning. Journal of proteome research 19(11):4624–4636

Zeng Z, Tung AK, Wang J, Feng J, Zhou L (2009) Comparing stars: On approximating graph edit distance. Proceedings of the VLDB Endowment 2(1):25–36

Zhang B, Hill E, Clause J (2016a) Towards automatically generating descriptive names for unit tests. In: Proceedings of the 31st IEEE/ACM International Conference on Automated Software Engineering, ACM, pp 625–636

Zhang C, Huang C, Yu L, Zhang X, Chawla NV (2018a) Camel: Content-aware and meta-path augmented metric learning for author identification. In: Proceedings of the 2018 World Wide Web Conference, pp 709–718

Zhang C, Chao WL, Xuan D (2019a) An empirical study on leveraging scene graphs for visual question answering. arXiv preprint arXiv:190712133

Zhang C, Song D, Huang C, Swami A, Chawla NV (2019b) Heterogeneous graph neural network. In: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 793–803

Zhang C, Swami A, Chawla NV (2019c) Shne: Representation learning for semantic-associated heterogeneous networks. In: Proceedings of the Twelfth ACM International Conference on Web Search and Data Mining, pp 690–698

Zhang D, Yin J, Zhu X, Zhang C (2016b) Collective classification via discriminative matrix factorization on sparsely labeled networks. In: Proceedings of the 25th ACM International on Conference on Information and Knowledge Management, pp 1563–1572

Zhang D, Yin J, Zhu X, Zhang C (2018b) Metagraph2vec: Complex semantic path augmented heterogeneous network embedding. In: Pacific-Asia conference on knowledge discovery and data mining, Springer, pp 196–208

Zhang D, Yin J, Zhu X, Zhang C (2018c) Network representation learning: A survey. IEEE transactions on Big Data 6(1):3–28

Zhang G, He H, Katabi D (2019d) Circuit-GNN: Graph neural networks for distributed circuit design. In: International Conference on Machine Learning, pp 7364–7373

Zhang H, Zheng T, Gao J, Miao C, Su L, Li Y, Ren K (2019e) Data poisoning attack against knowledge graph embedding. In: Proceedings of the Twenty-Eighth International Joint Conference on Artificial Intelligence, IJCAI-19, International Joint Conferences on Artificial Intelligence Organization, pp 4853–4859

Zhang J (2020) Graph neural distance metric learning with graph-bert. arXiv preprint arXiv:200203427

Zhang J, Bargal SA, Lin Z, Brandt J, Shen X, Sclaroff S (2018d) Top-down neural attention by excitation backprop. International Journal of Computer Vision 126(10):1084–1102

Zhang J, Shi X, Xie J, Ma H, King I, Yeung DY (2018e) Gaan: Gated attention networks for learning on large and spatiotemporal graphs. arXiv preprint arXiv:180307294

Zhang J, Wang X, Zhang H, Sun H, Wang K, Liu X (2019f) A novel neural source code representation based on abstract syntax tree. In: 2019 IEEE/ACM 41st International Conference on Software Engineering (ICSE), IEEE, pp 783–794

Zhang J, Zhang H, Xia C, Sun L (2020a) Graph-bert: Only attention is needed for learning graph representations. arXiv preprint arXiv:200105140

Zhang L, Lu H (2020) A Feature-Importance-Aware and Robust Aggregator for GCN. In: ACM International Conference on Information & Knowledge Management, DOI 10.1145/3340531.3411983

Zhang M, Chen Y (2018a) Link prediction based on graph neural networks. In: Advances in Neural Information Processing Systems, pp 5165–5175

Zhang M, Chen Y (2018b) Link prediction based on graph neural networks. In: Proceedings of the 32nd International Conference on Neural Information Processing Systems, pp 5171–5181

Zhang M, Chen Y (2019) Inductive matrix completion based on graph neural networks. In: International Conference on Learning Representations

Zhang M, Chen Y (2020) Inductive matrix completion based on graph neural networks. In: International Conference on Learning Representations

Zhang M, Schmitt-Ulms G, Sato C, Xi Z, Zhang Y, Zhou Y, St George-Hyslop P, Rogaeva E (2016c) Drug repositioning for alzheimer's disease based on systematic 'omics' data mining. PloS one 11(12):e0168,812

Zhang M, Cui Z, Neumann M, Chen Y (2018f) An end-to-end deep learning architecture for graph classification. In: Association for the Advancement of Artificial Intelligence

Zhang M, Cui Z, Neumann M, Chen Y (2018g) An end-to-end deep learning architecture for graph classification. In: the AAAI Conference on Artificial Intelligence, pp 4438–4445

Zhang M, Hu L, Shi C, Wang X (2020b) Adversarial label-flipping attack and defense for graph neural networks. In: 2020 IEEE International Conference on Data Mining (ICDM), IEEE, pp 791–800

Zhang M, Li P, Xia Y, Wang K, Jin L (2020c) Revisiting graph neural networks for link prediction. arXiv preprint arXiv:201016103

Zhang N, Deng S, Li J, Chen X, Zhang W, Chen H (2020d) Summarizing chinese medical answer with graph convolution networks and question-focused dual attention. In: Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing: Findings, pp 15–24

Zhang Q, Chang J, Meng G, Xiang S, Pan C (2020e) Spatio-temporal graph structure learning for traffic forecasting. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 1177–1185

Zhang R, Isola P, Efros AA (2016d) Colorful image colorization. In: European conference on computer vision, Springer, pp 649–666

Zhang S, Hu Z, Subramonian A, Sun Y (2020f) Motif-driven contrastive learning of graph representations. arXiv preprint arXiv:201212533

Zhang W, Tang S, Cao Y, Pu S, Wu F, Zhuang Y (2019g) Frame augmented alternating attention network for video question answering. IEEE Transactions on Multimedia 22(4):1032–1041

Zhang W, Fang Y, Liu Z, Wu M, Zhang X (2020g) mg2vec: Learning relationship-preserving heterogeneous graph representations via metagraph embedding. IEEE Transactions on Knowledge and Data Engineering 14(8):1

Zhang W, Liu H, Liu Y, Zhou J, Xiong H (2020h) Semi-supervised hierarchical recurrent graph neural network for city-wide parking availability prediction. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 1186–1193

Zhang W, Wang XE, Tang S, Shi H, Shi H, Xiao J, Zhuang Y, Wang WY (2020i) Relational graph learning for grounded video description generation. In: Proceedings of the 28th ACM International Conference on Multimedia, pp 3807–3828

Zhang X, Zitnik M (2020) Gnnguard: Defending graph neural networks against adversarial attacks. Advances in Neural Information Processing Systems 33

Zhang X, Li Y, Zhou X, Luo J (2019) Unveiling taxi drivers' strategies via cgail: Conditional generative adversarial imitation learning. In: 2019 IEEE International Conference on Data Mining (ICDM), pp 1480–1485, DOI 10.1109/ICDM.2019.00194

Zhang X, Li Y, Zhou X, Luo J (2020a) cgail: Conditional generative adversarial imitation learning—an application in taxi drivers' strategy learning. IEEE Transactions on Big Data pp 1–1, DOI 10.1109/TBDATA.2020.3039810

Zhang X, Li Y, Zhou X, Zhang Z, Luo J (2020b) Trajgail: Trajectory generative adversarial imitation learning for long-term decision analysis. In: 2020 IEEE International Conference on Data Mining (ICDM), pp 801–810, DOI 10.1109/ICDM50108.2020.00089

Zhang Y, Zheng W, Lin H, Wang J, Yang Z, Dumontier M (2018h) Drug–drug interaction extraction via hierarchical rnns on sequence and shortest dependency paths. Bioinformatics 34(5):828–835

Zhang Y, Fan Y, Ye Y, Zhao L, Shi C (2019a) Key player identification in underground forums over attributed heterogeneous information network embedding framework. In: Proceedings of the 28th ACM International Conference on Information and Knowledge Management, pp 549–558

Zhang Y, Khan S, Coates M (2019b) Comparing and detecting adversarial attacks for graph deep learning. In: Representation Learning on Graphs and Manifolds Workshop at ICLR

Zhang Y, Li Y, Zhou X, Kong X, Luo J (2019c) Trafficgan: Off-deployment traffic estimation with traffic generative adversarial networks. 2019 IEEE International Conference on Data Mining (ICDM) pp 1474–1479

Zhang Y, Pal S, Coates M, Ustebay D (2019d) Bayesian graph convolutional neural networks for semi-supervised classification. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 33, pp 5829–5836

Zhang Y, Defazio D, Ramesh A (2020a) Relex: A model-agnostic relational model explainer. arXiv preprint arXiv:200600305

Zhang Y, Deng W, Wang M, Hu J, Li X, Zhao D, Wen D (2020b) Global-local gcn: Large-scale label noise cleansing for face recognition. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 7731–7740

Zhang Y, Guo Z, Teng Z, Lu W, Cohen SB, Liu Z, Bing L (2020c) Lightweight, dynamic graph convolutional networks for amr-to-text generation. In: Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing (EMNLP), pp 2162–2172

Zhang Y, Yu X, Cui Z, Wu S, Wen Z, Wang L (2020d) Every document owns its structure: Inductive text classification via graph neural networks. In: Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics, pp 334–339

Zhang Z, Wang M, Xiang Y, Huang Y, Nehorai A (2018i) Retgk: Graph kernels based on return probabilities of random walks. In: Advances in Neural Information Processing Systems, pp 3964–3974

Zhang Z, Cui P, Zhu W (2020e) Deep learning on graphs: A survey. IEEE Transactions on Knowledge and Data Engineering pp 1–1, DOI 10.1109/TKDE.2020.2981333

Zhang Z, Zhang Z, Zhou Y, Shen Y, Jin R, Dou D (2020f) Adversarial attacks on deep graph matching. Advances in Neural Information Processing Systems 33

Zhang Z, Zhao Z, Lin Z, Huai B, Yuan NJ (2020g) Object-aware multi-branch relation networks for spatio-temporal video grounding. arXiv preprint arXiv:200806941

Zhang Z, Zhao Z, Zhao Y, Wang Q, Liu H, Gao L (2020h) Where does it exist: Spatio-temporal video grounding for multi-form sentences. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp 10,668–10,677

Zhang Z, Zhuang F, Zhu H, Shi Z, Xiong H, He Q (2020i) Relational graph neural network with hierarchical attention for knowledge graph completion. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 9612–9619

Zhao H, Du L, Buntine W (2017) Leveraging node attributes for incomplete relational data. In: International Conference on Machine Learning, pp 4072–4081

Zhao H, Zhou Y, Song Y, Lee DL (2019a) Motif enhanced recommendation over heterogeneous information network. In: Proceedings of the 28th ACM international conference on information and knowledge management, pp 2189–2192

Zhao H, Wei L, Yao Q (2020a) Simplifying architecture search for graph neural network. In: Conrad S, Tiddi I (eds) Proceedings of the CIKM 2020 Workshops co-located with 29th ACM International Conference on Information and Knowledge Management (CIKM 2020), Galway, Ireland, October 19-23, 2020, CEUR-WS.org, CEUR Workshop Proceedings, vol 2699

Zhao J, Zhou Z, Guan Z, Zhao W, Ning W, Qiu G, He X (2019b) Intentgc: a scalable graph convolution framework fusing heterogeneous information for recommendation. In: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 2347–2357

Zhao J, Wang X, Shi C, Liu Z, Ye Y (2020b) Network schema preserving heterogeneous information network embedding. In: Bessiere C (ed) Proceedings of the Twenty-Ninth International Joint Conference on Artificial Intelligence, IJCAI-20, International Joint Conferences on Artificial Intelligence Organization, pp 1366–1372

Zhao J, Wang X, Shi C, Hu B, Song G, Ye Y (2021) Heterogeneous graph structure learning for graph neural networks. In: Proceedings of the AAAI Conference on Artificial Intelligence

Zhao K, Bai T, Wu B, Wang B, Zhang Y, Yang Y, Nie JY (2020c) Deep adversarial completion for sparse heterogeneous information network embedding. In: Proceedings of The Web Conference 2020, pp 508–518

Zhao L, Akoglu L (2019) Pairnorm: Tackling oversmoothing in gnns. In: International Conference on Learning Representations

Zhao L, Song Y, Zhang C, Liu Y, Wang P, Lin T, Deng M, Li H (2019c) T-GCN: A temporal graph convolutional network for traffic prediction. IEEE Transactions on Intelligent Transportation Systems 21(9):3848–3858

Zhao M, Wang D, Zhang Z, Zhang X (2015) Music removal by convolutional denoising autoencoder in speech recognition. In: 2015 Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA), IEEE, pp 338–341

Zhao S, Su C, Sboner A, Wang F (2019d) Graphene: A precise biomedical literature retrieval engine with graph augmented deep learning and external knowledge empowerment. In: Proceedings of the 28th ACM International Conference on Information and Knowledge Management, pp 149–158

Zhao S, Qin B, Liu T, Wang F (2020d) Biomedical knowledge graph refinement with embedding and logic rules. arXiv preprint arXiv:201201031

Zhao S, Su C, Lu Z, Wang F (2020e) Recent advances in biomedical literature mining. Briefings in Bioinformatics

Zhao T, Deng C, Yu K, Jiang T, Wang D, Jiang M (2020f) Error-bounded graph anomaly loss for gnns. In: Proceedings of the 29th ACM International Conference on Information & Knowledge Management, pp 1873–1882

Zhao Y, Wang D, Gao X, Mullins R, Lio P, Jamnik M (2020g) Probabilistic dual network architecture search on graphs. arXiv preprint arXiv:200309676

Zheng C, Fan X, Wang C, Qi J (2020a) Gman: A graph multi-attention network for traffic prediction. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 1234–1241

Zheng C, Zong B, Cheng W, Song D, Ni J, Yu W, Chen H, Wang W (2020b) Robust graph representation learning via neural sparsification. In: International Conference on Machine Learning, pp 11,458–11,468

Zheng D, Song X, Ma C, Tan Z, Ye Z, Dong J, Xiong H, Zhang Z, Karypis G (2020c) Dgl-ke: Training knowledge graph embeddings at scale. In: Proceedings of the 43rd International ACM SIGIR Conference on Research and Development in Information Retrieval, pp 739–748

Zheng L, Lu CT, Jiang F, Zhang J, Yu PS (2018a) Spectral collaborative filtering. In: Proceedings of the 12th ACM Conference on Recommender Systems, ACM, pp 311–319

Zheng L, Li Z, Li J, Li Z, Gao J (2019) Addgraph: Anomaly detection in dynamic graph using attention-based temporal gcn. In: Proceedings of the Twenty-Eighth International Joint Conference on Artificial Intelligence, IJCAI-19, pp 4419–4425

Zheng X, Aragam B, Ravikumar PK, Xing EP (2018b) Dags with no tears: Continuous optimization for structure learning. Advances in Neural Information Processing Systems 31:9472–9483

Zheng Y, Liu F, Hsieh HP (2013) U-air: When urban air quality inference meets big data. In: Proceedings of the 19th ACM SIGKDD international conference on Knowledge discovery and data mining, pp 1436–1444

Zheng Y, Capra L, Wolfson O, Yang H (2014) Urban computing: Concepts, methodologies, and applications 5(3), DOI 10.1145/2629592

Zhou C, Liu Y, Liu X, Liu Z, Gao J (2017) Scalable graph embedding for asymmetric proximity. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 31

Zhou C, Bai J, Song J, Liu X, Zhao Z, Chen X, Gao J (2018a) Atrank: An attention-based user behavior modeling framework for recommendation. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 32

Zhou C, Ma J, Zhang J, Zhou J, Yang H (2020a) Contrastive learning for debiased candidate generation in large-scale recommender systems. arXiv preprint csIR/200512964

Zhou D, Bousquet O, Lal TN, Weston J, Schölkopf B (2004) Learning with local and global consistency. Advances in neural information processing systems 16(16):321–328

Zhou F, De la Torre F (2012) Factorized graph matching. In: 2012 IEEE Conference on Computer Vision and Pattern Recognition, IEEE, pp 127–134

Zhou G, Zhu X, Song C, Fan Y, Zhu H, Ma X, Yan Y, Jin J, Li H, Gai K (2018b) Deep interest network for click-through rate prediction. In: Proceedings of the 24th ACM SIGKDD, pp 1059–1068

Zhou G, Wang J, Zhang X, Guo M, Yu G (2020b) Predicting functions of maize proteins using graph convolutional network. BMC Bioinformatics 21(16):420

Zhou J, Cui G, Zhang Z, Yang C, Liu Z, Sun M (2018c) Graph neural networks: A review of methods and applications. arXiv preprint arXiv:181208434

Zhou K, Song Q, Huang X, Hu X (2019a) Auto-gnn: Neural architecture search of graph neural networks. arXiv preprint arXiv:190903184

Zhou K, Dong Y, Wang K, Lee WS, Hooi B, Xu H, Feng J (2020c) Understanding and resolving performance degradation in graph convolutional networks. arXiv preprint arXiv:200607107

Zhou K, Huang X, Li Y, Zha D, Chen R, Hu X (2020d) Towards deeper graph neural networks with differentiable group normalization. In: Advances in Neural Information Processing Systems, vol 33

Zhou K, Song Q, Huang X, Zha D, Zou N, Hu X (2020e) Multi-channel graph neural networks. In: International Joint Conference on Artificial Intelligence, pp 1352–1358

Zhou N, Jiang Y, Bergquist TR, et al (2019b) The CAFA challenge reports improved protein function prediction and new functional annotations for hundreds of genes through experimental screens. Genome Biology 20(1), DOI 10.1186/s13059-019-1835-8

Zhou T, Lü L, Zhang YC (2009) Predicting missing links via local information. The European Physical Journal B 71(4):623–630

Zhou Y, Tuzel O (2018) Voxelnet: End-to-end learning for point cloud based 3d object detection. In: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pp 4490–4499

Zhou Y, Hou Y, Shen J, Huang Y, Martin W, Cheng F (2020f) Network-based drug repurposing for novel coronavirus 2019-ncov/sars-cov-2. Cell discovery 6(1):1–18

Zhou Z, Kearnes S, Li L, Zare RN, Riley P (2019c) Optimization of molecules via deep reinforcement learning. Scientific reports 9(1):1–10

Zhou Z, Wang Y, Xie X, Chen L, Liu H (2020g) Riskoracle: A minute-level citywide traffic accident forecasting framework. In: Proceedings of the AAAI Conference on Artificial Intelligence, vol 34, pp 1258–1265

Zhou Z, Wang Y, Xie X, Chen L, Zhu C (2020h) Foresee urban sparse traffic accidents: A spatiotemporal multi-granularity perspective. IEEE Transactions on Knowledge and Data Engineering pp 1–1, DOI 10.1109/TKDE.2020.3034312

Zhu D, Cui P, Wang D, Zhu W (2018) Deep variational network embedding in wasserstein space. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 2827–2836

Zhu D, Zhang Z, Cui P, Zhu W (2019a) Robust graph convolutional networks against adversarial attacks. In: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery amp; Data Mining, Association for Computing Machinery, KDD '19, p 1399–1407, DOI 10.1145/3292500.3330851

Zhu J, Li J, Zhu M, Qian L, Zhang M, Zhou G (2019b) Modeling graph structure in transformer for better AMR-to-text generation. In: Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP), Association for Computational Linguistics, Hong Kong, China, pp 5459–5468

Zhu JY, Park T, Isola P, Efros AA (2017) Unpaired image-to-image translation using cycle-consistent adversarial networks. In: Proceedings of the IEEE international conference on computer vision, pp 2223–2232

Zhu Q, Du B, Yan P (2020a) Self-supervised training of graph convolutional networks. arXiv preprint arXiv:200602380

Zhu R, Zhao K, Yang H, Lin W, Zhou C, Ai B, Li Y, Zhou J (2019c) Aligraph: a comprehensive graph neural network platform. Proceedings of the VLDB Endowment 12(12):2094–2105

Zhu S, Yu K, Chi Y, Gong Y (2007) Combining content and link for classification using matrix factorization. In: Proceedings of the 30th annual international ACM

SIGIR conference on Research and development in information retrieval, pp 487–494

Zhu S, Zhou C, Pan S, Zhu X, Wang B (2019d) Relation structure-aware heterogeneous graph neural network. In: 2019 IEEE International Conference on Data Mining (ICDM), IEEE, pp 1534–1539

ZHU X (2002) Learning from labeled and unlabeled data with label propagation. Tech Report

Zhu Y, Elemento O, Pathak J, Wang F (2019e) Drug knowledge bases and their applications in biomedical informatics research. Briefings in bioinformatics 20(4):1308–1321

Zhu Y, Che C, Jin B, Zhang N, Su C, Wang F (2020b) Knowledge-driven drug repurposing using a comprehensive drug knowledge graph. Health Informatics Journal 26(4):2737–2750

Zhu Y, Xu Y, Yu F, Liu Q, Wu S, Wang L (2020c) Deep graph contrastive representation learning. arXiv preprint arXiv:200604131

Zhu Y, Xu Y, Yu F, Liu Q, Wu S, Wang L (2021) Graph Contrastive Learning with Adaptive Augmentation. In: Proceedings of The Web Conference 2021, ACM, WWW '21

Zhuang Y, Jain R, Gao W, Ren L, Aizawa K (2017) Panel: cross-media intelligence. In: Proceedings of the 25th ACM international conference on Multimedia, pp 1173–1173

Zimmermann T, Zeller A, Weissgerber P, Diehl S (2005) Mining version histories to guide software changes. IEEE Transactions on Software Engineering 31(6):429–445

Zitnik M, Leskovec J (2017) Predicting multicellular function through multi-layer tissue networks. Bioinformatics 33(14):i190–i198

Zitnik M, Agrawal M, Leskovec J (2018) Modeling polypharmacy side effects with graph convolutional networks. Bioinformatics 34(13):i457–i466

Zoete V, Cuendet MA, Grosdidier A, Michielin O (2011) SwissParam: A fast force field generation tool for small organic molecules. Journal of Computational Chemistry 32(11):2359–2368

Zoph B, Le QV (2016) Neural architecture search with reinforcement learning. arXiv preprint arXiv:161101578

Zoph B, Yuret D, May J, Knight K (2016) Transfer learning for low-resource neural machine translation. In: Proceedings of the 2016 Conference on Empirical Methods in Natural Language Processing, pp 1568–1575

Zoph B, Vasudevan V, Shlens J, Le QV (2018) Learning transferable architectures for scalable image recognition. In: Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pp 8697–8710

Zügner D, Günnemann S (2019) Adversarial attacks on graph neural networks via meta learning. In: International Conference on Learning Representations, ICLR

Zügner D, Günnemann S (2019) Certifiable robustness and robust training for graph convolutional networks. In: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 246–256

Zügner D, Günnemann S (2020) Certifiable robustness of graph convolutional networks under structure perturbations. In: Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery amp; Data Mining, Association for Computing Machinery, KDD '20, p 1656–1665, DOI 10.1145/3394486.3403217

Zügner D, Akbarnejad A, Günnemann S (2018) Adversarial attacks on neural networks for graph data. In: Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp 2847–2856

Zügner D, Borchert O, Akbarnejad A, Günnemann S (2020) Adversarial attacks on graph neural networks: Perturbations and their patterns. ACM Trans Knowl Discov Data 14(5):57:1–57:31

Zügner D, Kirschstein T, Catasta M, Leskovec J, Günnemann S (2021) Language-agnostic representation learning of source code from structure and context. In: International Conference on Learning Representations