

Ninghao Liu

CONTACT INFORMATION

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APPOINTMENTS

- Assistant Professor Department of Computer Science, University of Georgia Aug 2021 - Now

EDUCATIONAL BACKGROUND

- Texas A&M University Ph.D., Computer Science Jan 2016 - May 2021
 - *Dissertation: Extracting and Harnessing Interpretation in Data Mining*
 - *Advisor: Dr. Xia “Ben” Hu*
 - *Committee members: Dr. Xia Hu, Dr. James Caverlee, Dr. Nick Duffield, Dr. Ruihong Huang*
- Georgia Institute of Technology M.S., Electrical and Computer Engineering Aug 2014 - Dec 2015
- South China University of Technology BEng., Information Engineering (Pilot Class) Sept 2010 - July 2014

RESEARCH INTERESTS

- **Explainable Artificial Intelligence (XAI):** Post-Hoc Model Interpretation, Representation Interpretation, Interpretable Modeling, Health Informatics
- **Data Mining:** Recommender Systems, Model Fairness, Graph Neural Networks
- **Information Security:** Anomaly Detection, Adversarial Machine Learning, Backdoor Attacks

PUBLICATIONS

- Summary Published in top-notch conferences: KDD, WWW, WSDM, CIKM, IJCAI, ICDM, NeurIPS, ICLR, with 1000+ citations
- Awards Best Paper Award Candidate, ICDM 2019
Best Paper Award Shortlist, WWW 2019
Best Paper Award, IEEE ICC 2014

Refereed Conference Publications

- [C1] Qizhang Feng, **Ninghao Liu**, Fan Yang, Ruixiang Tang, Mengnan Du, Xia Hu. “DEGREE: Decomposition Based Explanation for Graph Neural Networks”, *International Conference on Learning Representations (ICLR)*, 2022
- [C2] Yushun Dong, **Ninghao Liu**, Brian Jalaian, Jundong Li. “EDITS: Modeling and Mitigating Data Bias for Graph Neural Networks”, *The Web Conference (WWW)*, 2022
- [C3] Xiaotian Han, Zhimeng Jiang, **Ninghao Liu**, Qingquan Song, Jundong Li, Xia Hu. “Geometric Graph Representation Learning via Maximizing Rate Reduction”, *The Web Conference (WWW)*, 2022
- [C4] Shuang Zhou, Xiao Huang, **Ninghao Liu**, Qiaoyu Tan, Fu-lai Chung. “Unseen Anomaly Detection on Networks via Multi-Hypersphere Learning”, *SIAM International Conference on Data Mining (SDM)*, 2022
- [C5] Qiaoyu Tan, Jianwei Zhang, **Ninghao Liu**, Xiao Huang, Hongxia Yang, Jingren Zhou, Xia Hu. “Dynamic Memory based Attention Network for Sequential Recommendation”, *AAAI Conference on Artificial Intelligence (AAAI)*, 2021
- [C6] Qiaoyu Tan, Jianwei Zhang, Jiangchao Yao, **Ninghao Liu**, Jingren Zhou, Hongxia Yang, Xia Hu. “Sparse-Interest Network for Sequential Recommendation”, *ACM International Conference on Web Search and Data Mining (WSDM)*, 2021

- [C7] **Ninghao Liu**, Yong Ge, Li Li, Xia Hu, Rui Chen, Soo-Hyun Choi. “Explainable Recommender Systems via Resolving Learning Representations”, *The Conference on Information and Knowledge Management (CIKM)*, 2020
- [C8] Kion Fallah, Adam Willats, **Ninghao Liu**, Christopher Rozell. “Learning Sparse Codes From Compressed Representations With Biologically Plausible Local Wiring Constraints”, *Advances in Neural Information Processing Systems (NeurIPS)*, 2020
- [C9] Qiaoyu Tan, **Ninghao Liu**, Hongxia Yang, Jingren Zhou, Xia Hu. “Learning to Hash with Graph Neural Networks for Recommender Systems”, *The Web Conference (WWW)*, 2020
- [C10] Ruixiang Tang, Mengnan Du, **Ninghao Liu**, Fan Yang and Xia Hu. “An Embarrassingly Simple Approach for Trojan Attack in Deep Neural Networks”, *ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD)*, 2020
- [C11] Fan Yang, **Ninghao Liu**, Mengnan Du, Kaixiong Zhou, Shuiwang Ji, Xia Hu. “Deep Neural Networks with Knowledge Instillation”, *SIAM International Conference on Data Mining (SDM)*, 2020
- [C12] **Ninghao Liu**, Qiaoyu Tan, Yuening Li, Hongxia Yang, Jingren Zhou, Xia Hu. “Is a Single Vector Enough? Exploring Node Polysemy for Network Embedding”, *ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD)*, 2019
- [C13] Mengnan Du, **Ninghao Liu**, Fan Yang, Xia Hu. “Learning Credible Deep Neural Networks with Rationale Regularization”, *IEEE International Conference on Data Mining (ICDM)*, 2019
(Best Paper Award Candidate, ICDM 2019)
- [C14] **Ninghao Liu**, Mengnan Du and Xia Hu. “Representation Interpretation with Spatial Encoding and Multimodal Analytics”, *ACM International Conference on Web Search and Data Mining (WSDM)*, 2019
- [C15] Mengnan Du, **Ninghao Liu**, Fan Yang, Shuiwang Ji, Xia Hu. “On Attribution of Recurrent Neural Network Predictions via Additive Decomposition”, *The Web Conference (WWW)*, 2019
(Best Paper Award Shortlist, WWW 2019)
- [C16] Yuening Li, **Ninghao Liu**, Jundong Li, Mengnan Du, Xia Hu. “Deep Structured Cross-Modal Anomaly Detection”, *International Joint Conference on Neural Networks (IJCNN)*, 2019
- [C17] **Ninghao Liu**, Xiao Huang, Jundong Li, Xia Hu. “On Interpretation of Network Embedding via Taxonomy Induction”, *ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD)*, 2018
- [C18] **Ninghao Liu**, Hongxia Yang, Xia Hu. “Adversarial Detection with Model Interpretation”, *ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD)*, 2018
- [C19] Mengnan Du, **Ninghao Liu**, Qingquan Song, Xia Hu. “Towards Explanation of DNN-based Prediction with Guided Feature Inversion”, *ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD)*, 2018
- [C20] Fan Yang, **Ninghao Liu**, Suhang Wang, Xia Hu. “Towards Interpretation of Recommender Systems with Sorted Explanation Paths”, *IEEE International Conference on Data Mining (ICDM)*, 2018
- [C21] **Ninghao Liu**, Donghwa Shin, Xia Hu. “Contextual Outlier Interpretation”, *International Joint Conference on Artificial Intelligence (IJCAI)*, 2018
- [C22] **Ninghao Liu**, Xiao Huang, Xia Hu. “Accelerated Local Anomaly Detection in Attributed Networks”, *International Joint Conference on Artificial Intelligence (IJCAI)*, 2017
- [C23] Jing Lu, Zuming Huang, **Ninghao Liu**, and Quansheng Guan. “Distance-weighted backlog differentials for back-pressure routing in multi-hop wireless networks”, *IEEE/CIC International Conference on Communications in China*, 2014.
(Best Paper Award, IEEE ICC 2014)

Book Chapters

- [A1] **Ninghao Liu**, Qizhang Feng, Xia Hu. “Interpretability in Graph Neural Networks”. In Lingfei Wu, Peng Cui, Liang Zhao and Jian Pei. *Graph Neural Networks: Foundations, Frontiers, and Applications*. Springer, Singapore. 2022.
- [A2] **Ninghao Liu**, Xia Hu. “Spam detection in online social media: A survey”. In Jiliang Tang and Charu Aggaral. *Social Media Analytics: Advances and Applications*. forthcoming with CRC Press, 2020.

Refereed Journal Publications

- [J1] **Ninghao Liu**, Mengnan Du, Ruocheng Guo, Huan Liu, Xia Hu, “Adversarial Attacks and Defenses: An Interpretation Perspective”, SIGKDD Exploration Newsletter, 2021.
- [J2] Fan Yang, **Ninghao Liu**, Mengnan Du, Xia Hu. “Generative Counterfactuals for Neural Networks via Attribute-Informed Perturbation”, SIGKDD Exploration Newsletter, 2021.
- [J3] Weijie Fu, Meng Wang, Mengnan Du, **Ninghao Liu**, Shijie Hao, Xia Hu, “Differentiated Explanation of Deep Neural Networks with Skewed Distributions”, *IEEE Transactions on Pattern Analysis and Machine Intelligence* (TPAMI), 2020.
- [J4] Mengnan Du, **Ninghao Liu**, Fan Yang, Xia Hu. “Learning Credible DNNs via Incorporating Prior Knowledge and Model Local Explanation”, *Knowledge and Information Systems* (KAIS), 2020
- [J5] Mengnan Du, **Ninghao Liu**, Xia Hu. “Techniques for Interpretable Machine Learning”, *Communications of the ACM*, 2019
(The Highlighted Article on the cover page of the January 2020 issue, *Communications of the ACM*)
- [J6] Qiaoyu Tan, **Ninghao Liu**, Xia Hu. “Deep Representation Learning for Social Network Analysis”, *Frontiers in Big Data*, 2019
- [J7] Nur Hafieza Ismail, **Ninghao Liu**, Mengnan Du, Zhe He, Xia Hu, “Identification of Cancer Survivors Living with PTSD on Social Media”, *Studies in health technology and informatics*, 2019
- [J8] **Ninghao Liu**, Xia Hu. “Spam Detection on Social Networks”, *Encyclopedia of Social Network Analysis and Mining*, 2017
- [J9] Jun Gao, **Ninghao Liu**, Mark Lawley, Xia Hu. “An Interpretable Classification Framework for Information Extraction from Online Healthcare Forums”, *Journal of Healthcare Engineering*, 2017
- [J10] Xia Hu, Peter Reaven, Aramesh Saremi, **Ninghao Liu**, Mohammed Ali Abbasi, Huan Liu, Raymond Migrino. “Machine learning to predict rapid progression of carotid atherosclerosis in patients with impaired glucose tolerance”, *EURASIP Journal on Bioinformatics and Systems Biology*, 2016
- [J11] Xiangyu Yu, **Ninghao Liu**, Xin Qian, Tao Zhang. “Deployment Method Based on Spring Force in Wireless Robot Sensor Networks”, *International Journal of Advanced Robotic Systems*, 2014
- [J12] Xiangyu Yu, **Ninghao Liu**, Weipeng Huang, Xin Qian, Tao Zhang. “A Node Deployment Algorithm Based on Van Der Waals Force in Wireless Sensor Networks”, *International Journal of Distributed Sensor Networks*, 2013

Patent

- [A1] **Ninghao Liu**, Yong Ge, Li Li, Xia Hu, Rui Chen, Choi Soo-Hyun. “System and method for explainable embedding-based recommendation system”, US Patent App. 17/318,808, 2021.

ArXiv Preprint

- [A1] Yushun Dong, **Ninghao Liu**, Brian Jalaian, Jundong Li. “EDITS: Modeling and Mitigating Data Bias for Graph Neural Networks”, arXiv preprint arXiv:2108.05233, 2021.
- [A2] **Ninghao Liu**, Yunsong Meng, Xia Hu, Tie Wang, Bo Long. “Are Interpretations Fairly Evaluated? A Definition Driven Pipeline for Post-Hoc Interpretability”, arXiv preprint arXiv:2009.07494, 2020.

RESEARCH EXPERIENCE

- Research internship at Samsung Research America June 2019 - Aug 2019
 - *Developed a novel recommendation model based on graph neural networks to capture diverse user interests.*
 - *Published a research paper in CIKM 2020.*
- Visiting student at Alibaba DAMO Academy June 2018 - Aug 2018
 - *Developed multi-aspect network embedding by considering node polysemy for network embedding.*
 - *Published a research paper in KDD 2019*
- Research assistant, Texas A&M University, College Station Jan 2016 - present
 - *Explored how to open the black-boxes of machine learning and deep learning models with applications in information security and health informatics.*
 - *Member of a NSF Project: Adversarial Learning via Modeling Interpretation.*
 - *Member of a DARPA Project: Transforming Deep Learning to Harness the Interpretability of Shallow Models: An Interactive End-to-End System.*

TEACHING AND TALKS

- Teaching Assistant at Texas A&M University Jan 2017 - May 2017
 - *Undergraduate course: Information Storage and Retrieval*

AWARDS & ACTIVITIES

- Conference travel grant to attend CIKM 2020 Sep 2020
- Highlighted Article on the cover page of the January 2020 issue, Communications of the ACM Jan 2020
- 2019 ICDM Best Paper Award Candidate, Beijing, China Nov 2019
- Conference travel grant to attend KDD 2019, Anchorage, USA Aug 2019
- 2019 WWW Best Paper Award Shortlist, San Francisco, USA Apr 2019
- Conference travel grant to attend KDD 2018, London, UK Aug 2018
- “Meritorious Winner” in the Interdisciplinary Contest of Modeling Apr 2013
- National Scholarship Oct 2013
- “Hongping Changqing” Science and Technology Innovation Award Apr 2013
- First Class Scholarship in South China University of Technology Oct 2012
- First Class Scholarship in South China University of Technology Oct 2011

SERVICE

- Reviewer & Program committee member:
 - *The 10th International Conference on Learning Representations (ICLR), 2022*
 - *The 15th ACM International Conference on Web Search and Data Mining (WSDM), 2022*
 - *The 30th ACM International Conference on Information and Knowledge Management (CIKM), 2021*
 - *The 35th Conference on Neural Information Processing Systems (NeurIPS), 2021*
 - *The 27th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, Singapore, 2021*
 - *The 38th International Conference on Machine Learning (ICML), Vienna, Austria, 2021*
 - *The 4th IJCAI-PRICAI 2020 Workshop on XAI, Yohoama, Japan, 2020*
 - *The 1st Workshop on Artificial Intelligence for Anomalies and Novelities, Yohoama, Japan, 2020*
 - *The 26th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, San Diego, CA, 2020*
 - *The 3rd IJCAI Workshop on Explainable Artificial Intelligence (XAI 19), Macau, China, 2019*
 - *The 25th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, Anchorage, Alaska, 2019*
 - *The 28th ACM International Conference on Information and Knowledge Management, Beijing, China, 2019 (Long Papers, Short Papers)*

- *The 2nd IJCAI Workshop on Explainable Artificial Intelligence (XAI 18), Stockholm, Sweden, 2018*
- *The 1st IJCAI Workshop on Explainable Artificial Intelligence (XAI 17), Melbourne, Australia, 2017*
- Reviewer:
 - *IEEE Transactions on Neural Networks and Learning Systems (TNNLS) (2019, 2021)*
 - *The ACM Transactions on Knowledge Discovery from Data (TKDD) (2018, 2019, 2020, 2021)*
 - *AMIA 2020 Annual Symposium (2020)*
 - *Journal of Healthcare Informatics Research (JHIR) (2020)*
 - *Data Mining and Knowledge Discovery (DAMI) (2017, 2018)*
 - *Applied Stochastic Models in Business and Industry (ASMB) (2018)*
- External reviewer:
 - *IEEE International Conference on Data Mining (ICDM 2019)*