

Muhao Chen

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Research Interests

Representation learning for complex multi-relational data. Machine learning and commonsense reasoning for natural language understanding. Deep learning approaches to computational biology.

EDUCATION

University of California, Los Angeles, USA

Ph.D. in Computer Science

2014.9-2019.6

Dissertation: Multi-relational Representation Learning and Knowledge Acquisition Advisor: Carlo Zaniolo Collaborators: Kai-Wei Chang, Wei Wang, Yizhou Sun

Fudan University, Shanghai, China

B.S. in Computer Science

2010.9-2014.6

Advisor: X. Sean Wang

PUBLICATIONS

*Indicating equal contributions. ✉Indicating contact authors. ^Indicating advisee students.

Refereed Journal Publications

- Guangyu Zhou*, **Muhao Chen**✉*, Chelsea J. T. Ju*, Zheng Wang, Jyun-Yu Jiang, Wei Wang✉. Mutation effect estimation on protein-protein interactions using deep contextualized representation learning. *NAR Genom. Bioinform.* Oxford University Press. 2020.
- Muhao Chen**✉*, Chelsea J. T. Ju*, Guangyu Zhou, Tianran Zhang, Kai-Wei Chang, Carlo Zaniolo, Wei Wang. Multifaceted Protein-Protein Interaction Prediction Based on Siamese Residual RCNN. *Bioinformatics*, Oxford University Press. Proceedings of ISMB/ECCB, 2019.
- Carlo Zaniolo✉, Shi Gao, Maurizio Atzori, **Muhao Chen**, Jiaqi Gu. User-Friendly Temporal Queries on Historical Knowledge Bases. *Information and Computation*. Elsevier, 2018.

Refereed Publication in Conference Proceedings

- Zequn Sun, Chengming Wang, Wei Hu, **Muhao Chen**, Jian Dai, Wei Zhang, Yuzhong Qu. Knowledge Graph Alignment Network with Gated Multi-hop Neighborhood Aggregation. In *the 34th International Conference on Artificial Intelligence (AAAI)*, 2020.
- Changping Meng, **Muhao Chen**, Jie Mao, Jennifer Neville. ReadNet: A Hierarchical Transformer Framework for Readability Analysis. In *the 42nd European Conference on Information Retrieval (ECIR)*, 2020.
- Muhao Chen**, Yingtao Tian, Haochen Chen, Kai-Wei Chang, Steve Skiena, Carlo Zaniolo. Learning to Represent Bilingual Dictionaries. In *Proceedings of the 23rd SIGNLL Conference on Computational Natural Language Learning (CoNLL)*, 2019
- Muhao Chen**, Chris Quirk. Embedding Edge-attributed Relational Hierarchies. In *Proceedings of the 42nd ACM SIGIR Conference on Research and Development in Information Retrieval (SIGIR)*, 2019.
- Junheng Hao^, **Muhao Chen**, Wenchao Yu, Yizhou Sun, Wei Wang. Universal Representation Learning of Knowledge Bases by Jointly Embedding Ontological Concepts and Instances. In *Proceedings of the 25th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)*, 2019. (Oral presentation)
- Xuelu Chen^, **Muhao Chen**, Weijia Shi^, Yizhou Sun, Carlo Zaniolo. Uncertain Knowledge Graphs Embeddings. In *the 33rd International Conference on Artificial Intelligence (AAAI)*, 2019.
- Weijia Shi^*, **Muhao Chen***, Pei Zhou^, Kai-Wei Chang. Retrofitting Contextualized Word Embeddings with Paraphrases. In *Proceedings of the 24th Conference on Empirical Methods in Natural Language Processing (EMNLP)*, 2019 (Oral presentation)

11. Pei Zhou[^], Weijia Shi[^], Jieyu Zhao, Kuan-Hao Huang, **Muhao Chen**, Ryan Cotterell, Kai-Wei Chang. Examining Gender Bias in Languages with Grammatical Gender. In *Proceedings of the 24th Conference on Empirical Methods in Natural Language Processing (EMNLP)*, 2019.
12. Qingheng Zhang, Zequn Sun, Wei Hu, **Muhao Chen**, Lingbing Guo, Yuzhong Qu. Multi-view Knowledge Graph Embedding for Entity Alignment. In *Proceedings of the 28th International Joint Conference on Artificial Intelligence (IJCAI)*, 2019.
13. Zequn Sun, Jiacheng Huang, Wei Hu, **Muhao Chen**, Yuzhong Qu. TransEdge: Translating Relation-contextualized Embeddings for Knowledge Graphs. In *the 18th International Semantic Web Conference (ISWC)*, 2019.
14. Haochen Chen, Syed Fahad Sultan, Yingtao Tian, **Muhao Chen**, Steven Skiena. Fast and Accurate Network Embeddings via Very Sparse Random Projection. In *Proceedings of the 28th ACM International Conference on Information and Knowledge Management (CIKM)*, 2019.
15. Changjun Fan, Yuhui Ding, Li Zeng, **Muhao Chen**, Yizhou Sun and Zhong Liu. Learning to Identify High Betweenness Centrality Nodes from Scratch: A Novel Graph Neural Network Approach. In *Proceedings of the 28th ACM International Conference on Information and Knowledge Management (CIKM)*, 2019.
16. **Muhao Chen**, Changping Meng, Gang Huang, Carlo Zaniolo. Learning to Differentiate Between Main-articles and Sub-articles in Wikipedia. In *IEEE International Conference on Big Data (BigData)*, 2019.
17. Yingtao Tian, Haochen Chen, Bryan Perozzi, **Muhao Chen**, Xiaofei Sun, Steven Skiena. Social Relation Inference via Label Propagation. In *the 41st European Conference on Information Retrieval (ECIR)*, 2019.
18. Qi Zhao, **Muhao Chen**, Pengyuan Du, Tuan Le, Mario Gerla. Towards Efficient Cellular Traffic Offloading via Dynamic MPTCP Path Configuration with SDN. In *IEEE International Conference on Computing, Networking and Communications (ICNC)*, 2019.
19. **Muhao Chen**, Gang Huang, Changping Meng, Carlo Zaniolo. Neural Article Pair Modeling for Wikipedia Sub-article Matching. In *the 29th European Conference on Machine Learning (ECML)*, 2018 (**Plenary Presentation**, ~1.7% acceptance rate)
20. **Muhao Chen**, Yingtao Tian, Kai-Wei Chang, Steven Skiena, Carlo Zaniolo. Co-training Embeddings of Knowledge Graphs and Entity Descriptions for Cross-lingual Entity Alignment. In *the 27th International Joint Conference on Artificial Intelligence (IJCAI)*, 2018.
21. **Muhao Chen**, Yingtao Tian, Xuelu Chen, Zijun Xue, Carlo Zaniolo. On2Vec: Embedding-based Relation Prediction for Ontology Population. In *Proceedings of the 17th SIAM International Conference on Data Mining (SDM)*. SIAM, 2018
22. Haochen Chen, Xiaofei Sun, Yingtao Tian, Bryan Perozzi, **Muhao Chen** and Steven Skiena. Enhanced Network Embeddings via Exploiting Edge Labels. In *the 27th ACM Conference on Information and Knowledge Management (CIKM)*. ACM 2018.
23. Pengyuan Du, Seunghyun Yoo, Qi Zhao, **Muhao Chen**, Mario Gerla. Towards Opportunistic Resource Sharing in Mobile Social Networks - an Evolutionary Game Theoretic Approach. In *Proceedings of the 19th ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc)*, ACM 2018.
24. **Muhao Chen**, Qi Zhao, Pengyuan Du, Carlo Zaniolo, Mario Gerla. Demand-driven Cache Allocation Based on Context-aware Collaborative Filtering. In *Proceedings of the 19th ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc)*, ACM 2018.
25. **Muhao Chen**, Yingtao Tian, Mohan Yang, Carlo Zaniolo. Multilingual Knowledge Graph Embeddings for Cross-lingual Knowledge Alignment. In *Proceedings of the 26th International Joint Conference on Artificial Intelligence (IJCAI)*. 2017.
26. **Muhao Chen**, Carlo Zaniolo. Learning Multi-faceted Knowledge Graph Embeddings for Natural Language Processing. In *Proceedings of the 26th International Joint Conference on Artificial Intelligence (IJCAI)*. 2017 (Extended abstract)
27. **Muhao Chen**, Shi Gao, X. Sean Wang. Converting Spatiotemporal Data Among Heterogeneous Granularity Systems. In *Proceedings of the 25th IEEE International Conference on Fuzzy Systems (FUZZ-IEEE)*. IEEE, 2016
28. **Muhao Chen**, Shi Gao, Jingheng Zhou, X. Sean Wang. Converting Spatiotemporal Data Among Multiple Granularity Systems. In *Proceedings of the 31st ACM SIGAPP Symposium on Applied Computing (SAC)*. ACM, 2016.

Tutorial

29. **Muhao Chen**, Kai-Wei Chang, Dan Roth. Recent Advances in Transferable Representation Learning. **AAAI**, 2020.

Refereed Workshop and System Demonstration Papers

30. Weijia Shi[^], **Muhao Chen**, Yingtao Tian, Kai-Wei Chang. Learning Bilingual Word Embeddings Using Lexical Definitions. In *Proceedings of ACL Workshop on Representation Learning for NLP (RepL4NLP)*, 2019.

31. Zhubo Deng[^], Pei Zhou[^], Weijia Shi[^], **Muhao Chen**, Kai-Wei Chang. Computational Analysis of French-origin Reborrowing Process for English Loanwords. In *ICDM Workshop on Multilingual Cognitive Services (ICDMW)*, 2019
32. Changjun Fan, Yizhou Sun, Li Zeng, Yang-Yu Liu, **Muhao Chen**, Zhong Liu. Dismantle Large Networks through Deep Reinforcement Learning. In *ICLR Workshops*, 2019.
33. Pei Zhou[^], **Muhao Chen**, Kai-Wei Chang, Carlo Zaniolo. Quantification and Analysis of Scientific Language Variation by Research Fields. In *Proceedings of the ICDM Workshops (ICDMW)*, 2018.
34. **Muhao Chen**, Tao Zhou, Pei Zhou[^], Carlo Zaniolo. Multi-graph Affinity Embeddings for Multilingual Knowledge Graphs. **Contributed talk** in the *6th Workshop on Automated Knowledge Base Construction at NIPS (AKBC)*. 2017.
35. Tao Zhou, **Muhao Chen**, Demetri Terzopoulos, Jie Yu. Attention-based Natural Language Person Retrieval. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition Workshops (CVPRW)*. IEEE, 2017.
36. Shi Gao, **Muhao Chen**, Maurizio Atzori, Carlo Zaniolo. SPARQL^T and its User-Friendly Interface for Managing and Querying the History of Knowledge Bases. In *the 14th International Semantic Web Conference (ISWC)*, 2015 (demo).

In Submission

37. **Muhao Chen**, Weijia Shi, Ben Zhou, Dan Roth. Cross-lingual Entity Alignment for Knowledge Graphs with Incidental Supervision from Free Text.
38. Zequn Sun, **Muhao Chen**, Wei Hu, Chengming Wang. Knowledge Association with Hyperbolic Representation Learning of Knowledge Graphs.
39. Fangyu Liu, **Muhao Chen**, Dan Roth, Nigel Collier. Visual Pivoting for (Unsupervised) Entity Alignment.
40. Haoyu Wang, **Muhao Chen**, Hongming Zhang, Dan Roth. Joint Constrained Learning for Event-Event Relation Extraction.
41. Hongming Zhang, **Muhao Chen**, Haoyu Wang, Dan Roth. Open-domain Process Structure Induction.
42. Junheng Hao[^], Chelsea J. T. Ju, **Muhao Chen**, Yizhou Sun, Carlo Zaniolo, Wei Wang. Bio-JOIE: Joint Representation Learning of Biological Knowledge Bases.
43. Zequn Sun, Qingheng Zhang, Wei Hu, Chengming Wang, **Muhao Chen**, Chengkai Li, Yuzhong Qu. A Benchmarking Study of Embedding-based Entity Alignment for Knowledge Graphs.
44. Xuelu Chen, **Muhao Chen**, Changjun Fan, Ankith Uppunda[^], Yizhou Sun, Carlo Zaniolo. Multilingual Knowledge Graph Completion via Ensemble Knowledge Projection.
45. Dat Duong, Ankith Uppunda[^], Chelsea Ju, James Zhang, **Muhao Chen**, Eleazar Eskin, Jingyi Jessica Li, Kai-Wei Chang. Evaluating Representations for Gene Ontology Terms.
46. Jyun-yu Jiang, Chelsea J. T. Ju, Junheng Hao[^], **Muhao Chen**, Wei Wang. Circular RNA Prediction based on Junction Encoders and Deep Interaction among Splice Sites.
47. Tianran Zhang[^], **Muhao Chen**, Alex Bui. Diagnostic Prediction with Sequence-of-sets Representation Learning for Clinical Events.

PRESENTATIONS

1. Event Schema Instantiation as Knowledge Graph Alignment. *PI meeting (KAISOS)*, DARPA. June 2020.
2. Recent Advances in Transferable Representation Learning. *Half-day tutorial at AAAI*. NYC, NY, Feb 2020.
3. Multi-relational Knowledge Acquisition with Transferable Representation Learning. *AI Seminar, USC ISI*. Los Angeles, Jan 2020.
4. Multi-relational Knowledge Acquisition with Transferable Representation Learning. *IBM Research Almaden*. San Jose, Jan 2020.
5. Multi-relational Knowledge Acquisition with Transferable Representation Learning. *Invited talk at FDSiF, Fudan Univ., Shanghai, China*. Dec 2019.
6. Retrofitting contextualized word embeddings with paraphrases. *Conference talk at EMNLP, Hong Kong, China*. Nov 2019
7. Cross-lingual Dependency Parsing with Unlabeled Auxiliary Languages. *Conference talk at CoNLL, Hong Kong, China*. Nov 2019
8. Multi-relational representation learning and knowledge acquisition. *Invited talk at Stanford SNAP Seminar*. Jan 2019
9. Multi-relational representation learning and knowledge acquisition. *UCLA Machine Learning and Big Data Seminar*. Jan 2019
10. Neural Article Pair Modeling for Wikipedia Sub-article Matching. *Plenary talk at ECML, Dublin, Ireland*. Sept 2018

11. Co-training Embeddings of Knowledge Graphs and Entity Descriptions for Cross-lingual Entity Alignment. *Conference talk at IJCAI. Stockholm, Sweden.* July 2018
12. On2Vec: Embedding-based Relation Prediction for Ontology Population. *Conference talk at SDM. San Diego, CA, USA.* May 2018
13. Multilingual Knowledge Graph Embeddings for Cross-lingual Knowledge Alignment. *Contributed talk at AKBC. Longbeach, CA, USA.* Dec 2017
14. Neural Article Pair Modeling for Wikipedia Sub-article Matching. *Google Search Intelligence Seminar Talk.* Sept 2017
15. Multilingual Knowledge Graph Embeddings for Cross-lingual Knowledge Alignment. *Conference talk at IJCAI. Melbourne, Australia.* Aug 2017
16. Converting Spatiotemporal Data Among Heterogeneous Granularity Systems. *Conference talk at FUZZ-IEEE. Vancouver, Canada.* Aug 2016
17. Reasoning Across Multiple Spatiotemporal Granularity Systems. *Invited talk at Teradata Labs. El Segundo, CA, USA.* Mar 2015

PROFESSIONAL EXPERIENCE

- Postdoctoral Fellow**, University of Pennsylvania, Philadelphia, PA (CogCompGroup) *Host: Dan Roth* 2019.8-2020.7
- Research Intern**, Microsoft Research, Redmond, WA (NLP Group) 2018.6-2018.9
- *Embedding Edge-attributed Relational Hierarchies.* [7]
- Research Intern**, Google, Mountain View, CA (Google Knowledge Graph) 2017.6~2017.9
- *Neural Article Pair Modeling for Large-scale Sub-article Relation Extraction from Wikipedia.* [19,16,5]
- System SDE Intern**, Google, Mountain View, CA (Procella Real-time Data Infrastructure) 2016.6~2016.9
- *Dynamic Shard-partitioning for Large-scale Windowed Event Streams.*
- R&D Intern**, Teradata Labs, Los Angeles, CA (Optimizer Group) 2015.6~2015.9
- *Multi-task Learning for Cost-based Database Optimizers.*

SELECTED AWARDS

- UCLA Dissertation Fellowship.* 2018-2019
- Google Research & Travel Support Archimedes Program.* 2018
- NSF Travel Grants.* 2016, 2017, 2018, 2019
- Research Grant of the National University Student Innovation Program.* Ministry of Education of China. 2014
- Tung OOCL Scholarships.* Tung's Foundation of Hong Kong & The Oriental Overseas Container Line. 2012, 2013
- Wang-Dao Fellowship.* President of Fudan University. 2013
- EMC Scholarship.* EMC Inc. 2013
- Chun-Tsung Fellowship.* Hui-Chun Chin and Tsung-Dao Lee Chinese Undergraduate Research Endowment. 2012

TEACHING AND MENTORING EXPERIENCE

Mentoring:

- Haoyu Wang, UPenn MS Student in Computer and Information Science. **Research mentor** (EMNLP'20 in submission) 2019.9-2020.7
- Xuelu (Shirley) Chen, UCLA PhD student in Computer Science. **Research mentor** 2017.10-date
- Junheng Hao, UCLA PhD student in Computer Science. **Research mentor** 2017.10-date
- Tianran Zhang, UCLA PhD student in Bioengineering. **Research mentor** 2019.6-2020.6

Chen, Muhao - CV

Pei Zhou, UCLA undergraduate student (Now PhD student at USC CS). **Research mentor** (First-author publications in EMNLP'19 and ICDMW'18. Coauthored paper in AKBC'18) 2019.12-2019.6

Weijia Shi, UCLA undergraduate student (Now PhD student at UW). **Research mentor** (First-author publications in EMNLP'19 and RepL4NLP'19. Coauthored paper in AAAI'19) 2018.6-2019.12

Ankith Uppunda. UCLA undergraduate student. **Research mentor.** 2019.3-2019.6.

Zhubo Deng, UCLA undergraduate student. **Research mentor** (First-author publication in ICDMW'19). 2019.1-2019.6

Xiaoshuang Wei, UCLA MS student in Computer Science (Now software engineer at Google). **Thesis mentor** 2016.10-2017.3

Teaching:

Teaching assistant (2015.9-2016.6), associate (2016.9-2017.6), fellow (2017.9-2018.6) at UCLA (Data Structures and Algorithms; Introduction to Computer Science).

ACADEMIC SERVICES

PC Member:

2021: WSDM.

2020: AAAI, ACL-IJCNLP, AKBC, COLING, EMNLP, IJCAI, ISWC, KDD, SIGIR, WSDM, *SEM.

2019: AAAI, AKBC, NAACL, ACL, EMNLP-IJCNLP, BigData, NLPCC, WISE, ICSC.

2018: AAAI, EMNLP, BigData, NLPCC, SoCal NLP.

Organization Committee: 2019: IEEE AIKE (Doctoral Consortium Co-chair)

Journal Reviewer: W3J, TKDD, BMC Genomics, BMC Medical Genomics, TNNLS, Clinical and Translational Medicine, Evolutionary Intelligence, Frontiers of Computer Science, Information Sciences, IEEE Access.