

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

1. **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.
2. 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

3. 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.
4. 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.
5. **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
6. **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.
7. 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)**
8. Xuelu Chen, **Muhao Chen**, Weijia Shi[^], Yizhou Sun, Carlo Zaniolo. Uncertain Knowledge Graphs Embeddings. In *the 33rd International Conference on Artificial Intelligence (AAAI)*, 2019.
9. 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)**
10. 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.

11. 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.
12. 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.
13. 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.
14. Changjun Fan, Yuhui Ding, Li Zeng, **Muhao Chen**, Yizhou Sun and Zhong Liu. Betweenness Centrality Estimation from Scratch: A Novel Graph Neural Network Based Approach. In *Proceedings of the 28th ACM International Conference on Information and Knowledge Management (CIKM)*, 2019.
15. **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.
16. 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.
17. 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.
18. **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)
19. **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.
20. **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
21. 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.
22. 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.
23. **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.
24. **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.
25. **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)
26. **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
27. **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

28. **Muhao Chen**, Kai-Wei Chang, Dan Roth. Recent Advances in Transferable Representation Learning. **AAAI**, 2020 (accepted)

Refereed Workshop and System Demonstration Papers

29. 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.
30. 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

31. Changjun Fan, Yizhou Sun, Li Zeng, Yang-Yu Liu, **Muhao Chen**, Zhong Liu. Dismantle Large Networks through Deep Reinforcement Learning. In *ICLR Workshops*, 2019.
32. 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.
33. **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.
34. 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.
35. 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

36. 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. In revision in *Nucleic Acids Res: Genom. Bioinform.* Oxford University Press.
37. **Muhao Chen**, Weijia Shi, Ben Zhou, Dan Roth. Cross-lingual Entity Alignment for Knowledge Graphs with Incidental Supervision from Free Text. In submission to **ACL**, 2020.
38. Zequn Sun, **Muhao Chen**, Wei Hu, Chengming Wang, Jian Dai, Wei Zhang. Knowledge Association with Hyperbolic Representation Learning of Knowledge Graphs. In submission to **ACL**, 2020.
39. Zequn Sun, Qingheng Zhang, Wei Hu, Chengming Wang, Lingbing Guo, **Muhao Chen**, Chengkai Li, Yuzhong Qu. A Benchmarking Study. In submission to **VLDB**, 2020
40. Xuelu Chen, **Muhao Chen**, Changjun Fan, Ankith Uppunda[^], Yizhou Sun, Carlo Zaniolo. Cross-lingual Knowledge Graph Completion via Ensemble Knowledge Projection.
41. Dat Duong, Ankith Uppunda[^], Chelsea Ju, James Zhang, **Muhao Chen**, Eleazar Eskin, Jingyi Jessica Li, Kai-Wei Chang. Evaluating Representations for Gene Ontology Terms.

PRESENTATIONS

1. Transferable Representation Learning for Multi-relational Data. *Invited talk at FBDC. Fudan Univ., Shanghai, China. Dec 2019.*
2. Retrofitting contextualized word embeddings with paraphrases. *Conference talk at EMNLP. Hong Kong, China. Nov 2019*
3. Cross-lingual Dependency Parsing with Unlabeled Auxiliary Languages. *Conference talk at CoNLL. Hong Kong, China. Nov 2019*
4. Multi-relational representation learning and knowledge acquisition. *Invited talk at Stanford SNAP Seminar. Jan 2019*
5. Multi-relational representation learning and knowledge acquisition. *UCLA Machine Learning and Big Data Seminar. Jan 2019*
6. Neural Article Pair Modeling for Wikipedia Sub-article Matching. *Plenary talk at ECML. Dublin, Ireland. Sept 2018*
7. Co-training Embeddings of Knowledge Graphs and Entity Descriptions for Cross-lingual Entity Alignment. *Conference talk at IJCAI. Stockholm, Sweden. July 2018*
8. On2Vec: Embedding-based Relation Prediction for Ontology Population. *Conference talk at SDM. San Diego, CA, USA. May 2018*
9. Multilingual Knowledge Graph Embeddings for Cross-lingual Knowledge Alignment. *Contributed talk at AKBC. Longbeach, CA, USA. Dec 2017*
10. Neural Article Pair Modeling for Wikipedia Sub-article Matching. *Google Search Intelligence Seminar Talk. Sept 2017*
11. Multilingual Knowledge Graph Embeddings for Cross-lingual Knowledge Alignment. *Conference talk at IJCAI. Melbourne, Australia. Aug 2017*
12. Converting Spatiotemporal Data Among Heterogeneous Granularity Systems. *Conference talk at FUZZ-IEEE. Vancouver, Canada. Aug 2016*
13. Reasoning Across Multiple Spatiotemporal Granularity Systems. *Invited talk at Teradata Labs. El Segundo, CA, USA. Mar 2015*

ACADEMIC SERVICES

PC Member:

2020: AAAI, AKBC, IJCAI, WSDM.

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: TKDD, Information Sciences, BMC Genomics, BMC Medical Genomics, Frontiers of Computer Science, IEEE Access.

WORK EXPERIENCES

Postdoctoral Fellow, University of Pennsylvania, Philadelphia, PA (CogCompGroup) 2019.8-Present

Research Intern, Microsoft Research, Redmond, WA (NLP Group) 2018.6-2018.9

- *Embedding Edge-attributed Relational Hierarchies*. [6]

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*. [18,15,4]

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 EXPERIENCES

Mentoring:

Pei Zhou (2017.6-2019.6, UCLA undergraduate student). Worked on semantic variation projects. Published in EMNLP'19*2, ICDMW'18 '19, AKBC'17. Now Ph.D. student in USC.

Weijia Shi (2018.6-present, UCLA undergraduate student). Work on lexical semantics and knowledge graph projects. Published in EMNLP'19*2, AAAI'19, Repl4NLP'19, ICDMW'19.

Ankith Uppunda (2019.3-2019.6, UCLA undergraduate student). Worked on knowledge graph and machine learning for proteins projects.

Chen, Muhao - CV

Zhubo Deng (2019.1-present, UCLA undergraduate student). Worked on bilingual loanwords detection projects. Published in ICDMW'19.

Xiaoshuang Wei (2016.10-2017.3, UCLA master student). Capstone project on machine learning for cost-based query optimizer. Now software engineer at Google.

Teaching:

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

ACADEMIC SOCIETY MEMBERSHIP BY NOMINATION

Sigma Xi (2019.9)

REFERENCES

1. Carlo Zaniolo
N.E. Friedmann Chair Professor, UCLA
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<http://web.cs.ucla.edu/~zaniolo/>
2. Kai-Wei Chang
Assistant Professor, UCLA
kw@kwchang.net
<http://web.cs.ucla.edu/~kwchang/>
3. Wei Wang
Leonard Kleinrock Chair Professor, UCLA
weiwang@cs.ucla.edu
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4. Yizhou Sun
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yzsun@cs.ucla.edu
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