Kaixun Hua

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PROFESSIONAL EXPERIENCE

University of British Columbia, Vancouver, BC 07/2020 – Current
Postdoctoral Fellow, Institute of Applied Mathematics Advisor: Yankai Cao
Research Topic: Next Generation Training Algorithms with Deterministic Global Optimality

University of Massachusetts Boston, Boston, MA 09/2013 – 05-2019
Graduate Research Assistant

InsuranceQuotes, Cambridge, MA 05/2015 – 08-2015
Machine Learning Engineer

EDUCATION

University of Massachusetts Boston, Boston, MA 09/2013 – 05/2019
Ph.D., Computer Science Advisor: Dan A. Simovici
Thesis: Clusterability, Model Selection and Evaluation

Cornell University, Ithaca, NY 09/2012 – 08/2013
M.Eng., Systems Engineering Advisor: Hsiao-Dong Chiang
Thesis: A Study on State Estimation of Power System with Uniform Distributed Residuals

Shanghai Jiao Tong University, Shanghai, China 09/2008 – 08/2012
B.Sci., Electrical and Computer Engineering

HONORS & AWARDS

- NeurIPS 2022 Scholar Award (Total Award Amount: $3,200)
- INFORMS 2022 Data Mining Best Paper Award (Theoretical track, 1/25)
- PICS Scholar (Pacific Institute for Climate Solutions)
- ICML 2022 Participation Grant (Total Award Amount: $2,850)
- Best Presentation Award (4th BC Universities Systems and Control Meeting, 2021)
- Outstanding Research Award (Doctoral Dissertation, UMass Boston)
- Annual Research Symposium Competition (1st Place '18, 3rd Place '16, UMass Boston)
- The Third Prize Scholarship (2011-2012, Shanghai Jiao Tong University)
- Dean's List (2010-2012, University of Michigan-Shanghai Jiao Tong University Joint Institute)

CONFERENCE PUBLICATIONS

1. [**NeurIPS 2022**] **Hua, K.**, Ren, J., & Cao, Y. (2022). A Scalable Deterministic Global Optimization Algorithm for Training Optimal Decision Tree. *Advances in Neural Information Processing Systems*, accepted.
2. [**NeurIPS 2022**] Ren, J.*, **Hua, K.***, & Cao, Y. (2022). Global Optimal K-Medoids Clustering of One Million Samples. *Advances in Neural Information Processing Systems*, accepted. (**Co-first Author**)
3. [**ICML 2022**] Shi, M.*, **Hua, K.***, Ren, J., & Cao, Y. (2022). Global Optimization of K-Center Clustering. In *International Conference on Machine Learning* (pp. 19956-19966). PMLR. (**Co-first Author**)
4. [**ICML 2021**] **Hua, K.**, Shi, M., & Cao, Y. (2021). A Scalable Deterministic Global Optimization Algorithm for Clustering Problems. In *International Conference on Machine Learning* (pp. 4391-4401). PMLR.

5. [**MMCTSE 2019**] Simovici, D. A. & **Hua, K.** (2019). Data Ultrametricity and Clusterability. In *Journal of Physics: Conference Series* (Vol. 1334, No. 1, p. 012002). IOP Publishing.
6. [**SYNASC 2018**] **Hua, K.**, & Simovici, D. A. (2018). Dual Criteria Determination of the Number of Clusters in Data. In *2018 20th International Symposium on Symbolic and Numeric Algorithms for Scientific Computing* (pp. 201-208). IEEE.
7. [**ICNSC 2016**] **Hua, K.**, & Simovici, D. A. (2016). Long-lead Term Precipitation Forecasting by Hierarchical Clustering-based Bayesian Structural Vector Autoregression. In *2016 IEEE 13th International Conference on Networking, Sensing, and Control* (pp. 1-6). IEEE.

JOURNAL PUBLICATIONS

1. Li, Y., **Hua, K.**, & Cao, Y. (2022). Using Stochastic Programming to Train Neural Network Approximation of Nonlinear MPC Laws. *Automatica*, 146, 110665.
2. Li, Y., Wang, Y., Chen, Y., Lu, Y., **Hua, K.**, Ren, J., Mozafari, G., Lu, Q. & Cao, Y., (2022). Deep-Learning-Based Predictive Control of Battery Management for Frequency Regulation. *Industrial & Engineering Chemistry Research*, 61(24), 8432-8442.
3. Chen, Q., Zuo, L., Wu, C., Li, Y., **Hua, K.**, Mehrtash, M., & Cao, Y. (2022). Optimization of compressor standby schemes for gas transmission pipeline systems based on gas delivery reliability. *Reliability Engineering & System Safety*, 221, 108351.
4. Mehrtash, M., Mozafari, G., **Hua, K.**, & Cao, Y. (2022). Stochastic Optimal Device Sizing Model for Zero Energy Buildings: A Parallel Computing Solution. *IEEE Transactions on Industry Applications*, 58(3), 3275-3284.
5. Xu, Z., Lian, J., Wang, R., Qiu, Y., Song, T., & **Hua, K.** (2022). Development of Method for Assessing Water Footprint Sustainability. *Water*, 14(5), 694.(**Co-Corresponding Author**)
6. Xu, Z., Lian, J., Bin, L., **Hua, K.**, Xu, K., & Chan, H. Y. (2019). Water Price Prediction for Increasing Market Efficiency Using Random Forest Regression: A Case Study in the Western United States. *Water*, 11(2), 228. (**Co-Corresponding Author**).
7. Simovici, D. A., Vetro, R., & **Hua, K.** (2017). Ultrametricity of dissimilarity spaces and its significance for data mining. In *Advances in Knowledge Discovery and Management* (pp. 141-155). Springer, Cham.
8. Scheffner, I., **Hua, K.**, Simovici, D., Abeling, T., Haller, H., & Gwinner, W. (2016). Prediction of Patient Survival After Kidney Transplantation: Construction, Validation and Evaluation of Decision Models Using Data Mining Approaches. In *American Journal of Transplantation* (Vol. 16, pp. 572-573).

MANUSCRIPTS UNDER PEER-REVIEW

1. **Hua, K.**, Ren, J., Ji, C., & Cao, Y. Deep Optimal Decision Tree with Global Optimality. In preparation for *Journal of Machine Learning Research*.
2. **Hua, K.**, Ren, J., Ji, C., & Cao, Y. GO-Clustering.jl: A Julia Package for Global Optimal Centroid-based Clustering. In preparation for *INFORMS Journal on Computing*.
3. **Hua, K.**, Ren, J., Shi, M., & Cao, Y. Global Optimal K-means Clustering. In preparation for *IEEE Transactions on Pattern Analysis and Machine Intelligence*.
4. Ren, J., **Hua, K.**, & Cao, Y. Global Optimal K-center Clustering of One Billion Samples. In preparation for *Operation Research*.
5. Ren, J., **Hua, K.**, & Cao, Y. Global Optimal Explainable Models for Biorefining. In preparation for *European Symposium on Computer Aided Process Engineering (ESCAPE33)*.
6. Okamoto, M., **Hua, K.**, Ren, J., & Cao, Y. Fast Model Predictive Control for Scheduling Using Mixture Density Networks, In preparation for *Automatica*.
7. Xiao, D.*, **Hua, K.***, Pal, S., Cao, Y., & Murphy, T. BrainSformer: a Scalable Transformer-based Framework for Motion Synthesis from Neural Decoding of Cortex-wide Spatiotemporal Dynamics. In preparation for *Nature Methods*. (**Co-first Author**)

SELECTED ORAL PRESENTATIONS

1. **Hua, K.**, Ren, J., & Cao, Y. "A Scalable Deterministic Global Optimization Algorithm for Training Optimal Decision Tree." UBC Postdoc Research Day, Vancouver, BC, December 2022.
2. **Hua, K.**, Ren, J., & Cao, Y. "A Scalable Deterministic Global Optimization Algorithm for Training Optimal Decision Tree." The 36th Conference on Neural Information Processing Systems (NeurIPS 2022), New Orleans, LA, November 2022.
3. Ren, J., **Hua, K.**, & Cao, Y. "Global Optimal K-Medoids Clustering of One Million Samples." The 36th Conference on Neural Information Processing Systems (NeurIPS 2022), New Orleans, LA, November 2022.
4. Ren, J., **Hua, K.**, & Cao, Y. "A Scalable Global Optimization Algorithm for K-Medoids Clustering." The 72nd Canadian Chemical Engineering Conference (CCEC 2022), Vancouver, BC, October 2022.
5. **Hua, K.**, Ren, J., & Cao, Y. "A Deterministic Global Optimization Algorithm for Training Optimal Decision Tree on Large Datasets." The 17th INFORMS Workshop on Data Mining and Decision Analytics, Indianapolis, IN, October 2022 (**INFORMS Data Mining Best Theoretical Paper Award**).
6. Shi, M., **Hua, K.**, Ren, J., & Cao, Y. "Global Optimization of K-Center Clustering." Spotlight, The 39th International Conference on Machine Learning (ICML 2022), Baltimore, MD, July 2022. (Virtual)
7. **Hua, K.** "Trustworthy Machine Learning and Its Recent Progress." CS105, Guest Lecture, University of Massachusetts Boston, Boston, MA, December 2021. (Virtual)
8. **Hua, K.**, Mozafari, G. & Cao, Y. "Tutorial for Julia and JuMP." BC Hydro, Vancouver, BC. November 2021. (Virtual)
9. **Hua, K.** & Cao, Y. "A Scalable Global Optimization Algorithm for Stochastic Nonlinear Programs." Conference of the International Federation of Operational Research Societies (IFORS 2021), Seoul, South Korea, August 2021. (Virtual)
10. **Hua, K.** & Cao, Y. "A Scalable Deterministic Global Optimization Algorithm for Clustering Problems." 4th BC Universities Systems and Control Meeting. University of Victoria, Victoria, BC, August 2021. (**Best Presentation Award**) (Virtual)
11. **Hua, K.** & Cao, Y. "A Scalable Deterministic Global Optimization Algorithm for Clustering Problems." SIAM Conference on Optimization (OP21), Spokane, WA, USA, July 2021. (Virtual)
12. **Hua, K.**, Shi, M., & Cao, Y. "A Scalable Deterministic Global Optimization Algorithm for Clustering Problems." Spotlight, The 38th International Conference on Machine Learning (ICML 2021), Vienna, Austria, July 2021. (Virtual)
13. **Hua, K.** "Improving Auto-parts Production Process with Large-scale Machine Learning Algorithm." Ningbo TIJ Automotive Parts Co., Ltd, Zhejiang, China. June 2021.
14. **Hua, K.** & Cao, Y. "A Global Optimization Algorithm for Clustering Problem." Canadian Mathematical Society, Montreal, QC, December 2020. (Virtual)
15. Simovici, D. A. & **Hua, K.**"Clusterability and Model Selection." Bigwood System Inc., Cornell Business & Technology Park, Ithaca, NY. August 2019.
16. **Hua, K.** "Application of Machine Learning in Power System Industry." State Grid Corporation of China, Shanghai, China. July 2018.
17. **Hua, K.** "Data Ultrametricity and Clusterability." Annual Research Symposium, Department of Computer Science, University of Massachusetts Boston, Boston, MA, May 2018.
18. **Hua, K.** "On Finding Natural Clustering Structures in Data." Annual Research Symposium, Department of Computer Science, University of Massachusetts Boston, Boston, MA, May 2016.

TEACHING EXPERIENCE

- *Teaching Assistant: CS110 Introduction to Computing (Python)*
  University of Massachusetts Boston, Boston, MA 09/2015 – 06/2019
- *Teaching Assistant: CS420 Introduction to the Theory of Computation*
  University of Massachusetts Boston, Boston, MA 09/2014 – 06/2015

- *Teaching Assistant: CS240 Programming in C*
  University of Massachusetts Boston, Boston, MA 09/2013 – 06/2014
- *Teaching Assistant: VE311 Electronic Circuits*
  Shanghai Jiao Tong University, Shanghai, China 05/2012 – 08/2012

RESEARCH MENTORING

- **Doctoral Students**:
  - Jiayang Ren, University of British Columbia, 2021 - Present
  - Chengjie Li (visiting scholar), University of British Columbia/SCAU (China), 2021 - 2022;
  - Luo Zhao (visiting scholar), University of British Columbia/HEU (China), 2021 - 2022;
  - Ziyao Xu, Tianjing University (China), 2019-2020.
- **Master Students**:
  - Mingfei Shi, University of British Columbia, 2020 - 2022;
  - Qinyu Zhu, University of British Columbia, 2020.
- **Undergraduate Students**:
  - Shraman Pal, University of British Columbia/IIT Kharagpur (India), 2022;
  - Abhishek Ramesh Gopalan, University of British Columbia/IIT Madras (India), 2022;
  - Nusair Islam, University of British Columbia, 2022.

SCIENTIFIC COMMUNITY AND OUTREACH ACTIVITIES

- Manuscript Review:
  - International Conference on Machine Learning (ICML)
  - Conference on Neural Information Processing Systems (NeurIPS)
  - International Conference on Knowledge Discovery and Data Mining (KDD)
  - The Conference on Information and Knowledge Management (CIKM)
  - Knowledge and Information System
  - Artificial Intelligence
  - Automatica
- Conference Organization:
  - Session Chair, *Artificial Intelligence and Machine Learning in Process Systems Engineering*, Canadian Chemical Engineering Conference (CCEC), 2022
  - Session Chair, *Data Driven Analytics, Controls, and Optimization (Tuesday AM2)*, Canadian Chemical Engineering Conference (CCEC), 2022
  - Session Chair, *Data Driven Analytics, Controls, and Optimization (Wednesday AM2)*, Canadian Chemical Engineering Conference (CCEC), 2022
- Member Affiliation:
  - Association for Computing Machinery (ACM), Since 2021
  - Society for Industrial and Applied Mathematics (SIAM), Since 2021
  - The Institute for Operations Research and the Management Sciences (INFORMS), Since 2021
  - Association for Information Systems (AIS), Since 2021
  - Institute of Electrical and Electronics Engineers (IEEE), Since 2016

LIST OF REFERENCES

- **Dr. Yankai Cao**
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  Assistant Professor
  Institute of Applied Mathematics
  Department of Chemical and Biological Engineering
  Univeristy of British Columbia
  2360 East Mall
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- **Dr. Dan A. Simovici**
  Ph.D. Dissertation Supervisor
  Professor and Graduate Director
  Department of Computer Science
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  100 William T Morrissey Blvd
  Boston, MA 02125
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- **Dr. Wei Ding**
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- **Dr. Marc Pomplun**
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- **Dr. Wei Huang (Wayne)**
  Collaborator
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  Department of Information Systems and Management Engineering
  Southern University of Science and Technology
  1088 Xueyuan Avenue
  Shenzhen, Guangdong P.R. China 518055
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