# JIACHENG ZHU

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## RESEARCH INTERESTS

Jiacheng Zhu's research aims to develop interpretable machine learning techniques that transport and utilize knowledge across different domains. To achieve this goal, he leverages probabilistic theory, Bayesian inference, and optimal transport. He tackles machine learning problems on heterogeneous real-world datasets in healthcare and robotics.

## RESEARCH AND WORK EXPERIENCE

**Postdoctoral Researcher,** *MIT CSAIL, Cambridge, MA, USA* *Sep 2023 - Now*
Advisors: Justin Solomon, Marzyeh Ghassemi
Topics: Geometric-inspired foundational models & generalizable ML for healthcare

**Research Assistant,** *CMU, Pittsburgh, PA, USA* *Sep 2018-Aug 2023*
Advisors: XuanLong Nguyen, Ding Zhao, Bo Li
Topic: Generalizable machine learning on heterogeneous domains with optimal transport

**Research Scientist Intern,** *Apple AI/ML Health AI, Seattle, WA, USA* *May 2023-Aug 2023*
Mentors: Haraldur Hallgrímsson, Shirley Ren
Topic: Self-Supervised Learning (SSL) for time sequence data

**Research Intern,** *AT&T Labs, New York, NY, USA* *May 2022-Aug 2022*
Mentors: Aritra Guha, Zhengyi Zhou, Cheryl Brooks
Topic: Statistical machine learning and algorithmic fairness

**Research Scientist Intern,** *Apple AI/ML Health AI, Seattle, WA, USA* *May 2021-Oct 2021*
Mentors: Greg Darnell, Shirley Ren
Topic: Physiology-informed generalizable machine learning for time sequence data

**Research Intern,** *Isuzu Technical Center of America, Ann Arbor, MI, USA* *May 2020-Aug 2020*
Mentor: Yong Sun
Topic: Domain adaptation and deep generative model for motion prediction

**Quantitative Research Intern,** *Etiger Capital Partners, Shanghai, China* *May 2017-Aug 2017*
Topic: Event-driven strategy based on probabilistic graphical models

## EDUCATION

**M.S. in Machine Learning,** *Machine Learning Department* *Dec 2019 - Jan 2022*
School of Computer Science, Carnegie Mellon University, PA, USA

**Ph.D. Candidate,** *Mechanical Engineering* *Sept 2018 - Aug 2023*
College of Engineering, Carnegie Mellon University, PA, USA

**Minor in Data Science**, *Sept 2015 - June 2017*
School of Computer Science, Fudan University, Shanghai, China

**B.Eng. in Aerospace design and Engineering**, *Sept 2013 - June 2017*
School of Aeronautics and Astronautics, Fudan University, Shanghai, China

## SELECTED PUBLICATIONS & PREPRINTS

**Generalizable Machine Learning**

1. **[Under review] Functional Optimal Transport: Map Estimation and Domain Adaptation for Functional Data**,
**Jiacheng Zhu***, Aritra Guha*, Dat Do*, Mengdi Xu, XuanLong Nguyen, Ding Zhao, *submitted to Journal of Machine Learning Research, under review.*

2. **[ICML 2023] Interpolation for Robust Learning: Data Augmentation on Wasserstein Geodesics**,
**Jiacheng Zhu**, Jielin Qiu, Aritra Guha, Zhuolin Yang, Xuanlong Nguyen, Bo Li, Ding Zhao. PMLR International Conference on Machine Learning (ICML), 2023.

3. **[ACL 2023] Semantics-Consistent Cross-domain Summarization via Optimal Transport Alignment**,
Jielin Qiu, **Jiacheng Zhu**, Mengdi Xu, Frank Dernonocourt, Trung Bui, Zhaowen Wang, Bo Li, Ding Zhao, Hailin Jin, Annual Meeting of the Association for Computational Linguistics (ACL) 2023.

4. **[NeurIPS 2022] Curriculum Reinforcement Learning using Optimal Transport via Gradual Domain Adaptation**,
Peide Huang, Mengdi Xu, **Jiacheng Zhu**, Laixi Shi, Fei Fang, Ding Zhao, *Conference on Neural Information Processing Systems (NeurIPS )2022.*

5. **[NeurIPS 2020] Task-Agnostic Online Reinforcement Learning with an Infinite Mixture of Gaussian Processes**
Mengdi Xu, Wenhao Ding, **Jiacheng Zhu**, Zuxin Liu, Baiming Chen, Ding Zhao, *Conference on Neural Information Processing Systems (NeurIPS 2020).*

6. **[NeurIPS Workshop 2019] Recurrent Attentive Neural Process for Sequential Data**
Shenghao Qin*, **Jiacheng Zhu***, Jimmy Qin, Wenshuo Wang, Ding Zhao, *Conference on Neural Information Processing Systems (NeurIPS 2019) Workshop.*

**Artificial Intelligence & Machine Learning for Health**

7. **[ICASSP 2023] Cardiac Disease Diagnosis on Imbalanced Electrocardiography Data Through Optimal Transport Augmentation**,
Jielin Qiu*, **Jiacheng Zhu***, Mengdi Xu, Peide Huang, Michael Rosenberg, Douglas Weber,Emerson Liu, Ding Zhao, *2023 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2023.*

8. **[EACL 2023] Transfer Knowledge from Natural Language to Electrocardiography: Can We Detect Cardiovascular Disease Through Language Models?**,
Jielin Qiu, William Han, **Jiacheng Zhu**, Mengdi Xu, Michael Rosenberg, Emerson Liu, Douglas Weber and Ding Zhao, *The 17th Conference of the European Chapter of the Association for Computational Linguistics (EACL) 2023.*

9. **[MLHC 2022] GeoECG: Data Augmentation via Wasserstein Geodesic Perturbation for Robust Electrocardiogram Prediction**,
**Jiacheng Zhu***, Jielin Qiu*, Zhuolin Yang, Douglas Weber, Michael Rosenberg, Emerson Liu, Bo Li, Ding Zhao, *PMLR Machine Learning for Healthcare (MLHC) 2022.*

10. **[CHIL 2022] PhysioMTL: Personalizing Physiological Patterns using Optimal Transport Multi-Task Regression**,
**Jiacheng Zhu**, Gregory Darnell, Agni Kumar, Ding Zhao, Bo Li, XuanLong Nguyen, Shirley You Ren, *PMLR Conference on Health, Inference, and Learning (CHIL) 2022.*

**Artificial Intelligence & Machine Learning for Autonomy**

11. **[CoRL 2022] Robustness Certification of Visual Perception Models via Camera Motion Smoothing**,

Hanjiang Hu, Zuxin Liu, Linyi Li, **Jiacheng Zhu** Ding Zhao, *PMLR Conference on Robot Learning (CoRL) 2022.*

12. **[BuilSys 2022] Re-vibe: vibration-based indoor person re-identification through cross-structure optimal transport**,
Yiwen Dong, **Jiacheng Zhu**, Hae Young Noh, *The 9th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (BuildSys) 2022.*

13. **[ICRA 2021] Context-Aware Safe Reinforcement Learning for Non-Stationary Environments**
Baiming Chen, Zuxin Liu, **Jiacheng Zhu**, Mengdi Xu, Wenhao Ding, Liang Li, Ding Zhao
*The 2021 International Conference on Robotics and Automation (ICRA 2021).*

14. **[T-ITS] Spatiotemporal learning of multivehicle interaction patterns in lane-change scenarios**
Chengyuan Zhang, **Jiacheng Zhu**, Wenshuo Wang, Junqiang Xi, *IEEE Transactions on Intelligent Transportation Systems, 2021.*

15. **[ITSC 2018] A Tempt to Unify Heterogeneous Driving Databases using Traffic Primitives**
**Jiacheng Zhu**, Wenshuo Wang, Ding Zhao, *The 21st IEEE International Conference on Intelligent Transportation Systems (ITSC) 2018.*

16. **[NME] A theoretical model for delayed hydride cracking velocity considering the temperature history and temperature gradients**
Jingyu Zhang, **Jiacheng Zhu**, Shurong Ding, etc., Nuclear Materials and Energy 16 (2018): 95-107.

17. **[SMiRT] Evaluation of the Effect of Temperature Gradient and Irradiation on Threshold Stress Intensity Factor in Delayed Hydride Cracking and Simulation on DHC Velocity for Zirconium Alloy Cladding Tubes**
**Jiacheng Zhu**, Jingyu Zhang, Shurong Ding, etc. oral report, proceedings with the 19th Conference on Structural Mechanics in Reactor Technology, Beijing, China, Oct 16-18, 2016

## ACADEMIC SERVICES

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| **Conference reviewer** | International Conference on Machine Learning (ICML)<br>Conference on Neural Information Processing Systems (NeurIPS)<br>International Conference on Learning Representations (ICLR)<br>Artificial Intelligence and Statistics Conference (AISTATS), (2023 top reviewer)<br>Association for the Advancement of Artificial Intelligence (AAAI)<br>Conference on Health, Inference, and Learning (CHIL)<br>Machine Learning for Healthcare (MLHC) |
| **Journal reviewer** | Transactions on Machine Learning Research (TMLR)<br>Transactions on Pattern Analysis and Machine Intelligence (TPAMI)<br>IEEE Robotics and Automation Letters (RA-L)<br>IEEE Transactions on Intelligent Transportation Systems (T-ITS)<br>IEEE Transactions on Intelligent Vehicles (T-IV) |
| **Organizer** | ICRA 2022 SeasonDepth Challenge |

## TALKS & ACTIVITIES

**Generalizing AI/ML for Physiological & Cardiovascular Health** June 2023
*Long talk Doctoral Symposium, Conference on Health, Inference, and Learning 2023, Cambridge, MA.*

**Generalizing AI/ML for Physiological Health with Heterogeneous Data** April 2023
*Long talk* *AISOC Lab, CMU, USA, Hosted by Prof. Fei Fang, CMU*

**Generalizing AI/ML for Autonomous Driving under Distribution Shift** Oct 2022
*Long talk* *Wayve AI, London (remote), Hosted by Vijay Badrinarayanan,*

**Robustify ECG Automatic diagnosis via distribution interpolation** Sep 2022
*Long talk* *Allegheny Health Network, Pittsburgh*

**GeoECG: Data augmentation for robust cardiovascular prediction** Aug 2022
*Spotlight presentation* *Machine Learning for Healthcare, 2022, Durham, North Carolina*

**PhysioMTL: Physiology-informed multi-task Learning** April 2022
*Spotlight presentation* *Conference on Health, Inference, and Learning, 2022*

**Functional Optimal Transport** February 2022
*Spotlight presentation* *AAAI Workshop on Optimal Transport and Structured Data Modeling*

**Demographic aware multitask learning for Heart Rate Variability** August 2021
*Intern presentation* *Apple AI/ML, Remote*

**Oxford Machine Learning Summer School** July 2020
*Attendee* *OxML 2020, Oxford University (Online)*

**Recurrent Attentive Neural Process for Sequential Data** Dec 2019
*Lightning talks* *NeurIPS 2019,Learning with Rich Experience (LIRE) Workshop,Vancouver*

**Artificial Intelligence for Data Discovery and Reuse (AIDR) 2019** May 2019
*Long talk* *Carnegie Mellon University, Pittsburgh*

## HONORS

- Conference on Health, Inference, and Learning, Doctoral Symposium, 2023
- International Conference on Artificial Intelligence and Statistics (AISTATS) top reviewer, 2023
- Qualcomm Innovation Fellowship, North American, 2022
- Apple Scholars in AI/ML PhD fellowship nomination, 1 out of 3 at CMU College of Engineering, 2021
- Certification, Oxford Machine Learning Summer School, 2020 (Online)
- NeurIPS Student Travel Award, NeurIPS , 2019
- Rackham Travel Grant Fellowship, University of Michigan, Ann Arbor, 2018
- Junyuan Scholarship for Undergraduate Student, Fudan University, 2017
- Outstanding Undergraduate Thesis, Fudan University, 2016
- Xiexin Excellent Student Scholarship, Fudan University, 2016
- Junyuan Scholarship for Undergraduate Student, Fudan University, 2016
- 'GuangHua Innovation Prize' of Fudan University, Fudan University, 2015
- China Graduate Future Flight Vehicle Innovation Competition, First Prize, 2014

## SELECTED COURSES

Statistical Machine Learning, Probabilistic Graphical Models, Convex Optimization, Reinforcement Learning, Advanced Deep Learning, Intro to Machine Learning, Computer Vision, Machine Learning with Large Datasets, Mobile Robotics: SLAM, Robot Kinematics & Dynamics, Database Management Systems, Data Structures and Algorithms

## TECHNICAL AND PERSONAL SKILLS

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|---|---|
| **Computer Languages** | Python, JavaScript, C/C++, MATLAB |
| **Softwares & Tools** | TensorFlow, Pytorch, ROS, OpenRAVE, MySQL, OpenCV, CUDA, Solidworks, LaTeX |
| **Languages** | English, Mandarin, Shanghai Dialect |