

# Jiameng Fan

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## CONTACT INFORMATION

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## RESEARCH INTERESTS

My research lies at the intersection of Machine Learning, Formal Methods and Robotics. I am particularly interested in

- Developing formal analysis tools for learning-enabled systems to prove safety and robustness.
- Developing data-efficient techniques that combine machine learning and formal methods to improve system performance and ensure safety in unknown environments.
- Developing computationally efficient representation learning algorithms to train robust models and bridge the gap between simulation and real-world applications.

## EDUCATION

### **Boston University**

*Ph.D. in Electrical Engineering*

Sep. 2017 - Aug. 2022  
*Advisor: Prof. [Wenchao Li](#)*

### **Beijing Institute of Technology**

*B.E. in Mechtronic Engineering (with honor)*

Sep. 2013 - Jul. 2017  
*Advisors: Prof. [Qiang Huang](#) and [Weimin Zhang](#)*

### **University of California, Irvine**

*Visiting Student*

Jul. 2016 - Nov. 2016  
*Advisor: Prof. [Mohammad Al Faruque](#)*

### **University of California, Berkeley**

*Summer School Student*

Jul. 2015 - Aug. 2015

## WORK EXPERIENCE

### **Google**

*Software Engineering*

Sep. 2022 - Present

Work at the intersection of machine learning, computer vision and multimodal learning with a focus on video-text understanding for user generated contents on Google Maps. The developed video-to-text matching model can be used for ranking, retrieval, or new features to provide an efficient navigation and consumption model for video content.

### **Google, Remote**

*Software Engineering Intern*

Sep. 2021 - Dec.2021

*Mentors: [Bryan Klingner](#) and [Rongqi Qiu](#)*  
Develop a novel constrained-optimization based data alignment technique for world-scale Geo imagery data (e.g. ground-level, aerial and satellite). The technique provides a new imagery alignment quality metric and improves the alignment quality with black-box optimization methods.

## SELECTED PUBLICATIONS

### [Google Scholar](#)

1. **Safety-Assured Design and Adaptation of Connected and Autonomous Vehicles**  
Xin Chen, [Jiameng Fan](#), Chao Huang, Ruochen Jiao, Wenchao Li, Xiangguo Liu, Yixuan Wang, Zhilu Wang, Weichao Zhou, and Qi Zhu  
*Chapter in Machine Learning and Optimization Techniques for Automotive Cyber-Physical Systems, Springer, 2023 (to appear).*
2. **REGLO: Provable Neural Network Repair for Global Robustness Properties** [\[pdf\]](#)  
Feisi Fu, Zhilu Wang, [Jiameng Fan](#), Yixuan Wang, Chao Huang, Xin Chen, Qi Zhu and Wenchao Li  
*NeurIPS Workshop on Trustworthy and Socially Responsible Machine Learning (TSRML), December 2022*
3. **DRIBO: Robust Deep Reinforcement Learning via Multi-View Information Bottleneck** [\[pdf\]](#)  
[Jiameng Fan](#) and Wenchao Li  
*International Conference on Machine Learning (ICML), July 2022*

4. **POLAR: A Polynomial Arithmetic Framework for Verifying Neural-Network Controlled Systems** [\[preprint\]](#)  
Chao Huang, Jiameng Fan, Xin Chen, Wenchao Li and Qi Zhu  
*The 20th International Symposium on Automated Technology for Verification and Analysis (ATVA), October 2022*
5. **Adversarial Training and Provable Robustness: A Tale of Two Objectives** [\[pdf\]](#)  
Jiameng Fan and Wenchao Li  
*AAAI Conference on Artificial Intelligence (AAAI), February 2021.*
6. **Divide and Slide: Layer-Wise Refinement for Output Range Analysis of Deep Neural Networks** [\[pdf\]](#)  
Chao Huang, Jiameng Fan, Xin Chen, Wenchao Li and Qi Zhu  
*In Proceedings of the ACM SIGBED International Conference on Embedded Software (EMSOFT), September 2020.*
7. **ReachNN\*: A Tool for Reachability Analysis of Neural-Network Controlled Systems** [\[pdf\]](#)  
Jiameng Fan, Chao Huang, Xin Chen, Wenchao Li and Qi Zhu  
*The 18th International Symposium on Automated Technology for Verification and Analysis (ATVA), October 2020.*
8. **Towards Verification-Aware Knowledge Distillation for Neural-Network Controlled Systems** [\[pdf\]](#)  
Jiameng Fan, Chao Huang, Wenchao Li, Xin Chen and Qi Zhu  
*In Proceedings of the 38th ACM/IEEE International Conference on Computer Aided Design (ICCAD), November 2019.*
9. **ReachNN: Reachability Analysis of Neural-Network Controlled Systems** [\[pdf\]](#)  
Chao Huang, Jiameng Fan, Wenchao Li, Xin Chen and Qi Zhu  
*In Proceedings of the ACM SIGBED International Conference on Embedded Software (EMSOFT), October 2019.*
10. **Safety-Guided Deep Reinforcement Learning via Online Gaussian Process Estimation** [\[pdf\]](#)  
Jiameng Fan and Wenchao Li  
*International Conference on Learning Representation (ICLR), Workshop on Safe Machine Learning: Specification, Robustness, and Assurance, May 2019.*

PEER REVIEWING **Reviewer for Journals and Conference Articles**

1. AAAI Conference on Artificial Intelligence (AAAI), 2023
2. Neural Information Processing Systems (NeurIPS), 2022, 2023
3. International Conference on Machine Learning (ICML), 2022, 2023
4. IEEE Transactions on Neural Networks and Learning Systems (TNNLS), 2020, 2021
5. Transactions on Design Automation of Electronic Systems (TODAES), 2020
6. Design, Automation and Test in Europe Conference (DATE), 2020, 2021
7. Design Automation Conference (DAC), 2018, 2019, 2020
8. International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS), 2020, 2022
9. ACM International Conference on Hybrid Systems: Computation and Control (HSCC), 2020
10. IEEE Robotics & Automation Magazine (RAM), 2019
11. International Conference On Computer Aided Design (ICCAD), 2018, 2022
12. Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN), 2021, 2022

- SELECTED AWARDS
- **Silver Medal (2nd Place) in the 2021 ACM SIGBED Student Research Competition:** Association for Computing Machinery, 2021
  - **ESWEEK Student Travel Grant:** the US National Science Foundation (NSF), 2019.
  - **Distinguished Electrical Engineering Fellowship:** Boston University, 2017

- **College Graduate Excellence Award of Beijing:** Beijing City Ministry of Education, 2017
- **Diwen Scholarship:** Beijing Institute of Technology, 2016
- **National Scholarship:** Ministry of Education of the People's Republic of China, 2014
- **First-class Scholarships:** Beijing Institute of Technology, 2013, 2014, 2015, 2016

SKILLS Python, C++, MATLAB, Robot Operating System (ROS), Pytorch, Tensorflow, Gurobi, L<sup>A</sup>T<sub>E</sub>X

OPEN-SOURCE TOOLS **DRIBO:** A new multi-view information bottleneck (MIB) objective that maximizes the mutual information between sequences of observations and sequences of representations while reducing the task-irrelevant information identified through the multi-view observations.

- DRIBO achieved the state-of-the-art results on the DeepMind Control Suite (with videos playing in the background as visual distractors) and the Procgen Benchmark (in terms of the performance of generalizing the learned policy to unseen levels).
- Github Repository: <https://github.com/JmfanBU/DRIBO>

**AdvIBP:** Certified Adversarial Training by Combining Adversarial Training and Provable Robustness Verification in a Principled Way.

- AdvIBP achieved state-of-the-art verified (certified) errors on MNIST and CIFAR-10.
- Github Repository: <https://github.com/JmfanBU/AdvIBP>

**ReachNN\*:** A formal reachability analysis tool to verify the neural-network controlled system (NNCS) with GPU support.

- ReachNN\* uses Bernstein polynomials to approximate neural networks with general types of activation functions. It also offers a feature to automatically retrain a verification-friendly network.
- Github Repository: <https://github.com/JmfanBU/ReachNNStar>

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| CORE GRADUATE<br>COURSEWORK | <b>EC 719</b> Statistical Machine Learning  | Spring 2019 |
|                             | <b>ME 570</b> Robot Motion Planning         | Fall 2018   |
|                             | <b>EC 724</b> Advanced Optimization Methods | Spring 2017 |
|                             | <b>EC 505</b> Stochastic Process            | Fall 2017   |