

# Li JING

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## Education

### Massachusetts Institute of Technology

Ph.D. in Physics

Advisor: *Marin Soljagic*

Thesis: *Physical Symmetry Enhanced Neural Networks*

Cambridge, MA  
Sept. 2014 - Dec. 2019

### Peking University

B.S. in Physics

B.A. in Economics

Beijing, China  
Sept. 2010 - Dec. 2014  
Sept. 2012 - Dec. 2014

## Experiences

### Facebook AI Research

Postdoctoral Researcher

*Advised by Yann LeCun*

- developed state-of-the-art self-supervised learning methods
- investigated semi-supervised learning, multimodal learning

New York, NY  
Feb. 2020 - now

### Massachusetts Institute of Technology

Research Assistant

*Advised by Marin Soljagic*

- invented long-term memory recurrent neural networks and their applications in NLP
- investigated physics inspired efficient neural network architectures
- pioneered the direction AI methods for optical material design

Cambridge, MA  
Sept. 2016 - Dec. 2019

### Lightelligence Inc.

Co-founder, Algorithm Team Lead

*AI-hardware company, B-series (\$40+ million funding)*

- invented quantization algorithm for low-precision noisy neural networks
- led a team building optical computing unit SDK

Boston, MA  
Jul. 2018 - Jan. 2019

### Massachusetts Institute of Technology

Research Assistant

*Advised by Wolfgang Ketterle*

- conducted research in large-scale experimental quantum physics

Cambridge, MA  
Sept. 2014 - Jul. 2016

### Peking University

Undergrad Research Assistant

*Advised by Heng Fan*

- conducted research in theoretical quantum information and quantum cryptography

Beijing, China  
Jan. 2011 - Jun. 2014

## Selected Honors and Awards

Forbes China 30 under 30 - *Enterprise Technology*

2019

International Physics Olympiad (**IPhO**) - *Gold Medal*

Zagreb, Croatia, 2010

## Publications

1. Jure Zbontar\*, **Li Jing\***, Ishan Misra, Yann LeCun, Stéphane Deny, “Barlow Twins: Self-Supervised Learning via Redundancy Reduction”, International Conference on Machine Learning (**ICML**) (2021)
2. Rumén Dangovski, Michelle Shen, Dawson Byrd, **Li Jing**, Desislava Tsvetkova, Preslav Nakov, Marin Soljagic, “We Can Explain Your Research in Layman's Terms: Towards Automating Science Journalism at Scale”, AAAI Conference on Artificial Intelligence (**AAAI**) (2021)
3. **Li Jing**, Jure Zbontar, Yann LeCun, “Implicit Rank-Minimizing Autoencoder”, Conference on Neural Information Processing Systems (**NeurIPS**) (2020)
4. Matthew Khoury, Rumén Dangovski, Longwu Ou, Yichen Shen, Preslav Nakov, **Li Jing**, “Vector-Vector-Matrix Architecture: A Novel Hardware-Aware Framework for Low-Latency Inference in NLP Applications”, Conference on Empirical Methods in Natural Language Processing (**EMNLP**) (2020)
5. Samuel Kim, Peter Lu, Srijon Mukherjee, Michael Gilbert, **Li Jing**, Vladimir Ceperic, Marin Soljagic, “Integration of Neural Network-Based Symbolic Regression in Deep Learning for Scientific Discovery” IEEE Transactions on Neural Networks and Learning Systems (**TNNLS**) (2020)
6. Thomas Christensen, Charlotte Loh, Stjepan Picek, Domagoj Jakobovic, **Li Jing**, Sophie Fisher, Vladimir Ceperic, John Joannopoulos, Marin Soljagic, “Predictive and generative machine learning models for photonic crystals”, **Nanophotonics** (2020)
7. Mihika Prabhu, Charles Roques-Carmes, Yichen Shen, Nicholas Harris, **Li Jing**, Jacques Carolan, Ryan Hamerly, Tom Baehr-Jones, Michael Hochberg, Vladimir Ceperic, John Joannopoulos, Dirk Englund, Marin Soljagic, “A Recurrent Ising Machine in a Photonic Integrated Circuit”, **Optica**, (2020)
8. Chao Qian, Bin Zheng, Yichen Shen, **Li Jing**, Erping Li, Lian Shen, Hongsheng Chen, “Deep learning enabled self-adaptive invisibility cloak”, **Nature Photonics** (2020)
9. Charles Roques-Carmes, Yichen Shen, Cristian Zanoci, Mihika Prabhu, Fadi Atieh, **Li Jing**, Tena Dubček, Vladimir Ceperic, John Joannopoulos, Dirk Englund, Marin Soljagic, “Heuristic Recurrent Algorithms for Photonic Ising Machines”, **Nature Communications** (2020)
10. Rumén Dangovski\*, **Li Jing\***, Marin Soljagic, “Rotational Unit of Memory: A Novel Representation Unit for RNNs with Scalable Applications”, Transactions of the Association for Computational Linguistics (**TACL**) (2019)
11. Yurui Qu\*, **Li Jing\***, Yichen Shen, Min Qiu, Marin Soljagic, “Migrating Knowledge between Physical Scenarios based on Artificial Neural Networks”, **ACS Photonics** (2019)
12. **Li Jing\***, Caglar Gulcehre\*, John Peurifoy, Yichen Shen, Max Tegmark, Marin Soljagic, Yoshua Bengio, “Gated Orthogonal Recurrent Units: On Learning to Forget”, **Neural Computation** (2019)
13. John Peurifoy, Yichen Shen, **Li Jing**, Yi Yang, Fidel Cano-Renteria, Brendan Delacy, John Joannopoulos, Max Tegmark, Marin Soljagic, “Nanophotonic Particle Simulation and Inverse Design Using Artificial Neural Networks”, **Science Advances** (2018)
14. **Li Jing\***, Yichen Shen\*, Tena Dubček, John Peurifoy, Scott Skirlo, Yann LeCun, Max Tegmark, Marin Soljagic, “Tunable Efficient Unitary Neural Networks (EUNN) and their application to RNNs”, Proceedings of International Conference on Machine Learning (**ICML**) (2017)

15. Heng Fan, Yi-Nan Wang, **Li Jing**, Jie-Dong Yue, Han-Duo Shi, Yong-Liang Zhang, Liang-Zhu Mu, “Quantum cloning machines and the applications”, **Physics Reports** (2014)
16. Yong-Liang Zhang, Huan Wang, **Li Jing**, Liang-Zhu Mu, Heng Fan, “Fitting magnetic field gradient with Heisenberg-scaling accuracy”, **Scientific Reports** (2014)
17. Yong-Liang Zhang, Yi-Nan Wang, Xiang-Ru Xiao, **Li Jing**, Liang-Zhu Mu, VE Korepin, Heng Fan, “Quantum network teleportation for quantum information distribution and concentration”, **Physical Review A** (2013)
18. **Li Jing**, Yi-Nan Wang, Han-Duo Shi, Liang-Zhu Mu, Heng Fan, “Minimal input sets determining phase-covariant and universal quantum cloning”, **Physical Review A** (2012)
19. Zhao-Xi Xiong, Han-Duo Shi, Yi-Nan Wang, **Li Jing**, Jin Lei, Liang-Zhu Mu, Heng Fan, “General quantum key distribution in higher dimension”, **Physical Review A** (2012)
20. Yi-Nan Wang, Han-Duo Shi, **Li Jing**, Zhao-Xi Xiong, Jin Lei, Liang-Zhu Mu, Heng Fan, “Non-compression of quantum phase information”, **Journal of Physics A: Mathematical and Theoretical** (2012)
21. Yi-Nan Wang, Han-Duo Shi, Zhao-Xi Xiong, **Li Jing**, Xi-Jun Ren, Liang-Zhu Mu, Heng Fan, “Unified universal quantum cloning machine and fidelities”, **Physical Review A** (2011)

### Pre-prints

1. Ileana Rugina, Rumen Dangovski, Renbin Liu, **Li Jing**, Preslav Nakov, Marin Soljagic, “Data-Informed Global Sparseness in Attention Mechanisms for Deep Neural Networks”, arXiv: 2012.02030
2. Evan Vogelbaum, Rumen Dangovski, **Li Jing**, Marin Soljačić, “Contextualizing Enhances Gradient Based Meta Learning”, arXiv: 2007.10143
3. **Li Jing\***, Rumen Dangovski\*, Marin Soljagic, “WaveletNet: Logarithmic Scale Efficient Convolutional Neural Networks for Edge Devices”, arXiv:1811.11644
4. Han-Duo Shi, Yi-Nan Wang, **Li Jing**, Ru-Quan Wang, Liang-Zhu Mu, Heng Fan, “Quantum key distribution based on a quantum retrodiction protocol”, arXiv: 1205.3556

### Invited Talks, Posters and Panels

1. Implicit Rank-Minimizing Autoencoder  
**Conference on Neural Information Processing Systems (NeurIPS)** Virtual, Dec. 2020
2. Physics Inspired Deep Learning Algorithms  
**Facebook AI Research** New York, NY, Nov. 2019
3. Phase-encoded Recurrent Neural Networks and their Applications  
**DeepMind** Mountain View, CA, Oct. 2019
4. Phase-encoded RNNs and Scientific Text Summarization  
**Amazon Alexa AI** Cambridge, MA, Sept. 2019

5. Photonics and AI: Algorithms and Applications  
**APS Physics of AI conference** Yorktown Heights, NY, Apr. 2019
6. **MIT-CHIEF Annual Conference, AI panel** Cambridge, MA, Nov. 2018
7. Nanophotonic Particle Simulation and Inverse Design Using Artificial Neural Networks  
**Conference on Neural Information Processing Systems (NIPS) - Deep Learning for Physical Science Workshop** Long Beach, CA, Dec. 2018
8. Gated Orthogonal Recurrent Units: On Learning to Forget  
**AAAI Conference on Artificial Intelligence (AAAI) - Workshop on Reasoning and Learning for Human-Machine Dialogues** New Orleans, LA, Jan. 2018
9. Tunable Efficient Unitary Neural Networks (EUNN) and their application to RNNs  
**International Conference on Machine Learning (ICML)** Sydney, Australia, Jul. 2017

### **Professional Services**

#### **Conference reviewer:**

International Conference on Learning Representations (ICLR), International Conference on Machine Learning (ICML), Conference on Neural Information Processing Systems (NeurIPS)

#### **Journal reviewer:**

IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), IEEE Transactions on Neural Networks and Learning Systems (TNNLS), IEEE Computational Intelligence Magazine (CIM), Proceedings of the National Academy of Sciences of the United States of America (PNAS), Physical Review A, Physical Review X, Physical Review Research, Physical Review Applied, Scientific Reports, Journal of Applied Physics, Optics Express, Optica, Advanced Photonics, Nanophotonics, IEEE Photonic Technology Letters, Nature Photonics, ACS Photonics, Physical Review Letters

### **Press Coverage**

1. **Techacute:** Self-Adaptive Invisibility Cloak: The “Magic” in Optics 2020
2. **SciTechDaily:** Solving complex problems at the speed of light 2020
3. **MIT News:** Can science writing be automated? A neural network can read scientific papers and render a plain-English summary. 2019
4. **MIT News:** AI-based method could speed development of specialized nanoparticles. Neural network could expedite complex physics simulations. 2018

### **Mentoring**

1. Pawan Goyal (undergrad at MIT): Efficient architecture for video understanding 2019
2. Lay Jain (undergrad at MIT): Equivariance in CNN 2019
3. Alvaro Inesta (Exchange master student at MIT): Pretraining for differential privacy 2018

4. Ivan Ivanov (RSI program, now undergrad at Cambridge University): Efficient unitary recurrent neural networks 2017
5. Rawn Henry (undergrad at MIT, now Engineer at Nvidia): Nonlinearity for spectral pooling 2017
6. John Peurifoy (undergrad at MIT, now CEO at Floating point group): Unitary RNNs, AI application for physics 2017
7. Rumén Dangovski (undergrad at MIT, now PhD at MIT EECS): Orthogonal RNNs with associative memory, NLP applications 2017