

# Peilun Dai

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## Education

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**Boston University**, Boston, MA, USA May 2022

- Master of Science in Computer Science (GPA: 3.92/4.00)
- Advisor: Prof. Peter Chin
- Selected Coursework: Machine Learning; Compressed Sensing and Sparse Recovery; Advanced Optimization Algorithms; Computational Game Theory; Introduction to Natural Language Processing; Computer Networks; Principles of Programming Languages; Randomness in Computing

**Massachusetts Institute of Technology**, Cambridge, MA, USA May 2018

- Master of Science in Brain and Cognitive Sciences (GPA: 4.90/5.00)
- Advisor: Prof. Edward S. Boyden
- Thesis: Towards Optical Connectomics: Feasibility of 3D Reconstruction of Neural Morphology Using Expansion Microscopy and In Situ Molecular Barcoding
- Selected Coursework: Systems Neuroscience; Computational Cognitive Science; Applied Probability; Cognitive Science; Optimization Methods; Algorithms for Inference; Pioneering Technologies for Interrogating Complex Biological Systems; Introduction to Machine Learning

**Nanyang Technological University**, Singapore May 2014

- Bachelor of Engineering (1st Class Hons) in Electrical and Electronic Engineering (GPA: 4.69/5.00)
- Selected Coursework: Data Structures and Algorithms; Software Engineering; AI and Data Mining; Computer Communications; Computer Networking; Digital Video Processing; Multimedia Systems; Circuit Analysis; AC Circuits and Machines; Analog Electronics; Digital Electronics; Integrated Electronics; Microprocessors; Semiconductor Fundamentals; Cellular Communication System Design; Enterprise Network Design; Image Processing; Engineering Electromagnetics; Signals and Systems; Modelling and Control; Engineering Mathematics; Business Finance

## Work Experience

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**Institute of High Performance Computing, A\*STAR**, Singapore May 2022 - Present

- Research Engineer
- AI research and development for healthcare and FinTech with deployment at Singapore General Hospital
- Skills: Python, PyTorch, LLMs, Agents, LangChain, LangGraph, PostgreSQL, MLOps

**Sea AI Lab (SAIL), Sea Group**, Singapore June 2021 - Nov 2021

- Research Intern
- Model-based reinforcement learning with JAX and the Brax differentiable physics engine
- Skills: JAX, Functional Programming, Reinforcement Learning

**Singapore University of Technology and Design**, Singapore May 2019 - Jul 2019

- Visiting Student
- Music emotion analysis using self-attention models
- Skills: PyTorch, Transformer, Music Analysis, Time Series Analysis, Affective Computing

**Synthetic Neurobiology Lab, MIT Media Lab**, Cambridge, MA, USA Sep 2016 - Sep 2018

- Graduate Research Assistant
- Computational connectomics; behavior modeling with zebrafish larvae
- Skills: Behavior Analysis, Neurobiology, Data Analysis, Optical Microscopy

**Institute for Infocomm Research, A\*STAR**, Singapore Aug 2014 - Jul 2015

- Research Engineer
- Visual attention, memory and visual search modeling
- Skills: Python, MATLAB, ConvNets, Computer Vision, Visual Attention, Deep Learning

<b>Advanced Digital Sciences Center, University of Illinois, Singapore</b>	May 2013 - Aug 2013
<ul style="list-style-type: none"> <li>• Intern</li> <li>• Video analysis with supervoxels and dense trajectories</li> <li>• Skills: MATLAB, Computer Vision, Video Analysis, SVM</li> </ul>	
<b>Panasonic R&amp;D Center Singapore, Singapore</b>	Sep 2012 - Dec 2012
<ul style="list-style-type: none"> <li>• Intern</li> <li>• 3D reconstruction from multi-view images using Structure from Motion</li> <li>• Skills: C++ , OpenCV, Computer Vision, Structure from Motion (SfM)</li> </ul>	
<b>Singapore-MIT Alliance for Research and Technology (SMART), Singapore</b>	May 2011 - Aug 2011
<ul style="list-style-type: none"> <li>• Intern</li> <li>• Smart traffic control system optimization</li> <li>• Skills: MATLAB, Traffic Control, Optimization</li> </ul>	

## Honors and Awards

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<b>Dean's Fellowship</b> , Graduate School of Arts and Sciences, Boston University	2018 - 2019
<ul style="list-style-type: none"> <li>• Full tuition award for first year of graduate studies</li> </ul>	
<b>National Science Scholarship</b> , Agency for Science, Technology and Research (A*STAR), Singapore	2015
<ul style="list-style-type: none"> <li>• Full tuition and living expenses for graduate studies at MIT for up to 5 years</li> </ul>	
<b>Full Scholarship for Undergraduate Studies in Singapore</b> , Ministry of Education (MOE), Singapore	2010
<ul style="list-style-type: none"> <li>• Full tuition and living expenses for undergraduate studies at NTU or NUS for 4 years</li> </ul>	

## Training and Skills

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### Technical Skills & Expertise:

- **Domain Expertise:** Computational Neuroscience, Computer Vision, Reinforcement Learning, Healthcare AI, FinTech
- **Technical Skills:** Python, MATLAB, JAX, PyTorch, TensorFlow, PostgreSQL, Git, GitHub, Functional Programming, MLOps

### Completed Massive Open Online Courses (MOOCs):

- **Computer Science:** Programming Languages (UW); Computer Networks (UW); Computer Science: Programming with a Purpose (Princeton); Computer Science: Algorithms, Theory, and Machines (Princeton); Algorithms: Design and Analysis (Stanford); Database Design and Basic SQL in PostgreSQL (UMich); Coding the Matrix: Linear Algebra through Computer Science Applications (Brown)
- **Machine Learning:** Generative Adversarial Networks Specialization (DeepLearning.AI); Reinforcement Learning Specialization (UAlberta); Deep Learning Specialization (DeepLearning.AI); Practical Reinforcement Learning (HSE University); Generative AI with Large Language Models (DeepLearning.AI & AWS); Bayesian Methods for Machine Learning (HSE University); Neural Networks for Machine Learning (UToronto); Machine Learning Foundations (NTU); Machine Learning Techniques (NTU); Machine Learning (Stanford); Learning from Data (Caltech)
- **Neuroscience:** The Brain and Space (Duke); Foundational Neuroscience for Perception and Action (Duke); Visual Perception and the Brain (Duke); Computational Neuroscience (UW)
- **Other:** Financial Markets (Yale); Introduction to Mathematical Philosophy (LMU)

### Training and Summer Schools:

• Oxford Machine Learning Summer School (OxML)	2021
• Gaussian Process and Uncertainty Quantification Summer School	2020
• Intelligent Sensing Summer School	2020
• Telluride Neuromorphic Workshop	2020
• AI Summer School by AI Singapore	2020
• International Conference on Mathematical Neuroscience	2020

- MIT Kaufman Teaching Certificate Program 2018
- MIT Brain, Minds and Machines Summer School 2015
- IEEE SPS Winter School on Visual Image Search and Visual Analytics 2014

## Teaching and Services

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### Teaching at Boston University

- Teaching Fellow, CS542 Machine Learning Spring 2019, Summer 2020, Summer 2021
- Teaching Fellow, CS112 Introduction to Computer Science II Fall 2019, Spring 2020
- Grader, CS655 Computer Networking Fall 2020
- Grader, CS591-C1 Computational Game Theory Spring 2020
- Grader, CS591-C1 Compressed Sensing and Sparse Recovery Fall 2019

### Teaching at Massachusetts Institute of Technology

- Teaching Assistant, 9.012 Cognitive Science Fall 2017
- Teaching Assistant, 9.40 Introduction to Neural Computation Spring 2017

**Volunteering and Reviewing:** International Conference on Machine Learning (ICML); International Conference on Learning Representations (ICLR); International Conference on Artificial Intelligence and Statistics (AISTATS); Medical Image Computing and Computer Assisted Intervention (MICCAI); Translational Vision Science and Technology (TVST)

**Supervised Students:** Madhav Girish Nair (Utrecht); Bryan Liu (ANU); Shawn Cheng (NUS); Borui Li (NUS); Yufei Liu (NTU); Elijah Yeo (NTU)

## Publications

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- [1] Ting Fang Tan, Peilun Dai, Xiaoman Zhang, Liyuan Jin, Stanley Poh, Dylan Hong, Joshua Lim, Gilbert Lim, Zhen Ling Teo, Nan Liu, et al. Explainable artificial intelligence in ophthalmology. *Current opinion in ophthalmology*, 34(5):422–430, 2023.
- [2] Peilun Dai and Sang Chin. Training many-to-many recurrent neural networks with target propagation. In *Artificial Neural Networks and Machine Learning–ICANN 2021: 30th International Conference on Artificial Neural Networks, Bratislava, Slovakia, September 14–17, 2021, Proceedings, Part IV 30*, pages 433–443. Springer International Publishing, 2021.
- [3] Young-Gyu Yoon, Zeguan Wang, Nikita Pak, Demian Park, Peilun Dai, Jeong Seuk Kang, Ho-Jun Suk, Panagiotis Symvoulidis, Burcu Guner-Ataman, Kai Wang, et al. Sparse decomposition light-field microscopy for high speed imaging of neuronal activity. *Optica*, 7(10):1457–1468, 2020.
- [4] Young-Gyu Yoon, Peilun Dai, Jeremy Wohlwend, Jae-Byum Chang, Adam H Marblestone, and Edward S Boyden. Feasibility of 3d reconstruction of neural morphology using expansion microscopy and barcode-guided agglomeration. *Frontiers in computational neuroscience*, 11:97, 2017.
- [5] Keng-Teck Ma, Liyuan Li, Peilun Dai, Joo-Hwee Lim, Chengyao Shen, and Qi Zhao. Multi-layer linear model for top-down modulation of visual attention in natural egocentric vision. In *2017 IEEE International Conference on Image Processing (ICIP)*, pages 3470–3474. IEEE, 2017.
- [6] Bappaditya Mandal, Rosary Yuting Lim, Peilun Dai, Mona Ragab Sayed, Liyuan Li, and Joo Hwee Lim. Trends in machine and human face recognition. In *Advances in Face Detection and Facial Image Analysis*, pages 145–187. Springer, Cham, 2016.
- [7] Keng-Teck Ma, Rosary Lim, Peilun Dai, Liyuan Li, and Joo-Hwee Lim. Unconstrained ego-centric videos with eye-tracking data. In *CVPR Workshop*, 2015.