Ye Shi

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Education

Purdue University **Expected Fall 2024**
Ph.D. Candidate in Electrical and Computer Engineering GPA 3.7/4.0 *West Lafayette, IN*

- Advisor: Prof. C. S. George Lee
- Research areas: Deep Learning, Generative AI, Constrained Optimization, Robotics, Computer Vision

Drexel University **June 2016**
Master of Science in Electrical Engineering GPA 4.0/4.0 *Philadelphia, PA*

- Advisors: Prof. Yon Visell and Prof. Adam Fontecchio
- Research areas: Haptics, Machine Learning, Data Analysis, Embedding Systems, Wearable Devices

Harbin Institute of Technology **July 2013**
Bachelor of Engineering in Automation GPA 87/100 *Harbin, China*

Research Experience

Constrained Optimization in Deep Learning (Ph.D. Thesis) **Nov. 2017 – Present**
Purdue University *West Lafayette, IN*

- Shifted focus from traditional constrained optimization to deep learning within latent-based frameworks such as VAEs, GANs, and Transformers, addressing complex, real-world challenges that are underexplored.
- Developed a transparent, latent-based optimization framework that integrates constraints and produces stable solutions.
- Optimized latent spaces by minimizing dimensionality and maximizing disentangled encoding capacity for downstream tasks such as regression, classification, and generation. (Journal paper under review)
- Enhanced the robustness and stability of solutions by transforming irregularly distributed latent representations into regular distributions. (Conference paper accepted)
- Created a method to embed complex, hard-to-define constraints directly into latent representations. (Journal paper in preparation)

Programming by Demonstration **July 2016 – Feb. 2017**
Purdue University *West Lafayette, IN*

- Led an undergraduate team in advancing AI-driven robot programming, resulting in significant reductions in programming costs and time.
- Pioneered new methodologies in programming humanoid and non-humanoid robots by implementing reinforcement learning and NLP (Lisp), enhancing their autonomous trajectory planning.
- Rapidly prototyped and deployed 'Super Baxter,' a humanoid robot, incorporating extensive testing, simulation, and kinematic analysis for navigation in free space and collision environments. (Demoed at IROS 2017)
- Developed prototypes of remote-controlled racing cars, integrating SLAM algorithms with sensor fusion of LiDAR, IMU, and other sensors to enable complex maneuvers such as racing and drifting.
- Organized and executed a campus-wide autonomous car race, showcasing the capabilities of the developed systems.

Wearable Skin-like Tactile Sensor Array (Master Project) **Aug. 2015 – June 2016**
Drexel University *Philadelphia, PA*

- Developed spatial signal processing algorithms for prototype tactile sensors aimed at wearable robotics and medical device integration.
- Enhanced sensor accuracy and processing speed by optimizing algorithms and implementing Kalman filter noise reduction on RAM-constrained MCUs.
- Conceptualized, designed, and prototyped a complete tactile imaging system, including modeling, circuit design, PCB layout, signal processing, visualization, API development, and UI design.
- Created an SVM-based algorithm for tumor detection, simulating medical palpation techniques using a spring-damper model.
- Published 2 journal papers and 1 conference paper, with a demo presented at Haptics Symposium 2016.

PID Control Assessment (Bachelor Thesis) **Sept. 2012 – July 2013**
Harbin Institute of Technology *Harbin, China*

- Developed a self-tuning algorithm for PID controller for an unknown system using statistical techniques.
- Adapted time series modeling methods (ARIMA) to identify the unknown system and evaluated it by the minimum variance controller derivations and Harris index calculations of the PID performance.
- Proposed an algorithm based on the evaluation to retune the PID controller.

Publications

Y. Shi, C.S.G. Lee, "Uniform Transformation: Refining Latent Representation in Variational Autoencoders," , *IEEE 20th International Conference on Automation Science and Engineering*, 2024, (Best Student Paper Nominee)

Y. Shi, C.S.G. Lee, "Soft-Constrained Optimization of Latent Space in Variational Autoencoders," , *IEEE Transactions on Neural Networks and Learning Systems*, (Submitted)

B. Li, Y. Shi, A. Fontecchio, Y. Visell, "Mechanical Imaging of Soft Tissues with a Highly Compliant Tactile Sensing Array," , *IEEE Transactions on Biomedical Engineering*, vol. 64, no. 8. 1982-1992, 2017

B. Li, Y. Shi, H. Hu, A. Fontecchio, Y. Visell, "Assemblies of Microfluidic Channels and Micropillars Facilitate Sensitive and Stretchable Tactile Sensing," , *IEEE Sensors Journal*, vol. 17, no. 5. 1286-1295, 2016

B. Li, Y. Shi, A. Fontecchio, Y. Visell, "Design, Analysis, and Fabrication Methods for Highly Compliant Tactile Sensing Arrays," , *Proc. IEEE Haptics Symposium*, 2016, Work-in-Progress Paper

Y. Shi, "PID Control System Assessment," , *Harbin Institute of Technology Library*, 2013, Undergraduate Thesis

Technical Skills

Deep Learning: Python (PyTorch, TensorFlow, Caffe), MATLAB
Embedding Systems: C/C++, Linux, ROS, PLC, FPGA
Database: PL/SQL (Microsoft, Oracle), IBM Cognos, R, SAS
Web Development: ASP.NET, VB, JavaScript, C#, HTML
Other Tools: Mathematica, LaTeX, Git (GitHub, Bitbucket), Photoshop, Microsoft Office Suite

Work Experience

Administrative Database Programmer **June 2018 – Present**
Purdue University *West Lafayette, IN*

- Architect and lead full-stack development of critical web applications, streamlining management, analysis, prediction, reporting, and operational data processes.
- Oversee the management of sensitive and restricted databases, ensuring meticulous maintenance, effective troubleshooting, robust security, and forward-thinking strategic planning.
- Enhance cross-functional collaboration, partnering with on-campus and external stakeholders to leverage statistical analysis and predictive modeling for informed decision-making.
- Provide expert guidance to faculty and staff on data collection methodologies, experimental design, and analytical strategies.

Assistant Electrical Engineer **July 2013 – December 2013**
Shanghai Baosheng Automobile Parts Manufacturing Co., Ltd. *Shanghai, China*

- Provided onsite technical support for equipment, effectively resolving issues.
- Participated in OEM Tier 2 liaisons, ensuring alignment with Tier 1 manufacturing requirements.
- Researched and recommended new product equipment, staying abreast of technological advancements for innovation.

Management Trainee **July 2012 – August 2012**
Shanghai Tenneco Exhaust System Co., Ltd. *Shanghai, China*

- Completed a rotational management trainee program in the auto industry.
- Acquainted with comprehensive insight into industry processes from production to management.

Leadership & Affiliations

Student Member, IEEE **Sept. 2015 - Present**
Director of Academic Affairs, IGSA, Drexel University **July 2015 - June 2016**
Secretary and Host, 201 Studio, Harbin **Sept. 2009 - June 2011**
Cameraman, HIT TV Station, Harbin **Sept. 2009 - Dec. 2010**

Honors & Awards

Dean Scholarship at Drexel University **2014, 2015, 2016**
First Class National Scholarship (China) **2012**
Outstanding Social Activity Activist at Harbin Institute of Technology **2011**