

# Shubhankar Patankar

Ph.D. Candidate, University of Pennsylvania

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in shubhankarpatankar • 🌐 spatank

## Education

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### University of Pennsylvania

Doctor of Philosophy, Network Science (in progress)

August 2018 - present

Philadelphia, PA

### University of Pennsylvania

Master of Science in Engineering, Robotics

August 2018 - December 2021

Philadelphia, PA

### University of California - Davis

Bachelor of Science (with Honors), Mechanical Engineering

September 2014 - June 2018

Davis, CA

## Experience

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### Tesla

Machine Learning Engineer Intern

November 2023 - May 2024

San Francisco, CA

- Developed machine learning models for predictive maintenance, root-cause analysis, process optimization, and quality evaluation in the 4680 cell manufacturing team.
- Trained high-fidelity time series and vision auto-encoder models for early outlier detection, helping identify defects at multiple upstream locations in the 4680 manufacturing process.
- Integrated inference outputs into data pipelines for dashboards and analysis at two manufacturing sites, providing real-time insights for process improvement and evaluation.

### General Motors

Machine Learning Engineer Intern

May 2023 - August 2023

Detroit, MI

- Developed models using graph neural networks and transformers for downtime prediction using multivariate manufacturing time-series data, improving plant downtime forecasts by an average of 6 hours.
- Adapted large language models to automotive text data; used resulting models to build high-accuracy (>90%) text-based classifiers for lowering GM's warranty costs.

### Complex Systems Group

Graduate Research Associate, Penn Engineering

August 2018 - present

Philadelphia, PA

- Trained reinforcement learning agents to explore graph-structured environments using human-like artificial curiosity signals, demonstrating learning generalization to environments 50X larger and trajectories 3X longer than those seen during training.
- Discovered three critical curiosity-based drivers of knowledge graph expansion in humans, using tools from algebraic topology, information theory, and analytical mechanics.
- Demonstrated using control theory that path-based structure in graphs determines control properties of dynamics.

### Hyundai

Research Intern

January 2018 - June 2018

Davis, CA

- Designed and manufactured a driving simulator to enable hardware-in-the-loop (HIL) testing for the steering column of the Hyundai Sonata; manufacturing process involved 190+ hours of fabrication.
- Built a controller to mitigate the adverse impacts of road feel at the steering through the steering column of the Hyundai Sonata.

### Harvard University

Research Intern

June 2017 - September 2017

Boston, MA

- Created a computational pipeline to perform non-negative matrix factorization of high-resolution calcium imaging data collected from larval zebra fish into spatial and temporal components.

## Technical Skills

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**Programming:** Python (PyTorch, TensorFlow), Julia, MATLAB, C, SQL, R, Apache Airflow

**Machine Learning:** Computer Vision, Reinforcement Learning, Graph Neural Networks, NLP

## Research

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- Publications.....
1. **Shubhankar P. Patankar**, Mathieu Ouellet, Juan Cerviño, Alejandro Ribeiro, Kieran A. Murphy & Dani S. Bassett. Intrinsically motivated graph exploration using network theories of human curiosity. [Learning on Graphs](#) (November 2023).
  2. Mathieu Ouellet, **Shubhankar P. Patankar**, Kieran A. Murphy, Lee Bassett & Dani S. Bassett. Prion-like self-reproducing mechanical nanostructures. [arXiv](#) (February 2024).
  3. Dale Zhou, **Shubhankar P. Patankar**, Martin Gerlach, David M. Lydon-Staley, Perry Zurn & Dani S. Bassett. Architectural styles of curiosity in readers of Wikipedia. [PsyArXiv](#) (November 2023).
  4. **Shubhankar P. Patankar**, Dale Zhou, Christopher W. Lynn, Jason Z. Kim, Mathieu Ouellet, Harang Ju, Perry Zurn, David M. Lydon-Staley & Dani S. Bassett. Curiosity as filling, compressing, and re-configuring knowledge networks. [Collective Intelligence](#) (October 2023).
  5. **Shubhankar P. Patankar**, Jason Z. Kim, Fabio Pasqualetti & Dani S. Bassett. Path-dependent connectivity, not modularity, predicts controllability of structural brain networks. [Network Neuroscience](#) (November 2020).
  6. Xiaohuan Xia, Mathieu Ouellet, **Shubhankar P. Patankar**, Diana I. Tamir, & Dani S. Bassett. Sentiment analysis by LLMs reveals multiscale sociocultural citation norms (in preparation).

## Relevant Coursework

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|---|---|---|
| <input type="radio"/> Machine Learning        | <input type="radio"/> Computational Linguistics | <input type="radio"/> Big Data Analytics    |
| <input type="radio"/> Artificial Intelligence | <input type="radio"/> Machine Perception        | <input type="radio"/> Linear Systems Theory |
| <input type="radio"/> Deep Learning           | <input type="radio"/> Brain-Computer Interfaces | <input type="radio"/> Network Neuroscience  |

## Teaching Experience

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- University of Pennsylvania.....
- Course Assistant - Deep Learning (CIS 522)** *January 2022 - June 2022*
- Led weekly recitations for a graduate-level deep learning course for 30 students.
- Course Assistant - Ancient and Modern Thinking about Thinking (INTG 3440)** *March 2020*

## Awards

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- University of Pennsylvania.....
- Penn Engineering Graduate Fellowship** *August 2018 - present*
- Perry World House Graduate Fellowship** *August 2022 - August 2023*
- University of California - Davis.....
- Yampol-Egerman Scholarship** *January 2018*
- College of Engineering Scholarship** *March 2018*