# John Zeng

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## Education

**Purdue University** — West Lafayette, IN

*Bachelor of Science* — *Expected May 2026*

- Double Major: Computer Science & Artificial Intelligence
- Relevant Coursework: Analysis of Algorithms, Relational Database Systems, Data Mining and Machine Learning, Systems Programming, Intro to AI, Computer Architecture, Data Engineering, Data Science, Data Structures and Algorithms

## Experience

**Undergraduate Machine Learning Researcher** — January 2025 – Present

*Purdue University Department of Computer Science* — *West Lafayette, IN*

- Developing novel environment exploration methods in **meta-reinforcement learning** applications to optimize **adaptation speed** in highly stochastic environments.
- Writing experiments using **PyTorch** to evaluate the performance of the proposed algorithms against existing methods.

**Manufacturing Software Researcher** — March 2024 – Present

*Digital Enterprise Center* — *West Lafayette, IN*

- Leading a team to build a **Python** program to detect manufacturing anomalies with **Patch Distribution Modeling**.
- Implementing assembly traceability and tolerance enforcement strategies with **MySQL** and **Atlas Copco Controller**
- Implemented an automated documentation site process to enhance clarity for future developers by leveraging **GitHub Actions** and **Pages** to maintain an up-to-date, accessible API documentation site.
- Built a desktop application prototype for a real time multi-camera detection system using **Rust**, **Tauri**, and **Svelte**.
  - Optimized frame rate by **5x** with a combination of **asynchronous runtimes** and **multi-threading** to process camera inputs and inference in parallel.

## Projects

**Berkeley Pac-man Projects** | *Python, Numpy, PyTorch* — *Fall 2024*

- Implemented a variety of foundational AI algorithms in the Pac-man environment.
- Vanilla Searches: DFS, BFS, UCS, **A***
- Stochastic Searches: Minimax and **Expectimax** with the **Alpha-Beta pruning** optimization
- Reinforcement Learning: Q-learning, **Approximate Q-learning**
- Supervised Learning: Hidden Markov Model, Bayes Net

**Wisconsin Minibase Project** | *Java* — *Spring 2025*

- Implementing the core components of a **Database Management System**
- Notable features include heap files, buffer pools, B+ tree indexing, and query parsing/optimization/execution.

**Rugby Infinite Passing Simulator** | *Python, PyGame* — *Winter 2024*

- Using Python and **PyGame** to simulate a common rugby passing drill "infinite passing" to demonstrate a phenomenon I call player oscillations
- Mathematically determines if and when a player will oscillate between two lines given any valid drill configuration and number of total passes.
- Includes **proofs** and **lemmas** supporting the algorithm's correctness.

**johnzeng.me** | *Astro, TailwindCSS, Javascript, Cloudflare* — *Winter 2024*

- Built a personal website with the Astro web framework, using Cloudflare and Github for **CI/CD**.
- Leveraged TailwindCSS to create a **responsive design**, ensuring compatibility with mobile and desktop devices.

**Custom Unix Shell** | *Lex, Yacc, C++, CMake* — *Spring 2024*

- Implemented a Unix shell interface capable of executing commands with **subshell**, if/while statements, script execution, and **wildcarding** in addition to basic terminal functions like **pipes**, env variables, and **file system traversal**.

## Technical Skills

**Languages**: Python, Java, C, C++, Javascript/Typescript, Rust, HTML, CSS
**Frameworks**: Ultralytics, Tensorflow, Keras, PyTorch, Astro, Svelte, Tauri, TailwindCSS
**Libraries**: OpenCV, Imgaug, NumPy, Pandas, PyGame, plotnine
**VCS**: Git, GitHub, GitHub Actions, GitHub Pages