

# Nathaniel Shawe

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## PROJECTS

**NNLearner** - Python, NumPy, FastAPI, React.js

- Built a full-stack machine learning platform that lets users design, train, and evaluate **neural networks** from first principles, paired with **original technical documentation** explaining the underlying math.
- Implemented a custom neural network engine in **pure NumPy** (no ML libraries), including forward propagation, backpropagation, and **gradient-based optimization**.
- Supports 8+ configurable training parameters, including activations, loss functions, optimizers, initialization strategies, dropout, batch sizing, and LR scheduling.
- Designed a **FastAPI backend** to manage configurable training pipelines and model evaluation.
- Developed a **React frontend** for interactive configuration and post-training visualizations (loss and accuracy).

**OmniSec (In Progress)** | Python, SQL, FastAPI, NetworkX, PySide6

- Building a **modular, event-driven** cyber conflict simulator modeling red-team vs blue-team behavior across realistic networked infrastructure.
  - Implemented a core pub/sub EventBus architecture to **decouple** actions, alerts, and system state updates.
  - Designed a TimeManager using a min-heap (heapq) capable of scheduling and processing **1,000+ asynchronous events per simulation minute**.
  - Built the core network topology using **NetworkX graph structures** to model assets, edges, and vulnerabilities with rich metadata.
  - Enabled efficient infrastructure analysis with  **$O(\log N)$**  complexity for critical operations such as event scheduling, path traversal, and neighborhood analysis.
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## SKILLS

**Languages:** Python, JavaScript

**Frameworks & Tools:** FastAPI, React, Git, NetworkX

**Core Skills:** Full-Stack Development, API Design, Event-Driven Architecture, System Architecture, Automation

**Additional:** Prompt Engineering, Technical Documentation

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## EDUCATION

**University of Wisconsin–Madison**, Madison, WI

B.S. in Computer Science | Expected May 2029

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## CERTIFICATIONS

**SoloLearn** - Python Developer Certification