SHILAN HE

Champaign, IL | 447-902-1836 | shilanh2@illinois.edu | Portfolio: shellyriver.github.io

EDUCATION

University of Illinois at Urbana-Champaign   **Champaign, IL**
Ph.D. candidate in Computer Engineering | GPA: 3.86/4.0   *Aug. 2022 - Present*
- Advisor: Prof. Matthew Caesar

Bachelor of Science in Computer Engineering | GPA: 3.85/4.0   *Sep. 2018 - May 2022*
Zhejiang University   **Hangzhou, China**
Bachelor of Engineering in Electronic and Computer Engineering | GPA: 3.93/4.0   *Sep. 2018 - Jun. 2022*

SKILLS

Programming Python, C/C++, C, Matlab
Wireless & Signal Processing Digital signal processing, MIMO fundamentals, network simulation (ns-3), routing protocols
AI/ML   PyTorch, Scikit-learn, Pandas, deep reinforcement learning, multi-agent RL, CNN, attention mechanisms
Systems   Linux/UNIX, distributed systems, concurrency (multi-threading)
Cloud/Tools Git, AWS (ECS/Fargate, S3, DynamoDB, CloudWatch)

WORK AND PROJECT EXPERIENCE

Federated Learning Platform Development   **Lemont, IL**
Argonne National Laboratory | Distributed Systems, Cloud Infrastructure   *May 2023 – Aug. 2023*
- Developed and maintained components of a **distributed systems platform** for federated learning across heterogeneous cloud and HPC clients.
- Implemented backend services using **Python** and integrated with **AWS (ECS/Fargate, S3, DynamoDB, CloudWatch)** for scalable execution and logging.
- Built **observability and analytics** tooling, including client CPU/GPU/memory/network monitoring dashboards, data distribution visualization, and experiment comparison reports.
- Contributed to a **compute-aware task scheduling mechanism** that adapts to heterogeneous system resources.

Adaptive Wireless Routing for Mobile UAV Networks   **Champaign, IL**
Research Project | C++, Wireless Networking, ns-3 Simulation   *Oct. 2024 – Present*
- Designed a **predictive, reliability-aware routing system** for highly dynamic networks with frequent topology changes.
- Built a **C++ ns-3 packet-level simulation** with UAV mobility and map-based **LoS occlusion** modeling.
- Defined and tracked metrics (outage rate, packet loss, latency) to guide iterative design and performance optimization.

UAV Swarm Deployment Using Deep Reinforcement Learning   **Champaign, IL**
Research Project | Multi-Agent RL, PyTorch, Simulation   *Aug. 2023 – May 2024*
- Formulated dynamic resource placement as a **multi-agent decision-making problem** under partial observability.
- Designed a **centralized-training, decentralized-execution** learning system to balance performance and efficiency.
- Processed simulation logs and results using **Pandas**, and performed baseline analysis and ablations with **Scikit-learn**.
- Evaluated tradeoffs between **coverage quality and movement cost**, achieving **$>2\times$ improvement** over baselines.

Room-Scale Pet Localization System   **Champaign, IL**
Course Project | IoT (BLE/Wi-Fi), Real-Time Systems, Web Visualization   *Jan. 2023 – May 2023*
- Designed a **real-time IoT system** using **BLE beacons, ESP32 receivers (Arduino/C++)**, and a **Raspberry Pi backend**.
- Implemented a **multi-threaded Python backend** for low-latency data ingestion and aggregation from distributed devices.
- Developed a **web-based visualization dashboard** (Flask + HTML/CSS/JS) to display real-time locations.
- Used temporal modeling to stabilize noisy signals and improve system reliability, achieving **91% accuracy**.

TCP Protocol Implementation   **Champaign, IL**
Course Project | C, Networking   *Oct. 2021 – Nov. 2021*
- Implemented a **reliable transport protocol** in **C** over UDP, including sequencing, acknowledgments, retransmissions, and congestion control.
- Designed protocol logic to handle **loss, reordering, and fairness** under adverse network conditions.
- Validated correctness and performance using **instrumentation and log-based analysis**.

Linux-Like Operating System Supporting Multiple Terminals   **Champaign, IL**
Course Project | C, x86, OS Kernels, Scheduling   *Mar. 2021 – May 2021*
- Built a Linux-like OS from scratch in a team of four using **x86** and **C**.
- Implemented interrupt handling, virtual memory, file systems, and system calls.
- Developed a **round-robin scheduler** supporting **3 concurrent terminals**.

PUBLICATIONS

- [1] **He S.**, Kim, K., Caesar, M., et al, 2024. Obstacle-Aware UAV Swarm Deployment for User Coverage Using Deep Reinforcement Learning. Accepted and presented at *IEEE Military Communications Conference (MILCOM 2024)*.
- [2] Li, Z., Chaturvedi, P., **He S.**, et al, 2024. FedCompass: Efficient Cross-Silo Federated Learning on Heterogeneous Client Devices using a Computing Power Aware Scheduler. In *The Twelfth International Conference on Learning Representations (ICLR 2024)*.