Swarup Majumder

US Citizen | 217-607-3792 | swarupm2@illinois.edu | linkedin.com/in/swarup1 | swarupm3.github.io

Education

University of Illinois at Urbana-Champaign GPA: 3.74/4.00

Bachelors of Science in Computer Engineering *Graduation: May 2027*

Relevant Coursework: Data Structures and Algorithms (**C++**), Operating Systems (**C, RISC-V, UART**), FPGA Lab (**SystemVerilog, AXI, SPI**), GPU Parallel Programming (**CUDA**), Digital and Analog Signal Processing

Experience

Undergraduate Teaching Assistant Aug 2025 – Present

University of Illinois at Urbana-Champaign *Champaign, IL*

- **ECE 220: Computer Systems Programming**
  - Mentored 30+ students weekly, providing technical feedback for **C**, **C++**, and **Assembly** machine projects
- **ECE 385: Digital Systems (FPGA) Laboratory**
  - Assisted students with FPGA-based **SystemVerilog** designs with FSMs, VGA control, and SOC integration
  - Debugged timing, synthesis, and simulation issues using **Vivado** and on-board instrumentation

Undergraduate Research Assistant May 2025 – Present

Parasol Lab, University of Illinois at Urbana-Champaign *Champaign, IL*

- Benchmarked **C++** STAPL and STL algorithm runtimes across 64 samples (99% Confidence Interval)
- Enabled multi-GPU STAPL execution using **C++** and **CUDA**, achieving 100x speedup over CPU baseline
- Streamlined compilation, linking and execution for 25+ **MPI** configurations via **Bash** and **Linux** toolchains
- Automated data visualization using **Python** to graph runtime metrics, accelerating algorithm analysis

Robotics Software Mentor Jun 2024 – Present

FIRST Robotics Competition Team 4096 *Champaign, IL*

- Utilized **Python** APIs to interface with the **CAN** bus and reliably control 30+ motors across 8 subsystems
- Authored structured **Markdown** technical documentation for software onboarding within a 40+ student team
- Deployed computer vision **AI** object detection to provide operator feedback, reducing cycle times by 30%
- Guided students in implementing a RUBIK-Pi based localization system, integrating camera-based pose estimation

Projects

Camera Vision Pipeline on FPGA | *SystemVerilog, RTL Design, I2C, Vivado* Nov 2025 – Dec 2025

- Designed real-time camera video streaming pipeline in pure **RTL**, achieving sub-microsecond latency
- Initialized 40 camera registers via **I2C** protocol with a custom **SystemVerilog** controller for stable color output
- Implemented filters and UV thresholding in **SystemVerilog** with line buffers for seamless edge detection
- Integrated 7-bit **Vivado** XADC IP-based brightness dial with 128 discrete levels for precise luminance scaling

GPT-2 Transformer Model | *C++, CUDA, Bash, Linux, Slurm* Oct 2025 – Dec 2025

- Accelerated matmul and layernorm **CUDA** kernels with tensor cores and reduction trees, achieving 30x throughput
- Built **Bash** sweep script to evaluate 80+ kernel configurations, optimizing inference throughput on **Slurm** clusters
- Leveraged **CUDA** constant memory for weights/biases, reducing global memory traffic and forward pass latency

Interactive Thermometer | *Oscilloscope, Multimeter, Circuit Design* Feb 2025 – May 2025

- Built a temperature measurement circuit with op-amps and comparators, supporting a range of 0–99 C
- Designed an analog-to-digital stage to drive 7-segment displays showing temperature and user thresholds
- Verified signal integrity, temperature, and threshold accuracy using an **Oscilloscope** and **Multimeter**

24-Hour Clock | *Arduino, C++, Circuit Design* Feb 2025

- Built an Arduino-based 24-hour clock using **C++** to display time with precise minute-level accuracy
- Implemented multiplexed control for 4x7-segment displays, reducing I/O to 11 pins with 4 ms cycles
- Integrated a potentiometer interface converting analog input to time values for real-time calibration

Skills

Programming: C, C++, SystemVerilog, Verilog, Python, CUDA, Bash, Java
Protocols/Interfaces: I2C, UART, SPI, CAN, AXI-4 Lite
Tools: Linux, git, gdb, Vivado, MPI, NVIDIA NSight, Docker
Hardware/Equipment: Oscilloscope, Logic Analyzer, Function Generator, Multimeter, Soldering Iron