Nikhil Vishnoi

Grainger College of Engineering, University of Illinois at Urbana-Champaign
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Technical Interests

I'm interested in embedded hardware systems that integrate firmware, digital logic, and custom IC architectures. My work focuses on FPGA SoC design, low-level firmware, and mixed-signal hardware for real-time control, sensing, and communication applications. I'm also interested in custom ASIC design for embedded platforms.

Education

University of Illinois at Urbana Champaign Aug 2022 - May 2026
BS in Electrical Engineering and BS in Nuclear Engineering 3.85/4.0
Minor in Computer Science

Relevant Course Work: Data Structures (CS 225), Computer Architecture (CS 233), Digital Systems Laboratory (ECE 385), Computer Systems Engineering (ECE 391), Advanced Digital Projects Lab (ECE 395), Electronic Circuits (ECE 342, ECE 343, ECE 340), Signal Processing (ECE 210, ECE 310), Fields and Waves (ECE 329, ECE 350), Numerical Analysis (CS 440), VLSI System Design (ECE 425 - Planned)

Skills

- *Software / Firmware:* C, C++, Python, Java, Matlab; Assembly (MIPS, RISC-V); Verilog, SystemVerilog; bare-metal embedded programming; FPGA SoC firmware development; threading and hardware-software integration
- *Hardware / Embedded:* Microcontrollers (PIC, STM32, Arduino); FPGA SoC platforms (Spartan, BAYSE); DAC/ADC integration; custom circuit design; SPI, I^2C, UART, USB, AXI bus communication; mixed digital-analog interfacing
- *Tools / Equipment:* Oscilloscope, multimeter, soldering, LTSpice, KiCad, Vivado, gdb, Git, SVN, Linux, Docker

Experience

Sandia National Laboratory ***Livermore*, California**
R&D Research Intern (National SULI program) May 2025 - Aug 2025

- Implemented custom USB firmware on Arduino for HID emulation, enabling remote equipment control with precise motion input.
- Integrated Arduino-controlled servos with NI DAC-based IV measurements to automate strain test measurements with proper timing constrained measurements.
- Designed and tested precision measurement and control circuits for experimental automation increasing experimental efficiency by 50%.
- Built Python tools to process and analyze multidimensional data.

Lawrence Livermore National Laboratory – National Ignition Facility ***Livermore*, California**
R&D Research Intern (National SULI program) May 2024 - Aug 2024

- Designed and conducted deposition experiments to create dense films of a novel high entropy alloy.
- Characterized film structure and composition using SEM, EDS, Confocal Microscopy, LIBS, and XRF.

Center for Plasma Material Interactions ***UIUC*, Illinois**
Undergraduate Research Assistant Oct 2022 - Dec 2024

- Developed multi-threaded Python control software with GUI for synchronized equipment operation using Sockets and Pyvisa.
- Automated Langmuir Probe plasma characterization experiment, increasing efficiency by 200%.
- Wrote Matlab/Python scripts for experimental data analysis and figure generation.

Bitkiva Inc ***Santa Clara*, CA**
Software Engineer Intern June 2022 - Aug 2022

- Programmed real-time dynamic filters in C for structured data streams; optimized memory with Valgrind.

Bitkiva Inc ***Santa Clara*, CA**
Software Engineer Intern June 2021 - Aug 2021

- Designed an in-memory Java database with custom search features.
- Built Selenium web scraper to automate CSV collection and metadata generation.

Publications / Conferences

- Goodelman, D. C.; Engwall-Holmes, A. M.; Taylor, G. V.; Bocklund, B. J.; Strozzi, D. J.; Shin, S. J.; Kim, E.; **Vishnoi, N.**; Kucheyev, S. O.; Bayu Aji, L. B. (2025). *Sputter deposition of ultrathick Bi coatings onto rotating planar substrates.* Surface & Coatings Technology. *View Article*

- Goodelman, D. C.; Engwall-Holmes, A. M.; Taylor, G. V.; Bocklund, B. J.; Strozzi, D. J.; Shin, S. J.; Kim, E.; **Vishnoi, N.**; Kucheyev, S. O.; Bayu Aji, L. B. (2025). "Combinatorial Deposition of Ultrathick Ta-W-Au-Bi High-Entropy Alloys for Next-Generation Hohlraums by Direct-Current Magnetron Sputtering." *Research Articles – 25th Target Fabrication Specialists Meeting special issue*, Published online 17 Oct 2025. *View Article*
- Goodelman, D. (LLNL); **Vishnoi, N.**, Taylor, G.; Kim, E.; Engwall-Holmes, A.; Shin, S.; Strozzi, D.; Bocklund, B.; Peters, S.; Kucheyev, S.; Bayu Aji, L. B. (LLNL). "MA4-3-WeA-2 Sputter Deposition of Ta-W-Au-Bi High Entropy Alloys for Inertial Confinement Fusion Hohlraums." *ICMCTF 2025, Session MA4-3-WeA: High Entropy and Other Multi-principal-element Materials III, Wednesday, May 14, 2025.*
- Jeckell, Z.; Choi, T.; Hossain, M. A.; Kepelyan, D.; **Vishnoi, N.**; Jurczyk, B.; Ruzic, D. (2023). "AP+PS+TF-WeM-5 Time Resolved Energy Diagnostics of HiPIMS Discharges With Positive Cathode Reversal." *AVS 69, Session AP+PS+TF-WeM, Nov 8, 2023.*
- Jeckell, Z.; Choi, T.; Connolly, N.; Das, S.; Hossain, M.; Kapelyan, D.; **Vishnoi, N.**; Pickering, R.; Qerimi, D.; Ruzic, D. (2024). "Time Resolved Diagnostics of HiPIMS Discharges With Positive Cathode Reversal." *AVS 69, PS-ThM-5 Hoffman Scholarship Talk, Nov 7, 2024.*

Projects

PIC18 Audio Synthesizer

- Implemented DAC-based waveform generator on PIC18F47Q84 (sine, triangle, square) using timers and lookup tables.
- Enabled user control via ADC input to select waveform type and frequency on a custom-soldered board.

Spartan-7 Chess Arcade Game

- Designed and built an FPGA SoC with a MicroBlaze CPU to run a C-based alpha–beta minimax chess engine, integrating SPI-driven USB mouse input for real-time gameplay.
- Engineered custom AXI modifications in SystemVerilog to implement writable VRAM, enabling dynamic graphics rendering from C-based code over HDMI output.

BAYSE-3 Piano

- Led 3 person team in developing FPGA-based piano on BAYSE 3 in Verilog, with switch-controlled chords/octaves and DAC–op-amp audio output.

C++ Course Search Engine

- Implemented an in-memory search engine in C++ for fast querying of university course data scraped from catalog pages.

Honors, Awards, and Scholarships

- **Engineering Excellence Scholarship**, College of Engineering, UIUC (2022–2026)
- **ECE Gary Whitledge Scholarship**, Electrical and Computer Engineering, UIUC (2025–2026)
- **Departmental Scholarship #1**, Grainger College of Engineering (2023–2025)
- **Roy Axford Scholarship**, Nuclear, Plasma, and Radiological Engineering (2022–2023)
- **Engineering Visionary Scholarship**, UIUC (2024–2025)
- **Illinois Engineering Achievement Scholarship**, UIUC (2024–2025)
- **Illinois Engineering Outstanding Scholarship**, UIUC (2024–2025)
- **NPRE David Ruzic Scholarship**, UIUC (2024–2025)
- **Edmund J. James Scholar Honors Program**, UIUC (2022–2026)
- **Dean's List**, UIUC (Fall 2022, Spring 2023)