Shivam Kundan, PhD

Technology Lead, OpenGrowth Ventures

shivamkundan@gmail.com +1 (217) 974 5324

YouTube (projects): **@shivamkundan1**
web: **shivamkundan.info**
LinkedIn: **in/shivamkundan**
GitHub: **shivamkundan**
Google Scholar

EDUCATION

Southern Illinois University, Carbondale | Ph.D. **May 2024**
Electrical & Computer Engineering
Dissertation: Resource-Optimized Scheduling for Enhanced Power Efficiency and Throughput on Chip Multi-Processor Platforms.

Southern Illinois University, Carbondale | M.S. **May 2019**
Electrical & Computer Engineering **GPA: 3.74**
Thesis: Contention-Aware & Power-Constrained Scheduling for Chip Multicore Processors

Southern Illinois University, Carbondale | B.S. **Dec 2017**
Electrical & Computer Engineering **GPA: 3.67**

EXPERIENCE

OpenGrowth Ventures | Technology Lead
September 2024 – Present | Hybrid (Illinois, USA)

- Developed an AI-native OS for edge/personal computing using Linux kernel and NVIDIA Jetson Orin AGX, including real-time multi-modal ambient intelligence through sensor integration based on my custom Tricorder project hardware.
- Designed FPGA-based Mathematical Processing Units (MPUs) for making our multimodal ambient intelligence operations more power efficient. Submitted specification paper to International Journal of Critical Computer Systems.
- Initiating a startup to commercialize this platform. (*website*)

Southern Illinois University | PhD Research Assistant, Embedded Systems Lab
January 2018 – May 2024 | Carbondale, IL

Developed the following under academic advisor Dr. Iraklis Anagnostopoulos:

- A machine-learning approach for improving performance-per-Watt on Samsung Exynos 5422 Octa SoC with big. LITTLE ARM architecture (*paper* *conference video*)
- (With Intel Corp.) Scheduling and profiling tool in C (with x86 Assembly) to rapidly test new scheduling mechanisms on x86 processors (from user-space in Linux). Reads Performance Counters in real time and provides Python API for faster UX. (*code* *documentation*)
- (With Intel Corp.) A priority-aware scheduling approach for x86 architectures that yields performance within **0.2%** to **14%** of hardware-assisted methodologies (*paper*)
- (With Intel Corp.) Two versions of resource-pressure aware scheduler using Intel's Cache Monitoring Technology. Improves single threaded performance by up to **16%** and multi-threaded performance by up to **40%** compared to Linux. (*paper*)

Southern Illinois University, College of ECE | Graduate Teaching Assistant
August 2018 – January 2020 | Carbondale, IL

As Teaching Assistant for Introduction to Computer Architecture (ECE329L):

- Conducted lab sessions using Verilog HDL, SimpleScalar, QTSpim, and MARS Simulators, and helped implement functioning 32-bit MIPS architecture for final projects.
- Helped to re-design lab assignments, based on own undergrad experience in this class and feedback from current students.
- Added an extra lab session to discuss history & background of computer architecture and address **why** and **how** we reached current methods and technologies, and the next steps involved in pursuing this sub-field of ECE.

SKILLS

Languages & Tools
C • Python • Verilog • C++
MIPS & ARM Assembly • Bash • R • Git • CMake • GDB • MATLAB • LaTeX

Hardware Design Tools
Xilinx Vivado • Cadence Virtuoso • Cadence ADE L • Cadence Spectre AMS • Cadence Liberate • Synopsys VCS • Atalanta ATPG

Embedded Systems
PCB Design: KiCAD, Fritzing • Microcontrollers: RP2040, ESP32 • I2C, SPI, UART, GPIO • ADC/DAC • PWM • FreeRTOS

Frameworks & APIs
MPI • OpenMP • Intel RDT • Intel CAT/CMT • CUDA

RESEARCH PROJECTS

Heterogeneity-Aware Scheduling on Asymmetric Chip Multicore Processors
Aug '20 – May '21
NSF I/UCRC CES, SIU
Partners: Intel Corporation

Explored/published workload migration strategies and energy-performance trade-offs on heterogeneous cores

SELECT PUBLICATIONS

- ***IEEE ISCAS '20***
  A Machine Learning Approach for Improving Power Efficiency on Clustered Multi-Processor System
  paper *video*

- ***Comp & Elec Eng. Vol 90 '21***
  Online frequency-based performance and power estimation for clustered multi-

Southern Illinois University, College of Education | IT Technician
October 2015 – December 2017 | Carbondale, IL

- ◊ Troubleshooting Windows and Mac computers, network configuration, hardware and software support.
- ◊ Wrote weekly newsletters pertaining to IT-related news and topics.

PROJECTS

Sun Tracking Astronomical Clock *video*
See the exact positions of sun and earth for any given time of day and day of the year. Visualizes altitude, azimuth, distance, speed, and more. Accurate to the minute, without needing any external communication. RP2040 MCU on a Pi Pico board, C, custom-designed 2-layer PCB.

Ridiculously Advanced Tricorder *video1* *video2*
The most advanced *Tricorder* device from *Star Trek* yet implemented. If you ever ask yourself *"is the sky redder at sunset?", "how clean is my air?", "how bright is my TV?", "how busy are the airwaves?"*, and seek the answer in real-time, beautifully visualized 18-bit color, then this is the device for you. ESP32 MCU & RaspberryPi 4, 15+ sensors, 4x custom PCBs, written in C & Python.

MIPS Pipelined CPU on AMD Artix-7 FPGA *code*
32-bit, 5-pipeline-stage MIPS CPU implemented on an Artix-7 FPGA embedded on a Digilent Basys 3 development board. Verilog & Xilinx Vivado Design Suite.

X86 Profiling & Scheduler Development Tool *code* *documentation*
A runtime system that allows for rapid prototyping of resource-aware scheduling methodologies directly from user space on x86 processors. Handles memory management, signal handling, creation & termination of programs, and collection and analysis of experimental results. C with embedded assembly.

Microsoft HoloLens: Holographic Interface for IoT Smart Rooms *video* *documentation*
AR application using object recognition and hand gestures to interact with real world objects such as sensors, lights, household electronics, etc. Provides a holographic interface to convert any room to a 'smart room'. Microsoft HoloLens, RaspberryPi 3B, C# & Unity 3D Engine

Robotics: Autonomous and Manual Navigation *code*
Navigate through an obstacle course using two Raspberry Pi's communicating through ad-hoc Wi-Fi & TCP/IP sockets. Awarded **2nd prize** at 2015 ATMAE Robotics Competition in Pittsburgh, PA.

processor systems *paper*

- ◊ ***IEEE ISCAS '21***
  Priority-Aware Scheduling Under Shared-Resource Contention on Chip Multicore Processors *paper*
- ◊ ***ACM TACO '22***
  A Pressure-Aware Policy for Contention Minimization on Multicore Systems *paper*

INTERNSHIPS

- ◊ **Honeywell Automation**
  May '14 – Aug '14 | Pune, India
  Operated Distributed Control Systems, Programmable Logic Controllers (PLCs), and Supervisory Control and Data Acquisition (SCADA) systems.
- ◊ **Unique Identification Authority of India** **May '12 – Aug '12 | Mumbai, India**
  Wrote a program using Java, MySQL, and MS Excel to parse & consolidate loosely structured data, helping to streamline the process of reviewing scholarship applications for new college students.