Ayoosh Bansal

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I am deeply passionate about crafting effective and efficient systems to solve intricate challenges. My problem-solving methodology revolves around harnessing expertise across diverse layers within a system, fostering collaboration among components, and prioritizing simplicity in design. This approach has empowered me to architect frameworks for safe autonomous driving, enable comprehensive security audit for real-time systems, and mitigate execution variability stemming from cache coherence mechanisms. I am excited to continue tackling new challenges and create innovative solutions that drive progress.

Education

University of Illinois Urbana-Champaign

Ph.D. in Computer Science, Advised by Prof. Lui Sha — Aug 2017 - Present

Research Topics: Cyber-Physical Systems, Real-Time Systems, Functional Safety, Temporal Safety, System Security, Architecture

University of Wisconsin-Madison

Master of Science in Electrical Engineering, GPA 4/4 — Sep 2013 - May 2015

Birla Institute of Technology and Science Pilani, India

Bachelor of Engineering Electrical and Electronics, CGPA 8.6/10 — Aug 2006 - Jul 2010

Experience

Cyber Physical Systems Integration Lab — Urbana, Illinois, USA

Graduate Research Assistant — Aug 2017 – Present

- Conducted diverse research within the realms of cyber-physical and real-time systems, enhancing functional safety, bolstering system security, and refining temporal predictability. A presentation summarizing the research works can be found at this link.
- Ongoing work on *Synergistic Simplex* system architecture that harnesses cooperation among safety- and mission-critical elements, as well as between perception and control modules, to enhance the safety and performance of autonomous ground and aerial vehicles.
- Devised *Perception Simplex*, a system architecture for autonomous vehicles, providing verifiable collision avoidance in the presence of obstacle detection faults. Validated using software-in-the-loop simulation with ongoing real-world validation.
- Recognizing the lack of context-aware metrics for object detection in autonomous driving, created *Risk Ranked Recall*.
- Enhanced Linux Audit for real-time applications by creating *Ellipsis*. Harnessing the inherent predictability of behaviors in real-time applications, *Ellipsis* significantly curtails auditing data volume, >90% across a wide spectrum of real-time use cases, while preserving all security-relevant information.
- Invented a novel memory type, *Inner Non-Cacheable, Outer Cacheable*, empowering real-time applications to selectively bypass cache coherence mechanisms and mitigate memory access latency fluctuations for shared data.
- Helped design security-aware task scheduling for real-time applications and input prioritization schemes for object detection DNN.

NVIDIA — Santa Clara, California, USA

Automotive System Software Intern — May 2020 – Aug 2020

- Developed a hypervisor level latency analysis system, made available to customers with real-time performance requirements.

Automotive System Software Intern — Jun 2018 – Aug 2018

- Analysis of latency variability stemming from processor architecture and helped verify proposed solutions.

System Software Engineer — Jul 2015 – Jul 2017

- Developed device drivers to manage memory bandwidth allocations and participated in kernel bring-up on Tegra Parker SoC.
- Developed the infrastructure to deploy Linux Kernel on the full-chip simulation platform for Tegra Xavier SoC.
- Successfully led a cross-organizational effort to integrate the new full-chip simulation platform with a new regression testing infrastructure.
- Mentored an internship project which overhauled simulator software startup process to create a seamless silicon like flow.

NetApp — Bangalore, Karnataka, India

Member of Technical Staff — Jul 2010 – Jul 2013

- Progressed through roles in CIFS server quality assurance, NFS server maintenance, and finally NFS server development over three years.
- Resolved diverse customer issues and escalations, mitigating active disruptions. Conducted SSH CVE applicability analysis.
- Awarded a monetary reward for the invention report aimed at optimizing stale mount point handling in NFS server implementations.

Skills

C, Python, C++, Assembly, Git, Linux Kernel Development, Gem5, Perl, Verilog, Apollo, Autoware, ROS, Gem5-Aladdin, LLVM, Xilinx Vivado.

Work Authorization: Eligible to work in USA through Optional Practical Training