

NANDA VELUGOTI

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RESEARCH INTERESTS

My research interest is in exploring *memory centric computing*, which involves analyzing and characterizing memory behavior of HPC and Cloud applications to improve performance, energy utilization and portability. To achieve such improvements, I work on constructing novel analytical models to predict memory behavior and developing tooling frameworks to apply them to workloads using hardware/software co-design. Recently, I have been working on investigating opportunities for improving application performance on *tiered-memory* architecture. I am also working on developing filesystem like isolation/access semantics for agentic serverless workflows.

EDUCATION

Oregon State University <i>PhD in Computer Science (Advisor: Dr. Kyle Hale) GPA: 4.0</i>	Sept. 2024 – Present <i>Corvallis, Oregon, USA</i>
Illinois Institute of Technology <i>PhD in Computer Science (Advisor: Dr. Kyle Hale) GPA: 3.8 (transferred out)</i>	Aug. 2021 – Aug 2024 <i>Chicago, Illinois, USA</i>
Illinois Institute of Technology <i>Master of Science in Computer Science GPA: 3.7</i>	Aug. 2019 – June 2021 <i>Chicago, Illinois, USA</i>
Lovely Professional University <i>Bachelor of Technology in Computer Science and Engineering CGPA: 9.1</i>	Aug. 2013 – May 2017 <i>Jhalandhar, Punjab, India</i>

RESEARCH EXPERIENCE

HiPCastor Group at Oregon State University <i>Research Assistant</i>	Sept 2024 – Present <i>Corvallis, Oregon, USA</i>
• MemPower [CLUSTER '26]: is an analytical model paired with a framework that transforms the target application binary into one that is more energy-efficient. The goal of the model is to analyze the memory access patterns of a given application at fine granularity (i.e., individual and architecturally visible loads and stores made by the application) and modulate the CPU clock frequency based on memory behavior at runtime • CXL Tiered memory: The goal of this project is to investigate the types of workloads that would benefit from a CXL tiered memory. To achieve this, we characterize memory behavior and predict the data offloading potential for a given workload • Isolated Agentic Serverless Workflows: The adoption of LLM coding agents in serverless workflows risks data access conflicts when parallel DAG nodes interact with centralized storage. We propose a novel resource isolation framework that prevents these conflicts and ensures data consistency across agent-generated code execution.	
Pacific Northwest National Laboratory <i>PhD Intern</i>	June 2022 – Aug 2024 <i>Chicago, Illinois, USA</i>
• Memory Analysis: Research on concurrency aware power and memory analysis of HPC workloads on emerging big.LITTLE like computer architectures. The goal here is to improve power efficiency of HPC applications using analytical models to analyze the memory and power behavior of such applications.	
HEXSA Lab at Illinois Tech <i>Research Assistant</i>	May 2020 – Sept 2024 <i>Chicago, Illinois, USA</i>
• Provenance: Implemented the debugger component, <i>provenance</i>, of the compiler based debugging and blending part of the Interweaving Project (interweaving.org). The goal of <i>provenance</i> is to parse a ELF binary to extract the function information based on the address ranges and provide that information to Nautilus Aerokernel runtime. It is implemented as a library where user can fetch relevant function information for a given address from the kernel's address space.	

- **Processing-In-Memory:** This is an ongoing research effort that focuses on the area of Processing-In-Memory, where the goal is to study how Stream Processing workloads effect the performance of applications that use Processing-In-Memory models. Currently working on building a QEMU based emulator for UPMEM chipset that can run DPU programs and a benchmarking suite to measure the performance of PIM based applications that have stream processing workloads compared to batch processing workloads.

PUBLICATIONS

Research Papers

- **MEMPOWER:** Efficient Power Management with Fine-grained Memory Analysis and Modeling for HPC Workloads
Nanda Velugoti, Joseph Manzano, Andres Marquez, Nathan Tallent, Kyle C. Hale.
CLUSTER '26. IEEE International Conference on Cluster Computing 2026. (Accepted)
- **CURATE:** Leveraging LLM Agents to Compose, Catalog, and Deploy Reproducible Workflows
Nolan Cutler, Laura Kuo, Nanda Velugoti, Kathryn Newhart, Renato Figueiredo.
SC '26 Workshops. International Conference for High Performance Computing, Networking, Storage and Analysis 2026. (Under review)

Posters

- Exploring Fine-grained Memory Analysis for PIM Offloading
Thomas M. Papka, Nanda Velugoti, Kyle C. Hale.
SC '24. International Conference for High Performance Computing, Networking, Storage and Analysis 2024.
- Memory Disaggregation in Serverless Computing
Joshua Lowe, Nanda Velugoti, Kyle C. Hale.
SC '24. International Conference for High Performance Computing, Networking, Storage and Analysis 2024.
- Predicting and alleviating bottlenecks in Hybrid CPU and Memory Architectures
Nanda Velugoti, Nathan Tallent, Joseph Manzano, Kyle Hale.
GCASR '23. Greater Chicago Area Systems Research Group Workshop 2023.

TEACHING EXPERIENCE

Illinois Institute of Technology

Aug 2023 – Dec 2023

Teaching Assistant, Systems and Network Security (CSP 544)

Chicago, Illinois, USA

- **Systems and Network Security (CSP 544):** This is a graduate-level (Master's and above) programming-oriented course that focuses on teaching security vulnerabilities and exploits that exist in computer and networking systems. This course requires low-level programming (mostly in C and Assembly) and prerequisites include knowledge in C programming language, Operating Systems and Computer Organization
- As a Teaching Assistant for this course, I have gained experience in teaching CS concepts to students in a practical manner which involved a more hands-on approach with students. My responsibilities as TA included: student one-on-one clarification sessions, programming assignment grading and regular office hours.

Illinois Institute of Technology

Aug 2022 – May 2023

Teaching Assistant, Science of Programming (CS 536)

Chicago, Illinois, USA

- **Science of Programming (CS 536):** This is a graduate-level (Master's and above) theory-oriented course that focuses on teaching solid programming fundamentals such as program verification and program correctness. This course requires basic knowledge on predicate/propositional logic, data structures and algorithms.
- I have gained experience in teaching theoretical concepts in Computer Science and Programming to students. My responsibilities as TA included: student one-on-one clarification sessions, assignment grading and regular office hours.

WORK EXPERIENCE

Temenos (formerly, Kony Labs)

May 2017 – August 2019

Software Development Engineer

Hyderabad, Telangana, India

- Worked as an Android and Windows cross-platform applications and API framework developer. Developed a JavaScript-based API framework with which mobile app developers can build cross-platform apps.

- Implemented cross-platform APIs for various features for both Android and Windows platforms (Windows 10/8.1/8/7 and Windows Phone 8/8.1) such as Speech to Text, i18n, Calendar, Contacts, Camera, Database, UI Containers, and Components, etc. Designed and implemented cross-platform Voice Assistants API framework that includes Microsoft's Cortana, Amazon's Alexa and Google Assistant.
- Resolved a major memory leak issue in the Windows API framework that was affecting almost all applications that were built using the same. Fixed numerous bugs ranging from UI issues to app functionality/behavior inconsistencies to i18n and locale-based problems.

Temenos (formerly, Kony Labs)

Associate Engineer (Intern)

May 2016 – August 2017

Hyderabad, Telangana, India

- Designed and implemented a UI Automation framework for Windows Applications using Microsoft's CodedUI. This UI Automation framework had functionalities such as Recording, Playback, Capturing and Comparing results.
- Wrote Unit Tests for the Windows API framework to maintain code quality and stability.

PROJECTS

P2P Tasking Runtime | *Java*

November 2021

- A platform independent tasking runtime, where tasks are defined using a Java "Taskable" interface which extends Runnable and Serializable interfaces. User can define their own tasks by just implementing the "Taskable" interface, which then can be scheduled to runtime for execution.
- Tasks are executed by nodes of a P2P network, where each node has the runtime and scheduler uses work stealing algorithm to distribute tasks among the nodes in the network. The information about the network is stored in a DHT.
- Github Repository: <https://github.com/nandavelugoti/p2p-task-runtime>

Remote Memory Pool | *C, Linux*

October 2021

- A userspace memory management API that supports remote memory i.e., pages are offloaded to a remote machine instead of storing in local memory. Read/Write operations to these pages are translated to send/receive network calls to the remote machine.
- The underlying implementation uses Linux's userfaultfd interface that allows pagefaults to be handled at userspace. This is important because the remote pages can be accessed in the same way as local pages which provides transparency to users.
- Github Repository: <https://github.com/nandavelugoti/rmpool>

Critical Access | *Android SDK, Java*

March 2020

- The Tech to Protect Challenge is a national open innovation contest designed to support the work of emergency responders, including EMS, firefighters, and law enforcement, by connecting with creative individuals and collaborating to create new technologies for the future of public safety communications.
- As part of a 3 member team, we designed and implemented a Missin Critical Push-to-Talk Android application, *Critical Access*, based on MCOP SDK. Our team received the winner prize money of \$10,000 as part of the challenge.
- Github Repository: <https://github.com/nandavelugoti/critical-access>

SQLite Re-encryptor | *C*

January 2018

- This is a tool that takes an arbitrary encrypted sqlite database and allows users to re-encrypt to any other supported encryption scheme. For example, a database encrypted with AES-128 scheme can be re-encrypt it with RSA-256 scheme with the help of this tool.
- This was built as part of Windows Team internal tooling at Kony while working as a Software Developer.

Watch Apps and Watch Faces for Pebble SmartWatch | *Pebble SDK, C*

July 2017

- Developed a Watch app "Control Center" which enabled users to turn on/off various smartphone settings such as WiFi, Bluetooth, Airplane Mode, etc. This app supported both Android and iOS smartphones.
- Developed a Watch Face to "Ensemble" that displayed time, date, weather, battery status, and Bluetooth connection status. All apps and faces were developed using Pebble SDK - C APIs and JS scripts (for fetching weather info).
- Github Repository: <https://github.com/nandavelugoti/PebbleDevelopment>

AVR Controlled Line Follower Robot | *Embedded C, ATmega16 Micro-controller*

March 2015

- As part of a 3 member team, we built a Line Follower Robot using AVR microcontroller (ATmega16) and embedded C. This project was a workshop/competition conducted by Technophilia at Lovely Professional University.
- We received first place in Zonal Level Competition at Lovely Professional University, Punjab and proceeded to receive Certificates of Merit, Honour, and Excellence in National Indo - US Robo League Competition by Technophilia at Indian Institute of Technology, Bombay.

AWARDS AND RECOGNITION

- Winner of NIST MCPTT Tech-to-Protect-Challenge with a prize money of \$10,000, Chicago, USA (2020).
- Spot Award for stabilizing automation at Kony Labs, Hyderabad, India (2018).
- First Prize in Battle of the Bands at Daviet College, Jalandhar, India (2016).
- Volunteer Recognition Certificate by Lakshyam NGO, Delhi, India (2015).
- Runner UP in Limit Zero Fest in Lovely Professional University, Jalandhar, India (2015).
- Certificates of Merit, Honour and Excellence in National Indo - US Robo League Competition by Technophilia at IIT Bombay, India (2015).
- First place in Zonal Indo - US Robo League Competition by Technophilia at Lovely Professional University, Jalandhar, India (2015).

MISCELLANEOUS

- Worked as a part-time Student Assistant at Academic Technology Services, Illinois Tech
- Fluent in English, Telugu and Hindi languages