PIROUZ NAGHAVI

ADDRESS: GAINESVILLE, FLORIDA
PHONE: 352.278.4935 **EMAIL:** PIROUZ.NAGHAVI@GMAIL.COM

RESEARCH INTERESTS

- Systems security
- Network and cellular network security
- Smartphone and IoT security
- Software security
- Health information and security
- Cyber-physical systems and IoT security
- Health Informatics
- Machine learning and big data
- Natural language processing
- Deep learning
- Mobile health
- Wearable devices and security

EDUCATION

Master of Science in Computer and Information Science and Engineering Student, Fall 2023 | *GPA: 3.9*

University of Florida, Gainesville, FL, USA

IEEE-HKN Honor Society

Relevant Coursework: Computer and Information Security, Network Security, Introduction to Cryptology, Computer Networks, Distributed Operating Systems, Advanced Data Structures, Cyber-Physical System Security

Master of Science in Electrical Engineering, 2020 | *GPA: 3.9*

University of Washington, Seattle, WA, USA

Golden Key Honor Society | Tau Beta Pi Honor Society

Relevant Coursework*:* Natural Language Processing, Machine Learning for Big Data, Reinforcement Learning, Deep Learning, Machine Learning, AI for Mobile Robots and Self-Driving Vehicles, Models of Robot Manipulation, Applied High-Performance GPU Computing, Software Engineering for Embedded Applications, GPU Accelerated Scientific Visualization Techniques, Mobile Applications for Sensing and Control, Analytical Methods for Electrical Engineering

Bachelor of Applied Science in Mechanical Engineering, with Emphasis in Mechatronics, 2015

University of British Columbia, Vancouver, BC, Canada

Dean's Honor List | Most Innovative Prototype Awardee for Capstone Project

Relevant Coursework*: Data Structures and Algorithms, System Software Engineering, Computer Control of Mechatronics Systems, Digital Systems and Microcomputers, Mechatronics System Instrumentation, Electronic Circuits for Mechatronics, Project Management, Fluid Dynamics, Thermodynamics and Heat Transfer, Mechanical Vibration, Mechanical Design*

AWARDS

HWCOE Dean's Research Awardee at University of Florida

NSF Generation NEXT Scholarship Awardee at University of Florida

Dean's Honor List Awardee at University of British Columbia

Most Innovative Prototype Awardee for the Capstone Project at University of British Columbia

AFFILIATION

Member of the Golden Key Honor Society

Member of Tau Beta Pi Honor Society

Member of IEEE-HKN Honor Society and Chair of Research

AREAS OF EXPERTISE

Systems Security
Cellular Cybersecurity
Fuzzing and Dynamic Testing
Network Security and Cryptography
Cyber-Physical System Security
Embedded Software Security
Autonomous Vehicles Security
Health Information and Evaluation
Artificial Intelligence and Machine Learning
Big Data Management and Analysis
Deep and Reinforcement Learning
Natural Language Processing
Mobile and Wearable Sensing and Prediction
Mental Health Global Burden of Disease

PUBLICATIONS

Conference Publications:

[1] Side Eye: Characterizing the Limits of POV Acoustic Eavesdropping from Smartphone Cameras with Rolling Shutters and Movable Lenses. Yan Long, **Pirouz Naghavi**, Blas Kojusner, Kevin Butler, Sara Rampazzi, and Kevin Fu. *IEEE Symposium on Security and Privacy (SP)*, 2023.

[2] You Can't See Me: Physical Removal Attacks on LiDAR-based Autonomous Vehicles Driving Frameworks. Yulong Cao, S Hrushikesh Bhupathiraju, **Pirouz Naghavi**, Takeshi Sugawara, Z Morley Mao, and Sara Rampazzi. *USENIX Security Symposium*, 2023.

Journal Publications:

[1] PermPress: Machine Learning-Based Pipeline to Evaluate Permissions in App Privacy Policies. Muhammad Sajidur Rahman, **Pirouz Naghavi**, Blas Kojusner, Sadia Afroz, Byron Williams, Sara Rampazzi, and Vincent Bindschaedler. *IEEE Access*, 10:89248–89269, 2022

[2] Reproduction and Extension of "Queens are Powerful too: Mitigating Gender Bias in Dialogue Generation". Erica Eaton and **Pirouz Naghavi**. *ReScience C*, 8, 2022.Presented at Conference on Neural Information Processing Systems (NeurIPS) 2022

Presentations:

[1] Reproduction and Extension of "Queens are Powerful too: Mitigating Gender Bias in Dialogue Generation". Erica Eaton and **Pirouz Naghavi**. *ReScience C*, 8, 2022.Presented at Conference on Neural Information Processing Systems (NeurIPS) 2022

PROFESSIONAL RESEARCH EXPERIENCE

INSTITUTE FOR HEALTH METRICS AND EVALUATION AT UNIVERSITY OF WASHINGTON, SEATTLE, WA, USA

Researcher 2023–Present

- Developed high performance algorithms to efficiently process health information big data for evaluation tasks
- Coauthored multiple works which analyze global causes of death in the past 30 years. These works are currently under review at the top medical journals including Lancet
- Assisted in completion of various research projects in Global Burden of Disease (GBD)
- Assisted in writing and assessment of various papers under review in top medical journals including Lancet

FLORIDA INSTITUTE FOR CYBERSECURITY RESEARCH AT UNIVERSITY OF FLORIDA, GAINESVILLE, FL, USA

Research Assistant 2021–2023

- Currently leading a research project focused on baseband security
- Assisted on a number of projects in system security, software security, cellular network security, and cyber-physical system security
- Coauthored multiple papers that are currently published in top security conferences
- Effectively communicated and delivered publishable results on projects with different principal investigators, faculty, and research assistants

ACADEMIC PROJECTS

Project Name: Side Eye: Characterizing the Limits of POV Acoustic Eavesdropping from Smartphone Cameras with Rolling Shutters and Movable Lenses
Software Used: Python, PyTorch, Audacity, LaTeX
Role: Second Author 2022

- Developed the ML section of the signal-processing pipeline and conducted all ML evaluations
- Assisted in the development of high-performance signal extraction and processing pipeline
- Assisted in determining all signal quality metrics in various evaluation scenarios
- Collected majority of the side channel samples used for evaluation
- Assisted in developing the iOS app used to collect samples on iPhones
- Wrote various evaluation and methodology sections of the paper and described the scientific reasons for performance variations in different evaluation scenarios
- Published the paper in IEEE Symposium on Security and Privacy in 2023

Project Name: You Can't See Me: Physical Removal Attacks on LiDAR-based Autonomous Vehicles Driving Frameworks
Software Used: Python, LaTeX
Role: Third Author 2022

- Worked on evaluation and visualization of the experimental results on the paper
- Assisted with circuit setup for physical testing and evaluation
- Wrote the related works section of the paper

- Published the paper in USENIX Security Symposium in 2023

Project Name: PermPress: Machine Learning-Based Pipeline to Evaluate Permissions in App Privacy Policies
Software Used: Python, PyTorch, LaTeX
Role: Second Author **2022**

- Downloaded and reverse engineered over 150K Android apps from the Google play store to create a dataset that includes the privacy policies and the corresponding manifest files as the label
- Applied various Natural Language Processing (NLP) models and techniques to determine privacy policy transparency
- Wrote various sections of the paper, including methodology and evaluation
- Published the article in IEEE Access Journal in 2022

Project Name: Reproduction and Extension of "Queens are Powerful too: Mitigating Gender Bias in Dialogue Generation"
Software Used: Python, PyTorch, LaTeX
Role: Second Author **2022**

- Fine-tuned multiple transformer models to evaluate the natural language bias mitigation techniques described in the original paper and additional techniques as part of the extension to the original work
- Implemented various bias mitigation techniques such as counterfactual data augmentation, bias controlled training, and infusing additional data into the original dataset using positively biased data collection or neutral data generation
- Described findings and experimentation setup as a coauthor of the paper
- Published the article in the ReScience C journal in 2022 after submitting the paper to the ML Reproducibility Challenge
- Presented the work at Neural Information Processing Systems (NeurIPS) 2022

Project Name: Deepfake Detection
Software Used: Python, PyTorch, OpenCV, HTML, CSS, LaTeX
Role: Member **2020**

- Implemented three-dimensional convolutional neural network models and convolutional long short-term memory network models to detect deepfake videos using a 500GB dataset containing over 100,000 videos
- Extracted faces from every third frame of each video using deep neural networks and OpenCV to reduce the size of the massive dataset, utilizing 35 CPU instances and 3 GPU instances running for two days to process the videos
- Applied deep learning and computer vision techniques to design, train, and tune multiple models to find the most suitable model structure for this dataset
- Boosted the final accuracy even further by creating an ensemble of the top-performing models, achieving state-of-the-art 87% accuracy in detecting deepfake videos on a balanced test dataset
- Developed a website to showcase the project using HTML and CSS
- Created a research paper on LaTeX, describing deepfake detection using Facebook's Deepfake Detection Challenge dataset

Project Name: Fast kNN Graph Construction with Locality Sensitive Hashing
Software Used: Python, LaTeX, scikit-learn
Role: Member **2020**

- Created a research paper on LaTeX, discussing a fast kNN graph generation algorithm implementation and testing
- Implemented the fast kNN graph generation algorithm utilizing locality sensitive hashing to estimate several kNN graphs to combine into one with much higher accuracy according to the original algorithm paper
- Tested this algorithm on two datasets to experiment and ascertain the effects of this algorithm's hyperparameters on graph and classification accuracy and to determine the validity of assumptions made to simplify this algorithm's time complexity derived in the original paper
- Achieved a similar classification accuracy at a much faster runtime comparing to scikit-learn's kNN classifier on both tested datasets, North American Mushrooms (1981) and MNIST Fashion

Project Name: Autonomous Hospital Navigation with MuSHR and MPC
Software Used: Python, ROS, rviz, LaTeX
Role: Member **2020**

- Prepared a research paper in LaTeX describing the implementation of a new approach in reinforcement learning and autonomous vehicle navigation
- Designed a model predictive controller (MPC) for autonomous robots, capable of navigating the tight corners and narrow corridors of a hospital

- Implemented an innovative approach that significantly improved the oscillatory performance of the controller using a state-of-the-art, yet noisy, localization method, such as particle filter, by producing similar responses to results obtained while using absolute position feedback
- Reviewed research papers and applied proposed novel approaches, including the latest techniques introduced in the field of autonomous vehicles

Project Name: Multimodal Emotion Recognition from Videos
Software Used: Python, Keras, scikit-learn, Pandas, LaTeX
Role: Member **2020**

- Utilized novel ideas, identified by literature review, on the latest techniques in machine learning, multimodal classification, speech processing, emotion recognition from speech, and the classification of nonhomogeneous data to write a cutting-edge scientific research paper using LaTeX
- Extracted various parameters and coefficients from the audio of every video in the dataset for feature selection and engineering to design classification models producing the highest accuracies
- Implemented multimodal classification models by combining video, audio, and text mode features, using a variety of dimensionality reduction and classification methods to increase the overall classification accuracy
- Developed a novel approach in combining multimodal, nonhomogeneous features from audio, video, and text to increase the accuracy of the overall classification by utilizing class probabilities of top-performing models from each mode as features for a final classification model on the multimodal data, achieving a higher accuracy than other methods suggested by our literature review for classification of nonhomogeneous features

Project Name: Direct Volume Rendering of Human Brain
Software Used: C/C++, OpenGL
Role: Independent Researcher **2019**

- Created a ray casting algorithm through OpenGL to render the human brain and various other density datasets
- Implemented appropriate shaders and texture data structures to maximize OpenGL's utilization of GPU parallelization
- Developed a user interface, enabling the user to modify the color scheme transfer function to produce the desired color that highlights the appropriate areas of the tissue
- Conducted independent research on various approaches and techniques utilized in ray casting to optimize the performance of the algorithm while using small integration steps for higher quality renderings

Project Name: Autonomous Vehicle Race with MuSHR
Software Used: Python, ROS, rviz
Role: Member **2019**

- Created a research paper describing the controls scheme and various algorithms used to enable MuSHR car navigation
- Made use of robot operating system (ROS) in developing PID position controller, particle-filter localization, and lazy A-star path generation allowing MuSHR cars to navigate through challenging racetracks
- Handled the testing and tuning of all algorithms on the actual MuSHR car to maximize car performance before the race
- Employed more complex heuristics and utilized OpenCV to allow for different costs for different areas of the environment map of the racecourse to generate the least costly path
- Maintained proactive communication with teammates to develop and test all algorithms before the race
- Ranked third among fourteen teams in the race

Project Name: Restaurant Management Android App
Software Used: Kotlin, Google Firestore
Role: Member **2019**

- Designed an Android App using the Google Cloud Firestore database and Kotlin to help restaurant owners and staff improve customer satisfaction
- Created the application to maximize the benefits of using Firestore's NoSQL database for the documentation of service-related information
- Developed a data access layer, business logic layer, and user interface by generating appropriate class hierarchy and employing object-oriented design principles
- Implemented and used Arduino as a prototyping platform, which served as a physical handheld device for customers in notifying staff
- Selected by students and professor as the best app developed among more than twenty teams

Project Name: Stepper Motor Control using Raspberry Pi

Software Used: C/C++
Role: Independent Developer **2019**

- Utilized Raspberry Pi and C++ libraries such as HTTPlib, JSON, and WiringPi in sending a GET request to Open Weather Map server to obtain current weather information for Seattle
- Parsed the JSON response from the server to determine the current temperature of Seattle in Kelvins and produce a pulse train to control the rotation of the stepper motor
- Developed an algorithm in C using Texas Instruments' Code Composer to control the stepper drive and power a NEMA34 stepper motor to ensure proper rotation based on the current temperature in Seattle
- Produced an HTTP client, state machine, process, and many other object-oriented classes in C++ following the latest design approaches in software development
- Designed and shared the application using Git, Github, Docker, and Raspbian

Project Name: Matrix Inversion using GPU Parallelization
Software Used: C/C++, OpenCL, VTune
Role: Independent Researcher **2018**

- Created a research paper describing scientific and implementation challenges of inverting large matrices in parallel using OpenCL and GPUs
- Researched various methodologies for matrix inversion to apply the best parallelizable method to address and minimize computational bottlenecks
- Developed parallelizable Gauss Jordan method in inverting matrices using OpenCL API to maximize GPU's massive parallel computation resources
- Built and implemented the algorithm using both device-side and traditional host-side queuing
- Analyzed different kernels used in the matrix inversion algorithm through VTune to identify computational bottlenecks of the algorithm for further improvement
- Assessed the effect of global and local data sizes for each kernel by timing each kernel with various data sizes for performance optimization
- Performed detailed theoretical analysis on the arithmetic intensity and roofline performance model, as well as empirical analysis using VTune and event timing of the implemented algorithm

Project Name: Motorized Knee Orthosis – Capstone Project
Software Used: C++
Role: Controls Team Leader/Member **2014–2015**

- Researched different methods to find a novel and effective approach in creating an active knee orthosis capable of supporting users in regaining strength around the joint
- Led the software engineering and circuit design of the active knee orthosis project that obtained the most innovative project award among the graduating class of the department
- Designed the control system and programmed the motorized knee orthosis, made to rehabilitate people with knee injuries and the elderly seeking to regain muscle strength at the knee joint
- Acquired data from users to analyze and model users' walking patterns and velocity profiles
- Developed an algorithm utilizing linear regression, previously collected walking gait cycle data, and real-time sensor readings to command the correct velocity profile to the motor while the active orthosis is in use

Project Name: Propeller-driven Vehicle – Second Year Design Project
Software Used: MATLAB
Role: Controls Team Leader/Member 2011

- Researched and developed a propeller design software using blade element theory to create an optimization algorithm with random sampling and black-box optimization to design propellers that produce maximized thrust
- Coordinated with four individuals to design and manufacture a propeller-driven vehicle to maximize the speed of the car according to our manufacturing means
- Created a regression model capable of estimating drag and lift coefficients of a similar group of airfoils based on variables such as the angle of attack, width, length, and readily available test data

PROFESSIONAL EXPERIENCE

THE ROBBINS COMPANY, KENT, WA, USA
Design Engineer | Applications Engineer **2016–2020**

- Researched mathematical approaches to optimize slurry fluid speed, flow, density, and pressure required to maximize the performance of the slurry transportation system
- Created scalable proof of concept for research and development projects using MySQL, C++, C#, and Kotlin
- Developed software applications using C# and SQL Server under the mentorship of chief engineers and the director of engineering
- Designed user interfaces using C# to allow users to input technical design parameters
- Researched and developed report generators using C# and SQL Server to generate detailed mathematical computations, bill of materials, and optimized design parameters for the engineering department, as well as elegant and professional reports to submit to customers
- Led various research and development projects requiring software engineering for the Electrical Engineering Department and the Application Engineering Department

Design Engineer, Mechatronics 2016–2020

- Created the electrical design and component selection for primary, three-phase cabinets with 2000A incoming breakers with a variety of motor control circuits and other branch circuits, along with small controls cabinets for tunnel boring machine (TBM) feedback and controls, including operating console
- Created schematics and wiring/cabling diagrams for the electrical design of international TBM projects
- Troubleshot and maintained electrical, electronics, variable frequency drive (VFD), hydraulics, and controls equipment
- Developed innovative designs for large machine structures for TBM and backup assemblies, as well as assemblies with moving parts, including hydraulics cylinders and mechanisms
- Obtained hands-on experience in mechanical design, 3D modeling, manufacturing, and assembly of steel structures, precision machined parts, mechanisms, and subsystems on TBMs
- Optimized the design of massive steel structure weldments weighing up to 10 tons of plate and structural steels using finite element analysis (FEA)
- Partook in research and preparation of several TBM project proposals that include drawings and technical specification development
- Served as an onsite engineer for the execution of various projects, including:
  - Machine startup in Atlanta, Georgia, for two weeks
  - Machine assembly and repair of the primary bearing sealing system in Ankara, Turkey for a month
  - Mechanical assembly and electrical, hydraulic, lube, and water systems assembly support in Osaka, Japan for a month
  - TBM assembly, integration with backup, and final startup of TBM in Hiroshima, Japan for five months
- Successfully performed project engineer duties and supervised experienced engineers in delivering high-quality projects within set schedules

UNIFILLER SYSTEMS | DELTA, BC, CANADA

Engineer-in-Training (EIT), Electrical and Automation 2015–2016
Co-op Student, Electrical and Automation 2011–2014

- Researched various velocity profile and trajectory generation methods for smooth movements of servo motors, stepper motors, brushed DC motors, and brushless DC motors to create accurate portion control pumps
- Developed software using C/C++ and designed a printed circuit board for control of portion control pumps
- Worked on various research and development projects requiring software engineering and electrical engineering
- Performed the duties of control systems project lead, such as electrical and schematics design, VFD setup, servo motor control and PID tuning, as well as controls programming for various customer projects with over $2.2M budget
- Utilized controller area network (CAN) bus, Modbus, Profibus, DeviceNet, PROFINET, and Ethernet protocols in establishing a communication network across servo motor drives, controllers, input and output expansion modules, and VFDs
- Expertly handled the selection and 3D modeling of concepts for mechanical and electrical design problems on research and development projects using SolidWorks and AutoCAD
- Troubleshot high voltage electrical devices, low voltage electronics, servo motors, pneumatic circuits, and controllers
- Acted as an onsite engineer focused on supporting the startup of a cake assembly line at a bakery for one week in Nashville, Tennessee, USA

BLUE SOFTWARE, TEHRAN, IRAN

Software Developer 2006–2007

- Developed customer relationship management (CRM) software applications
- Researched various APIs for emailing and faxing messages and reports to customers through the application

- Improved users' awareness of their daily commitments through the development of an effective reminder system
- Devised a program for the smooth transition of existing Microsoft Access database records to the new SQL Server database
- Used SQL Server for database design and administration
- Generated a variety of queries for clients' research, relationship development, and analysis, accessible through a graphical user interface (GUI), using C# and SQL
- Produced several reports allowing the client to control and quantify their relationship with their customers
- Utilized object-oriented design in developing multiple queries to add, maintain, search, and analyze customers and interactions to create a comprehensive and maintainable software
- Coordinated with clients throughout the development of the software to deliver a product suitable for their existing systems and new requirements

TEACHING EXPERIENCE

THE ROBBINS COMPANY, KENT, WA, USA

AutoCAD Electrical Teacher and Administrator 2016–2020

- Provided training on AutoCAD Electrical for the Electrical Engineering Department for three days during the initial integration of the software for the department
- Trained new employees and assisted existing employees with implementation issues

UNIFILLER SYSTEMS | DELTA, BC, CANADA

AutoCAD Electrical Teacher and Administrator 2015–2016

- Trained new employees and supported existing employees with implementation issues
- Oversaw AutoCAD Electrical administration duties for the Controls Department, as well as developing a data synchronizer tool to build the connection between company enterprise and resource planning (ERP) database and the AutoCAD Electrical database using C# and SQL Server

SKILLS

Programming Languages	Python | C | C++ | C# | Kotlin
Framework, Computing Platform, & Machine Learning	PyTorch| AFL++ | Ghidra | Keras | scikit-learn | OpenCL | OpenGL | OpenCV | PySpark | Rospy | Pandas Numpy | Gym Google Face API | Flask | Django | BeautifulSoup | .NET Core | ASP.NET Core
Cloud Resources	AWS | GCP| Microsoft Azure
Software and Applications	Docker | Git | Apache Spark | ROS | Visual Studio | VS Code | Android Studio | TI Code Composer Studio | VTune | LaTeX | EAGLE CAD | VHDL | MATLAB/Simulink | LabVIEW | Microsoft Office Suite SolidWorks | Solid Edge | Adobe Photoshop | RsLogix 500/5000 | FactoryTalk | RSLinx | TIA Portal KEPServerEX | Wonderware
Operating Systems	Microsoft Windows | Raspbian Linux OS | Ubuntu Linux OS
Server and Database	Firestore | Firebase | MongoDB | MySQL | SQL Server
Electrical/Mechanical Process	Electrical and Mechanical Assembly | Hydraulics | Soldering | Mill | Lathe | Fabrication