Divas Subedi

Curriculum Vitae

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Education

M.S. in Computer Science
Jan 2025 - Present

Georgia Institute of Technology — *Altanta, GA, USA*

- Current GPA: 4.0

B.S. in Computer Engineering and Physics
Jan 2019 - May 2022

Trinity College — *Hartford, CT, USA*

- Cumulative GPA: 4.1
- Physics Senior Project: Analysis of BB84 Quantum Key Distribution Algorithm
- Engineering Senior Project: Biometric Signature Authentication

Relevant Courseworks

- Applied Linear Algebra
- Abstract Algebra
- Data Structures and Algorithm
- Numerical Approach to PDE
- Probability
- Digital Signal Processing
- Quantum Mechanics
- Algorithms and Intro to QC
- Automatic Control System

Work Experience

Software Developer I
Sep 2022 - Present

Fermi National Accelerator Laboratory — *Batavia, IL, USA*

- Developed and maintained a data virtualization codebase in Denodo and ETL codebase in Clover, implementing new features for real-time data integration and performance optimization.
- Collaborated closely with software operations teams, diagnosing and resolving production bugs that impacted critical data pipelines.

Tech Skills

Programming Python (Scikit-learn, SciPy, PyTorch, TensorFlow, Pandas), MATLAB, C++, R, SQL

Softwares Linux, Github, Jupyter, LaTeX

Research Projects

Biometric Signature Authentication [C5,C7][P4,P6]
Sep 2021 - Feb 2023

Trinity College Department of Engineering — *Hartford, CT, USA*

- Conceptualized and developed an accelerometer-integrated stylus that authenticates users by analyzing the inertial data captured during the signature execution process.
- Developed a high-speed data collection apparatus using embedded sensors with C, for real-time communication with the Raspberry Pi.
- Developed mathematical model for motion of pen and crafted manual features from time-series signal data for classification using MATLAB.
- Implemented neural network, using manually crafted features, capable of authenticating users with 94% accuracy.

Quantum Sensor for detection of Dark Matter [T2][P5]
May 2022 - Aug 2022

Fermi National Accelerator Laboratory, Particle Physics Division — *Batavia, IL, USA*

- Utilized Geant4 (G4CMP) to simulate the generation and transport of phonons resulting from the Beyond Standard Model interaction of light Dark Matter with Silicon.
- Identified and documented bugs in the G4CMP library, enhancing the accuracy and completeness of the phonon simulation by rectifying the code and integrating additional physics principles.
- Analysed hit profile of phonon to create visualisations of phonon transport in crystals using Python.

Vibration-based Contact Sensing [C3,C4][P3]
May 2020 - Sep 2021

Trinity College Department of Engineering — *Hartford, CT, USA*

- Conceptualized and designed a novel low-cost vibration-based contact sensor for tactile sensing
- Developed a mathematical model for the rod's motion within the research apparatus, to determine the system identification (SID) and craft manual features for classification.
- Implemented a convolutional neural network (CNN) using MATLAB and Python to classify contact location using manually crafted features with accuracy of 95%.

Ground Impedance Monitor for DUNE [T1][P2]
May 2021 - Aug 2021

Fermi National Accelerator Laboratory, Particle Physics Division — *Batavia, IL, USA*

- Designed and coded firmware for ground impedance monitor (GIZMo) for isolation of ground for Deep Underground Neutrino Experiment (DUNE) far side detector.
- Implemented signal processing models in FPGA for real-time impedance monitoring.
- Created a circuit elements parameters optimizer using LTSPICE and Python that implements the L-BFGS algorithm to identify optimal inductor ranges for the parasitic capacitor of the far-side detector for precise calibration of the impedance monitor by

Haptic Interface for Robot Locomotion [J1]

Sep 2020 - Dec 2020

Trinity College Department of Engineering — *Hartford, CT, USA*

- Developed a haptic telelocomotion interface for controlling a hexapedal robot using Python and Chai3D, enabling users to experience realistic force feedback during locomotion.
- Mathematically model and implement gait trajectories and appropriate force feedback based on haptic device configurations.
- Designed an experimental procedure for users to operate the hexapedal robot and devised a scoring method to evaluate the performance of haptic feedback controller against keyboard and joystick.

Vision-based force-feedback in RMIS [C2]

Jan 2020 - Mar 2020

Trinity College Department of Engineering — *Hartford, CT, USA*

- Examined the performance of haptic feedback in Robot-Assisted Minimally Invasive Surgery using simulated tissue.
- Developed mathematical models for node-to-node interaction within mesh used for modeling tissue surfaces.
- Implemented statistical models to analyze user study data using R.

Semiconductor Device Modeling [C1][P1]

May 2019 - Aug 2019

Trinity College Department of Engineering — *Hartford, CT, USA*

- Led a comprehensive study utilizing COMSOL Multiphysics to evaluate the effects of constant-field scaling on FIBMOS compared to conventional MOSFETs in nanometer regime.
- Designed simulation to reproduce and expand on work by Shen et al. (1998) on 122.5-nm to 350-nm channel-length devices.
- Analyzed results showcasing FIBMOS's superiority in threshold voltage stability, enhanced output resistance, resistance to punch-through effects, and mitigating hot electron degradation compared to traditional MOSFETs.

Publications

[J1] K. Huang, **D. Subedi**, R. Mitra, I. Yung, K. Boyd, E. Aldrich, and D. Chitrakar, "Telelocomotion—Remotely Operated Legged Robots", *Applied Sciences 2021*, vol. 11, no. 1:194.

[C8] **D. Subedi**, Wenfan Jiang, Ramisa Tahsin Rahman, Heidi Zhang, Kevin Huang, Yun-Hsuan Su, "Smoothness Constrained Curiosity Driven Multicamera Trajectory Optimization for Robot-Assisted Minimally Invasive Surgery", *2023 International Symposium on Medical Robotics (ISMR)*, Atlanta, GA, USA, 2023.

[C7] **D. Subedi**, D. Chitrakar, I. Yung, Y. Zhu, Y. Su, K. Huang, "Biometric Signature Authentication with Low Cost Embedded Stylus", *2023 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, Seattle, WA, USA, 2023.

[C6] **D. Subedi**, W. Jiang, R. Rahman, H. Zhang, K. Huang, Y. Su, "Smoothness Constrained Curiosity Driven Multicamera Trajectory Optimization for Robot-Assisted Minimally Invasive Surgery", *2023 International Symposium on Medical Robotics (ISMR)*, Atlanta, GA, USA, 2023.

[C5] **D. Subedi**, I. Yung, D. Chitrakar, K. Huang, "Inertial-Measurement-Based Biometric Authentication of Handwritten Signature", *2022 44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, Glasgow, Scotland, United Kingdom, 2022.

[C4] **D. Subedi**, E. Schoemer, D. Chitrakar, Y. Su and K. Huang, "Contact Location via Active Oscillatory Actuation", *2022 IEEE/SICE International Symposium on System Integration (SII)*, Narvik, Norway, 2022.

[C3] R. Mitra, K. Boyd, **D. Subedi**, D. Chitrakar, E. Aldrich, A. Swamy, and K. Huang, "Contact Sensing via Active Oscillatory Actuation", *2020 3rd International Conference on Mechatronics, Robotics and Automation (ICMRA)*, Shanghai, China, 2020.

[C2] K. Huang, D. Chitrakar, R.Mitra, **D.Subedi**, and Y. Su, "Characterizing Limits of Vision-Based Force Feedback in Simulated Surgical Tool-Tissue Interaction", *2020 42nd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, Montreal, QC, Canada, 2020.

[C1] **D. Subedi** and D. A. Fixel, "MOSFET Channel Engineering and Scaling Study using COMSOL® Multiphysics Simulation Software", *2019 COMSOL Conference*, Boston, MA, USA, 2019.

Technical Reports

[T2] **D. Subedi**, K. Stifter, "Quantum Sensor for detection of Dark Matter", *Fermilab Summer Internships in Science & Technology (SIST)*, Batavia, IL, 2022.

[T1] **D. Subedi**, M.J. Utes, P.M. Rubinov, "GIZMo for DUNE at LBNF", *Fermilab Summer Internships in Science & Technology (SIST)*, Batavia, IL, 2021.

Presentations

[P6] "Biometric Signature Authentication with Low Cost Embedded Stylus", *2023 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, Seattle, WA, USA, June 29, 2023.

[P5] "Quantum Sensor for detection of Dark Matter", *Fermilab Summer Internships in Science & Technology (SIST)*, Batavia, IL, August 12, 2022.

[P4] "Inertial-Measurement-Based Biometric Authentication of Handwritten Signature", *2022 44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, Glasgow, Scotland, United Kingdom, July 14, 2022.

[P3] "Contact Location via Active Oscillatory Actuation", *2022 IEEE/SICE International Symposium on System Integration (SII)*, Narvik, Norway, January 9, 2022.

[P2] "GIZMo for DUNE at LBNF", *Fermilab Summer Internships in Science & Technology (SIST)*, Batavia, IL, August 9, 2021.

[P1] "MOSFET Channel Engineering and Scaling Study using COMSOL Multiphysics Simulation Software", *2019 COMSOL Conference*, Boston, MA, USA, October 2, 2019.