

Divas Subedi

CURRICULUM VITAE

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Education

M.S. in Computer Science

GEORGIA INSTITUTE OF TECHNOLOGY

Jan 2025 - Present

Hartford, CT, USA

B.S. in Computer Engineering and Physics

TRINITY COLLEGE

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

Jan 2019 - May 2022

Hartford, CT, USA

Work Experience

Software Developer

FERMI NATIONAL ACCELERATOR LABORATORY

- Developed and maintained a data virtualization codebase, 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.

Sep 2022 - Present

Batavia, IL, USA

Teaching Experience

Teaching Assistant

TRINITY COLLEGE

Assisted in course management, conducted labs, graded assignments, and presented supplementary lectures.

- CPSC 203: Mathematical Foundation of Computing
- PHYS 231: Physics II: Electricity, Magnetism and Waves
- PHYS 141: Physics I: Mechanics
- ENGR 110: Engineering and Analysis
- ENGR 120: Introduction to Engineering Design
- ENGR 212: Linear Circuit Theory

Jan 2020 - May 2022

Hartford, CT, USA

Research Projects

Biometric Signature Authentication [C5,C7][P4,P6]

TRINITY COLLEGE DEPARTMENT OF ENGINEERING

- 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 for embedded sensors using C, enabling real-time communication with the Raspberry Pi.
- Crafted a set of 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.

Sep 2021 - Feb 2023

Hartford, CT, USA

Quantum Sensor for detection of Dark Matter [T2][P5]

FERMI NATIONAL ACCELERATOR LABORATORY, PARTICLE PHYSICS DIVISION

- 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.

May 2022 - Aug 2022

Batavia, IL, USA

Vibration-based Contact Sensing [C3,C4][P3]

TRINITY COLLEGE DEPARTMENT OF ENGINEERING

- Conceptualized and designed a novel low-cost vibration-based contact sensor utilizing an off-the-shelf accelerometer, with focus on cost-effectiveness and miniaturization.
- Developed a mathematical model for the rod's motion within the research apparatus, playing a crucial role in determining the system identification (SID) and crafting manual features for classification.
- Implemented a convolutional neural network (CNN) using MATLAB and Python to classify contact location with accuracy of 95%.

May 2020 - Sep 2021

Hartford, CT, USA

Ground Impedance Monitor for DUNE [T1][P2]

FERMI NATIONAL ACCELERATOR LABORATORY, PARTICLE PHYSICS DIVISION

- 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 and maintained a codebase using LTSPICE and Python that implements the L-BFGS algorithm to optimize circuit element parameters, enabling precise calibration of the impedance monitor by identifying optimal inductor ranges for the parasitic capacitor of the far-side detector.

May 2021 - Aug 2021

Batavia, IL, USA

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.
- Implemented gait trajectories based on haptic device configurations, generating appropriate force feedback to enhance user control and immersion.
- 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

JOURNAL PUBLICATION

- [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.

CONFERENCE PUBLICATIONS

- [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.

Leadership & Community Involvement

President: IEEE Student Chapter

Jan 2020 - May 2021

TRINITY COLLEGE

Hartford, CT, USA

- Revived a dormant IEEE chapter, increasing membership and activity; secured regular funding for the chapter.
- Acted as the principal liaison, facilitating effective communication between the Connecticut section of IEEE and the Trinity chapter.
- Organized a TechSavvy LEGO robot programming workshop for about 50 students, inspiring middle school girls in STEM.
- Coordinated TryEngineering program, connecting college students with underprivileged kids through STEM pen-pal projects.

Member: SPECTRUM

Sep 2022 - Present

FERMI NATIONAL ACCELERATOR LABORATORY

Batavia, IL, USA

- Organized lab activities such as intern luncheons, fostering a welcoming and inclusive environment for LGBTQIA+ communities.
- Assisted in organization of the 2023 Pride Parade, contributing to the visible presence of Spectrum and promoting LGBTQIA+ awareness within and beyond the Fermilab community.
- Attended and contributed to discussions on policy-making related to diversity and inclusion, advocating for equitable and respectful practices within Fermilab.

Software Projects

BB84 Simulator Designed and implemented simulation of BB84 Quantum Key Distribution protocol using IBM-Q to demonstrate the effect of eavesdropper in a quantum channel

E91 Simulator Designed and coded E91 Quantum Key Distribution protocol for iQuHack hackathon.

FermiLT Designed and maintained circuit element optimizer for Fermilab DUNE's Far end detector during summer internship.

Quantum Wave Evolution Simulator Designed a simulator to estimate time evolution of a given quantum wave function for a class term project.

Quantum full adder Coded quantum analogue of full bit adder for a class term project.

Skills

Programming Python (Qiskit, SciPy, TensorFlow, Pandas), MATLAB, C, C++, R, Mathematica, C#, SQL

Softwares Geant4, COMSOL, SPICE, Github, Linux, Jupyter, LaTeX

Hardwares FPGA, Raspberry Pi, Arduino, Data Acquisition and Timing systems

Honors & Awards

The Physics Senior Prize, Excellence in physics at advanced undergraduate level

Trinity College May 2022

The Travelers Companies Foundation Senior Research Prize, Best engineering senior project

Trinity College May 2022

President's Fellow for Physics, Nominated senior for outstanding achievement within the major

Trinity College Nov 2021

Thomas Holland Scholarship, For high academic rank in class

Trinity College Aug 2021

The Albert J. Howard, Jr. Prize, Excellence in physics among the junior class

Trinity College May 2021

The Theodore R. Blakeslee II Award, Excellence as TA in engineering

Trinity College May 2021

The Junior Engineering Book Prize, Excellence in engineering among the junior class

Trinity College Nov 2021

The Phi Gamma Delta Prize in Mathematics, Outstanding achievement in second year Mathematics

Trinity College May 2021