GAUTHAM ANNE

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OBJECTIVE STATEMENT

An excessively caffeinated and highly motivated nerd trying to decrease world-sucking. Student @ Northwestern University that loves learning about all things Physics, Math, and Engineering. Seeking to use strong technical background with functional interpersonal skills to make a difference.

EDUCATION

BS Mechanical Engineering & Physics, MS Electrical Engineering, Northwestern University, 2023-2027
Relevant Courses: Intro to Nonlinear Control, Intro to Nanophotonics, Mechanical Vibrations, Advanced Electrodynamics, Random Processes in Communication and Control, Theory of Machines - Dynamics, Feedback Systems, Quantum Mechanics, Electronic System Design 1 & 2, Fundamentals of Circuits, Fundamentals of Signals and Systems, Fluid Mechanics, Organic Chemistry, Thermodynamics, Mechanics of Materials, Probabilistic Systems

High School Diploma, Illinois Mathematics and Science Academy 2020-2023

SKILLS

Technical Solidworks, EAGLE, KiCad, Altium, MATLAB/Simulink, Microchip Studio, STMCubeIDE, SQL, Python, C/C++ Linux, 3D Printing, Precision Instrument Use (LDV, Profilometer), Tensorflow, Keras, scikit-learn, NumPy, pandas, JQuery, Flask, PyTorch

EXPERIENCE

SoCo (Social Companion) Sept 2024 - Present
Electrical Lead *Evanston, IL*

- Designing a candid photo-taking tool with automated framing using stepper actuation and onboard sensing
- Designed and implemented a custom 4S BMS with charging and active balancing in Altium Designer
- Programmed STM32WB55RGV6 microcontroller in STM32CubeIDE, enabling WiFi functionality and stepper control via A4988 driver

Northwestern Haptics Group (advised by Professors Colgate & Peshkin) Sept 2023 - Present
Researcher in Haptics Development *Evanston, IL*

- Developing High Bandwidth 3 Axis Pin Array for haptic stimulation of finger pad.
- Conducted impulse response measurements of the human finger using exponential chirps with sine wave deconvolution, under varied boundary conditions, to inform haptic device design
- Characterized lateral skin stretch across indentation depths and frequencies to guide future actuation strategies
- Co-authoring a paper in development for submission to the IEEE World Haptics Symposium

MIT Quantum & Precision Measurements Group (advised by Professor Sudhir) Jun 2024 - Nov 2024
Visting Scholar, Electrical Network Theory Research *Cambridge, MA*

- Studying theory for optimizing circuit synthesis (multiport synthesis methods) by minimizing Nyquist noise
- Developed Mathematica & SPICE framework for calculating input referred thermal noise at nodes of any circuit

Omnid Research Group (advised by Professors Elwin & Lynch) Oct 2023 - Feb 2024
MARS Omnid Team *Evanston, IL*

- Prepared Omnid Mocobots (collaborative mobile manipulators consisting of omnidirectional mobile bases and series-elastic Delta-type parallel manipulators) for the 2024 Amazon MARS conference

- Replaced Tiva Launchpad on JC satellite boards, built PCB Shielding Boxes, and implementing Omnid E-Stop recovery system through STOs on motor controllers

Dave's Italian Kitchen Sept 2023 - Present
Hosting, Waiting, & Dishwashing *Evanston, IL*

- Prepared dining room by setting cloths, laying out tableware and ensuring dining spaces were clean and tidy
- Ensured customers received their food in a timely manner and cleaned dishes

NASA L'Space Program Fellow Sept 2023 - July 2024
NPWEE (9 hrs/week)

- Worked alongside team of students to research ideas to solve one of NASA's pain points
- Gained experience in the evaluation process by writing, reviewing, and scoring proposals based on NASA's reviewing standards, and received NX Certificate

Fermi National Accelerator Laboratory Aug 2021 - Jun 2023
Undergraduate Researcher in Particle Physics *Batavia, IL*

- Supervised by P. Dong, P. Karchin (Wayne State), and L. Spiegel (Fermilab), Work available here
- Found optimal cuts for reducing background on 4 same-sign dilepton pairs for H++ decay
- Developed automatic datacard generation framework and integrated it with Higgs Combine Tool
- Derived simple approximation without a-priori expectations of sensitivity for Poisson counts with background
- Implemented Deep Learning Neural Net to classify prompt lepton jet decays
- Presented at APS (American Physical Society) April 2023 meeting and at IMSAloquium research symposium

Ross Mathematics Summer Program Jun 2021 - Aug 2022
Junior Counselor and Camper *Rose-Hulman Institute of Technology*

- Supervised by Dr. Timothy All, Attended twice with full merit scholarships
- Taught and guided first years as they worked through Number Theory problem sets
- Taught multiple dorm lectures to attendees, topics include Dynamical Systems and Number Theory
- Took courses in Post-Quantum Cryptography, Logic, Radiosity, and Topology
- Taught lecture series to first years on the proof of Cubic Reciprocity and properties of $Z[\omega]$

Introduction to Modern Physics Feb 2022 - Dec 2023
Author *Amazon, Barnes & Nobles, other distributors*

- Wrote, illustrated, & self published 100-page "Introduction to Modern Physics" book - ISBN: 979-8849892566
- Used by students @ IMSA & other high schools in physics courses and available in libraries
- Recognizes that different schools & students have different opportunities, so wrote engaging book
- Covers introductory Special Relativity, Quantum Mechanics, Particle Physics, & Cosmology

PROJECTS

Low-Cost Scanning Tunneling Microscope (Ongoing) Designing a low-cost STM, from scratch, to image HOPG and other materials (gold, platinum sputtered films). So far, I've built low noise regulated linear power supply, a tunneling amplifier (OPA928), and sheet metal housings. Working on mainboard (analog circuitry, digital feedback), unimorph disk scanner piezo driver, coarse approach mechanism, vibration isolation setup, and STM tip etching. Work so far!

Motor Control Dashboard Developed full fledged PID controller for DC motor on PIC32MX. Includes current and position control feedback. Work available here!

EE326 Custom Webcam PCB Designed a fully functional webcam in EAGLE. Featured SAM4S8B MCU, ESP32 WiFi Module, and OV2640 Camera. Programmed firmware for interrupt-driven communication, and enabled live streaming of camera to webserver. Work available here!

Lagrangian Dynamics Simulation Implemented falling jack in spinning box simulated for ME314. Using lagrangian mechanics, I calculated body velocities using rigid body transformations and and set up equations with external forcing components. Work available here!

Design Thinking and Communication Projects As part of 2 quarter design course sequence, my teams and I developed the Nesting Number Blocks (Fall 2023, manipulatives to teach number sense and basic arithmetic), and Safesplash (Spring 2024, modular wheelchair ramp for Misericordia Home showers).

Low-Cost Electroencephalogram Designed an EEG to predict neural anomalies. The project achieved acceptable accuracy with cost-effective components such as the AD622ANZ in-amp and TL074 op amp. Developed Matlab script for further processing. Work available here!

Fun Projects Automated Covid Card Sorter for the Nurse office @ IMSA, Facial Recognition Laser Turret, Sound Sensor based 'Knock Lock', Gesture Control Dashboard, Automated Sleep Detection Water Turret, Built a PID controller in Simulink for drone with RPLidar. Check out my portfolio! *Not fully updated :(

EXTRA-CURRICULAR ACTIVITIES

- CEO of Epoch ML, a student organization at IMSA working to provide computing resources to the community. Developed a new CUDA-enabled HPC cluster and oversee technological vision and reliability of the HPC cluster at hardware and software levels. Contributed to various open-source projects to improve the automated deployment of the SLURM job management software and other HPC software. Worked with IMSA staff to write and improve Computer Science and Machine Learning curriculum and hosted multiple speaker events
- Captain of multiple VEX and First Robotics teams. Coaching and mentoring Phoenix Rocketry and Phoenix Zero Robotics Team. ZR Team recently awarded 2nd place world wide in 2023 Middle School Program. Both won Worlds and State Excellence Awards.
- Co-Editor-in-Chief of Hadron, IMSA's Science and Mathematics monthly periodical. Articles available here

AWARDS

- Sig Ep Balanced Man Scholarship, 1 of 12 students at Northwestern, chosen for academic excellence
- AIME (American Invitational Mathematical Examination) score of 9. Invited to AIME through being in the top 5% of 50,000+ test-takers in AMC 12 competition
- AP Scholar with Distinction
- Top 10 in Illinois state in Math Kangaroo contest
- Invited to VEX Worlds Championship, Tournament Champion, Excellence Award
- First Robotics 2nd Place Inspire Award, 1st Place State Think Award, ranked 16th in world
- AAU Taekwondo Nationals Invite