

BIOMEDICAL ENGINEERING STUDENT

Susmit Acharya (he/him/his)

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PROFESSIONAL SUMMARY

An incoming Engineering UG student at Trinity College Dublin, aspiring to specialize in Biomedical Engineering. I am spending the summer building my skills in this domain, via online courses from reputed companies/universities, job simulations, and hands-on projects, so that I can have a head start when college begins in the fall. I look forward to using my skills to contribute to biomedical engineering and computational neuroscience research and commercial products.

SKILLS

Industry Skills: Mathematical Modeling, Sensory Systems Analysis, Probability Distribution, Neuroanatomy, Neuroimaging, Python, Data Analytics

Creative Skills: Content Writing, SEO, Personal Branding

Interpersonal Skills: Public Speaking, Team Leadership, Team Building, Student Engagement

Languages: English, Bengali, Hindi, Odia

RELEVANT PROJECTS

Glucose-Insulin ODE Model Simulation

- Developed a parameterized three-state Bergman Minimal Model (coupled ODEs for glucose, remote insulin action, and plasma insulin) in Python to simulate physiological response to an IV glucose bolus, using SciPy's adaptive RK45 integrator
- Modeled normal vs. insulin-resistant physiological states and evaluated outcomes using clinically standard IVGTT metrics — incremental AUC, glucose disappearance rate (Kg), and recovery time — rather than qualitative curve comparison
- Quantified that insulin resistance produced a 54% higher incremental glucose AUC, reduced Kg from 2.22%/min to 1.44%/min, and nearly doubled glucose recovery time (42.5 to 80.4 minutes)
- Conducted a five-point insulin sensitivity parameter sweep confirming monotonic degradation of glucose clearance metrics, validating the result as a systematic model property rather than an isolated comparison
- Built a reusable simulation-analysis pipeline for glucose-insulin dynamics, applicable to future physiological modeling extensions

Kuramoto Oscillator EEG Model

- Built a network of 50 all-to-all coupled Kuramoto oscillators ($K = 2.0$, mean frequency 10 Hz) in Python using SciPy's RK45 solver to model alpha-band (8–13 Hz) synchronization in human EEG
- Processed and band-pass filtered (1–45 Hz) the C3 channel across all 45 recordings in the BCI Competition IV Dataset 2b for validation against real physiological data
- Computed power spectral density via Welch's method to extract alpha peak frequencies across the full dataset, avoiding single-sample bias

- Validated model output against real EEG data, achieving a synthetic alpha peak of 10.254 Hz vs. a 10.664 Hz average real-EEG peak (0.692 Hz mean deviation) across all 45 recordings, with 4 exact matches
- Delivered a reusable simulate-filter-compare pipeline demonstrating that a minimal, low-parameter oscillator model can reproduce large-scale physiological rhythm data

EXPERIENCE

School Captain, *Auxilium Convent School, Barasat, Kolkata, India - 700124*

Apr 2025 – Mar 2026

- Spearheaded student initiatives, and organized major inter-school events in collaboration with school faculty.
- Represented the school at inter-school meetings.
- Fostered teamwork among council members and students to enhance collaboration.

EDUCATION

Auxilium Convent School, *Barasat, Kolkata, India - 700124*

Apr 2022 – Mar 2026

High School Diploma (Indian School Certificate) - 97%

Coursework: Physics, Chemistry, Mathematics, Computer Science, Economics, and English.