Sankalp Gambhir

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Indian Institute of Technology Bombay

academics

Examination	University	Institute	Year	CPI/%
Graduation	IIT Bombay	IIT Bombay	2022	9.18
Intermediate/+2	CBSE	Remal Public School, Delhi	2018	96.40
Matriculation	CBSE	Indraprastha World School, Delhi	2016	10.0

Majoring in Engineering Physics, pursuing minor degrees in Computer Science and Mathematics.

current projects

Quantitatively Learning LTL Specification — Ongoing

Mohammad Afzal, *Sankalp Gambhir*, Ashutosh Gupta, Krishna Shankaranarayanan

- Developed a system to rank and learn LTL formulae for a set of input traces with high resilience to noise and low input size requirement compared to state-of-the-art systems presented in literature.
- Studying topological structure of ω–regular languages to improve algorithmic efficiency for inference.

Information Theoretic Bounds on NISQ Learning Systems — Ongoing

Advisor: Prof. Sai Vinjanampathy, Department of Physics, IIT Bombay

B.Tech Project

- Reviewed literature on learning algorithms on hybrid Noisy Intermediate-Scale Quantum (NISQ) computers.
- Establishing error and complexity bounds for learning systems induced by known limits on classical feedback circuits.

key projects

Ardio - Model for realtime audio processing on low power embedded systems — Fall 2020

Advisor: Prof. Pradeep Sarin, Department of Physics, IIT Bombay

Course Project, `https://github.com/sankalpgambhir/ardio`

- Developed an optimized Fourier Transform algorithm capable of working on low power devices such as an Arduino whilst retaining reasonable accuracy.
- Demonstrated frequency finding on live audio samples in near real-time on an Arduino Uno with less than 2KB RAM.

Petris - An FPGA based Tetris clone — Spring 2020

Advisor: Prof. Pradeep Sarin, Department of Physics, IIT Bombay

Course Project, `https://github.com/sankalpgambhir/petris`

- Designed and simulated the game of Tetris on an FPGA simulator. Used Verilog to make a state machine and created a C++ wrapper using SDL and OpenGL to handle display and I/O.
- Developed a VGA simulator using SDL2 to write the serial 'electronic' VGA output from the FPGA simulations into a low-level frame buffer.
- Developed an interface to pass keyboard presses on the computer to the FPGA via simulated electronic connections to allow for real-time input.

Logarithmic Order Long Binary Multiplication on TTL circuits — Spring 2019

Advisor: Prof. Mahesh B. Patil, Department of Electrical Engineering, IIT Bombay

Course Project

- Led a team of 3 to devise a shift-and-add cascade for efficient digital multiplication on TTL circuits.
- Utilised asynchronous modules to achieve logarithmic time performance.
- Achieved a scalable plug and play design to extend to larger systems.

seminars held

Eigenfunctions of Dirichlet Laplacians and Nodal Domains over Graphs — Fall 2019

Department of Mathematics, IIT Bombay

Advisor: Prof. Gopala K Srinivasan, Department of Mathematics, IIT Bombay

- Discussed spectral features of the Laplacian operator and the distribution of nodes relative to the spectrum, via variational principles and via optimisation of Rayleigh quotients over H^2 space.
- Discussed the multidimensional extension of Sturm's Oscillation and its application to discretized domains using graph Laplacians.

key courses

Computer Science	Complexity Theory ‡*, Computational Ring Theory and Algebras ‡*, Computer Networks‡, Data Structures ‡, Automated Reasoning *, Concepts, Tools and Algorithms for Model Checking *, Logic for Computer Science
Mathematics	Differential Geometry‡*, Coxeter Theory *, Semigroup Theory *, Topics in Algebra 2 (Representation and Category Theory)*, Complex Analysis*, Ordinary Differential Equations*, Partial Differential Equations, Linear Algebra
Physics	Quantum Information and Computing *, Condensed Matter Physics, Statistical Physics, Quantum Mechanics 1 & 2, Photonics, Electromagnetism, Special Theory of Relativity, Classical Mechanics
Others	Analog Electronics, Analog Electronics Lab, Digital Circuits, Digital Electronics Lab, Microprocessor Lab, Data Analysis and Interpretation

‡. To be completed by November 2021 ∗. Graduate level course

technical skills

Languages	English (native), Hindi (native)
Programming	C++, C, Python, Bash/POSIX tools, Verilog
Packages	LaTeX, Z3, LLVM, Mathematica, AutoCAD, Solidworks

academic achievements

2018	Ranked in the *99.98th percentile* in JEE Main 2018 amongst over 1 million candidates.
2018	Ranked in the *99.7th percentile* in JEE Advanced 2018 amongst 200,000 candidates.
2018	Awarded *National Top 1%* certification in National Standard Examination in Physics.
2018	Awarded *National Top 1%* certification in National Standard Examination in Chemistry.
2016	Qualified for KVPY Fellowship from the Department of Science and Technology, India.

extracurricular involvement

Teaching Activities

- Teaching Assistant for 'CS228M - Logic in Computer Science (Minor)' to a class of 160 students, under Prof. Krishna Shankaranarayanan. Fall 2021
- Teaching Assistant for 'CS228 - Logic in Computer Science' to a class of 147 students, under Prof. Ashutosh Gupta and Prof. Krishna Shankaranarayanan. Spring 2021

Social Involvement

- Recorded audiobooks for the blind as part of Voice of Purpose – NSS, IIT Bombay. Fall 2018
- Held classes in Physics for the JEE for underprivileged children; prepared study material and tests for the same, as a part of the Aarohan Winter Internship Program – NSS, IIT Delhi. Winter 2018
- Held basic English and computer classes, as part of the Computer Literacy Program – NSS, IIT Bombay. Spring 2019

Fine Arts

- Had four pieces of digital art on display at Vision 2019 – Design weekend of IIT Bombay.
- Had two pieces of digital art on display at Vision 2020 – Design weekend of IIT Bombay.