

# V Pramodh Gopalan

✉ pramodh@iitk.ac.in | 📧 pramodh-g.github.io | 🌐 github.com/pramodh-g | 📞 +91-7400047180

## ACADEMIC DETAILS

Examination	Institute	Year	CPI/%
Graduation	IIT Kanpur	2023	9.2/10.0
High School, CBSE	Ryan International School, Mumbai	2019	96.2
Secondary School, CBSE	Delhi Public School, Mumbai	2017	10/10

**Research Interests:** Statistics, Privacy and Security of Machine Learning, Stochastic Optimization, Scientific Computing.

## SCHOLASTIC ACHIEVEMENTS

- **Academic Excellence Award** for exceptional performance in Academics at IIT Kanpur for two consecutive years. (2020, 2021)
- Secured **All India Rank 217** in **JEE Advanced 2019** among 230K eligible aspirants. (2019)
- Secured **All India Rank 217** in **JEE Mains 2019** among 1.1 Million candidates. (2019)
- Awarded the prestigious **KVPY fellowship** by Dept. of Science and Technology, Govt. of India. (2019)
- Amongst the top students across the country to appear for the nation-level olympiads in Physics and Astronomy, **INPhO** and **INAO** respectively. (2019)
- Participated in a training camp for appearing in **INMO**(Indian National Math Olympiad). (2018)
- Recipient of the **National Talent Search (NTSE)** scholarship awarded by the NCERT. (2017)

## RESEARCH PROJECTS AND INTERNSHIPS

**Defending against Poisoning Attacks in Machine Learning** [May 2021-Present]  
*Research Intern | Prof. Alina Oprea & Prof. Battista Biggio* NDS2 Lab, Northeastern University

- Working on Creating **Defenses** against **Poisoning** Attacks in **ML**, using **Ensembles** of models.
- **Extended** existing **implementations** of attacks to accomodate **Drebin** and **MNIST** Datasets, and tested the attack efficacy on them.
- Formulated a **theoretical framework**, and derived a **lower bound** on the **effectiveness** of the defense.
- Carried out **experiments** to validate the **theoretical** claims, and **visualized** the results **interactively** using libraries like **Pluto.jl** and **Makie.jl**.
- A **report** can be found [here](#).

**Image Preprocessing as an Adversarial Defense** 📄 [Code Here](#) [Aug 2020- Jan 2021]  
*Research Project | Prof. Vireshwar Kumar* IIT Delhi

- Examined CV based navigation models for **Unmanned Aerial Vehicles** to determine **adversarial weaknesses**.
- Conducted a **literature review** on **Defenses** to Adversarial Examples from the **Reading List** of Nicholas Carlini.
- Implemented various **Adversarial Defenses** based on **Image Preprocessing**, such as **Blurring**, **Pixel Shuffling**, **Secret Key based Block Shuffling**.

**Decentralised Mechanism Design using Blockchains** 📄 [Code Here](#) [Oct 2020 - Nov 2020]  
*Course Project CS711 | Guide: Prof Swaprava Nath* IIT Kanpur

- Implemented various **Sealed-Bid Auction Mechanisms** using Blockchains.
- Learned about various problems in Blockchains related to **privacy** and tackling them using modern Cryptographic Primitives like **Secure MPC**.
- Modelled a game theoretic version of privacy problem in Blockchain as **Normal Form Game** and inferred various **equilibriums** that may be present according to different applications.
- Presented an analysis of how effective the current Enigma Protocol is, and proposed an **alternative better approach** for a particular step by using **VCG Mechanisms**.

## KEY PROJECTS

**Model Zoo: A study in GANs** 📄 [Code Here](#) [Summer 2020]  
*Summer Project | Programming Club* IIT Kanpur

- Learned about Convolutional Neural Networks in depth and implemented architectures like **ResNET** and **VGG** using **Pytorch**.
- Carried out a literature review on GANs and implemented basic **GAN** and **DCGAN** on **MNIST** and **CIFAR-10** Datasets.
- Read papers on **Context Encoders** and implemented it using Pytorch.
- Studied **Audio Generation** using **WaveGAN**.
- Created **Blogs** mentioning related Literature, along with **Results** and **Architectures**.

## Cross Validated

Summer Project | *Stamatics Club*

[Summer 2021]

IIT Kanpur

- Explored various sampling methods like **Inverse Transform**, **Accept-Reject**, **Bernoulli Factories**, **Importance Sampling**, **Box-Muller** and **Ratio of Uniforms** used in Monte Carlo Algorithms.
- Studied optimization methods like **SGD**, **Newton-Raphson**, **MM** and **EM** algorithms used in estimation of parameters.
- Implemented **Probit Regression** model in **Julia** on the titanic dataset to estimate chances of survival.
- Introduced to **MCMC** and **MH** algorithms and topics in Bayesian Modelling such as **Bayesian Linear and Logistic Regression**

## InfoSec IITK

Semester Project | *Association of Computing Activities*

[Feb'20 - Apr'20]

IIT Kanpur

- Studied various exploits such as **Binary Exploitation**, **SQL injection**, **Steganography**, and tools to use them like **gdb**, **SQL map**, **Steghide**, and **StegSolve**.
- Participated in numerous **CTFs** as a part of the project evaluation.

## TECHNICAL SKILLS

- **Programming & Scripting Languages:** C++, C, Python, Julia, Bash, R
- **Libraries and Frameworks:** Pandas, NumPy, seaborn, scikit-learn, PyTorch, PyTorch-Lightning, Flux.jl, Tensorflow/Keras(familiar).
- **Utilities:** Git,  $\LaTeX$  gcov, gtest, Markdown, Docker

## RELEVANT COURSEWORK

- **Computer Science:** Fundamentals of Programming, Data Structures and Algorithms, Game Theory and Mechanism Design, Computer Organisation, Software Development, Operating Systems, Theory of Computation, Advanced Algorithms, Introduction to Machine Learning, Parallel Computing <sup>‡</sup>, Deep Learning for Computer Vision <sup>‡</sup>, Compilers <sup>‡</sup>
- **Mathematics:** Real Analysis, Linear Algebra, Probability Theory, Logic for CS, Bayesian Analysis, Statistical Simulation and Data Analysis in R.
- **Online Courses:** Reliable and Interpretable AI (ETH Zürich), Introduction to Deep Learning using Tensorflow (Coursera)

<sup>‡</sup> - Upcoming Courses <sup>†</sup> - Ongoing Courses

## POSITIONS

### Secretary, Programming Club

*Programming Club, IITK*

[May 2020 - Apr 2021]

IIT Kanpur

- Part of a team of 20 students responsible for holding various events to the campus community of more than over 8000 students
- Responsible for managing a Competitive Programming Competition for students of the institute for a month.
- Hold

### Mentor - Julia for Machine Learning

*Association for Computing Activities, IITK*

[Apr 2021 - Jul 2021]

IIT Kanpur

- Introduced Julia, A High Performance Language to about a group of 30 students.
- Delivered Lectures on various aspects of Julia, Such as Multiple Dispatch, Type Inference, Meta-programming and Loop Fusion.
- Introduced them to fundamental concepts in Machine Learning such as Probability and Statistics, Different modes in Automatic Differentiation, Gradient Descent.

### Student Guide

*Counseling Service*

[Nov 2021-May 2021]

IIT Kanpur

- Mentored six freshmen throughout their first year and exposed them to academic and extracurricular opportunities available in the Institute.