# Gopi **Kishan**

MACHINE LEARNING ENTHUSIAST

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*"What I can not create, I do not understand."*

## Sum**mary**

A curious computer scientist in making trying to find answers and solutions for problems in Artificial Intelligence. Familiar with Machine Learning, Deep Learning, Reinforcement Learning and Computer Science Fundamentals, with a specific interest in Computer Vision, Bayesian Learning and Representation Learning. Easily excited by mathematics, music and tea.

## Edu**cation**

**Indian Institute of Technology, Roorkee**                                    *Roorkee, India*

B.TECH. IN COMPUTER SCIENCE AND ENGINEERING                                    *2017 - Exp. 2021*

- CGPA: 9.1/10

**Cambridge Public School, Raxaul**                                           *Raxaul, India*

GRADE 12 (SENIOR SECONDARY LEVEL)                                             *2017*

- Percentage: 90%

**Cambridge Public School, Raxaul**                                           *Raxaul, India*

GRADE 10 (SECONDARY LEVEL)                                                    *2015*

- CGPA: 10/10

## Exp**erience**

**CVR - VISTA Vision Science Summer School 2020**                             *York University, Canada*

CVRSS SUMMER SCHOOL FELLOW                                                    *July 6, 2020 - July 10, 2020*

- Selected for vision summer school program (under 40 around the world), goes virtual due to COVID-19

**Max Planck Institute - Intelligent System (MPI-IS)**                        *Tübingen, Germany*

REMOTE RESEARCH INTERNSHIP                                                    *May, 2020 - *Dec, 2020*

- Summer Research Internship under the guidance of Prof. Stefan Bauer and post-doc Xiaoguang Dong.
- Working jointly with Empirical Inference and Physical Intelligence Departments
- Work involves building a gym-simulator for particles and applying Deep Reinforcement Learning for control.
- Next step will be sim2real onsite depending on COVID-19 situation

**University of British Columbia, Okanagan (UBCO)**                           *British Columbia, Canada*

PROJECT COLLABORATION                                                         *Since April, 2020*

- Collaborating on project under the guidance of Prof. Apurva Narayan, Department of Computer Science, UBCO
- Part of the Data Science and Artificial Intelligence Group (DSAIG)
- Work involves verification of robustness of Deep Learning systems.

**Indian Institute of Science (IISc)**                                        *Bangalore, India*

RESEARCH INTERNSHIP                                                           *May, 2019 - Dec, 2019*

- Summer Research Internship under the guidance of Prof. Debasish Ghose.
- Part of the Guidance, Control and Decision Systems Laboratory (GCDSL) at the Department of Aerospace, IISc.
- Worked on model compression techniques.
- Experimented with pruning, weight matrix factorization, quantization and knowledge distillation on DNN and autoencoders.
- Explored latent representation priors in Variational AutoEncoder. Github *link*.

**Indian Institute of Technology Bombay (IIT B)**                             *Mumbai, India*

INTERNSHIP                                                                    *June 2018 - July 2018*

- Summer internship under the supervision of Dr. Biplab Banerjee
- Associated with VIP lab under CSRE department IIT Bombay
- Worked on Face detection algorithms (RCNN, Fast-RCNN, Faster-RCNN, YOLO) on VGG-16 architecture and trained on Widerface dataset.

# Projects

### Quantum Machine Learning
*IIT Roorkee 2020*

LAB BASED PROJECT
*Jan, 2020 - June, 2020*

- This project, under the guidance of Dr Sugata Gangopadhyay, aims at applying the advantages of quantum computing to Deep Learning.
- Explored the structure of Quantum GANs and method to discriminate a randomly initialised qubit.
- For a complete detail refer my *report* and *presentation* on this project and play around the experiments in google colab *here* and *here*.

### Reproducibility Challenge
*NeurIPS 2019*

COMPETITIVE GRADIENT DESCENT
*Nov 1, 2019 - Dec, 2019*

- The paper introduces a novel algorithm for the numerical computation of Nash equilibria of competitive two-player games.
- Following baseline track, I have re-implemented the proposed CGD algorithm in python3 (using PyTorch).
- The reproducibility report is publised at *arXiv* and source code in this GitHub *repository*.

### PunyNet
*DeepMind, hosted at NeurIPS 2019*

MICRONET: LARGE-SCALE MODEL COMPRESSION COMPETITION
*May, 2019 - Oct, 2019*

- This project aims at efficient inference on CIFAR100 dataset by compressing the model size.
- Quantized a resnet18 model by learning a codebook C that minimizes the difference between the output activations and their reconstructions.
- Detailed description and code are available *here*.

### Self Balancing Bot using RL
*IIT Roorkee, India*

PROJECT UNDER ARIES, IIT ROORKEE
*October, 2018 - March, 2019*

- This project aims at stabilising a two-wheeled robot using Reinforcement Learning.
- Q-learning algorithm is used to train the bot in a virtual environment made using gym and pyBullet.
- Detailed description and code are available *here*.

# Honours & Achievements

| | | |
|---|---|---|
| 2020 | **ICML**, Selected for volunteer at virtual ICML conference. | |
| 2020 | **CVRSS**, Selected for Vision Science Summer School at York University, Canada. Goes Virtual due to COVID-19 | |
| 2020 | **MITACS Fellow**, Selected for the MITACS Globalink program. Cancelled due to COVID-19 | *UBCO, Canada* |
| 2019 | **Micronet Challenge**, TPU Credits Awardee, Awarded to global top 25 proposals. | |
| 2019 | **Flipkart Grid-Challenge**, Under top 5 at IITR (and 36th in India). | |
| 2017 | **All India Rank - 1114**, JEE Advanced, administered by Indian Institutes of Technology | |
| 2017 | **All India Rank - 2700**, JEE Main, taken by more than a million students. | |

# AIChallenges

### IDAO 2020
*Online Round*

INTERNATIONAL DATA ANALYSIS OLYMPIAD 2020
*Jan 15, 2020 - Feb 11, 2020*

- The problem statement involves modeling of accurate trajectories of satellites from previous data. Repo at *link*.

### Inter-IIT Tech Meet 8.0
*India*

BITGRIT'S DATA SCIENCE CONTEST
*Nov. 2019 - Dec. 2019*

- The problem statement involves modeling of variation of exchange rates between local and foreign currency.

### PanIIT Challenge 2019
*India*

ORGANISED BY TATA CONSULTANCY SERVICES LIMITED (TCS)
*Jan. 2019*

- Built a tuberculosis detection andriod app based on Deep Visual Attention using TFLite.

### Microsoft AI Challenge 2018
*India*

ORGANISED BY MICROSOFT
*December 2018*

- phase 1 : Involved improvement in classical page rank algorithm.
- phase 2 : Involved exploration of NLP based technique to find relevant search results on bing search engines.

# Writing

### Tricks for Manipulating Probability
*Medium*

WRITER
*Dec 20, 2019*

- Published at towards data science, medium, this blog aims at summing up together the various techniques applied in different probability problems to make calculations easier and, sometimes,even possible! *Read*

# Skills

| | |
|---|---|
| **Programming** | Python, C++, JAVA, C, Javascript |
| **Frameworks and Packages** | Tensorflow, Keras, scikit-learn,, openCV, gym, Numpy, Pandas, Matplotlib |
| **Utilities** | Git, Linux Shell, Vim, VS Code, GitHub, jupyter |
| **Relevant Courses (online)** | Deeplearning.ai Specialization (by Andrew Ng), csn231n (for Computer Vision) |
| | csn229 (for Machine Learning), RL course by David Silver, stat110 (for Probability and Statistics) |
| **Books Referred** | Deeplearning by Goodfellow, Pattern Recognition and Machine Learning by Bishop, |
| | Reinforcement Learning : An Introduction by S. Sutton |
| **Courses** | Mathematics-1 (covered Linear Algebra and Calculus), Optimization Techniques, Artificial Intelligence |
| | Signal and Systems, Discrete Structures, Data Structures and Algorithms, Machine Learning, Quantum Computing |

# Extracurricular Activity

### Google Code-in 2019
*India*

TENSORFLOW MENTOR
*Dec,2 2019 - Jan., 2020*

- Here, I lent a helping hand to pre-university students to learn what it's like to work on an open source project.

### Artificial Intelligence and Electronic Society (ArIES)
*IIT Roorkee, India*

CORE MEMBER
*May 2019 - PRESENT*

- Here, I am currently working on robustness against Adversarial Attacks. I am studying various attacks and defence mechanisms with a particular interest in vision models.
- Alongside, I am mentoring the project "Translational Tools" for SHRISTI, an Annual Technical Exhibition of IIT Roorkee.

### ACM-IIT Roorkee Chapter
*IIT Roorkee, India*

OUTREACH HEAD, (PREVIOUSLY MODERATOR)
*July 2019 - PRESENT*

- As Outreach Head, I connect researchers from ACM network and organise talks.
- As Linux discussion moderator, my responsibility was to organise discussions on Linux OS for freshers and sophomores.

### Smart India Hackathon Grand Finale
*India*

ORGANISED BY MHRD, INDIA
*2019*

- Built a Blockchain based complaint system to assist fixing water wastage issues.

# References

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### Biplab Banerjee
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