Vipul Bajaj

Bachelor of Technology, Electrical Engineering
Double Major, Computer Science and Engineering

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Academic Qualifications

Year	Degree	Institute	CPI/%
2016-2021	B.Tech (Double Major)	Indian Institute of Technology Kanpur	**9.41 /10**
2016	Senior Secondary	Sawan Sr. Sec. School, Sirsa (CBSE)	95%
2014	Secondary	St. Xavier's Sr. Sec. School, Sirsa (CBSE)	10/10

Publications

** Equal contribution ** Under-review*

- Vinod Kurmi, **Vipul Bajaj**, KS Venkatesh, Vinay P Namboodiri "Curriculum based Dropout Discriminator for Domain Adaptation", *British Machine Vision Conference 2019* (**BMVC'19**).
- V Kurmi*, **Vipul Bajaj***, P Jyothi, VP Namboodiri "Learning to Generate Joint Audio-Visual Sequences**, *International Conference on Acoustics, Speech, and Signal Processing*" (**ICASSP'21**).

Work Experience

- Data Analyst and Product Management Intern, **Gartner Inc., Gurugram** (*May '19-Jul '19*)
  Predictive Reviewer Profiling ▶ presentation
  - **Constructed** a machine learning model to predict the credibility of new users on **Gartner's Peer Insights** platform.
  - **Improved efficiency** of the review moderation process by ∼**47%** via badging users leading to reduction in costs.
  - **Conceptualized badging** of the reviewers based on their **credentials** and the **quality** of reviews written by them.
  - **Identified strategic** clusters of users for targeted campaigning using **Jensen - Shannon divergence**.
- Research Intern, **Max Planck Institute For Software Systems(MPI-SWS), Germany** (*May '20-Jul '20*)
  Optimizing Covid-19 group testing process via contact tracing
  - **Overhauled group testing** algorithms to minimize the number of tests required to test a given number of people.
  - **Employed** location based **contact tracing** data to compute accurate prior **probability** of infection for every individual.
  - **Achieved** reduction in number of **RT-PCR** tests by **upto 87%** for data on Kaiserslaturn, Germany.
- Computer Vision Engineer, **Uplara, California, USA** (*Mar '20-May '20*)
  Object Detection in Augmented Reality github
  - **Implemented** several state of the art object detection algorithms namely **SSD, BlazeNet, RetinaNet, CornerNet, CenterNet, Transformers**, etc. optimized to work in AR setup to estimate apparel sizes based on short videos.
  - Deployed the models on mobile devices using **MobileNet-V2** as feature extractor underneath these single shot detectors.
- Machine Learning Research Intern, **National University of Singapore (NUS), Singapore** (*Nov '19-Mar '20*)
  Causal Anomaly Detection in Multivariate Time Series
  - **Developed** causal graphical models to solve the problem of anomaly detection in multivariate time series data.
  - **Identified** Granger Causal Relationships among various variables and used them to explain and infer hidden anomalies.
  - **Improved** existing performance on **SWaT** and **WADI** datasets by ∼**7%** in an interpretable and scalable manner.
- Data Science Intern, **Auquan Inc., Bangalore** (*Jan '18-May '18*)
  Predicting Stock Prices to Develop Trading Strategies for different stock market indices github report
  - **Built** predictive models for **stock prices** in Python using the fundamentals of quantitative finance research.
  - **Designed**, back-tested and optimized a data-driven **quantitative trading strategy** on **real-world data** in python.
  - **Formulated** an **intra-day** mean reversion strategy to give >**30% return on capital(RoC)** using **Hurst** and **ARIMA**.

Major Projects

- **Multimodal Generation based on Triangle GAN** (*Jan '19-Apr '19*)
  Supervisors : Prof.Preethi Jyothi, IIT Bombay github ▶ presentation report
  - Employed **cross-modal** relationships to generate audio-video using a GAN framework similar to Triangle GAN.
  - Deployed **1D convolutions** for audio stream and **twin discriminators** for alignment of video signal .
  - Obtained **significant improvements** over MoCoGAN for video generation and over WaveGAN for audio generation.
- **Curriculum based Dropout Discriminator for Domain Adaptation(CD^3A)** (*Nov '18-Jan '19*)
  Supervisor: Prof.Vinay P. Namboodiri, IIT Kanpur arxiv github project
  - **Proposed** a curriculum based approach for an **ensemble** of discriminators sampled from a Bernoulli distribution.
  - **Analyzed scalability of ensembles** and showed that our method is extremely scalable compared to other SoTA models.
  - **Thoroughly** analyzed the method (statistical significance, discrepancy distance, etc.) and compared against **SoTA**.
- **Abstractive Summarization using Semantic Representation** (*Nov '17-Jan '18*)
  Supervisor: Prof. Harish Karnick, IIT Kanpur github report
  - **Investigated** several SoTA models for Abstractive Summarization(build an **internal semantic representation** and use NLG techniques to create a summary that is closer to what a human might express) & its evaluation techniques.
  - **Programmed** AMRs(a **single rooted, directed graph** which include PropBank semantic roles, within-sentence coreference, namedentities and types, modality, negation, questions, quantities,etc.) for semantic representations.

Other Projects

- **Compiler for Java Language**(Course Project) *Prof. Swarnendu Biswas, IIT Kanpur* (*Jan '20-Jun '20*)
  - **Implemented** a compiler to generate **x86 Assembly code** from Java input through intermediate stages of Lexical analysis, parsing and 3 Address Code. **Incorporated** advanced features like Multiple Declarations, Lazy Allocation etc.
- **Buliding GemOS**(Course Project) *Prof. Debadatta Mishra, IIT Kanpur* (*Aug '19-Nov '19*)
  - **Extended** functionalities of **GemOS Operating System** by implementing 4-level radix tree Page Table and adding various **System Calls** and Signal Handlers including memory allocation, read-write locks, forks and page fault handling.
- **Explanable Machine Learning**(*Course Project*) (*Aug '18 - Nov '18*)
  Supervisor: Prof. Piyush Rai, IIT Kanpur github ▶ presentation report
  - Developed a web application to **explain the prediction** of any classifier on the user's dataset using LIME.
  - Implemented **feature visualization** using matrix factorisation by generating adversarial examples using BFGS method.
- **Prosthetic Arm**, *Won the award for **Best Social Project*** (*May '17-July '17*)
  Robotics Club, IIT Kanpur github ▶ presentation report
  - Engineered an **artificial gripper** on the concept of **prosthetics** using 3D printing and communication via **Bluetooth**.
  - Employed **micro-controllers**(Arduino ATmega and Nano) to communicate with an auxilliary glove having **flex sensors**.
- **Cross-Modal Generation using Causal Relationships** (*Aug '18-Nov '18*)
  Supervisors: Prof.Ketan Rajawat, IIT Kanpur github ▶ presentation report
  - Proposed a **novel** causal inference approach for **multimodal** generation involving audio & video modalities adversarially.
- **Model Zoo for Unsupervised Transfer Learning**(*Course Project*) (*Feb '19-Apr '19*)
  Supervisor: Prof.Vinay P. Namboodiri, IIT Kanpur ▶ presentation report
  - Implemented **Object Detection**, Classification, **Image Segmentation**, Pose Detection, Super Resolution, etc.
  - **Analyzed** them for failure cases & improved via attention, background removal & incorporating statistical measures.

Fellowships, Awards, & Recognition

- Served as a **reviewer** for one of the top peer reviewed computer vision conferences -**WACV'20**.
- **Grand Prize Winner** at Deloitte TechnoUtsav 2.0 - Cash Award of **Rs. 5 Lacs** and a **PPO** at US-India Deloitte.
- **Top 20 Award**, among 1235 participants in *3rd Summer School On Machine Learning* at IIIT Hyderabad.
- Awarded prestigous **Summer Undergraduate Research Grant for Excellence** (SURGE) for the year 2018.
- Awarded **Academic Excellence Award** for 4 years from 2016 - 2019 & **A*** grade for exceptional performance in **3 courses**.
- Awarded the prestigous **Panasonic** & **OPJEMS** scholarships for **academic, leadership and entrepreneurial excellence**.
- **Top 1% Nationwide** in **NSEP**, **NSEC**, **NSEA** and secured **AIR 147** in **KVPY**, Dept. of Science & Technology, GOI.
- Secured **AIR 729** in **JEE(Mains) 2016** & **AIR 1115** in **JEE(Advanced) 2016** amongst 1.5 million candidates.

Technical Skills

- **Languages:** C/C++, Python, R, Shell(bash), MATLAB/Octave, HTML, CSS, PHP, SQL, Verilog, ReactJS, NodeJS
- **Frameworks & Utilities:** PyTorch, Tensorflow, Keras, Git, LaTeX, Docker, Apache, NLTK, Scikit-Learn, Numpy, Pandas

Relevant Coursework *MOOC

- **ML & Probability:** Machine Learning, Computer Vision, NLP*, ML for Signal Processing, Probability & Statistics, DBMS
- **Computer System:** Data Structures & Algorithms, Algo-II, Computer Organization, Operating Systems, Compiler Design
- **Others:** Control Systems, Linear Algebra, Complex Analysis, Microeconomics, Macroeconomics, Economic Analysis of Law

Competitive Programming Achievements

- Secured a national rank of **225** and a regional rank of **52** in **ACM ICPC Regionals 2019** Amritapuri.
- Qualified **Level 4** of Codechef SnackDown 2019 and achieved a rating of **1714**. **Ranked 423 globally** in August Lunchtime.

Entrepreneurial activities - acadAI: An NLP based web app to automate education ▶ video

- A **Django** based **web application** that leverages the power of **AI** to automate the examination machinery comprising question generation, answer key generation & evaluation of answers, thereby revolutionizing education systems across globe.
- **Winner** of Microsoft Code.Fun.Do 2018, **2nd** in **"Pitch your Product"**, **2nd** in **"Pitch Prime"** & several other awards.

Extra-Curriculars

- **Head Finance**, Electrical Engineering Association IITK: *Digitized and managed finances of ∼5L rupees* (*Aug '17-Aug '18*)
  - **Increased** revenue by ∼**35%** by analysing & cutting down on superfluous expenditure in the balance sheet & devising ways of raising funds through sponsors, new profit-making initiatives & raising donations by increasing alumni reach.
  - **Organized** & **optimized** expenditure by ∼**60%** in Fresher's Night & Farewell by innovative crowd sourcing methods.
- **BloodConnect: Technical Executive & Camp Coordinator**, *Organized blood donation camps* (*Aug '16-July '18*)
  - Collaborated with Data Analytics and Management team to manage data of ∼ 10,000 blood donors all across the country.
- **Tutor, ESC 101, ESO207:** *Assisted professors in the courses on Computing & Algorithms* (*July '19-Present*)
  - **Developed & planned** conduct of course including logistics, teaching, assesment & evaluation of 600+ students.