Varun Babbar

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Citizenship: Indian • **Location**: London, United Kingdom

Research Interests

Human-Machine Collaboration, Explainable / Interpretable AI, Statistical Inference, Computer Vision, NLP

Current Position

September 2022 – Present

ML Scientist at JP Morgan Chase and Co
Working on projects in the following areas:

- Code completion
- Network compression
- Automated code quality analytics

Recently set up a reading group on human-centered AI for my team, with monthly paper discussions and frequent knowledge sharing.

Education

2018 – 2022

University of Cambridge – Cambridge, UK
BA + MEng in Information and Computer Engineering
MEng Supervisors: Dr Adrian Weller, Umang Bhatt
MEng Thesis: *Set Valued Predictions for Human-AI Teams*
MEng Grade: *78.8% - Honours with Distinction, Rank 14/261*
BA Grade: *79.4% - 1st Class Honours, Rank 18/289*

2016 – 2018

Singapore International School – Mumbai, India
IB Diploma
Grades:

- *45/45 Points (World Topper)*
- *5/5 in AP Mechanics, Chemistry, Calculus AB*
- *800/800 in SAT Subject Tests in Physics, Chemistry, Maths II*
- *35.25/36 in ACT*

Relevant coursework

- *Probability and Statistics*: Probabilistic Ranking, Bayesian Inference, Gaussian Processes, Latent Dirichlet Allocation, High-dimensional MCMC, Information theory, Statistical Signal Processing
- *Optimization Methods*: Bayesian Optimization, Simulated Annealing, Particle Swarm Optimization, Linear Programming
- *Machine Learning*: Image Compression (BA Project), Computational Neuroscience, MEng Thesis

Honors and Scholarships

2022 IIB Project Prize (*University of Cambridge*)
For a top ranked MEng Project in the Department.

2021, 2022 Foundation Scholarship (*Queens' College, University of Cambridge*)
Awarded twice for obtaining a first class in my BA and MEng exams respectively

2022 The James & Jean Bennett Prize (*Queens' College, University of Cambridge*)
For outstanding distinction in my MEng degree

2022 Ruth Hendry Year Prize (*Queens' College, University of Cambridge*)
For outstanding distinction in my MEng degree

2020 Hawks' Trust Prize (*University of Cambridge*)
For sporting and academic achievements

2017, 2018 Merit Scholarship in School
Topped the school in all subjects.

2018 Full Scholarship from Hong Kong University
On the basis of my IB results.

Publications and Workshops

2022 **Conformal Prediction for Resource Prioritisation in Predicting Rare and Dangerous Outcomes**
Varun Babbar, Umang Bhatt, Miri Zilka, Adrian Weller
NeurIPS Workshop on Human in the Loop Learning 2022.

2022 **On the Utility of Prediction Sets in Human-AI Teams**
Varun Babbar, Umang Bhatt, Adrian Weller.
International Joint Conference on Artificial Intelligence (IJCAI) 2022 ***(Long Oral)***

2021 **Style Transfer Preprocessing for Federated Learning**
Antonios Georgiadis*, **Varun Babbar***, Fran Silavong, Sean Moran
SPIE Medical Imaging 2022

2020 **Training a Task-Specific Image Reconstruction Loss**

Aamir Mustafa*, Aliaksei Mikhailiuk*, Dan Andrei Iliescu, Varun Babbar, Rafal Mantiuk

2022 IEEE CVF Winter Conference on Applications of Computer Vision (WACV).

Research experience

August 2022 – September 2022 **Research Assistant**

Supervisors: Dr Adrian Weller, Umang Bhatt

Applied risk control methods to a problem where we want to identify radicalised individuals and allocate resources for intervention and monitoring. Top 15% of accepted papers at the NeurIPS Human-in-the-Loop Learning Workshop.

September 2021 – June 2022 **MEng Project: Set Valued Predictions for Human-AI Teams**

Supervisors: Dr Adrian Weller, Umang Bhatt

Link to thesis (contains abstract).

June 2021 – September 2021 **JP Morgan Chase and Co**

Supervisor: Antonios Georgiadis

Proposed a CyclGAN augmented federated learning model for resolving heterogeneity in client datasets. The resulting system showed promising performance on a segmentation task, leading to a **pending patent** and a paper (see above).

June 2020 – September 2020 **Research Assistant: University of Cambridge - Dept of Computer Science**

Supervisor: Dr Rafal Mantiuk.

Experimented with different loss functions for image-to-image translation tasks in order to answer the question - which loss function provides the most perceptually pleasing images? Co-author of a paper accepted at WACV '22.

June 2019 – September 2019 **Research Assistant: University of Cambridge - Dept of Physics**

Supervisors: Dr Sarah Bohndiek, Emma Brown.

Wrote scripts in Matlab and Python that can perform image processing operations on tumour images. Link to research report

Some Projects

January 2022 **Hack Cambridge**

Built an app that determines your carbon footprint by taking a photo of your receipt and performing a semantic search for identified keywords. Winner of the Huawei Challenge. **(see Devpost)**

December 2021 **Analysis of Optimization Algorithms**
Implemented Simulated Annealing and Particle Swarm Optimization for a high dimensional, constrained function as part of a coursework project. Extended this by tweaking algorithm hyperparameters using Bayesian optimization - I scored 90% in this module.

May 2021 **Image Compression**
My 3rd year Image Processing project. Extended this by developing a decompressor that combines efficient hyperparameter tuning and deep learninng based denoising. Obtained a 1st class mark + placed 2nd in the competition. **(see Github)**

March 2020 **Vanilla CNN**
Built a modern CNN from scratch, using only matrix multiplications. **(see Github)**

Jan 2020 – April 2020 **Synthetic Medical Image Generator**
Trained a GAN for generating synthetic MRI images from their corresponding segmentations.

October 2019 **Hack Brunel**
Built an app that finds the optimal cycling route based on user risk preferences, crime levels, and traffic. Winner of the McAfee Security Challenge. **(see Devpost)**

November 2019 **Integrated Design Project**
Designed and wrote the navigation algorithm for a robot that can detect mines in a minefield, pick them up, and drop them to a safe zone. Came 2nd in the final competition out of 14 teams.

November 2018 **Oxford Hack**
Built an app that makes storytelling an interactive experience by outputting relevant images and playing appropriate background sounds as a story is narrated. Winner of the AWS Challenge. **(see Devpost)**

Miscellaneous

2022 Reviewer at TheWebConf2023

Technical skills

Programming languages
Proficient in: Python, MATLAB
Basic Knowledge: Java, Javascript, HTML

Software
LaTeX, Git, Shell

Languages
English, Hindi, French

Other interests

Racquet Sports, Juggling, Basketball, Climbing, Chess, Rubiks Cubes