

## EDUCATION

### Imperial College London

MEng Computing (Sept 2017 - July 2021)

Achieved 1st Class in 2nd year

Ilford County High School

Secondary School (Sept 2010 - July 2017)

- A level - 3 A\*, 2 A : Mathematics, Physics and Computing, EPQ (research project) and Further Mathematics.
- GCSE - 12 A\*, 1 A, 1 A\* with Distinction in Further Mathematics

## RAJAT RASAL

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## WORK EXPERIENCE

### ALLOT LIMITED

Freelance Consultant (Sept-Oct 2019)

- Created a single page React JS webapp to rank doctors by their effectiveness at treating a chosen disease for pharmaceutical salespeople to launch better targeted marketing campaigns.
- Deployed a Flask REST API over **AWS Elastic Beanstalk** which used SQLAlchemy ORM to connect to an AWS RDS Postgres instance.

### HSBC (Global Banking and Markets)

Data Science and Engineering Intern (July-Sept 2019)

- Gained experience with the **Hadoop ecosystem by using the 10 PTB cluster**; Engineered two new innovative big data projects:
  1. Large table joins using **SparkSQL** across multiple unstructured data sources, in order to detect unnecessary RWAs being held in reserve. Identified major RWA discrepancies within our data lake alone.
  2. Using **Spark MLlib** to predict whether the foreign key in a table was present as primary key in another table across unstructured data sources. Used feature importance to produce a prioritised list of factors contributing to missing or inconsistent data for feedback to data quality teams across the bank.
- Used Elasticsearch REST API, through Bash and Python, to write high speed algorithms to search the cluster for foreign-key strings to assist with dataset joining.
- Migrated internal cluster analytics platform to using **Elasticsearch** backend.
- Introduced good Python software engineering practices to the team: Pytest, PyLint, effective Jupyter notebook usage, standard library.

### Devito Project Research Group @ Imperial College London

Software Research Intern (July-Sept 2018)

- Implemented an ML regression algorithm using **TensorFlow** in Python to solve an inversion problem in which gradient calculations were performed by the Devito engine.
- Performance tuning using grid search and **Bayesian optimisation techniques** for hyperparameter optimisation
- Used Dask to distribute each shot within the gradient calculation using Docker containers over a Kubernetes cluster hosted on Google Kubernetes engine on **Google Cloud Platform**.
- My work has contributed to various conference presentations and academic papers, in which I will be a co-author.

### PythonAnywhere (Python web-based startup)

Intern (Aug 2016)

- Took part in a number of full-stack pair programming projects; redesigning the layout for the quickstart guide using JS and Bootstrap, linking pages hosted on the help server to a live PythonAnywhere IDE, churn analysis for paying users.
- Used **agile development methodologies**: pair programming, extreme programming, TDD, CI/CD, IID.

### Bank Of Tokyo Mitsubishi

Intern (Aug 2015)

- Improved their internal web portal design using HTML, CSS and Javascript.

## TECHNICAL SKILLS

	Proficient in	Comfortable with	Exposed to
Languages and Technologies	<b>Python 3+</b> (5 years): Numpy, Sklearn, Pandas, Flask, Pyspark, Pytest + mock (TDD), Flask, SQLAlchemy, PyLint + PEP8, Standard Lib; <b>Java 8-10</b> ; HTML5 + CSS;	C; Bash; Django; SQL; <b>Machine Learning: Tensorflow, Scikit-Learn, Keras</b> , Spark Mllib; <b>C++11-14</b> ; Elasticsearch; <b>Hadoop Ecosystem</b> : Spark, Hive, Yarn, Pig, HDFS; Docker; Javascript; JQuery; Haskell; <b>TDD</b> : JUnit4+, pytest; Concurrency in Java; MongoDB; Android SDK;	Google ARCore; NodeJS; Kubernetes; Dask; <b>Google Cloud Platform Tools</b> (Kubernetes Engine, App Engine, Storage, Cloud functions); <b>Google Analytics</b> ; Scratch; Prolog; <b>ReactJS</b> ; Scala; <b>AWS</b> (Elastic Beanstalk, RDS);
Software and Tools	Jupyter Notebooks; VIM; Slack; Github; GitLab; Markdown;	IntelliJ IDE; Latex; Android Studio and Material Design; Github Pages; Gitlab Runner;	ServiceNow; Gradle; Ansible;

## NOTABLE PROJECTS

### Neural Network Interpretability

(Oct 2019 - Dec 2019)

- Deep neural network interpretations visualisations dashboard to **increase transparency of black box models**, agnostic of the framework used to build the model.
- Interpretations: saliency and occlusion mapping, feature maps, controlled natural language to explain the interpretability models and word embedding to provide novel data driven interpretations also.
- Tool is platform and framework independent. Frontend - **ReactJS**; Backend - **Python** (ONNX, TF, Keras), **MongoDB**, **GCP**

### NotespaceAR

(May 2019 - June 2019)

- An innovative mobile app for students who are visual-spatial learners. **Students can post interactive virtual post-it notes through their camera using AR technology**, which they can later view for interactive revision on their own or with friends.
- **Camera View used Google AR Core** 📱; Frontend - written in **Java and used Material Design**; Backend - REST API using **Flask** server (Python), **MongoDB** for scalable data warehousing and Gitlab Runner + **Google App Engine** for CI/CD pipeline.

### WACC Compiler

(Jan 2019 - Apr 2019)

- Used Java and ANTLR tool to create a compiler for the WACC programming language.
- Added a number of optimisations, such as Constant Propagation and Array Bounds Checking, and an IntelliJ IDE plugin for the language.

### PintOS

(Sept 2018 - Dec 2018)

- **Optimised/developed key features of a simple OS framework for the 80x86 architecture in a small team using C.**
- The main features we implemented include: 1) system timer for sleeping threads, 2) priority scheduling with donations, 3) MLFQS scheduling, 4) system calls, 5) user programs in C and Bash using the implemented system calls, 6) virtual memory.

### Other Projects

- (Mar-Apr 2019) - **Facebook Hack-a-project**, designed a webapp using React to help connect local care-homes and volunteers.
- (Apr 2018) - Led 1st year group research project on **cloud computing with Tensorflow**, Spark and MapReduce; **we won the 2nd place prize overall** (Score: 100%)
- (Dec 2018) - **Predicted Stocks Movements based on Sentiment Analysis (NLP)** 📊 of Trump's Tweets in King College London Annual Hackathon using Word2Vec and Deep Stacked RNNs, **won runner up in Capital One Financial Challenge**.
- (Oct 2018) - Performed a detailed analysis and made predictions on the UK Road Accident's dataset for **Imperial AI Hack 2018**, using Random Forests Classifiers and Regressors, PCA, and Neural Networks.
- (May-Jun 2018) - Used conductive paint to create a handsfree music control interface for a Raspberry Pi
- (Aug 2018) - **Multivariate RNN and Statistical Models to do time series forecasting on Bitcoin prices** using Keras, ARIMA models and Facebook's Prophet.
- (2016) - Web based cricket scorecard using Django, JQuery and a Node.js server to post real-time score updates to Twitter.
- (2016) - Browser security research project - used Kali Linux tools to explore developments in web security, focusing on SQL injection, XSS, HTTPS and SSL and click-jacking.

## ACTIVITIES AND INTERESTS

### Extra-Curricular Interests

- (2019 - onwards) - **Imperial Advance Data Science Team**; entering competitions to do ML and data science challenges
- (2019 - onwards) - Treasurer for Imperial Cricket Club; aside from handling finances I'm making an app to help committee members manage internal processes and updating the club website also.
- (2018 - onwards) - **Data Science & ML - various Kaggle Competitions**, attended Cambridge Spark Data Science courses at JP Morgan and HSBC
- (Sept - Nov 2017) - Department of Computing Society education scheme - teaching weekly coding lectures to non-computing students.
- (2015) - Taught programming at local primary schools - ran after-school computer science course at a local primary schools, teaching year 5/6 students programming techniques in Python and Scratch. Won the Jack Petchey Award.

### Awards

- (Dec 2018) - **2nd place Capital One Financial programming challenge** in Kings College London Annual Hackathon
- (Apr 2018) - **2nd place Imperial College corporate partnership programming prize** for projects in topics in Computing
- (Apr 2018) - **2nd place Imperial College partnership programming prize** for presentations in topics in Computing

### Hobbies

🏏 Played semi professional county cricket for Essex and the Essex academy; 🎻 Played the violin - attained ABRSM Grade 5 exam.

## REFERENCES

**Dr Paul Kelly** - [p.kelly@imperial.ac.uk](mailto:p.kelly@imperial.ac.uk) (reference below); **Dr Gerard Gorman** - [g.gorman@imperial.ac.uk](mailto:g.gorman@imperial.ac.uk) (available on request);