RAJAT RASAL

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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

WORK EXPERIENCE

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 anywhere in the data lake. 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 algorithms 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	**Python 3+** (5 years): Numpy, Sklearn, Pandas, Flask, Pyspark, Pytest + mock (TDD), Flask, PyLint + PEP8, Standard Lib; **Java 8-10**; HTML5 + CSS;	**C**; **Bash**; Django; SQL; **Machine Learning:** Tensorflow, Scikit-Learn, Keras, Spark Mllib; C++11-14; Elasticsearch; **Hadoop Ecosystem:** Spark, Hive, Yarn, HDFS; **Docker;** Javascript; JQuery; Haskell; **TDD**: JUnit4+, pytest; Concurrency in Java; MongoDB; Android SDK;	**Google ARCore**; NodeJS; **Kubernetes;** Dask; **Google Cloud Platform Tools** (Kubernetes Engine, App Engine, Buckets); Scratch; Prolog; **React**; Scala;
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

NotespaceAR (Score: ~91%) (May 2019 - June 2019)

- An innovative mobile app for students who are visual-spacial 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 (Score: ~85%) (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 (Score: ~75%) (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.

ARM11 Assembler and Emulator (May 2018 - Jun 2018)

- Created an assembler and emulator for the ARM11 assembly language using C to run on a Raspberry Pi.
- **Used conductive paint with the Pi to create a handsfree music control interface** which allowed you to pause, play, change volume and shuffle between songs using hand gestures without having to touch the surfaces of the box. Written in Python.

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.
- (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, XXS, HTTPS and SSL and click-jacking.
- (2015 - onwards) - Using Bootstrap, JQuery, JS to make mobile-friendly, responsive webpages for friends and family.

ACTIVITIES AND INTERESTS

Extra-Curricular Interests

- (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 - Kaggle Competitions**, attended Cambridge Spark Data Science courses at JP Morgan and HSBC, Imperial AI Hack, AI academy in Imperial Data Science society, Kings College London Annual Hackathon, Google DevFest 2018.
- (Mar 2017) - Imperial Robotics Society - Raspberry pi programming and robotics course.
- (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
- (Dec 2015) - Bebreas Higher Computational Thinking Challenge - Distinction Award
- (2015) - Royal Society's Bronze Crest Award for Physics

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 (reference below); **Dr Gerard Gorman** - g.gorman@imperial.ac.uk (available on request);

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02 December 2018

Paul H J Kelly, PhD
Professor of Software Technology

Re: Mr Rajat Rasal

I lead Imperial's Software Performance Optimisation research group, and I teach on our second-year Compilers course, and our graduate-level Advanced Computer Architecture course. I have known Rajat since he started his studies here, in October 2017.

My research work is in domain-specific performance optimisations, to achieve more effective automated performance optimisations than compilers for general-purpose languages can achieve, while maintaining a high level of expressiveness and abstraction for the application developer. A key aspect of our work is performance portability – enabling a single body of source code to run efficiently on diverse computing platforms, including clusters of vector multicore CPUs as well as GPUs. Major projects include Firedrake and Devito, which target solution of partial differential equations, and SLAMBench, which targets realtime 3d scene understanding.

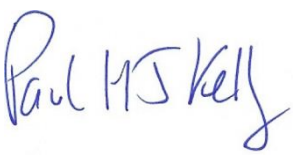
Rajat did really well in his first year, and on the basis of his exam performance and his contributions in our weekly small-group programming tutorials, I recommended him for a summer internship, through our Undergraduate Research Opportunities Programme, with my colleague Dr Gerard Gorman.

Rajat contributed to Dr Gorman's Devito project, and quickly became an active and valued participant in the project's online Slack discussion forum. He had an amazing summer – making exceptional progress in reproducing the results in a research paper on using Tensorflow to formulate the seismic inversion problem. Along the way, he integrated Devito into Tensorflow and extracted the resulting dataflow graphs so that he could then schedule their execution in a cloud facility. His work is now being followed up by a Masters student, and the fruits of his pathfinding work have proven invaluable in talking about Devito with industrial collaborators.

Rajat is evidently an extremely talented software engineer, with growing experience and discipline that already exceeds that of many more senior students. I have been advising him on internship opportunities for summer 2019 – he is clearly driven by a desire to learn. I am happy to be able to recommend him to you without reservation.

I confirm that Rajat's English is entirely satisfactory, and that he has always proven straightforward and reliable.

Yours faithfully,



Paul H J Kelly