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JAKE PENCHARZ

Personal Statement

I am a deeply curious person who intends to make a positive and widespread change to the world during my lifetime. I am convinced that Artificial Intelligence (AI) based technology will play a pivotal role in the long term future of humanity. The safe deployment of AI is therefore a problem to which I aim to dedicate significant time and energy. My background in Electrical and Computer Engineering and Neuroscience will hopefully form a solid technical foundation from which to contribute to this space.

Relevant Experience

Sep 2021 - present **Machine Learning Research Intern**, *Bayer AG.*

Working as a research engineer in Bayer's Machine Learning Research Group I have contributed to the development of (soon to be) open source Python tools, and semantic segmentation models aimed at Digital Pathology use cases. The project falls under a broader explainable AI program and by working closely with expert pathologists, aims to deliver and visualise the model's predictions in the most useful format possible.

`Research Engineer` `python` `Flask` `pytorch`

Mar - July 2021 (4 months) **Computational Neuroscience Intern**, *Max Planck Institute for Brain Research.*

Working in the Computation in Neural Circuits Group supervised by Shuai Shao and Julijana Gjorgjieva. I worked on modelling the relationship between dopaminergic neurons and Mushroom body output neurons in the Drosophila mushroom body. I built and compared linear models and a recurrent model of the circuit. The results were compared to recently published connectomics data.

`Computational Modelling` `pandas` `seaborn` `scikit-learn` `pytorch`

Feb - Apr 2021 (2 months) **Research Assistant**, *Technical University of Munich - Institute for Cognitive Systems.*

Wrote tutorials for a course on Brain Computer Interfaces using EEG (g.tec Unicorn Hybrid Black). The tutorials included using the Unicorn C API to log data to the lab streaming layer (C++), filtering techniques, visualisation, and a primer on motor imagery. These tutorials were used as a crash course for students competing in the BR41N.IO Hackathon (where I competed with my team as well).

`EEG Analysis` `scipy` `mne` `numpy`

Jan - Sep 2020 (9 months) **Software Engineer and Data Scientist**, *Isazi Consulting.*

Isazi is a South African startup specialising in applied machine learning and optimisation. I was tasked with building a data curation pipeline to generate, tag, and manage new training datasets that would be used to tune their optical character recognition (OCR) system.

- Designed and built a PostgreSQL database to ingest and store image data
- Built a RESTful API with Python (Flask) and a frontend with Vue.js to interact with the database
- Generated synthetic handwriting data
- Retrained image classification models on curated datasets boosting performance by ≈10 %
- Worked with a multidisciplinary team of data engineers, mathematicians, and software engineers

`Data Curation` `Flask` `Vue.js` `Docker` `PostgreSQL`

June 2018 – Jan 2019 (1 month each)

Software Engineering Intern, *Isazi Consulting*.

In two separate internships I worked as a full stack software developer. I mainly worked in Python (building an API with Flask) and in Android Studio (Java) to create a data labelling mobile application.

`App Development` `Flask` `SQL` `Android Studio` `Java`

Relevant Skill Set

</> Programming Skills

Proficient in:

- `Python`
- `C++`
- `SQL`

Comfortable with:

- `HTML` `CSS` `Javascript`
- `Matlab`
- `Java`

Tools and Frameworks

- `Git`
- `Docker`
- `Vue.js`
- `PostgeSQL`

Language Skills

English Native

German Basic (A1)

Education

Oct 2020 - present

MSc Neuroengineering, *Technical University of Munich.*

The program is interdisciplinary and combines experimental and theoretical neuroscience with profound training in engineering. I have focused my electives around building a strong mathematical grounding and exploring deep learning with some focus on computer vision.

Continuous

Online Courses.

- (Coursera) AI for Medical Diagnosis
- (Coursera) Mathematics for Machine Learning: Multivariate Calculus
- (Coursera) Mathematics for Machine Learning: Linear Algebra

2017–2019

BSc in Electrical and Computer Engineering (w. distinction), *University of Cape Town.*

Strong focus on signal processing, control engineering and embedded system design.

- Thesis project involved developing a machine learning approach to translate English to South African Sign Language. Translations were done using a RNN based encoder-decoder architecture.

2014–2016

BEngSc in Biomedical Engineering (w. distinction), *University of the Witwatersrand.*

Balanced content between Electrical Engineering and human anatomy and physiology.

- Selected for Deans List in 2015, 2016 (top 10% of students, with a minimum of 75% aggregate)
- Awarded the 'Undergraduate University Council Merit Scholarship' in 2015 and 2016
- Awarded the 'University Entrance Scholarship' in 2014

2001–2012

IEB High School Certificate, *King David Victory Park*, Johannesburg.

- Top 1% countrywide for English, Mathematics, Visual Arts and top 5%in at least five subjects

Other Interests

Youth Movement Volunteer

(2008-2017) Active member of Habonim Dror Youth Movement from 2008-2012, and a counsellor from 2012-2017.

Sports

Running (Two Oceans Half Marathon 2017, 2018) and rock climbing.

References

Prof. David Rubin

Adjunct Professor and Head of the WITS Biomedical Engineering Research Group

Dr Floriane Montanari

Research Scientist and head of XAI at Bayer AG