Roger de Mello Koch

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EDUCATION

Brown University — *Master's in Computer Science*

Sept 2023 - May 2025 (expected)

Subjects covered: Deep learning, computer vision, computer networks, probability for computing, software security and exploitation.

University of the Witswatersrand — *Bachelor of Science in Electrical (Information) Engineering*

Jan 2019 - Dec 2022

Subjects covered: Circuit/electronic design, signal analysis, control system design, microcontrollers, parallel computing, and machine learning

EXPERIENCE

ABSA Group Limited, Security team — *Summer Intern*

Dec 2020 - Jan 2021

- Single-handedly designed and implemented a web based job allocation prototype, meeting all design specifications within the 8 week period.
- The web application utilized **Django**, Bootstrap and **MySQL** to allow logging of job updates and new job allocation between penetration testers and the security automation team.

PROJECTS

Wildfire prediction map — *Undergraduate Honour's Laboratory Project*

- Conceptualised and realized a **wildfire prediction** tool leveraging the power of machine learning **SVMs**.
- Evaluated current MODIS **satellite data**, using the land surface temperature and NDVI to predict the next day's fire likelihood.
- The final design achieved an F1 score of 84% at a spatial resolution of $4km^2$, presented to members of staff and industry at the capstone exhibition.

Multi-conditioned diffusion model - *Master's Deep Learning Project*

- Lead a project pioneering a new approach to **Diffusion** model conditioning by leveraging the power of Open AI's **CLIP** model.
- Final architecture utilized a **U-Net** architecture built in **PyTorch** to achieve a final FID score of 7.63 on the Cifar dataset.

Live human emotion detection - *Master's Computer Vision Project*

- Developed a **real-time** application to **detect human emotions** from a computer's live camera feed. Using a Haar cascade algorithm for face detection and a deep model to classify detected faces.
- Evaluated the effectiveness of a **custom trained CNN**, pre-trained **VGG-16** and pre-trained a **Vision Transformer** in **TensorFlow** when classifying human emotions. The final application effectively operated at **15 fps**.

NVIDA FleX based Gymnasium extension- *Master's Research Project*

- Working as a research assistant in an open **research project** creating fluid based **OpenAI Gym** environments, powered by **NVIDIA FleX**'s comprehensive physics simulation.
- Personally focused on creating new **NVIDIA FleX** environments and exporting them to **OpenAI Gym** using **PyFleX,** single handedly working with the C++ original **NVIDIA FleX** to create a useable version in Python.

SKILLS

Languages: C++, Python, x86 Assembly, Bash, Go

Frameworks: Tensorflow, Pytorch, OpenCV, Pandas, Gymnasium, Django

Areas of interest: Deep learning, computer vision, networks, systems, machine learning

LANGUAGES

English: Native (all schooling completed in English)

Afrikaans: Basic

Mandarin: Basic