Benjamin Sanati

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EDUCATION

University of Southampton

Date of Completion: June 2023
Current Average: First (80% Average)

MEng Electronic Engineering with Artificial Intelligence
Impactful Modules: Foundations of ML, Advanced ML, Computational Finance
Differentiable Programming and Deep Learning, Data Mining
Advanced Computer Architecture, Optimisation, Numerical Methods

Hills Road Sixth Form College

Date of Completion: June 2019

A Levels: *Maths, Physics, Chemistry*

PROJECT EXPERIENCE

Masters Group Design Project

October 2022 - January 2023

University Project

GitHub: Currently a private repository, as requested by the industry client

- Worked on a collaborative project with 4 other members for an industry client
- Advised the team on the creation of a custom image dataset that was obtained at a train depot
- Trained state-of-the-art *object detector* (YOLOv7) and *image classification* (BEiT) models on the custom dataset
- Automated the creation of a damaged sign dataset for an image classification model
- Designed and implemented a custom *video object-tracking* algorithm
- Integrated the machine learning workflow with the server infrastructure to produce an efficient final system ready for testing
- Presented project to academic supervisors and other members of the cohort

Year 3 Individual Project

September 2021 - May 2022

University Project

GitHub: https://github.com/ben-sanati/P3-IP-Class-Granular-Classifications

- Investigated the accuracy-specificity trade-off of early-exiting *dynamic DNNs*
- Designed a novel CNN architecture that provides adaptable classifications in granularity during inference, which subsequently improved classification flexibility and hierarchical representation power at run-time
- Performed a thorough analysis of the model in comparison to other similar models and presented findings in a paper
- Presented the project findings to two academics in the project viva

Deep Learning Reproducibility Challenge

March 2023 - May 2023

University Coursework

GitHub: https://github.com/ben-sanati/Deep-Learning-Reproducibility

- Worked on a collaborative project with 2 other team members, conducting a reproducibility study on a paper titled 'Gradient Descent: The Ultimate Optimizer'
- Verified the claims made by Chandra et al. (2022) regarding the superiority of hyperoptimisers over standard implementations for various neural network models and optimiser functions
- Generated graphs illustrating the variation of hyperparameter values against epochs for three ResNet-20 models using different hyperparameter settings
- Extended the work from the paper, providing additional insights not mentioned in the original work
- Explored the impact of using higher-order hyperoptimizers, revealing diminishing returns in performance with increased stacking order
- Suggested future research directions, including investigating the effects of taller high-order hyperoptimizers on temporal and robustness aspects and developing improved methods for identifying specific functions
- Produced a reproducibility report detailing the implementation methodology and findings from the study

Computational Finance CW

March 2023 - May 2023

University Coursework

GitHub: https://github.com/ben-sanati/Computational-Finance-CW

- Worked on a collaborative project with 2 other team members, investigating three computational finance concepts: time series analysis, algorithmic trading, and portfolio optimization
- Implemented an ARIMA(2, 1, 1) model from scratch for forecasting and evaluated its performance using mean absolute percentage error (MAPE)
- Implemented and compared two pairs trading strategies using returns from the test set as a performance metric
- Derived an efficient portfolio from the efficient frontier through a grid search of weight combinations.
- Presented the implementation methodology and findings for each concept in the report

Forecasting the Performance of the Fashion Industry **March 2023 - May 2023**

University Coursework

GitHub: https://github.com/ben-sanati/COMP6237-Data-Mining-Project

- Worked on a collaborative project with 4 other team members, aiming to predict the performance of the luxury fashion sector in the UK
- Produced a custom dataset consisting of macroeconomic indicators and sentiment features used to forecast the PE of a UK luxury fashion index
- Performed dataset preprocessing by de-meaning and normalizing the data, checking for stationarity using the Augmented Dickey-Fuller (ADF) test, and applying transformations when necessary
- Conducted exploratory data analysis (EDA) to identify significant features by examining their correlation with the target variable
- Trained and tested a variety of time-series models on a custom dataset, including Last Observation Carried Forward (LOCF), Simple Moving Average (SMA), Exponential Moving Average (EMA), XGBoost, Monte Carlo Simulation, and Prophet
- Summarized the methodology, results, and analysis in the final report

AI Hackathon **March 2023**

Hosted by Cirium and BAE Systems

GitHub: https://github.com/ben-sanati/HackAI-23

- Participated with one teammate in Cirium's HackAI Challenge, aimed at forecasting a complex time series over a multi-period horizon
- Implemented a preprocessing pipeline consisting of embeddings, encodings, and feature engineering to understand and preprocess the datasets before training the model
- Developed a solution using LSTM models to capture the non-linear and non-stationary nature of the time series data
- Created a predictive model using XGBoost to estimate the average global stringency index for missing months in the validation and test datasets
- Presented our solution to a panel of judges, leading to the opportunity to do a summer internship at Cirium

UG Research Project Intern **June 2022 - September 2022**

University of Southampton

GitHub: https://github.com/ben-sanati/ViT-MOT

- Gained an extensive amount of experience using object detection models and the attention mechanism
- Created *Vision Transformer* (ViT) models using the *PyTorch* framework for the multiple object tracking task
- Fine-Tuned a pre-trained ViTDet object detection model on the MOT17 dataset
- Implemented an efficient video handling module with sparse temporal sampling
- Presented a summary of the project findings to both students and academics

AI Hackathon **February 2022**

Hosted by Cirium

GitHub: https://github.com/ben-sanati/HackAI-22

- Spearheaded a team of 3 members to create a solution that earned us a joint 3rd place finish
- Developed data analytical techniques to process data about organized events and online flight query volumes allowing us to determine and identify the events that lead to a spike in flight requirements
- Trained an autoencoder neural network to locate the anomalies in flight query volumes
- Presented our solution to a panel of judges, the majority of which were representatives from Cirium

Year 2 Design Project **February 2021 - April 2021**

University Project

GitHub: https://github.com/ben-sanati/Year-2-Group-Project

- Led a successful group project (9 members) that addressed the issues of employee mental and physical wellbeing during lockdown by encouraging physical activity during the remote working period
- Acted as a mediator, contingency planner, manager and organizer, promoting all team member's proactive collaboration to ensure a high standard of project completion
- Created a direct remote connection between all users and the website by setting up an MQTT communication server on AWS
- Integrated the server, website and embedded devices allowing data to be processed from the user and displayed on the website
- Presented our final solution as a team

ADDITIONAL INFORMATION

Skills: Python, C++, Linux, PyTorch, NumPy, SciPy, LaTeX, Slurm Workload Manager
Soft Skills: Teamworking, Creative Problem Solving, Project Management
GitHub: https://github.com/ben-sanati
LinkedIn: https://www.linkedin.com/in/benjamin-sanati/
Udacity Courses: Structuring ML Projects, NNs and DL, CNNs, Improving DNNs
Interests: Football, Basketball, Cinema, Pool, Reading
Referees:

- Academic - Professor Jonathon Hare 023 8059 7678 jsh2@ecs.soton.ac.uk
- Academic - Professor Geoff Merritt 023 8059 2775 gvm@ecs.soton.ac.uk
- Personal - Iain Monaghan 07808283335 iain.monaghan0@gmail.com