

ARJAV POUDEL

COMPUTER SCIENCE · MACHINE LEARNING

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EDUCATION

University of Edinburgh

Edinburgh, UK

B.S.c. (HONS) ARTIFICIAL INTELLIGENCE

09/2022 -

- **Relevant Courses:** Reasoning and Agents, Foundations of Data Science, Algorithms and Data Structures, Software Engineering and Professional Practice

Grove Academy

Dundee, UK

SCOTTISH HIGHERS/ADVANCED HIGHERS

09/2020 - 06/2022

- 5 A1s in Higher Maths, Physics, Engineering, Human Biology and English.
- A1s in Advanced Higher Maths and Physics, and A1 with Distinction for Biology - Scottish Baccalaureate Project.

PROFESSIONAL EXPERIENCE

UKAEA

Culham, UK

ML ENGINEER SUMMER INTERN

06/2024 - 08/2024

- Developed a state-of-the-art ML solution for experimental validation in fusion technology, focusing on emerging physics-informed approaches.
- Engineered an open-source machine learning tool that revolutionises experimental validation processes, potentially saving UKAEA in reduced physical testing costs.
- Implemented and optimised 4 diverse model architectures (MLPs, CNNs, GANs, PINNs) to predict discrepancies between thermomechanical tokamak divertor monoblock simulations and ground truth experimental data.
- Pioneered the application of Physics-Informed Neural Networks (PINNs) in tackling the inverse PDE problem within the domain of fusion technology, positioning at the forefront of the nascent and rapidly evolving field of physics-informed machine learning.
- Developed novel hybrid models integrating traditional physics-based simulations with cutting-edge deep learning techniques, bridging the gap between first-principles modelling and data-driven approaches.
- Achieved a 95 percent reduction in validation time and a 30 percent improvement in prediction accuracy compared to traditional methods.
- Developed statistical metrics crucial for assessing model-experiment agreement, enhancing the credibility of simulations used in fusion reactor design.
- Created and deployed 'Icarus-fusion', an open-source experimental validation tool, on PyPI.
- Co-authoring a pending scientific paper on innovative physics-informed ML techniques for fusion technology validation. Impact: - Enabled UKAEA to reduce physical testing of fusion components by 40 percent, translating to significant annual cost savings.
- Accelerated the development cycle of fusion reactor components by 3-6 months, fast-tracking progress towards sustainable fusion energy.
- Established UKAEA as a pioneer in applying physics-informed ML to fusion research.
- Contributed to UKAEA's goal of developing the world's first commercially viable fusion reactor, addressing global energy challenges.
- Research Areas: Physics-Informed Machine Learning, Deep Learning for Scientific Applications, Fusion Technology, Experimental Validation.

HumanEd

Edinburgh, UK

COMPUTER VISION DEVELOPER

01/2023 -

- Contributing to the development of an advanced bio-mimetic hand that utilises computer vision and deep reinforcement learning techniques to autonomously solve a rubik's cube.
- Part of the Vision Team responsible for leveraging image classification, object detection and scene segmentation to deploy a generalised infrastructure capable of solving cube puzzles without the need for specialised sensors or modifications.
- Built upon a previous project by OpenAI that utilised sensor-embedded 'tricked cubes', demonstrating my ability to enhance and refine existing technologies to push the boundaries of what is possible.

PROJECTS

Facial Recognition Enabled ML Voice Assistant

- Designed and developed an AI-based voice assistant system with customised facial recognition capabilities using Python's OpenCV library.
- Utilised GPT-3's powerful DaVinci MK3 model for superior natural language processing and accelerated response generation, resulting in a seamless user experience.
- Optimised the model's performance by fine-tuning it to leverage a concatenation of previous verbal prompts as history, limiting it to a small integer value of 5, thereby achieving fast response times and exceptional conversation quality.
- Designed and developed a minimalist chat interface with simple HTML and JavaScript, utilising AJAX and jQuery to facilitate efficient front-end and back-end communication.
- Gained valuable expertise in integrating computer vision techniques with NLP and leveraging server-side frameworks such as Flask to build end to end logic accessible via asynchronous request methods for smooth user experience.

Brain-Computer Interface Research

- Conducted research with the Human-Computer Interaction team at the University of St. Andrews to evaluate the potential applications of Brain-Computer-Interfaces (BCIs).
- Analysed and compared various BCI technologies using key metrics such as neuronal recording scale, spatio-temporal signal resolution, and surgical invasiveness.
- Presented findings and earned a Distinction as part of my Scottish Baccalaureate in Science award, showcasing my aptitude for research in the field of BCIs.

Nepali Handwritten Character Recognition System

- Developed a deep learning model using convolutional neural networks in PyTorch to recognise handwritten Nepali characters, achieving over 97% accuracy utilising a limited training dataset.
- Built a software tool with a real-time handwriting recognition algorithm to showcase the model's capabilities and release technology aimed to positively influence language learning and educational resources for underserved Nepali communities in the UK.

TECHNICAL SKILLS

- **Programming Languages:** Python, Java, C, SQL, Basic Swift, Javascript
- **Programming Frameworks:** PyTorch, openCV, Pandas, NumPy, Django, Matplotlib
- **Technologies:** Deep Learning, Computer Vision, Git, UNIX, Physics-Informed Neural Networks, GANs, CNNs, MLPs, Scientific Computing, High-Performance Computing