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WORK EXPERIENCE

MOLDEX3D – CORETECH SYSTEM CO., LTD. HEADQUARTERS

Software R&D Intern

Hsinchu, Taiwan
Sep 2023 ~ Jan 2024

- Integrating Neural Operator into Moldex3D API, allowing clients to simulate thermal analysis with pre-trained PINN and FNO models under various boundary/initial conditions and materials for molding.

RESEARCH EXPERIENCE

SPACE ENVIRONMENT LABORATORY – NATIONAL CENTRAL UNIVERSITY

Undergraduate Research Assistant (Supervisor: Prof. Jih-Hong Shue)

Taoyuan, Taiwan
Sep 2021 ~ Jun 2023

- Focused on physics models in space, machine learning, and their combination
- Project: Regression-based Physics Informed Neural Networks for Magnetopause Tracking*
- Project: Comparing Kalman Filter with Recurrent-based machine learning on Satellite Attitude Determination*
- Project: Automatic Emergency Dust-Free solution on-board International Space Station with Bi-GRU*

NATIONAL CENTER FOR HIGH-PERFORMANCE COMPUTING, NCHC

Deep Learning Research Intern (AI/Modulus [NVIDIA – SimNet]) (Supervisor: Dr. Chun-Yu Lin)

Hsinchu, Taiwan
Jul 2022 ~ Aug 2022

- Focused on Physics Informed Neural Networks including DeepONet and Fourier Neural Operator with their applications for Computational Fluid Dynamics.
- Examining zero-shot generalization on 1D Advection Equation via PINNs
- Project: Implementing Fourier Neural Operator (FNO) for Image Classification via TensorFlow*

EDUCATION

IMPERIAL COLLEGE LONDON

Master of Science in Applied Computational Science and Engineering (*In Progress*)

London, UK
Sep 2024 ~ Present

- Relevant Coursework: Advanced Programming, Inversion & Optimization, Parallel Programming
- Research Interests: Numerical Methods, Algorithm Design, Scientific Machine Learning, Parallel Computing

NATIONAL CENTRAL UNIVERSITY

Bachelor of Science in Space Science and Engineering

Taoyuan, Taiwan
Sep 2020 ~ Jan 2024

- Credit Program: Artificial Intelligence
- Relevant Coursework: Applied Mathematics, Mechanics, Plasma Physics, Electrodynamics, Mathematical Modelling
- Cumulative GPA: 4.01 / 4.3 (Top 5% in the class)

STANFORD UNIVERSITY

Undergrad Summer Session

California, USA
Jun 2023 ~ Aug 2023

- Relevant Coursework: Stochastic Process, High Performance Computing, Data Mining & Analysis
- Cumulative GPA: 3.70 / 4.3

SKILLS

Scientific Machine Learning, PDEs, Numerical Simulation, Remote Sensing Analysis, Computer Vision, Parallel Computing, Azure, TWCC, Nvidia-Modulus, TensorFlow, PyTorch, SciPy, NumPy, Simulink, Slurm, MPI, HuggingFace, Git/Github, Python, C++, MATLAB, Julia

PUBLICATIONS

- Hou, P.-H.**, Lin, W.-C., Hou, H.-C., Huang, Y.-H., Shue, J.-H. (2022) *Automatic Emergency Dust-Free solution on-board International Space Station with Bi-GRU (AED-ISS)*, *arXiv:2210.08549*. Available at: <https://doi.org/10.48550/arXiv.2210.08549>.
- Chou, H.-H., Chiang, W.-J., Kuo, C.-W., Lung, C., **Hou, P.-H.**, Wang, E.-J., Chen, Y.-T., Zhao, Y.-X., Kuo, J.-S (2021) *Utilizing Pop-Up Platform on the CubeSat to Achieve Commercial Activities in the Universe (UCCU)*, *International Conference on Astronautics and Space Exploration (iCASE)*.

AWARDS & RECOGNITION

Dean's Award of College of Earth Science (Valedictorian) – National Central University 2024

- Academic performance in the top 5%, recommended for selection by the department's curriculum committee.

Level 2 of the Asia AI Odyssey Challenge – Microsoft 2024

- The competition requires the top 1000 challengers to complete tasks in deploying cloud services for intelligent document processing (OCR) and language model deployment using Microsoft Azure.

Honor for Academic Excellence – National Central University 2023

- Placed in the top 1% of the department for the semester. (2023 Spring Term)

Future Star Awards – The Space Science Society of the Republic of China 2023

- Introduced the Regression-based Physics Informed Neural Network architecture, which ranked among the top five out of 54 posters presented at The Space Science Society of the Republic of China technology exhibition.

TensorFlow Developer Certificate – Google TensorFlow 2023

- This certification requires candidates to complete tasks in Computer Vision, Natural Language Processing, and Data Augmentation using TensorFlow during a five-hour examination. (Obtained by 50 individuals in Taiwan and approximately 4900 individuals worldwide)

Disaster Risk Monitoring Using Satellite Imagery Certification – United Nations Satellite Centre 2023

- This certification requires completing tasks within 8 hours, including data retrieval from the UNOSAT satellite image database, performing digital image pre-processing and pipelining, and training a high accuracy, near real-time flood prediction model with TensorRT.

Best Technical Awards – AI Space Challenge, ASEAN 2022

- Proposed a particulate matter sensor integrating atmospheric physics parameters and geomagnetic sensing on the International Space Station with Bi-GRU, which was specially awarded by Geo-Insight, for demonstrating the best design and technology among all participating teams (a total of 34 teams) from ASEAN countries.

EXTRACURRICULARS & LEADERSHIP EXPERIENCE

Member - Taiwanese Society for Computational Neurosciences, TSCN Aug 2022 ~ Present

- Participate in both in-person and online symposiums and workshops, sharing personal experiences and integrating concepts from cognitive neuroscience.

Student Representative - Department of Space Science and Engineering Sep 2022 ~ Jun 2023

- Held a Learning Effectiveness Committee meeting to collect student feedback and engage in discussions with relevant faculty and staff members, further strengthening the bond between learners and instructors.
- Organized various events as the designated events holder for the department, including the Learning Effectiveness Committee, Yuri's Night, and parties, among others.

Team Leader – AI Space Challenge, The Association of Southeast Asian Nations (ASEAN) Dec 2021 ~ Jun 2022

- As representatives of Taiwan, we proposed an integrated particle warning system that combines a multivariate physics model with an edge computing system on the International Space Station.
- Made scheduling decisions and acted as a bridge between the supervising professor and the organizing committee.
- Collaborated with Taipei-Tech to jointly develop an end-to-end particle warning system.

SIDE PROJECTS

Numerical Methods and Physics Informed Neural Networks in Advection Function

- Demonstrated that Physics-Informed Neural Networks (PINNs) have a relatively lower likelihood of dissipation occurrence during long-term evolution compared to traditional numerical solution methods such as the Finite Difference Method and Finite Volume Method. (Source: <https://github.com/KozakHou/Python-Tensorflow-DeepXDE/tree/main>)

High Performance Computing with NVIDIA-RAPIDS

- Conducted benchmarks on data manipulation from the geostationary satellite, HIMAWARI-8, using CPU nodes (Intel - Xeon W-2123) and multi-GPUs (NVIDIA - A100 * 2 / NVIDIA - RTX5000).
- Employed RAPIDS to replace Scikit-Learn and trained the MNIST dataset using SVM on a GPU (NVIDIA - RTX5000), resulting in a significantly reduced training time of only 17 seconds. (Source: <https://github.com/KozakHou/cuDF-and-cuML>)

Benchmarks on ImageNet and MNIST with self-constructed Neural Networks

- Investigated the mechanism of the Fourier Neural Operator and implemented it independently using TensorFlow.
- Benchmarks on the standard MNIST image classification problem showed that it outperformed FCN, CNN, and ResNet in terms of accuracy, albeit at the cost of longer training and inferencing times. (Source: <https://github.com/KozakHou/Image-Classification>)