KAUSHALYA MADHAWA

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PROFILE

A machine learning engineer with over seven years of experience in research and development of **deep neural networks (DNN)**-based machine learning solutions for **medical imaging**, **drug discovery**, **industrial computer vision applications**, and **graph-structured data**. Proficient in developing AI applications within the Python ecosystem (using PyTorch, JAX, Numpy, PolaRS, FastAPI etc.) and directly develpoping for Nvidia GPUS with CUDA C.

WORK EXPERIENCE

Precision Health Group, The University of Tokyo March 2023 - Present
Researcher (AI Scientist) *Tokyo, Japan*

- Conduct research in the field of precision health with a focus on discovering novel bio-markers using wearable device data and multi-omics data.
- Develop AI models to quantify personalized sleep quality, activity levels, and personalized recommendations for improving sleep and general healthiness of individuals.
- Develop AI models for predicting protein function using large language models.
- Closely collaborate with pharmaceutical companies, medical doctors, and app developers.

Skills: PyTorch, Pandas, PolaRS, Scikit-learn, AWS, ML-Ops, Docker, Git, SQL

Lily MedTech Inc. October 2020 - January 2023
Research Engineer *Tokyo, Japan*

- Designed and trained tumor detection models to detect tumors in ultrasound images obtained by a proprietary device (Ring Echo).
- Introduced novel image augmentation techniques that improve the predictive performance of the models.
- Developed algorithms to improve the reliability and consistency of predictions with less labeled data.
- Introduced and set up the ML-Ops system to ease the collaboration among team members.

Skills: PyTorch, Scikit-learn, Computer Vision, AWS, ML-Ops, Docker, Git, CI/CD, Azure Pipelines

AI Consultant (Part-time) May 2021-December 2021
OREL IT *Remote*

- Provided guidance to the AI team in developing and deploying computer vision models for product identification and localization on supermarket shelves, contributing to enhanced accuracy and reduced memory consumption of both object detection and image classification models.

Skills: PyTorch, Object Detection, Image Classification, AWS

Tokyo Institute of Technology January 2017 - January 2021
Research Assistant *Tokyo, Japan*

- Member of CREST Deep project, funded by Japan Science and Technology Agency (JST).
- Performed research on the robustness of compressed deep neural networks.
- Conducted research on how compression of DNN models impacts robustness to adversarial attacks on computer vision tasks.

Skills: Python, Caffe, CUDA, PyTorch, Git

Preferred Networks Inc. August 2018 - March 2019
Research Intern *Tokyo, Japan*

- Proposed and implemented GraphNVP, the first normalizing flow-based deep generative model for creating novel molecular graphs.
- Applied for a patent (patent ID: US20220044121A1).
- Released the code under MIT license: `https://github.com/pfnet-research/graph-nvp`.

Skills: Python, Chainer, ChainerMN, Git

LIRNEasia April 2014 - March 2016
Researcher *Colombo, Sri Lanka*

- Analyzed the movement of millions of people using a large dataset of anonymized call detail records (CDR) obtained from multiple mobile carriers in Sri Lanka.

Skills: R, Python, D3.js, Apache Hadoop, Apache Pig, Apache Giraph, Git

Codegen International December 2011 - March 2014
Senior Software Engineer *Colombo, Sri Lanka*

- Fixed production issues of TravelBox, a travel reservation engine used by large travel companies.
- Actively participated in the complete development cycle from understanding client requirements to implementing and delivering solutions on time within an agile environment.

Skills: Java, Webservices, SOA, Oracle DB, Postgres-SQL, GWT, Jenkins, Sonar, SVN, Scrum

Excel Technology Lanka Ltd. February 2010 - July 2010
Software Engineering Intern *Colombo, Sri Lanka*

- Implemented a laser path optimization algorithm for XLCAD, an application used for designing and making industrial laser engravings.

Skills: C#.NET

EDUCATION

Tokyo Institute of Technology *2016 - 2021*
PhD in Computer Science *Tokyo, Japan*
Graduate Major: Artificial Intelligence
Advisor: Prof. Tsuyoshi Murata
Thesis: Active Learning for Graph-structured Data

University of Colombo - School of Computing *2013 - 2015*
Master of Computer Science *Colombo, Sri Lanka*
Thesis: Machine Learning for Determining the Newsworthiness of Microblogs

University of Moratuwa *2007 - 2011*
BSc (Hons.) in Computer Science and Engineering *Moratuwa, Sri Lanka*
Research Project: Implementation of a Machine Learning Library for GPU clusters in CUDA and MPI.

SELECTED PUBLICATIONS [Google scholar]

- **Kaushalya Madhawa**, Yuu Jinnai, Masato Suzuki, Takashi Azuma, Sadako Akashi-Tanaka, and Takako Doi: "Deep learning-based model for tumor detection in ultrasound computed tomography.", *Computer Assisted Radiology and Surgery (CARS)*, Tokyo, Japan, 2022
- **Kaushalya Madhawa** and Tsuyoshi Murata: "MetAL: Active Semi-Supervised Learning on Graphs via Meta-Learning.", *Asian Conference on Machine Learning (ACML)*, 2020
- **Kaushalya Madhawa** and Tsuyoshi Murata: "Active Learning for Node Classification: An Evaluation.", *Entropy*, 2020
- **Kaushalya Madhawa**, Katushiko Ishiguro, Kosuke Nakago, and Motoki Abe: "GraphNVP: An Invertible Flow Model for Generating Molecular Graphs.", *Arxiv preprint*, 2019
- A. W. Wijayanto*, J. J. Choong*, **Kaushalya Madhawa*** and T. Murata: "Robustness of Compressed Convolutional Neural Networks.", *2019 IEEE International Conference on Big Data (Big Data)*, Seattle, USA, 2018
- **Kaushalya Madhawa** and Tsuyoshi Murata: "A multi-armed bandit approach for exploring partially observed networks.", *Applied Network Science*, 2019

OTHER MACHINE LEARNING PROJECTS

Antibody-antigen binding affinity prediction using Deep Learning January 2023 - Present
Machine Learning Advisor *University of Moratuwa*

· Advise on molecule representation and geometric deep learning methods for learning from antibody and antigen molecules.

MedCLIP - A pre-trained CLIP model for medical image retrieval July 2021 - Present

· Created a semantic search engine for searching medical images using a multi-modal CLIP model as a participant of the JAX/FLAX community week organized by Hugging Face.
Code: https://github.com/Kaushalya/medclip

AWARDS AND HONORS

- Japanese Government Scholarship (MEXT) for doctoral studies, 2016-2019.
- Bronze medal, Sri Lankan Physics Olympiad 2006.
- Advanced Level (Physical Sciences), National rank: 28 (out of $\sim 35,000$).

COMMUNITY WORK

- Academic reviewer of ICDM (2017, 2018, 2019), CIKM 2019, AAAI 2020, IROS 2021.
- Co-organizer of Colombo Machine Intelligence Meetup since 2015.
- Community teaching assistant of "Heterogeneous Parallel Programming" course on Coursera, 2013.
- Project Manager of SL2College, an educational non-profit organization in Sri Lanka 2013-2016.

TECHNICAL SKILLS

Programming languages	Python, Java, C, C++, R, CUDA
Machine learning frameworks	PyTorch, TensorFlow, Scikit-learn, JAX, WandB
Technologies	AWS, Docker, Apache Hadoop, Apache Pig, SQL
Software Engineering	CI/CD, ML-Ops, Scrum, Git, SVN

Date: 02nd December 2023