Siyi Du

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EDUCATION

M.A.Sc. in Electrical & Computer Engineering 2021.9-Present

University of British Columbia (UBC), Vancouver, BC, Canada

- Average Grade: 94% Supervisor: Dr. Rafeef Garbi
- Research Assistant in the Biomedical Signal and Image Computing Laboratory (BiSICL)

B.Eng in Automation (Pattern Recognition Direction) 2017.9-2021.7

Beihang University, Beijing, China

- GPA: 3.83/4.0 (Ranking: Top 5), GRE: 327+3.5
- Undergraduate Research Intern in the Intelligent Computing & Machine Learning Laboratory (ICMLL)

PUBLICATION

- **Du, S.** and Hers, B. and Bayasi, N. and Hamarneh, G. and Garbi, R., FairDisCo: Fairer AI in Dermatology via Disentanglement Contrastive Learning. *European Conference on Computer Vision (ECCV 2022) Workshops (Seventh ISIC Skin Image Analysis Workshop)*, **Accepted**
- Jiang, X. and **Du, S.** and Qin, Z. and Sun, Y. and Yu, J., KBGN: Knowledge-Bridge Graph Network for Adaptive Vision-Text Reasoning in Visual Dialogue, *The 28th Association for Computing Machinery International Conference on Multimedia (ACM MM2020)*, **Published**

RESEARCH EXPERIENCE

Transformer-based Multi-domain Learning for Skin Lesion Segmentation 2022.8-Present

BiSICL, UBC Supervisor: Prof. Rafeef Garbi

- Propose a multi-domain learning strategy that aggregates knowledge from multiple skin lesion segmentation datasets to alleviate the insufficiency of single-domain samples for training a data-hungry transformer
- Design a domain-guidance self-attention mechanism to adapt the model to different datasets

Deep Learning Fairness in Skin Lesion Classification 2021.1-2022.8

BiSICL, UBC Supervisor: Prof. Rafeef Garbi

- Was one of the first to investigate ethic disparity and various fairness algorithms in skin lesion classification task
- Proposed a disentanglement network with contrastive learning to mitigate skin-tone unfairness and avoid accuracy deterioration, achieving the best performance on the Fitzpatrick17k and DDI datasets (Increased average accuracy and fairness score by up to 5.96% and 15.22% compared with the baseline)
- Investigated common pre-processing and in-processing strategies and adapted two fairness metrics to better compare models, showing the existence of skin-tone unfairness
- Accepted as an oral paper in *ECCV ISIC Workshop 2022*

Multi-modal Visual Dialogue Based on Deep Learning 2020.4-2021.5

ICMLL, Beihang University Supervisor: Prof. Zengchang Qin

- Proposed a novel model using graph neural network (GNN) to bridge the cross-modal gap and was the first to apply graph structure to capture implicit dependence between two modalities in fine granularity
- Developed a more flexible information selection mode to adaptively retrieve information from vision and text knowledge, and utilized discriminative and generative decoders to generate the answer in the visual dialogue
- Implemented models on VisDial v1.0 and VisDial-Q datasets and achieved state-of-the-art results (outperformed previous SOTA model by 0.62% on R@1)
- Accepted as an oral paper in *ACM MM 2020*

Data Bias in Visual Dialogue Task 2020.10-2021.6

ICMLL, Beihang University Supervisor: Prof. Zengchang Qin

- Introduced a language branch and cost sensitive-loss into a data bias mitigating model based on Transformer to encourage predictive answers using vision and language modalities together
- Achieved the best results on VisDialConv and a self-designed data bias mitigating test set from VisDial v1.0
- Combined experiments and results as a bachelor thesis

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INTERNSHIP

Adaptation of Robot to New Environment Based on Self-Supervised Learning 2020.3-2020.10

Summer Research Intern, Cognitive Robotics and AI Lab, Kent State university Supervisor: Prof. Rui Liu

- Designed a novel encoder based on self-supervised learning to capture the high dimensional representation of objects' features related to similar physics laws in both old and new environments.
- Devised a policy decision module to generate action sequences based on representations extracted by the encoder

COURSE PORJECT

3D Ultrasound Segmentation using Transformer 2022.1-2022.4

UBC Supervisor: Prof. Renjie Liao

- Combined CNN and Transformer to create a hybrid model with axial attention to speed up computations
- Outperformed previous SOTA methods by 1.3% in the 3D DDH (Development dysplasia of the hip) dataset

Skin Lesion Semantic Segmentation based on Transformer 2022.1-2022.4

UBC Supervisor: Prof. Helge Rhodin

- Developed a hybrid framework combining ResUnet and Transformer and utilized the prior boundary information to assist the model to distinguish ambiguous boundaries.
- Outperformed Unet by 2% on IOU in the ISIC 2018 dataset and achieved better generalizability than the baseline

EEG Motor Imagery Task in Brain-Computer Interfaces Based on Machine Learning 2020.2-2020.6

Beihang University Supervisor: Prof. Yuzhu Guo

- Employed Independent Component Analysis (ICA) algorithm and Finite Impulse Response (FIR) digital filter to preprocess the raw data, removing signal wave and extracting features from time and frequency domain
- Proposed a classifier based on CNN to distinguish the data, achieving 94% accuracy (exceeded other machine learning algorithms with feature extraction by more than 25% on accuracy) and ranking 3/73

Development of the AI Tower Defense Game Based on Machine Learning 2019.7-2019.10

Beihang University Supervisor: Prof. Richard Xu

- Introduced an AI game player based on reinforcement learning -- Deep Q Network (DQN) that could compute records and punishments every round and choose a series of actions for a tower defense game
- Leveraged the trained AI player to compete with others' on the website, achieving rank 4/207 (Elo ranking)

COMPETITION

Meritorious Winner, 2020 Mathematical Contest in Modeling in USA Beijing, China

Design of the Longest Lasting Sandcastle Model Based on Cellular Automata (CA) 2020.3

- Wielded MATLAB to build a mathematical model of a wet sand pile with liquid bridge force between each sand
- Improved the traditional Cellular Automata algorithm via adding probability to simulate the process of sand loss
- Utilized correlation analysis and linear regression to find the superior shape of the sandcastle

OTHER INFORMATION

Honors:

- The Research Assistant Scholarship in UBC, CAD 42,000 2021-2023
- The International Tuition Awards in UBC, CAD 6,400 2021-2022
- The 1st Prize of National Mathematics Competition for College Students 2018.10
- The National Encouragement Scholarship in China, RMB 15,000 2018-2020
- The Prize of Outstanding Student in Beihang University 2018-2019

Activities:

- Teaching Assistant, Medical Imaging, UBC 2022.9-Present
- Teaching Assistant, Engineering Graphics, Beihang University 2018.9-2019.7

Computer Skills: Python, C, MATLAB, Verilog HDL, AutoCAD, Assembly Language, SolidWorks