Run Wang

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EDUCATION

Fudan University, Shanghai   *Sep.2018 - Present*

Bachelor of electrical engineering (Honours) and biomedical engineering

GPA: 3.81/4.00   **Ranking:** 2nd/204 in Department, 1st in Major

Course Highlights: Mathematical Analysis(A), Pattern Recognition and Machine Learning(A), Probability, Mathematical Statistics and Stochastic Processes(A), Data Structures and Algorithm Design(A), Signals and Systems(A), Information Theory(A-), Principles of Automatic Control(A), Communication Theory(A)

DUKE-NUS Medical School, Singapore *Visiting Student*   *Jun.2019 - Jul.2019*

Computational Neuroscience Summer School, Neuromatch *Summer School Student*   *Jul. 2020 - Aug. 2020*

PUBLICATION

Run Wang, Xiaotian Zhou and Zhongzhi Zhang. Maximizing the Smallest Eigenvalue of Grounded Laplacian Matrixes by Node Selection, *IEEE Transactions on Cybernetics_Under Review_* **[Paper]**

Run Wang, Ke Xu, Hui Feng and Wei Chen. Hybrid RNN-ANN Based Deep Physiological Network for Pain Recognition, *IEEE EMBC 2020* **[Paper]**

HONORS, GRANTS AND AWARDS

Junzheng Undergrad Research Grant, Nobel Prize winner Tsung-Dao Lee Top 0.1%   *2021*

Qingyun Undergrad Research Grant, Fudan Top 0.1% of all candidates   *2019/2020/2021*

KLA Scholarship, Fudan Four academically outstanding STEM undergraduates   *2020*

GaoShan Scholarship, Fudan Top 5% of all candidates   *2019*

Tengfei Undergrad Research Grant, Fudan Awarded to 10 undergraduates per year   *2019*

RESEARCH EXPERIENCE

1. Clifford Lab, GeorgiaTech   *May.2021 - Present*

Advisor: *Gari Clifford, Professor at the Biomedical Engineering Department, GeorgiaTech*

Topic: An Interpretable Framework for Pain Evaluation [Poster]

Description: Quantitative assessment of pain is vital for non-verbal patients. However, previous approaches based on black-box models are too elusive to trust. An interpretable framework that can figure out when and which went wrong is of significance. Besides, provide interpreter scores to human can help them make better decisions.

- ▶ Proposed an exploratory pipeline for interpretable ML application in pain evaluation scenario: Utilized interpretable ML methods to study scientific principles for physiological signals; Initiated a human-centered computing design with interpreters' score to improve human pain-classification capability
- ▶ Exhausted extant interpretable ML techniques to investigate what temporal or frequency features of the physiological signal the network learns
- ▶ Designed a human-centered computing system with video signals' interpreter score; Conducted large-scale experiments at Amazon MTurk to justify its effectiveness

2. Intelligent Complex Systems Lab, Fudan University *Sep. 2020 - May.2021*

Advisor: *Zhongzhi Zhang, Professor at the Computer Science Department, Fudan University*

Topic: Maximizing the Smallest Eigenvalue of Grounded Laplacian Matrix by node removel [Paper]

Description: For a connected graph, the grounded Laplacian matrix is a principal submatrix of its Laplacian matrix. The smallest eigenvalue of the grounded Laplacian matrix plays a pivotal role in various dynamics models. This work focuses on the problem of optimally selecting a fixed number of node subset, in order to maximize the smallest eigenvalue of the grounded Laplacian matrix. The proposed heuristic algorithm exhibited far better effectiveness than the state-of-art and enjoys nearly-linear time complexity.

- ▶ Proved that this combinatorial optimization problem is NP-hard and that the optimization function is not submodular, which implied the extreme difficulty
- ▶ Proposed nearly-linear time heuristic algorithm and proved the approximation via matrix perturbation theory and matrix derivative theory
- ▶ Evaluated the algorithm's effectiveness and efficiency on diverse large-scale real-world graphs

3. Department of Computer Science, Fudan University *Apr. 2020 - Jul. 2020*

Advisor: *Xipeng Qiu, Professor at the Computer Science Department, Fudan University*

Topic: MIT AI-Cures Open Task: Covid-19 Drug Discovery [Report]

Description: This work is to investigate effective antibiotics for COVID-19 by harnessing graph neural network and recurrent neural network based methods.

- ▶ Proposed a refined GCN which leveraged molecular descriptors and developed multiple classification models based on Mol2vec and other molecular fingerprints
- ▶ Achieved an 88% AUC-ROC score for predicting compounds property by its molecular structure, which was no less than the state of the art

4. Center for Intelligent Medical Electronics, Fudan University *Jun. 2019 - Feb.2020*

Advisor: *Wei Chen, Professor at the Information Science and Engineering Department, Fudan University*

Topic: System for Pain Detection in Nonverbal Patients [Paper]

Description: Quantitative assessment of pain is vital in evaluating treatment and ensuring distress relief for patients. However, previous approaches based on self-report fail to provide objective and accurate assessments.

- ▶ Proposed this pain research project to solve a real clinical problem in hospice care center
- ▶ Used a hybrid RNN-ANN method to classify pain levels on the Biovid Heat database and EmoPain database
- ▶ Achieved the state-of-art in terms of accuracy and clinical convenience

EXTRACURRICULAR

Hospice Volunteer Leader, Shanghai Jin'an Community Hospital [Link] *Sep. 2018 - Sep. 2019*

- ▶ Organized the rotation and training of 30 volunteers for a year; Managed multiple festival celebrations and religious community activities
- ▶ Cooperated with doctors, nurses to take note of every patient's mental health status
- ▶ Managed the hospice's website and publish regular articles with editors and photographers

"Youhunter" NGO Founder [Link] *Aiming against Information Cocoons and Censorship* *May. 2021 - Present*

Writer, sspai Tech Review Website *Oct. 2018 - Present*

SKILLS

Programming Languages	C, C++, Python, Julia, MATLAB, HTML/CSS/JS, Arduino
English Test	TOEFL 101 (Reading: 27, Listening: 27, Speaking: 23, Writing: 24)