

# ZIHENG DUAN

College of Control Science and Engineering, Zhejiang University, Hangzhou  
(+86) 18072703152; (+1) 6172302786  
[duanziheng1206@gmail.com](mailto:duanziheng1206@gmail.com) | <https://rrrussell.github.io>

## EDUCATION

### Zhejiang University

B.E. in Control Science and Engineering

Hangzhou, China

Sep 2016 – Jun 2020

- GPA: 3.74/4.00 (top 15%); admitted on basis of performance on national college admissions exam (top 0.1%)
- Minor: Computer Science and Engineering, Chu-Kochen Honors College
- Selected award: Research and Innovation Scholarship (Ranking of research and innovation: 5/77)

## PUBLICATIONS

1. **Ziheng Duan\***, Haoyan Xu\*, Jie Feng\*, Runjian Chen, Yida Huang, Yueyang Wang, “Graph Partitioning and Graph Neural Network based Hierarchical Graph Matching for Graph Similarity Computation,” In submission, CIKM-2020.
2. Boxing Wang, Chunlin Zhou, **Ziheng Duan**, Qichao Zhu, Jun Wu, Rong Xiong, “Untethered Quadrupedal Hopping and Bounding on a Trampoline,” Published 2019-10-24, *Frontiers of Mechanical Engineering*.
3. Yueyang Wang, **Ziheng Duan**, Binbing Liao, Fei Wu, Yuetong Zhuang, “Heterogeneous Attributed Network Embedding with Graph Convolutional Networks,” Published 2019-07-17, *AAAI-2019*.

## PAPER IN PROGRESS

1. **Ziheng Duan\***, Haoyan Xu\*, Yida Huang\*, Jie Feng, Pengyu Song, “Multivariate Time Series Forecasting Based on Causal Inference with Transfer Entropy and Graph Neural Network,” In progress.
2. Haoyan Xu, Runjian Chen, Yunsheng Bai, Jie Feng, **Ziheng Duan**, Ke Luo, Yizhou Sun, Wei Wang, “Hierarchical and Fast Graph Similarity Computation via Graph Coarsening and Deep Graph Learning,” In progress.
3. **Ziheng Duan**, Daniel Montes, Yangsibo Huang, Dufan Wu, Javier M. Romero, Ramon Gilberto Gonzalez, Quanzheng Li, “Deep Learning-Based Detection and Localization of Cerebral Aneurysms in Computed Tomography Angiography,” In progress.

## RESEARCH EXPERIENCE

### Harvard Medical School

Boston, MA

Research Assistant to Prof. [Quanzheng Li](#)

Aug 2019 – May 2020

### Deep Learning for Medical Image Analysis

- Proposed an automatic cerebral aneurysm diagnosis system, *DeepBrain*, based on deep learning.
- Used a 3D Faster R-CNN and a U-netlike encoder-decoder structure to detect a candidate’s aneurysm.
- Designed a multi-scale 3D CNN to reduce false positives from 2 per scan to 0.1.

### Robotics Laboratory, Zhejiang University

Hangzhou, China

Research Assistant to Prof. [Rong Xiong](#), Head of the Robotics Laboratory

Oct 2018 – July 2019

### Trampoline Jumping of Quadruped Robot

- Used a robot without elastic components jumping on a trampoline to solve the control problem. This required appropriate elastic components and elaborate control algorithms.
- Designed a control algorithm to balance the contact force of feet and avoid oscillation during jumping.
- Adjusted the time delay and models of leg stretching to control the jump height effectively.
- Designed different motion control algorithms to make the robot perform translational and rotational movement while hopping or bounding on the trampoline.

### Artificial Intelligence Laboratory, Zhejiang University

Hangzhou, China

Research Assistant to Prof. [Fei Wu](#), the Vice-Dean of College of Computer Science

June 2018 – Sept 2018

### Deep Learning for Graph Convolutional Network

- Designed a new network embedding method based on the graph convolution network, *HANE*, which uses network heterogeneity and node attributes to generate high quality embedding.
- Used a node aggregation method for heterogeneous networks, which enables nodes to keep their own characteristics while collecting information of neighboring nodes. Compared with GraphSAGE, this method achieves 1 ~ 4 percent point gain in terms of Macro-F1 and 1 ~ 2 percent point gain in terms of Micro-F1.
- Designed an attention mechanism on graph convolutional networks to leverage not only heterogeneity, but also the node attributes. Compared with GraphSAGE, this mechanism achieves 4 ~ 6 percent point gain in terms of Macro-F1 and 3 ~ 5 percent point gain in terms of Micro-F1.

**Power Measurement and Automatic Return of Unmanned Aerial Vehicle (UAV)**

- Proposed a general high precision electric quantity detection system based on the Kalman Filter method.
- Designed an innovative way to combine the extended Kalman Filter method and the Particle Filter method to fit the soc-ocv curve.
- Designed the dynamic gain in the EKF algorithm and it can now raise measurement accuracy.
- The algorithm compiled in this project has strong portability. By only adding current and voltage measurement modules we can improve the battery power measurement accuracy and anti-noise interference ability.

**SELECTED PROJECTS**

**Course Project of Natural Language Processing:**

**Pointer-Generator Network for Text Summarization** [[code](#)] [[report](#)]

Mar 2019 – June 2019

- Applied pointer-generator network, which facilitates copying words from original texts by pointing to it, thereby improving the accuracy and handles out of vocabulary (OOV) while retaining the ability to generate new words. This network can be thought of as a balance between the extractive method and the abstractive method.
- Applied the coverage model to solve the repetition problem for sequence-to-sequence models (words are often repeated, especially when generating multiple sentences).
- Used Sohu News as a training dataset and tested the model with different news. This demonstrated a good performance in rouge-n evaluation metric.

**Course Project of Math Modeling:**

**Optimization Model for Riding and Relocating Rules** [[code](#)] [[report](#)]

June 2018

- Used a neural network regression method to analyze and predict the starting capacity of each return point.
- Used the classification method of clustering to divide the return points into different categories.
- Visualized our model with real data from Hangzhou bicycles to verify its effectiveness.

**SELECTED AWARDS AND HONORS**

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|--|------|
| • Research and Innovation Scholarship, Zhejiang University                           | 2019 |
| • Merit Student, Zhejiang University   | 2019 |
| • Third Class Scholarship for Academic Excellence, Zhejiang University               | 2019 |
| • Merit Student, Zhejiang University   | 2018 |
| • Third Class Scholarship for Academic Excellence, Zhejiang University               | 2018 |
| • Third Prize of Zhejiang Physics Competition  | 2017 |
| • Third Class Scholarship for Academic Excellence, Zhejiang University               | 2017 |
| • First Prize in Chinese Physics Olympiad (CPhO; Top 0.1% in Shanxi Province, China) | 2015 |
| • Second Prize in Chinese Mathematical Olympiad (CMO)                                | 2015 |

**SKILLS AND OTHER INFORMATION**

**Skills**

- Major Related Skills: Control Theory, Numerical Analysis, Embedded System, Computer Vision, Natural Language Processing, Machine Learning, Medical Image Analysis
- Basic Science Knowledge: Probability, Mathematic Analysis, Linear Algebra, Physics

**Programming Language and Tools**

- Python, C/C++, MATLAB, Verilog, Assembly
- Pytorch, Tensorflow, LaTeX

**Extracurricular Activities**

- |   |                       |
|---|-----------------------|
| • <b>Characteristic Town Research Project</b><br>Investigation on the development of towns with Chinese characteristics.  | Hangzhou, China, 2019 |
| • <b>“Running Man,” Students Quality Training Project</b><br>Organized students to participate in various sports activities and supplied related knowledge about running, mountaineering, tennis, badminton, etc. | Hangzhou, China, 2019 |

**Leadership Activities**

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|---|----------------------|
| • <b>National Collegiate Honors Council (NCHC) Meeting</b><br>Attended the honors council on behalf of the Chu-Kochen Honors College and made suggestions for college development.            | Boston, USA. 2018    |
| • <b>Singapore Exchange and Studying Visiting Project</b><br>Took part in exchange activities in NUS on behalf of the Chu-Kochen Honors College and made suggestions for college development. | NUS, Singapore. 2018 |