

Runcheng Liu

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EDUCATION

Tsinghua University, Beijing, China (09/2018 – present)

- B.S. in Mathematics and Physics
- GPA: 3.46/4.00 (Rank: 27/118)

RESEARCH EXPERIENCE

Montreal Institute for Learning Algorithms (Mila)

Montréal, Canada

Research Intern, Advisor: Prof. Jian Tang (07/2021 – present)

Project I: TorchDrug: A Multi-Task Benchmark for General Protein Sequence Understanding

- Designed a unified multi-task framework and benchmark for the prediction of protein function, protein structure, protein contact, protein-protein interaction, and protein-ligand interaction.
- Implemented the state-of-the-art model and contributed the source code to [TorchDrug](#), an open-source machine learning platform for drug discovery (GitHub Star: 730).
- *TorchDrug: A Powerful and Flexible Machine Learning Platform for Drug Discovery* to be submitted on The Journal of Machine Learning Research.
- *GPSU: A Multi-Task Benchmark for General Protein Sequence Understanding* to be published.

Natural Language Processing Lab, Tsinghua University (THUNLP)

Beijing, China

Research Assistant, Advisor: Prof. Zhiyuan Liu (09/2020 – present)

Project I: Network Representation Learning Under Multi-Source Heterogeneous Data

- Designed and implemented a novel multi-task model that combines a feature converter and the state-of-the-art Heterogeneous Graph Transformer.
- Successfully applied transfer learning to novel downstream tasks.

Project II: Pre-trained Language Models (PLMs) For Data-To-Text Generation

- Demonstrated that PLMs such as BERT achieved the state-of-the-art result on DocRED dataset without explicitly encoding the graph structure.
- Applied PLMs on the Open Domain Event Text Generation (ODETG) task. Demonstrated that PLMs are able to generate more informative text than the traditional encoder- retriever-decoder framework on this ODETG task.

Project III: Exploration on the Pre-trained Representation of BERT and the Selection of Its Significant Subspace

- Reproduced the results in the paper “Information-Theoretic Probing with Minimum Description Length” by replacing ELMo in the setting with BERT.
- Proposed an effective and simple gradient-based selective method for significant subspace of pre-trained representation, and identified the missing factor of training time that could potentially complement the MDL metric in this paper.

Institute for Advanced Study, Tsinghua University (IASTU)

Beijing, China

Research Assistant, Advisor: Prof. Xuening Bai (04/2019 – 09/2019)

Project: Numerical Method for the Electron Magnetohydrodynamics (EMHD) Equations (An Open

Problem)

- Designed an effective numerical algorithm under the Constrained Transport framework to capture the evolution of hall drift mode in the EMHD equations in 2 and 3 dimensions.
- Awarded Technology Innovation Award at Tsinghua University.

COURSE PROJECTS

Big Data in Experimental Physics: Classification of the Types of OGLE Cepheids 09/2020

- Developed a simple and effective method using an external package to classify the types of OGLE Cepheids in a data contest hosted on crowdAI.

Programming Fundamentals: Simulation of Temperature Based on Heat Transfer 06/2019

- Simulated the evolution of temperature based on heat transfer in three-dimensional space with boundary conditions, and visualized the distribution of temperature using C language.

HONORS & AWARDS

Academic Scholarship

- Academic Excellence Award (ranked top 20), Tsinghua University, 2020
- Tsinghua Alumni Scholarship (ranked 5th among all recipients), Tsinghua University, 2019
- Technology Innovation Award (ranked top 10), Tsinghua University, 2019

Academic Awards

- Successful Participant, The Mathematical Contest in Modeling (MCM), 2020
- First Prize, Chinese Physics Olympiad, 2017
- First Prize, Chinese Physics Olympiad, 2016

Sports Awards

- Championship, University NTRP-6.0 Doubles Tennis Match, Tsinghua University, 2021
- Third Place, University NTRP-3.0 Single Tennis Match, Tsinghua University, 2021

SKILLS

- Programming Languages & Tools: Python, C/C++, Bash, Mathematica, MATLAB, Git, LATEX, PyTorch
- Language: Chinese (Native proficiency), Japanese (Native proficiency), English (Professional working proficiency)
- Music: Clarinet

EXTRACURRICULAR ACTIVITIES AND LEADERSHIP

- Chairman, Jingchu Cultural Exchange Association, Tsinghua University, 2019 - present
- Captain, Tennis Team of Physics Department, Tsinghua University, 2019 - present