Haonan Wu

Ph.D. Student/Research Assistant
Computer Science and Engineering at Penn State
State College, PA, USA

CONTACT INFORMATION

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EDUCATION

The Pennsylvania State University (PSU), USA Aug. 2023 - present
Ph.D. in Computer Science and Engineering **Research Topics**: Theoretical and Algorithmic Bioinformatics
Supervisor: Prof. Paul Medvedev

Shandong University (SDU), PRC Sep. 2020 - Jun. 2023
Master of Science in Operational Research and Cybernetics
GPA: 92.17/100
Relevant Coursework: Graphs and Digraphs, Combinatorial Optimization, Analysis and Design of Algorithms, Modern Functional Analysis, Elements of Modern Algebra, Mathematical Analysis

Shandong University (SDU), PRC Sep. 2016 - Jun. 2020
Bachelor of Science in Biotechnology
GPA: 90.65/100
Relevant Coursework: Biochemistry, Cell Biology, Molecular Biology

WORK EXPERIENCE

The Pennsylvania State University State College, USA
Research Assistant in Department of Computer Science and Engineering Jan. 2024 – present
Supervisor: **Supervisor**: Prof. Paul Medvedev

Developing bioinformatics theories and algorithms.

RESEARCH INTERESTS

- Bioinformatics and computational biology
- Algorithmic and Theoretical Bioinformatics
- Graph theory
- Deep Learning

RESEARCH EXPERIENCE

A k-mer-based estimator of the substitution rate between repetitive sequences 2025

We relax the non-repetitive assumption and propose a novel estimator for the mutation rate. We derive theoretical bounds on our estimator's bias. Our experiments show that it remains accurate for repetitive genomic sequences, such as the alpha satellite higher order repeats in centromeres. We demonstrate our estimator's robustness across diverse datasets like the HOR region of the centromere.

Softwares:

- https://github.com/medvedevgroup/Repeat-Aware_Substitution_Rate_Estimator
- https://github.com/Wu-Haonan/Repeat-Aware_mutation_rate_estimator
- https://github.com/Wu-Haonan/Repeat-Aware_phylogenetic_distance_estimator

Spatom: a graph neural network for structure-based protein–protein interaction site prediction 2023

We propose Spatom, a novel framework for PPI site prediction. This framework first defines a weighted digraph for a protein structure to precisely characterize the spatial contacts of residues, then performs a weighted digraph convolution to aggregate both spatial local and global information and finally adds an improved graph attention layer to drive the predicted sites to form more continuous region(s). We tested it on a diverse set of challenging protein–protein complexes and demonstrated the best performance among all the compared methods.

Softwares:

- Web server: http://liulab.top/Spatom/server
- Source code: https://github.com/Wu-Haonan/Spatom

PEER-REVIEWED PUBLICATIONS

Preprints

- **Haonan Wu**, Antonio Blanca, and Paul Medvedev, A k-mer-based estimator of the substitution rate between repetitive sequences, *bioRxiv* 2025.06.19.660607; doi: https://doi.org/10.1101/2025.06.19.660607

Journals

- **Haonan Wu**, Jiyun Han, Shizhuo Zhang, Gaojia Xin, Chaozhou Mou, Juntao Liu, Spatom: a graph neural network for structure-based protein–protein interaction site prediction, *Briefings in Bioinformatics*, Volume 24, Issue 6, November 2023, bbad345, https://doi.org/10.1093/bib/bbad345

Conference proceedings

- WABI

PROFESSIONAL SERVICE

Peer-Reviewer
RECOMB 2025, ISMB 2025, ACM-BCB 2025

Short courses

- Deep-learning workshop, School of Mathematics and Statistics, SDU, China Winter 2022
  Handouts of the course.

Undergraduate Mentor

- Inorganic and Analytical Chemistry, School of Marine, SDU, China Fall 2018
- Probability and Mathematical Statistics II, School of Marine, SDU, China Spring 2019

TALKS & POSTER

Talks

- WABI 2025, University of Maryland, MD, USA
- Graphs and Digraphs, School of Mathematics, SDU, China Spring 2022
  Topic: Applications of Digraph in bioinformatics and computational biology
- Sequence and Assembly Seminar, School of Mathematics and Statistics, SDU, China
  Topic: Introduction of Single Molecular Sequence and assembly algorithms for long-reads

Posters

- WABI 2025, University of Maryland, MD, USA (Link)
- Rao Prize Conference 2025, Penn State University, PA, USA (Link)

OTHER EXPERIENCES

Explored the possible reason for abundance of oxides on the Martian surface Jun. 2017 - Oct. 2018
Planetary Lab, Space Science School, SDU with Dr. Zhongchen Wu

SKILLS

- **Programming:** Python, MATLAB, C++, experience programming in Linux server
- **Package:** Pytorch, scikit-learn
- **Scripting Language:** LaTeX
- **Language:** Chinese (native speaker), English (working language)

REFERENCES

Prof. Paul Medvedev
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Department of Computer Science and Engineering
Department of Biochemistry and Molecular Biology
Director
Center for Computational Biology and Bioinformatics @ the Genome Sciences Institute of the Huck
The Pennsylvania State University, PA, USA
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