Zihan Hu

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Research Interests

- **Theoretical Computer Science (TCS)**, especially the interplay between quantum computing, cryptography and complexity theory

Education

- **Tsinghua University** *Aug. 2019 - Present*
  Bachelor in Computer Science (In Progress) Beijing, China
  - Yao Class, Institute for Interdisciplinary Information Sciences (IIIS), led by Prof. Andrew Yao
  - GPA: **3.98/4.0**, Rank: **1/30**
  - TOEFL: 106, GRE: 331

Research Experience

- Black-Box Separation for Public-Key Quantum Money *Jan. 2022 - Sep. 2022*
  Advisors: Prof. Prabhanjan Ananth and Prof. Henry Yuen UCSB (Remote)
  - Public-key quantum money scheme is a cryptographic protocol that allows a bank to issue banknotes that are publicly verifiable yet resistant to counterfeiting due to the laws of the physics. However, constructing provably secure public-key quantum money schemes based on well-studied assumptions remains challenging.
  - We ruled out the class of black-box constructions from collision-resistant hash functions to public-key quantum money schemes where the verification algorithm only makes classical queries to the hash functions.
  - My contribution includes extending our result to a more general case, deriving formal proofs, and writing.
- Attempts to Quantumly Solve Standard Lattice Problems *June 2021 - Nov. 2021*
  Advisor: Prof. Yilei Chen Tsinghua University
  - A wide range of cryptographic protocols are based on the hardness of lattice problems. Despite a large number of studies, the quantum hardness of lattice problems remains obscure.
  - We attempted to quantumly solve standard lattice problems by first modifying Regev's reduction to reduce the closest vector problem (a standard lattice problem) to a variant of learning with errors problem, and then solving the latter problem. We managed to close the first step but not the second. A summary of our partial results can be found on my homepage.
  - Collaborated with Prof. Yilei Chen, Dr. Qipeng Liu and Yaxin Tu.
  - My contribution includes brainstorm, formula derivation, and proofreading.

Publications

- On the (Im)plausibility of Public-Key Quantum Money from Collision-Resistant Hash Functions
  Prabhanjan Ananth, Zihan Hu, Henry Yuen *Submitted*

Honors and Awards

- Yao Award, Recognition Prize | IIIS, Tsinghua University *2022*
- Comprehensive Excellence Award | Tsinghua University *2021*
- Academic Excellence Award | Tsinghua University *2020*
- Sports Excellence Award | Tsinghua University *2020*
- Chinese Mathematical Olympiad, Silver Medal | Chinese Mathematical Society *2018*
- Chinese Girls' Mathematical Olympiad, Gold Medal (Rank 3) | Chinese Mathematical Society *2018*

Extracurricular Activities

- Class Leader | Yao Class 91, Tsinghua University *Sep. 2020 - Sep. 2021*
- Keen on a variety of sports, especially middle-distance and long-distance running.