

# Jingyi Liu

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## RESEARCH INTERESTS

- Online learning and its applications in Economics and Computation
- Algorithmic game theory and mechanism design
- Equilibria in games among learning agents

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## EDUCATION

<b>Princeton University, Princeton, NJ</b>	08/2022 - 05/2027
• Ph.D. student in Theoretical Computer Science	
• Advised by Mark Braverman and Matt Weinberg	
• Selected Courses: Algorithmic Mechanism Design, Theoretical Machine Learning (Online Convex Optimization), Advanced Algorithm Design, Advanced Computational Complexity	
<b>Harvey Mudd College, Claremont, CA</b>	08/2017-05/2022
• GPA: 3.97	
• Bachelor of Science in Joint Computer Science and Mathematics	
• Graduated with High Distinction and Departmental Honors in Mathematics	

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## PUBLICATIONS

### Economics and Computation

1. Braverman, Mark, Jingyi Liu, Jieming Mao, Jon Schneider, and Eric Xue. "A New Benchmark for Online Learning with Budget-Balancing Constraints." *arXiv preprint arXiv:2503.14796* (2025).
2. Cai, Linda, Jingyi Liu, S. Matthew Weinberg, and Chenghan Zhou. "Profitable Manipulations of Cryptographic Self-Selection Are Statistically Detectable." In *6th Conference on Advances in Financial Technologies*. 2024.

### Other Selected Publications

1. Aldape, Toby, Jingyi Liu, Gregory Pylypovych, Adam Sheffer, and Minh-Quan Vo. "Distinct distances in  $\mathbb{R}^3$  between quadratic and orthogonal curves." *European Journal of Combinatorics* 120 (2024): 103993.
2. Liu, Jingyi, I. Duan, Santi Santichaikein, and Ran Libeskind-Hadas. "Distance Profiles of Optimal RNA Foldings." In *International Symposium on Bioinformatics Research and Applications*, pp. 315-329. Cham: Springer Nature Switzerland, 2022.
3. Liu, Jingyi, Ross Mawhorter, Nuo Liu, Santi Santichaikein, Eliot Bush, and Ran Libeskind-Hadas. "Maximum parsimony reconciliation in the DTLOR model." *BMC bioinformatics* 22, no. Suppl 10 (2021): 394.
4. Santichaikein, Santi, Qing Yang, Jingyi Liu, Ross Mawhorter, Justin Jiang, Trenton Wesley, Yi-Chieh Wu, and Ran Libeskind-Hadas. "eMPReSS: a systematic cophylogeny reconciliation tool." *Bioinformatics* 37, no. 16 (2021): 2481-2482.

## **RESEARCH EXPERIENCE**

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### **Online Learning with Budget Constraints**

- We analyzed the online learning problem with adversarial rewards and costs where the goal is to achieve the best cumulative rewards subject to a budget constraint. We developed a new benchmark which effectively characterizes the maximal set of strategies we can compete against and developed a primal-dual based learning algorithm that achieves sublinear regret against this benchmark. We applied our results to design new algorithms and matching lower bounds for various settings (such as a “window-pacing benchmark” where we compete against strategies that can change their distribution over actions every  $w$  steps).
- Resulted in: preprint “*A New Benchmark for Online Learning with Budget-Balancing Constraints*” (an updated version of this preprint is included in this document)

### **Market-Based Solution for Resource Allocation**

- We analyzed the problem of allocating resources owned by multiple agents. Each agent has an initial endowment of the items and the goal is to price each item and potentially redistribute surplus from satiated agents so that each agent will get their favorite bundle of (divisible) items, the market clears and the allocation satisfies some notion of core stability. It is known that there do not exist single-currency prices that clear the market. We developed a multi-currency solution (the price of each item is a vector) that resolved this problem.
- Resulted in: one paper in preparation for EC’26

### **Auctions with an Intermediary**

- We analyzed the problem of an auctioneer who wishes to sell a single item to  $n$  interested buyers, with a single intermediary in between, who fully controls which bids can reach the auction in the first place. For example, in the blockchain setting, the intermediary is the block producer and the auctioneer is someone who wants to run an on-chain auction. We established approximately-optimal mechanisms and impossibility results across a range of settings: when the auctioneer leads a Stackelberg game, when the intermediary leads a Stackelberg game, and when the auctioneer and intermediary move simultaneously.
- Resulted in: one paper in preparation

### **Complexity of Approximating Market Equilibrium**

- We analyzed the computational hardness of approximating the Hylland-Zeckhauser Scheme and showed that a constant approximation is PPAD-hard if the PCP for PPAD conjecture is true.
- Resulted in: one paper in preparation

### **Incentives in Blockchain Protocols**

- We analyzed the incentive issue of the leader selection protocol in Algorand and found that for small stakeholders, any strictly profitable deviation from the protocol is statistically detectable.
- Resulted in: “*Profitable Manipulations of Cryptographic Self-Selection Are Statistically Detectable*” (AFT 2024)

## **UNDERGRADUATE RESEARCH EXPERIENCE**

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### **Combinatorics**

- We analyzed the distinct distances problem between point sets on two curves in  $\mathbb{R}^3$  and provided a full characterization for conic curves and curves that are smooth and contained in perpendicular planes. Resulted in a publication in *European Journal of Combinatorics* (2024).

### **Computational Biology**

- We analyzed the problem of phylogenetic tree reconciliation under the duplication-transfer-loss model and extended the model to account for additional biological events. Resulted in a paper in *BMC Bioinformatics* (2021) and one in *Bioinformatics* (2020).

## **TEACHING EXPERIENCE**

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### **Teaching Assistant, Economics and Computation (COS 445), Princeton University**

- Served as head TA, coordinating TAs and assisting with course logistics and materials.
- Led problem sessions, held office hours, and graded assignments for approximately 30 students.

## **WORK EXPERIENCE**

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**Software Engineer Intern, Meta, Menlo Park, CA**

06/2019-08/2019

**Software Engineer Intern, Meta, Seattle, WA**

06/2018-08/2018