

SHAO-HENG KO

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RESEARCH INTERESTS

Approximate, Randomized, Distributed, Streaming, and Online Algorithms, Algorithmic Game Theory

EDUCATION

M.S., GIEE, National Taiwan University 2015 - 2017

- Advisor: Prof. Ho-Lin Chen, Research area: Algorithmic Game Theory and Mechanism Design
- GPA: 4.20/4.3, Thesis: Encouraging Peer Grading in MOOCs

B.S., Electrical Engineering, National Taiwan University 2011 - 2015

- CS-related GPA: 4.17/4.3

EXPERIENCE

Research Assistant, Inst. of Information Science, Academia Sinica July 2017 - present

- Advisor: Dr. De-Nian Yang, Research area: Approximation Algorithms, Social Network

PUBLICATIONS

1. S.-H. Ko, Y.-C. Lin, H.-C. Lai, W.-C. Lee, and D.-N. Yang, “On VR Spatial Query for Dual Entangled Worlds”, in *ACM CIKM* 2019. (full research paper)
2. S.-H. Ko, H.-C. Lai, H.-H. Shuai, D.-N. Yang, W.-C. Lee, and P. S. Yu, “Optimizing Item and Subgroup Configurations for Social-Aware VR Shopping”, manuscript in revision in *VLDB 2020*.

AWARDS AND HONORS

Best Master Thesis *GIEE, NTU*, 2017
Undergraduate Research Grant (PI: I-Hsiang Wang, Grant 103-2815-C-002-063-E) *MOST, Taiwan*, 2014
Bronze Medal, Asian Pacific Mathematics Olympiad (APMO) 2009

RESEARCH EXPERIENCES

Finding Subgraphs with Customized Local Densities (ongoing)

- Formulate a combinatorial optimization problem on finding a subgraph to maximize total node weights with upper- and lower-bounded degree constraints.
- Prove the problem NP-hard to approximate within any superconstant factor in polynomial time.
- Design an FPT algorithm for bounded-treewidth graphs.

Maximizing Influence Spread for Social Item Hypergraph (ongoing)

- Investigate a problem of maximizing total influence spread on a hybrid influence model of *social influence* and *item inference* on hypergraphs without the submodular property.
- Prove the problem NP-hard to approximate within $n^{1-\epsilon}$ for any $\epsilon > 0$.
- Design an n -approximation algorithm.

Optimizing Item and Subgroup Configurations VR Group Shopping (in revision) [2]

- Formulate a combinatorial optimization problem on configuring displayed items and partitioning user subgroups for social-aware VR shopping recommendation systems.
- Prove the problem APX-hard, and design a 4-approximation algorithm via dependent randomized rounding and derandomization by conditional expectation.

Spatial Queries for Dual Entangled Worlds in VR (CIKM'19 [1])

- Formulate a multi-space spatial query problem for locomotion in virtual reality.
- Prove the problem NP-hard, design an FPTAS combining techniques of network transformation, Lagrange relaxation, dynamic programming, rounding-and-scaling, and problem-specific pruning strategies.

Encouraging Peer Grading in MOOCs

Master Thesis

- Built a game theoretical model of Massive Open Online Courses (MOOCs) for a mechanism of incentivizing peer grading efforts by rewarding grading accuracy.
- Found a set of sufficient conditions of existence and computability of pure-strategy Nash equilibria.

TEACHING/COORDINATING EXPERIENCES

Coordinator, Advanced Algorithms Study Group

Academia Sinica, ongoing

Coordinator, MPC/Distributed/Streaming Study Group

Academia Sinica, ongoing

TA, Advanced Algorithms

GIEE, NTU, 2017

TA, The Design and Analysis of Algorithms

GIEE, NTU, 2015 - 2016

Lead TA, Discrete Mathematics (lectured study group sessions)

Dept. EE, NTU, 2016

HIGHLIGHTED THEORY COURSEWORK

Enrolled (*Straight A's*):

- (CS Theory/Math) Design and Analysis of Algorithms, Network Science, Graph Theory (I, II), Introduction to Cryptography, Advanced Calculus (I), Game Theory, Network Information Theory
- (Interdiscipline) Optimization Models and Methods for Transportation, Game Theory with Applications to Marketing and Finance (I), Information Economy

Audited/Online Courses: Advanced Algorithms, Streaming Algorithms, Selected Topics in Intractable Problems, Approximation Algorithms (I, II), Games with Incomplete Information

ACADEMIC SERVICES

Reviewer, IEEE GLOBECOM

2018

ONLINE LEARNING/TEACHING INNOVATION

Massive Open Online Courses Explorer, Lab. Teaching Innovation, NTU

2015 - 2017

- Studied publications on online learning; helped manufacturing NTU MOOCs on Coursera
- Designed and produced mini-MOOCs for exhibition in ZaShare 2017
- Wrote column pieces to promote online learning
- Co-organized and paneled the “Why MOOCs” workshop

Co-editor of *Benson's amazement in probability*, a bestseller collection of self-proposed peer-assessment problems in flipped-classroom undergraduate probability classes in Taiwan. ISBN: 9789861371832

LANGUAGE PROFICIENCY

GRE: 334 (V:164, Q:170, AWA:5.0), TOEFL: 106 (R:29, L:28, S:22, W:27)