

# SHAO-HENG KO

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## RESEARCH INTERESTS

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

## EDUCATION

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**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

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

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

## PUBLICATIONS

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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”, to appear in *VLDB 2020*.

## AWARDS AND HONORS

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**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

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### 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.
- 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 VLDB’20 [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**

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<b>Coordinator, Advanced Algorithms Study Group</b>	<i>Academia Sinica</i> , ongoing
<b>Coordinator, MPC/Distributed/Streaming Study Group</b>	<i>Academia Sinica</i> , ongoing
<b>TA, Advanced Algorithms</b>	<i>GIEE, NTU</i> , 2017
<b>TA, The Design and Analysis of Algorithms</b>	<i>GIEE, NTU</i> , 2015 - 2016
<b>Lead TA, Discrete Mathematics</b> (lectured study group sessions)	<i>Dept. EE, NTU</i> , 2016

## **HIGHLIGHTED THEORY COURSEWORK**

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### **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**

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<b>Reviewer, IEEE GLOBECOM</b>	2018
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## **ONLINE LEARNING/TEACHING INNOVATION**

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<b>Massive Open Online Courses Explorer, Lab. Teaching Innovation, NTU</b>	2015 - 2017
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- 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**

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