Shi-Yuan Wang

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http://sywang1007.github.io/

EDUCATION

Georgia Institute of Technology *Aug. 2018 - PRESENT*
Ph.D. student in School of Electrical and Computer Engineering

- Course list:
  - Machine Learning: Statistical Machine Learning, Probabilistic Graphical Model
  - Communications and Signal Processing: Personal and Mobile Communications, Advanced Topics in Digital Signal Processing
  - Computer Vision: Computer Vision
  - Mathematics: Real Analysis I/II, Probability I/II, Stochastic Process I, Convex Optimization, Information Theory
- Ph.D. advisor: Dr. Matthieu R. Bloch

National Taiwan University (NTU), Taipei, Taiwan *Sept. 2013 - Jan. 2018*
B.S.E in Electrical Engineering

- Overall GPA: 4.22/4.3 (top 3%)
- Course list:
  - Engineering Mathematics: Linear Algebra, Probability and Statistics, Differential Equation, Complex Variable
  - Machine Learning and Natural Language Processing: Intro. to Digital Speech Processing, Machine Learning
  - Communications and Signal Processing: Signal and Systems, Principle of Communications, Intro. to Computer Networks, Digital Communications I
  - Computational Imaging: Digital Visual Effects
  - Hardware Design: Electronics I/II/III, Integrated Circuit Design, Computer Architecture, Electrical Engineering Lab - Digital Circuit
  - Programming: Data Structure and Programming
  - Electro-Optics: Fund. of Electro-Optics, Electrical Engineering Lab - Photonics

RESEARCH EXPERIENCE

Georgia Tech - Adaptive Communication Decision and Information Systems Research Group *Jan. 2019 - PRESENT*
Advisor: Professor Matthieu R. Bloch

Research Project: **Explicit Design of Provably Covert Channel Codes**

- Design and implement covert channel codes with MLCPPM, polar codes, and invertible extractors
- Analyze the covert channel code in terms of *variational distance*.
- Our scheme is efficient in terms of secret key usage and requires **2 orders of magnitude fewer secret key bits** than previous work.
- Accepted to *Proc. of IEEE International Symposium on Information Theory*.

Research Project: **Covert MIMO Communications under Variational Distance Constraint**

- Studied fundamental limit of communication without detecting by malicious adversary.
- Developed information-theoretic analysis and **characterize covert capacity of MIMO-AWGN channels**.
- Accepted to *Proc. of IEEE International Symposium on Information Theory* and IEEE TRANSACTIONS ON INFORMATION FORENSICS AND SECURITY.

Research Project: **Online Learning for Dynamic Spectrum Access**

- Minimized coordination overhead between users and learning access policy in a distributed manner.
- Proposed an online bandit learning framework to estimate the channel availability and user behaviors.

NTU - Speech Processing and Machine Learning Laboratory *Sept. 2016 - Jan. 2018*
Advisor: Professor Hung-Yi Lee

Research Project: **Learning Asking via Interacting with Insufficient Labeled Data**

- Addressed the problem of **insufficient labeled data** in **Question Answering** task of Natural Language Processing.
- Proposed a learner-expert interaction Reinforcement Learning framework to generate training data. and pretrained expert model gives an answer and a reward signal.
- Improved baseline with 32.6% gain on accuracy under limited labeled data on bAbI dataset.
- Utilized the Attention-based Seq2seq model with copy mechanism to study **Question Generation** in SQuAD dataset.

NTU - MicroSystem Research Laboratory *June 2016 - July 2017*
Advisor: Professor Tzi-Dar Chiueh

Research Project: **Low-density Parity-check (LDPC) Decoder Implemented on OpenCL**

- Utilized the parallelism of **Sum-product algorithm (SPA)** for GPU programming with OpenCL.
- Speed up 1000x in comparison with the baseline sequential decoder.
- The work has been documented as *a technical reference* by MediaTek Inc.

PUBLICATION

Accepted

1. S.-Y. Wang and M. R. Bloch, "Explicit Design of Provably Covert Channel Codes," in *Proc. of IEEE International Symposium on Information Theory*, Melbourne, Australia, Jul. 2021, pp. 190–195
2. ——, "Covert MIMO Communications Under Variational Distance Constraint," *IEEE Transactions on Information Forensics and Security*, vol. 16, pp. 4605–4620, 2021
3. ——, "Covert MIMO Communications under Variational Distance Constraint," in *Proc. of IEEE International Symposium on Information Theory*, Los Angeles, CA, Jun. 2020, pp. 828–833

AWARDS & HONORS

Department of Electrical Engineering, National Taiwan University

- Dean's List Award (**5 times**)
- **3rd place**, Undergraduate Innovation Award
- Cadence EE3011 (Data Structure & Programming) Competition Award

WORKING EXPERIENCE

MediaTek, Taiwan *July 2017 - Aug. 2017*
Summer Intern in Department of Wireless Communication Technology

- Designed an **Inter-Processor Communication** mechanism in hardware using Verilog.
- Verified the datapath and interface protocol of a **Vector Operation Engine**.
- Developed a **simulation tool** for vector operation engine in C++.

TEACHING EXPERIENCE

Teaching Assistant, Georgia Tech ECE *Fall 2021*
ECE7750 Mathematical Foundations of Machine Learning

SELECTED COURSEWORKS AND PROJECTS

Sparse MIMO Channel Estimation with Compressed Sensing and Learning Schemes *Fall 2018*
Final Project of ECE6604 (Personal & Mobile Communications)

- Implemented several *compressed sensing* algorithms for MIMO channel estimation, including orthogonal matching pursuit, compressed sampling matching pursuit, and expectation maximization.

User Coexistence via Online Learning *Spring 2019*
Final Project of ECE6254 (Statistical Machine Learning)

- Investigated the problem of *user coexistence* in multi-user communication networks.
- Formulated the problem into online learning scheme and solved with *online mirror descent* and *bandit convex optimization*.

RELATED SKILLS

- Standardized Test
  - TOEFL score: 105/120 (R:28/30, L:28/30, S:22/30, W:27/30) *Oct. 2017*
  - GRE score: 330/340 (V:161/170, Q: 169/170), AW: 3.5 *Sept. 2017*
- Programming: C++, Python, Matlab, Verilog
- Libraries&Tools: PyTorch, Tensorflow, OpenCV, OpenCL, LaTeX