

# Shi-Yuan Wang

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## EDUCATION

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### Georgia Institute of Technology

Aug. 2018 - PRESENT

Ph.D. student in School of Electrical and Computer Engineering

- Ph.D. advisor: Dr. Matthieu R. Bloch

### Georgia Institute of Technology

Jan. 2022 - PRESENT

M.Sc. student in School of Mathematics

### National Taiwan University (NTU), Taipei, Taiwan

Sept. 2013 - Jan. 2018

B.S.E in Electrical Engineering

- Overall GPA: 4.22/4.3 (top 3%)

## RESEARCH EXPERIENCE

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### 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**

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### **Articles**

1. S.-Y. Wang and M. R. Bloch, “Covert MIMO Communications Under Variational Distance Constraint,” *IEEE Transactions on Information Forensics and Security*, vol. 16, pp. 4605–4620, 2021

### **Accepted**

1. S.-Y. Wang, T. Ergodan, and M. R. Bloch, “Towards a characterization of the covert capacity of bosonic channels under trace distance,” in *Proc. of IEEE International Symposium on Information Theory*, Espoo, Finland, 2022
2. M.-C. Chang, T. Erdogan, S.-Y. Wang, and M. R. Bloch, “Rate and detection error-exponent tradeoffs of joint communication and sensing,” in *proc. of IEEE International Hybrid Symposium on Joint Communications & Sensing*, Seefeld (Tirol), Austria, Mar. 2022
3. 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
4. —, “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**

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### **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**

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### **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**

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### **Graduate Teaching Assistant, Georgia Tech ECE**

Fall 2021

*ECE7750 Mathematical Foundations of Machine Learning*

## **SELECTED COURSEWORKS AND PROJECTS**

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### **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

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- 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, L<sup>A</sup>T<sub>E</sub>X