

Chien-Lun Chen

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Background

2007-2014 In *Communications and Signal Processing*
2015-present In *Security and Privacy in Machine Learning*

Education

8/2010-5/2020 **Ph.D. in Electrical Engineering**, University of Southern California, Los Angeles, CA, USA.
PhD Thesis: *Security and Privacy in Information Processing*.
Advisor: Prof. Leana Golubchik.
9/2007-6/2009 **M.S. in Communications Engineering**, National Taiwan University, Taipei, Taiwan.
MS Thesis: *Performance Analysis of Spatial Diversity for MIMO-OFDM Systems with Power Allocation on Sub-carriers*.
9/2000-6/2004 **B.S. in Atomic Science**, National Tsing Hua University, Hsinchu, Taiwan.

Areas of Interest

- **Data Privacy:** Differential Privacy; Data Anonymization; Privacy-Utility Trade-offs
- **Security and Privacy in Machine Learning:** Poisoning Backdoor Attacks; Inference Attacks
- **Machine Learning:** Federated Learning; Meta-Learning; Attention Mechanisms; Autoencoder
- **Communications and Signal Processing:** Speech/Pattern Recognition; Cognitive Networks

Work Experience

5/2019-12/2020 **Research Assistant/Associate**, University of Southern California, Los Angeles, CA, USA.
Project: **Deconstructing Distributed Deep Learning**, funded by National Science Foundation, USA.
Investigated poisoning backdoor attacks and the associated defense methods in federated meta-learning.
8/2011-6/2013 **Research Assistant**, University of Southern California, Los Angeles, CA, USA.
Project: **Positive Train Control**, funded by Federal Transit Administration, USA.
Measured and/or simulated quality of Metrolink train control signals in Los Angeles metropolitan area.
7/2009-6/2010 **Research Associate (Full-Time)**, Telecommunications Research Center, NTU, Taipei, Taiwan.
Project: **Cross-layer Design of OFDMA Cooperative and Cognitive Communications**, funded by National Science Council, Taiwan.
Designed reliable communication schemes for multi-path multi-hop cognitive radio networks.

Publications

- [1] **C-L. Chen**, L. Golubchik, and M. Paolieri, "Backdoor Attacks on Federated Meta Learning", to appear in *NeurIPS Workshop on Scalability, Privacy, and Security in Federated Learning (NeurIPS-SpicyFL)*, 2020. [arXiv:2006.07026](https://arxiv.org/abs/2006.07026)
- [2] **C-L. Chen**, L. Golubchik, and R. Pal, "Achieving Transparency Report Privacy in Linear Time," submitted, under minor revision, January 2021.
- [3] **C-L. Chen**, L. Golubchik, and R. Pal, "Tractable Privacy Preservation in Transparency Reports," submitted, November 2020.
- [4] **C-L. Chen**, R. Pal, and L. Golubchik, "Oblivious Mechanisms in Differential Privacy: Experiments, Conjectures, and Open Questions," *IEEE Security and Privacy Workshops*, San Jose, 2016.
- [5] I-W. Lai, **C-L. Chen**, C-H. Lee, K-C. Chen and E. Biglieri, "End-to-End Virtual MIMO Transmission in Ad Hoc Cognitive Radio Networks," *IEEE Transactions on Wireless Communications*, 2014.

Awards, Professional Activities, and Services

Awards ◦ **Best Paper Award Nominee**
NeurIPS Workshop on Scalability, Privacy, and Security in Federated Learning, 2020

Paper Review	<ul style="list-style-type: none"> ◦ IEEE INFOCOM 2014 ◦ IEEE Trans. on Wireless Communications ◦ ACM Trans. on Management Information System 	<ul style="list-style-type: none"> ◦ ACM SIGMETRICS 2016-2019
Services	<ul style="list-style-type: none"> ◦ Camp Counselor, NTHU Interdisciplinary Science Summer Camp (2001, 2002) ◦ Military Service, ROC (Taiwan) Army, Corporal (2005-2006) ◦ Volunteer, USC Viterbi Summer Program: IIT Kharagpur Summer Research Internships (2012) ◦ Research Volunteer, Department of Computer Science, University of Southern California (2020) 	
Teaching Assistant	<ul style="list-style-type: none"> ◦ Applied Cryptography ◦ Introduction to Computer Networks ◦ Operating Systems 	<ul style="list-style-type: none"> ◦ Introduction to Internetworking ◦ Internet and Cloud Computing ◦ Seminar in Computer Science Research

Related Graduate Coursework

Graded	<ul style="list-style-type: none"> ◦ Privacy in the World of Big Data ◦ Mathematical Pattern Recognition ◦ Analysis of Algorithms ◦ Parallel and Distributed Computation ◦ Error Correcting Codes 	<ul style="list-style-type: none"> ◦ Machine Learning ◦ Uncertainty Modeling and Stochastic Optimization ◦ Stochastic Network Optimization ◦ Digital Signal Processing ◦ Advanced Wireless Communications
Audited	<ul style="list-style-type: none"> ◦ Machine Learning from Signals 	<ul style="list-style-type: none"> ◦ Convex and Combinatorial Optimization

Selected Research Experience

- 2019-2020
 - Investigated backdoor attacks and the associated defense methods in federated meta-learning.
 - Showed the effects of a one-shot backdoor attack can persist tens to hundreds of rounds in federated meta-learning; the fast-adaptation ability of meta-learning does not effectively remove backdoors during federated meta-training as well as during fine-tuning.
 - Proposed an *effective local* defense mechanism using matching network fine-tuning with customized attention mechanism to eliminate backdoors *without a centralized approach inspecting user updates*; backdoor accuracy can drop to *as low as 0% in only a few iterations*.
- 2016-2018
 - Investigated privacy breach brought on by releasing algorithmic transparency reports (ATRs) providing transparency schemes and measured fairness for opaque machine-learning models.
 - Explicitly demonstrated inference attacks on data subjects' private information via various transparency schemes and/or measured fairness in ATRs, with reasonable side-information.
 - Proposed a *linear-time optimal privacy preserving* scheme which provides optimal trade-offs for an ATR between the amount of disclosed information (utility) and data subjects' privacy.
- 2015-2016
 - Studied the unexplored spaces for designing utility-optimal differentially-private mechanisms.
 - Conducted an exploratory study to understand questions and challenges related to the design and analysis of optimal oblivious noise-generating mechanisms in differential privacy (DP).
 - Proposed a heuristic DP mechanism enhancing utility on the presence of side-information.
- 2009-2010
 - Designed reliable communication schemes for multi-path multi-hop cognitive radio networks.
 - Proposed a *low-complexity (as low as <1% of MAP)* joint sphere decoder to *efficiently* decode virtual MIMO space-time codes with unknown rank (due to opportunistic communications).
 - Provided error-resilient end-to-end transmission *without requiring end-to-end information*.

Skills and Interests

Programming Languages	Python: experience with building federated meta-learning in which poisoning attack is performed. MATLAB: experience with simulating an end-to-end wireless MIMO-OFDM environment. C/C++: experience with helping students debug programming assignments in TA jobs.
Tools	Tensorflow, Keras, L ^A T _E X
Interests	<i>Chinese chess:</i> ranked number 6 in the contest of Chinese chess in Taipei City (1994). <i>Piano:</i> Yamaha musical grading examination for piano performance Grade 7 passed.