

CURRICULUM VITAE



Name: Weiran Cai
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Affiliation: Raissa D'Souza's
Network Science
Group, Department of Computer Science,
University of California at Davis.

Education

2007 – 2012 Doctoral program, Department of
Electrical and Information Engineering,
Technische Universität Dresden, Germany

2003 – 2005 Master program, Department of Physics,
Shanghai Jiaotong University

1998 – 2003 Undergraduate (major), Department of
Physics, Shanghai Jiaotong University

1999 – 2003 Undergraduate (minor), Department of
Applied Mathematics, Shanghai Jiaotong
University

Academic Work

2017 – now Postdoctoral Researcher, Department of
Computer Science, UC Davis (network
science)

2012 – 2015 Researcher Associate, Department of
Electrical and Computer Engineering, TU
Dresden (network science, memristive
systems)

Research Areas

Areas: 1. Dynamical processes in complex systems and networks; 2. Statistical physics; 3. Analysis of networked data.

Methods: Numerical and agent-based simulations, Nonlinear dynamics and differential equations, Stochastic processes, Statistical analysis, Pattern detection algorithms.

Programming languages: C/C++, Python, Matlab/Octave, Maple.

Awards and Supports

2018	Society of Industrial and Applied Mathematics (SIAM) Travel Award
2014	Deutscher Akademischer Austauschdienst (DAAD) Travel Award
2014	Gesellschaft von Freunden und Förderern (GFF) der TU Dresden Travel Award
2005	Samsung Scholarship

Publications (journals and conferences)

Analysis of socio-economic networks:

W. Cai, J. Snyder, G. Gordon, B. San-Akca, Z. Maoz, and R. D'Souza, "Quantifying the Global Hidden Military Supporting Network", to be submitted (2020).

H. Wu, M. Posfai, **W. Cai** and R. D'Souza, "Layer Core-Periphery Specialization in Multiplex Networks and its Implication for Resilience," *to be submitted*, (2020).

Y. Lin, **W. Cai**, Q. Zhao, Y. Wu, and R. D'Souza, "Understanding Mobility Patterns for e-Commerce Users", Complex Network Conference 2019, Lisbon (2019).

Dynamical processes on ecological networks:

J. Snyder, **W. Cai** and R. D'Souza, "Degree-Targeted Cascades in Modular, Degree-Heterogeneous Networks", *Physical Review Research*, under review, arXiv:2004.09316 (2020).

W. Cai, J. Snyder, A. Hastings and R. D'Souza, "Generic Mechanism for the Evolution of Mutualistic Networks," *NetSci 2019*, Vermont, Contributed talk at main conference and satellite (2019).

W. Cai, J. Snyder, A. Hastings and R. D'Souza, "Mutualistic Networks Emerging from Adaptive Niche-Based Interactions," *Nature Communications*, under review, arXiv: 1812.03564 (2019).

W. Cai, J. Snyder, R. D'Souza and A. Hastings, "Generic Mechanism for the Evolution of Mutualistic Networks," *SIAM Workshop on Network Science*, Portland (2018).

Epidemics on networks:

P. Grassberger, L. Chen, F. Ghanbarnejad and W. Cai, "Phase Transitions in Cooperative Co-infections: Simulation Results for Networks and Lattices," *Physical Review E* **93**, 042316 (2016).

W. Cai, L. Chen, F. Ghanbarnejad and P. Grassberger, "Avalanche Outbreaks Emerging in Cooperative Contagions," *Nature Physics* **11**, 936-940 (2015).

W. Cai, F. Ghanbarnejad, L. Chen, P. Grassberger, "Phase Transitions in Cooperative Coinfections," German Physics Society (DPG) Conference, Dresden (2014).

L. Chen, F. Ghanbarnejad, W. Cai, P. Grassberger, "Outbreaks of Coinfections: The Critical Role of Cooperativity," *Europhysics Letters*, **104(5)** 298-304 (2013).

Nonlinear dynamics of memristive systems:

W. Cai and R. Tetzlaff, "Synapse as a Memristor", book chapter in *Memristor Networks*, 113-128, ed. A. Adamatzky and L. Chua, Springer.

W. Cai, F. Ellinger and R. Tetzlaff, "Neuronal Synapse as a Memristor: Modeling Pair- and Triplet-Based STDP Rule", *IEEE Transactions on Biomedical Circuits and Systems*, **9(1)** 87-95 (2015).

W. Cai and R. Tetzlaff, "Beyond Series and Parallel: Coupling as a Third Relation in Memristive Systems," *IEEE International Symposium on Circuits and Systems*, 1259-1262, Melbourne (2014).

W. Cai, R. Tetzlaff, and F. Ellinger, "Critical role of initial condition in the dynamics of memristive systems: Orbital narrowing revisited," *European Conference on Circuit Theory and Design*, 1-4, (2013).

W. Cai, T. Schmidt, U. Jörges, and F. Ellinger, "A Feedback Spin-Valve Memristive System," *IEEE Transactions on Circuits and Systems-I*, 59(10) 2405-2412 (2012).

W. Cai and R. Tetzlaff, "Advanced Memristive Model of Synapses with Adaptive Thresholds," *IEEE International Workshop on Cellular Nanoscale Networks and their Applications*, 1-6, Turin (2012).

W. Cai, "Nonlinear Dynamics in Memristive Systems", Doctoral Thesis, Vogt Verlag, Dresden (2012).

Conventional physics:

W. Cai, and S. Lou, "Post-Gaussian Double Sine-Gordon Potential," *Communications on Theoretical Physics*, 43 (6) 1075-1082 (2005).

W. Cai, and W. Shen, "A Proposal for Complete Interband Absorption in Indirect Semiconductors," *Physica B*, 352 179-184 (2004).

Media Coverage

2015 Work on Cooperative Percolation in Nature Physics, Publication highlight of the year, Max-Planck Institute for the Physics of Complex Systems.

2015 Reported by C. Packham on Phys.org: "Modelling the Dynamics of Avalanche Outbreaks".

2015 Reported by J. Löffken on Wissenschaft-aktuell: "Ausbruch von Epidemien: Physiker simulieren komplexe Verbreitungsszenarien".

2013 Cover Story in Europhysics Letter: "Outbreaks of Coinfections: The Critical Role of Cooperativity".

Projects

- 2017-2020 NS-CTA (Network Science-CTA), US Army Research Lab (ARL), leading role in application and research.
- 2017-2020 MURI, US Army Research Lab (ARL), participation in research.

Teaching

- 2013-2014 “Theory of Nonlinear Network Dynamics” at TU Dresden (English), entire course
- 2019 “Discrete Mathematics for Computer Science” at UC Davis, part of the course
- 2017-2019 2 Doctoral theses, 1 Bachelor thesis

Referees

Raissa D’Souza (raissa@cse.ucdavis.edu), Professor, Department of Computer Science, UC Davis.

Zeev Maoz (zmaoz@ucdavis.edu), Professor, Department of Political Science, UC Davis.

Ronald Tetzlaff (ronald.tetzlaff@tu-dresden.de), Professor, Department of Electrical and Information Engineering, Technische Universität Dresden, Germany.