

Aram Vajdi

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Charlottesville, Virginia, USA

PROFESSIONAL SUMMARY

Interdisciplinary researcher with expertise in machine learning, data science, control theory, signal processing, estimation and Mathematical modeling of complex biological and dynamical systems, with additional training in experimental atomic, molecular, and optical physics and theoretical Physics. An experienced educator in physics, computer engineering, and network science, with a strong record of funded research, peer-reviewed publications, and student mentorship.

APPOINTMENTS

- **University of Virginia, School of Data Science**  July 2025 - Present
Postdoctoral Research Associate
Charlottesville, VA, USA
 - Advanced Data Analytics, Modeling, and Control for Diabetes Technology
- **Kansas State University, Department of Electrical and Computer Engineering** June 2020 - July 2025
Postdoctoral Research Associate
Manhattan, KS, USA
 - Mathematical Modeling, Risk Estimation, and Control of Infectious Disease Dynamics
 - Lecturer in Electromagnetic Theory; Laboratory Instructor in Computer Networking

EDUCATION

- **Kansas State University** May 2015 - May 2020
Ph.D., Electrical and Computer Engineering
Manhattan, KS, USA
 - Dissertation: Stochastic Spreading Processes on Networks
- **Kansas State University** August 2012 - May 2015
M.S., Experimental Atomic, Molecular and Optical Physics
Manhattan, KS, USA
 - Thesis: Experimental Study of Strong-Field Ionization and High-Harmonic Generation in Molecules
- **University of Kurdistan** August 2006 - May 2009
M.S., Theoretical Physics
Sanandaj, Iran
 - Thesis: Spherically Symmetric Solutions in $f(R)$ Theories of Gravity
- **Razi University** August 2001 - May 2006
B.S., Physics
Kermanshah, Iran

AWARDS AND RESEARCH GRANTS



- **Grant Title: Vector-borne epidemic models and simulator** July 2022 - August 2025
Principal Investigator, Funding Agency: USDA , Grant Amount: \$200,000
- **Grant Title: Understanding COVID-19 transmission with Non-Markovian models** July 2020 - June 2022
Co-Investigator, Funding Agency: NSF , Grant Amount: \$100,000
- **Outstanding Graduate in Research** 2019
Department of Electrical and Computer Engineering, Kansas State University

TEACHING EXPERIENCE

- **Electromagnetic Theory - ECE 557, Kansas State University** Fall 2021 and Fall 2024
Lecturer, Department of Electrical and Computer Engineering
Designed course and developed syllabus. Prepared and delivered lectures. Supervised teaching assistants, held office hours, and wrote homework and exams. Developed computational assignments using MATLAB and COMSOL.
- **Computer Networking Lab - ECE 542, Kansas State University** Fall 2016 - Fall 2023
Instructor, Department of Electrical and Computer Engineering
Delivered instruction on laboratory assignments involving routers and switches. Developed virtual lab exercises using Cisco Packet Tracer and Wireshark.
- **Introduction to Computer Engineering - ECE 241, Kansas State University** Fall 2018 - Fall 2019
Instructor, Department of Electrical and Computer Engineering
Delivered instruction on laboratory projects involving electronic circuit implementation using Arduino

- **Network Theory - ECE 841, Kansas State University** Fall 2016 - Fall 2023
Teaching Assistant, Department of Electrical and Computer Engineering
Taught special topics on network analysis and algorithms. Assisted students in developing code for their computational assignments.
- **General Physics I (Mechanics and Heat), University of Kurdistan, Iran** Fall 2009 - Fall 2011
Lecturer and Lab Instructor, Department of Physics
Designed course and developed syllabus. Prepared and delivered lectures. Taught lab sections, held office hours, and wrote homework and exams.
- **Engineering Physics II (Electricity and Magnetism), University of Kurdistan, Iran** Fall 2009 - Fall 2011
Lecturer and Lab Instructor, Department of Physics,
Designed course and developed syllabus. Prepared and delivered lectures. Taught lab sections, held office hours, and wrote homework and exams.
- **Special Theory of Relativity, Payame Noor University, Iran** Fall 2010
Lecturer
Designed course and developed syllabus. Prepared and delivered lectures. Held office hours, and wrote homework and exams.
- **Calculus II, Payame Noor University, Iran** Spring 2011
Lecturer
Designed course and developed syllabus. Prepared and delivered lectures. Held office hours, and wrote homework and exams.

SELECTED RESEARCH PROJECTS

- **Advanced Data Analytics, Modeling, and Control for Diabetes Technology** July 2025 - Present
Tools: Python, MATLAB, TensorFlow, PyTorch, scikit-learn; Learning-Based Control (MPC, Reinforcement Learning)
◦ Developing machine learning algorithms for early detection of gestational diabetes.
◦ Developing control algorithms for integration into automated insulin delivery systems for patients with diabetes.
- **Gene Ontology (GO) term enrichment analysis using gene co-expression network** Spring 2025 - Present
Tools: Python, MATLAB, TensorFlow, scikit-learn; Graph Neural Networks (GNNs)
◦ Developing a machine learning algorithm using graph Laplacian embedding for Gene Ontology enrichment analysis.
- **Risk Prediction for West Nile Virus and Optimal Containment Measures** Spring 2023 - Spring 2025
Tools: Python, Numba, Tkinter (GUI), adjoint-based optimization for control of dynamical systems 
◦ Developed a risk prediction model for West Nile Virus using our non-Markovian dynamical model of Culex pipiens populations, integrating experimental life-cycle data and climate variables.
◦ Developed an adjoint-based optimization framework combining mathematical modeling and epidemiological analysis to design disease control strategies for public health applications.
◦ Implemented a GUI-based computational tool integrating the risk prediction model with optimization algorithm to support decision-making
- **Modeling and Forecasting Vector-Borne Disease** Fall 2020 - spring 2023
Tools: MATLAB, Java, Python, SQL, Recurrent Neural Networks (RNNs), Kalman Filter methods, Particle Filters 
◦ Developed a machine learning-based risk model for dengue transmission, integrating vector life cycle simulations with experimental data and climate variables.
◦ Developed an ensemble forecasting tool for outbreak case prediction, integrating a custom recurrent neural network with particle filter and Kalman filter prediction schemes.
◦ Designed and implemented the database architecture and automated data-update pipeline (using SQL and Python) for a web-based visualization platform to present computational modeling results from this project.
- **Reconstructing network links from time-dependent network states in stochastic SIS process** Fall 2016 - spring 2018
Tools: MATLAB; R; Markov chain Monte Carlo (MCMC); Gillespie simulation algorithm (SSA); Bayesian analysis.
◦ Designed and implemented a Bayesian algorithm to reconstruct network connectivity from observed dynamics, with applications in computational neuroscience and computer networks
◦ Developed computational tools in MATLAB and R to simulate a broad class of stochastic processes on complex networks
- **Experimental Atomic Molecular and Optical physics** Fall 2012 - spring 2015
Tools: Femtosecond laser systems; optical setups; vacuum chambers; velocity map imaging (VMI); LabVIEW; MATLAB.
◦ Compared and analyzed single-shot carrier-envelope-phase measurements obtained from two different synchronized setups: an f-2f interferometer and a phase meter
◦ Investigated the strong-field-induced wave packet dynamics in carbon dioxide molecules in a pump-probe experiment using 5fs laser pulses.
◦ Investigated the effect of carrier-envelope-phase of ultra-short laser pulses on high harmonic generation.
- **Spherically Symmetric Solutions in $f(R)$ Theories of Gravity** Fall 2007 - spring 2009
◦ Derived spherically symmetric solutions for a class of modified Einstein field equations in general relativity.

SELECTED PUBLICATIONS

- ◇ **Vajdi, Aram**, Lee W. Cohnstaedt, and Caterina M. Scoglio. **Assessing Dengue Risk Globally Using Non-Markovian Models**. *Journal of Theoretical Biology* 591 (2024): 111865.
- ◇ **Vajdi, Aram**, Lee W. Cohnstaedt, Leela E. Noronha, Dana N. Mitzel, William C. Wilson, and Caterina M. Scoglio. **A non-markovian model to assess contact tracing for the containment of covid-19**. *IEEE Transactions on Network Science and Engineering* 11, no. 1 (2023): 197-211.
- ◇ Yang, Qihui, Chunlin Yi, **Aram Vajdi**, Lee W. Cohnstaedt, Hongyu Wu, Xiaolong Guo, and Caterina M. Scoglio. **Short-term forecasts and long-term mitigation evaluations for the COVID-19 epidemic in Hubei Province, China**. *Infectious Disease Modelling* 5 (2020): 563-574.
- ◇ **Vajdi, Aram**, David Juher, Joan Saldaña, and Caterina Scoglio. **A multilayer temporal network model for STD spreading accounting for permanent and casual partners**. *Scientific reports* 10, no. 1 (2020): 3846.
- ◇ **Vajdi, Aram**, and Caterina M. Scoglio. **Identification of missing links using susceptible-infected-susceptible spreading traces**. *IEEE Transactions on Network Science and Engineering* 6, no. 4 (2018): 917-927.
- ◇ Sahneh, Faryad Darabi, **Aram Vajdi**, Joshua Melander, and Caterina M. Scoglio. **Contact adaption during epidemics: A multilayer network formulation approach**. *IEEE Transactions on Network Science and Engineering* 6, no. 1 (2017): 16-30.
- ◇ Rudenko, Artem, Varun Makhija, **Aram Vajdi**, Thorsten Ergler, Markus Schürholz, Rajesh K. Kushawaha, Joachim Ullrich, Robert Moshhammer, and Vinod Kumarappan. **Strong-field-induced wave packet dynamics in carbon dioxide molecule**. *Faraday Discussions* 194 (2016): 463-478.
- ◇ Ren, Xiaoming, A. M. Summers, **Aram Vajdi**, Varun Makhija, C. W. Fehrenbach, Nora G. Kling, K. J. Betsch et al. **Single-shot carrier-envelope-phase tagging using an f-2f interferometer and a phase meter: a comparison**. *Journal of Optics* 19, no. 12 (2017): 124017.
- ◇ Saaiddi, Kh, **A. Vajdi**, and A. Aghamohammadi **Static spherically symmetric solution of $(R \pm \mu^4/R)$ gravity**. *General Relativity and Gravitation* 42, no. 10 (2010): 2421-2429.

SELECTED TALKS

- ◇ Aram Vajdi, Caterina M. Scoglio. A Non-Markovian networked spreading model to assess the effectiveness of contact tracing. Presented at *Annual Meeting for the Central States Section of SIAM, Oklahoma State University, OK*, 2022.
- ◇ Aram Vajdi, Caterina M. Scoglio. Prediction of epidemic onset in networks via effective resistance distance. Presented at *Annual Meeting for the Northern States Section of SIAM, University of Wyoming, WY*, 2019.
- ◇ Aram Vajdi, Caterina M. Scoglio. SIS Epidemics in Multilayer-based Temporal Networks. Presented at *Annual Meeting for the Central States Section of SIAM, University of Oklahoma, OK*, 2018.
- ◇ Aram Vajdi, Caterina M. Scoglio. Identification of Missing Links Using Susceptible-Infected-Susceptible Epidemic Traces. Presented at *Annual Meeting for the Central States Section of SIAM, Colorado State University, CO*, 2017.

SKILLS

- Proficient in programming languages: MATLAB, Python (NumPy, SciPy, Matplotlib, Pandas, scikit-learn, TensorFlow PyTorch), R, LabVIEW, C++ and SQL
- Expertise in ► Mathematical modeling of dynamical systems ► Statistical inference and time-series analysis ► Machine learning (DL, GNNs, RL) ► Network science ► Optimization, control and state estimation ► Stochastic simulation
- Experienced in femtosecond laser systems, design and assembly of optical/experimental setups, and computer networking