Cina Aghamohammadi

CONTACT INFORMATION	✉ E-mail: ca6941@princeton.edu
	Homepage: **My Google Scholar**

APPOINTMENTS

Princeton Neuroscience Institute, Princeton, NJ, US,   Jan 2023 to Present

- Associate Research Scholar , **Engel Lab**

Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, US,   Feb 2019 to Jan 2023

- Post Doctoral Research Fellow , **Engel Lab**

EDUCATION

University of California, Davis, Davis, CA, US ,   Sep 2013 to Dec 2018

- PhD , Physics, under the supervision of Professor **James. P. Crutchfield**

Sharif University of Technology, Tehran, Iran   Sep 2008 to 2013

- ✍ B.Sc., Electrical Engineering (Information and communication theory),
- ✍ B.Sc., Physics (Complex systems),   (GPA of physics courses: 4/4)

Young Scholar Club, Tehran, Iran   July 2007 to Jun 2008

1 Year Courses on Physics and Mathematics for International Physics Olympiad Preparation

Allame Helli High School, Tehran, Iran   Sep 2004 to Jun 2007

National Organization for Development of Exceptional Talents (NODET)[1]

HONORS AND AWARDS

➢ **Swartz Fellowship**, Princeton University, June 2023 to Present.

➢ **UCD & Humanities Graduate Research Award**, University of California, Davis, August 2018.

➢ **Information Engines Scholarship Award**, Telluride Science Research Center, August 2017.

➢ **Biruni 2017 Graduate Student Research Award**, March 2017. *Recognize outstanding research by a physics graduate student.*

➢ **Gold Medalist** of 20th *National Physics Olympiad*, Tehran, Iran, Sep 2007

➢ **Bronze Medalist** of 39th **International Physics Olympiad**, Hanoi, Vietnam, Jun 2008

➢ **Mahmoud Hessabi prize** in 2012, an annual award given by *The Physics Society of Iran* during the Annual Physics Conference awards ceremony.

➢ **Fellow of Iranian *National Elites Foundation***; annul scholarship awarded 2009-2013.

➢ **Merit-based admission offer** to Physics graduate program at Sharif University, Iran; Awarded to 5 students during the course of undergraduate studies, May 2012.

PUBLICATIONS (PUBLISHED)

➢ Cina Aghamohammadi, & Amir Aghamohammadi;
"**Slipping and rolling on an inclined plane**",
European Journal of Physics **32** *(2011) 1049-1057*
http://iopscience.iop.org/0143-0807/32/4/017.

---

[1] NODET stands for National Organization for Development of Exceptional Talents. For entry to NODET's high schools, a few students are selected each year among tens of thousands of participants based on intelligence, mathematics knowledge and logical deduction.

➢ Amir Aghamohammadi, Cina Aghamohammadi, & Mohammad Khorrami;
"**Externally driven one-dimensional Ising model**",
Journal of Statistical Mechanics: Theory and Experiment (2012) P02004
http://iopscience.iop.org/1742-5468/2012/02/P02004.

➢ Amir Hossein Shirazi, Cina Aghamohammadi, Mehrnaz Anvari, Alireza Bahraminasab, M. Reza Rahimi Tabar, Joachim Peinke, Muhammad Sahimi, and Matteo Marsili;
"**Scale dependence of the directional relationships between coupled time series**",',
Journal of Statistical Mechanics: Theory and Experiment (2013) P02042
http://iopscience.iop.org/1742-5468/2013/02/P02042.

➢ Mehrnaz Anvari, Cina Aghamohammadi, H Dashti-Naserabadi, E Salehi, E Behjat, M Qorbani, M Khazaei Nezhad, M Zirak, Ali Hadjihosseini, Joachim Peinke, & M Reza Rahimi Tabar;
"**Stochastic nature of series of waiting times**",
Physical Review E **87** *(2013) 062139*
http://pre.aps.org/abstract/PRE/v87/i6/e062139.

➢ Cina Aghamohammadi, Mehran Ebrahimian, & Hamed Tahmooresi;
"**Permutation approach, high frequency trading and variety of micro patterns in financial time series**",
Physica A: Statistical Mechanics and its Applications *413 (2014): 25-30.*
http://www.sciencedirect.com/science/article/pii/S0378437114005020.

➢ John. R. Mahoney, Cina Aghamohammadi & James. P. Crutchfield;
"**Occam's Quantum Strop: Synchronizing and Compressing Classical Cryptic Processes via a Quantum Channel**",
Nature Scientific reports *6 (2016)*
http://www.nature.com/articles/srep20495

➢ Paul. M. Riechers, J. R. Mahoney, Cina Aghamohammadi & James. P. Crutchfield;
"**Minimized state complexity of quantum-encoded cryptic processes**",
Physical Review A *93.5 (2016): 052317.*
http://journals.aps.org/pra/abstract/10.1103/PhysRevA.93.052317.

➢ Cina Aghamohammadi, J. R. Mahoney & James. P. Crutchfield;
"**The ambiguity of simplicity in quantum and classical simulation**",
Physics Letters A *(2017).*
http://www.sciencedirect.com/science/article/pii/S0375960116310507.

➢ Cina Aghamohammadi & James. P. Crutchfield;
"**Minimum memory for generating rare events**",
Physical Review E *(2017)*
https://journals.aps.org/pre/abstract/10.1103/PhysRevE.95.032101.

➢ Cina Aghamohammadi & James. P. Crutchfield;
"**Thermodynamics of Random Number Generation**",
Physical Review E *(2017)*
https://journals.aps.org/pre/abstract/10.1103/PhysRevE.95.062139.

➢ Cina Aghamohammadi, J. R. Mahoney & James. P. Crutchfield;
"**Extreme Quantum Advantage when Simulating Classical Systems with Long-Range Interaction**",
Nature Scientific reports *(2017)*
https://www.nature.com/articles/s41598-017-04928-7.

➢ Cina Aghamohammadi, Samuel. P. Loomis, J. R. Mahoney & James. P. Crutchfield;
"**Extreme quantum memory advantage for rare-event sampling** ",
Physical Review X *(2018)*
https://journals.aps.org/prx/abstract/10.1103/PhysRevX.8.011025.

➢ Samuel. P. Loomis, John. R. Mahoney, Cina Aghamohammadi & James. P. Crutchfield;
"**Optimizing Quantum Models of Classical Channels: The Reverse Holevo Problem**",
Journal of Statistical Physics *(2020)*

https://link.springer.com/article/10.1007/s10955-020-02649-2.

➤ Amir Aghamohammadi, Cina Aghamohammadi & Saman Moghimi-Araghi;
  "**On swimmer's strategies in various currents**",
  European Journal of Physics (2023)
  https://iopscience.iop.org/article/10.1088/1361-6404/acdf2f.

➤ Mohammad Khorrami, Amir Aghamohammadi, Cina Aghamohammadi;
  "**Slipping and rolling on a rough accelerating surface**",
  Indian Journal of Physics (2024)
  https://link.springer.com/article/10.1007/s12648-023-02878-7.

➤ James P Crutchfield, Cina Aghamohammadi;
  "**Not All Fluctuations Are Created Equal: Spontaneous Variations in Thermodynamic Function**",
  Entropy (2024)
  https://www.mdpi.com/1099-4300/26/11/894.

➤ Cina Aghamohammadi, Chandramouli Chandrasekaran, & Tatiana Engel;
  "**A doubly stochastic renewal framework for partitioning spiking variability**",
  bioRxiv (2024)
  https://www.biorxiv.org/content/10.1101/2024.02.21.581457v1.abstract.

➤ Walter. Germán. Bast, Cina Aghamohammadi, Priyanka. Gupta, Tatiana Engel & Dinu. F. Albeanu;
  "**An optogenetic stimulation approach to quantify the contribution of individual glomeruli to olfactory percepts**",
  Chemical Senses
  https://repository.cshl.edu/id/eprint/41376/.

➤ Cina Aghamohammadi, Jochem. van. Kempen, Molly. Stapleton, Alwin Gieselmann, Alexander. Thiele & Tatiana Engel;
  "**Decision making under working memory limitations**",
  In prepration

RESEARCH
INTERESTS

➤ **Computational Neuroscience** ➤ **Theoretical Neuroscience** ➤ **Machine Learning** ➤ **Olfaction** ➤ **Decision making** ➤ **Simulation of Large Scale system** ➤ **Stochastic Systems** ➤ **Dynamical Systems** ➤ **Information Theory** ➤ **Statistical Physics** ➤ **Non equilibrium Thermodynamics** ➤ **Large Deviation Theory** ➤ **Quantum Computers** ➤ **Quantum Simulation** ➤ **Nano Computer**

SKILLS

Computer Skills

⇨ *Proficient in Python, PyTorch, Matlab, LATEX.*

Language Skills:

✎ English (Full professional proficiency), Farsi (*native*)

INVITED TALKS

➤ "**Beyond the Typical Set: Fluctuations in Intrinsic Computation**", CCS'15, Tempe, Arizona, September 30, 2015.

➤ "**Large deviation theory and fluctuations in intrinsic computation** ",Learning, Information Theory, and Non equilibrium Statistical Mechanics Seminar, Redwood Center, UC Berkeley, California, June 3, 2016.

- ➢ **"Thermodynamics of Random Number Generation"**, NEMS Information Engines and Networks, California Institute of Technology, Pasadena, California, March, 2017.

- ➢ **"Thermodynamic Functionality at Finite Length"**, Information Engines at the Frontiers of Nanoscale Thermodynamics, Telluride Science Research Center, Telluride, Colorado, August, 2017.

- ➢ **"Thermodynamic Versus Memory Resource for Simulation"**, NEMS Information Engines and Networks, California Institute of Technology, Pasadena, California, December, 2017.

- ➢ **"Ambiguous Nature of Complexity in the Observation Process "**, Simple Observers, Foundational Questions Institute, Scotts Valley, California, July, 2018.

- ➢ **"Large Deviations in Thermodynamic Computation"**, Information Engines at the Frontiers of Nanoscale Thermodynamics, Telluride Science Research Center, Telluride, Colorado, July, 2018.

- ➢ **"Information Theoretic Approach to Complex Systems"**, Cold Spring Harbor Lab, Cold Spring Harbor, New York, August, 2018.

- ➢ **"Deviations from optimality in sequential evidence accumulation due to temporal dependencies"**, Swartz meetinng, Aug, 2022.

- ➢ **"I Can't Believe It's Not an Inhomogeneous Poisson!"**, Cosyne meeting, March, 2024.

- ➢ **"I Can't Believe It's Not an Inhomogeneous Poisson!"**, Swartz meeting, August, 2024.

TALKS

- ➢ **"Extreme Quantum Advantage when Simulating Strongly Coupled Classical Systems "**, 2016 Annual APS Meeting of the Far West Section, Volume 61, Number 17, Session: Condensed Matter Physics I, UC Davis, California, October 28, 2016.

- ➢ **"Unbiased Estimation of"** CV^2 **of** ISI**s VarCE For Renewal Processes**, Cold Spring Harbor Lab, Cold Spring Harbor, New York, OCT, 2019.

- ➢ **"Unbiased estimation of firing-rate variance from spikes to reveal decision computations**, SFN, Chicago, OCT, 2019.

- ➢ **"Partitioning the Variability of Doubly Stochastic Renewal Point Process**, Cold Spring Harbor Lab Neuro-in-house**, Jan, 2020.

- ➢ **"Deviations from optimality in sequential evidence accumulation due to temporal dependencies"**, Neurobiology of Cognition Gordon Research Conference, Jul, 2022.

- ➢ **"Influence of working memory limitations and dopamine on evidence accumulation'**, SFN meeting, Nov, 2023.

- ➢ **"Influence of working memory limitations and dopamine on evidence accumulation "**, Cosyne meeting, March, 2024.

REFERENCES

- ➢ **Prof. Tatiana Engel**
  Address: Princeton Neuroscience Institute, Princeton, NJ
  ✉E-mail: tatiana.engel@princeton.edu
  Homepage: Google Scholar

- ➢ **Prof. James. P. Crutchfield**
  Address: Complexity Sciences Center, University of California, Davis
  ✉E-mail: chaos@ucdavis.edu
  Homepage: http://csc.ucdavis.edu/Crutchfield.html

- ➢ **Dr. John. R. Mahoney**
  Address: Complexity Sciences Center, University of California, Davis
  ✉E-mail: jrmahoney@ucdavis.edu
  Homepage: http://csc.ucdavis.edu/ jmahoney/

➢ **Prof. Alexander. Thiele**
Address: Biosciences Institute, Newcastle University, UK
✉E-mail: alex.thiele@ncl.ac.uk
Homepage: https://www.staff.ncl.ac.uk/alex.thiele/

➢ **Prof. Alexander. Thiele**
Address: Biosciences Institute, Newcastle University, UK
✉E-mail: alex.thiele@ncl.ac.uk
Homepage: https://www.staff.ncl.ac.uk/alex.thiele/