

eddielee

physics of collective behavior

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programming

eltrompetero@github
Python
MATLAB
R
Mathematica
C++

big question

What universal principles underlie collective behavior through time and space? I am inspired by concepts, intuition, and models from statistical physics to search for fundamental principles in the wondrous complexity of biology and society.

education

2014–2019 **Ph.D. in Physics** Cornell University
Quantitative modeling of collective behavior. Advisor Paul Ginsparg.

2008–2012 **A.B. in Physics & Certificate in Biophysics** Princeton University
Degree awarded cum laude.

positions held

2020–now **Program Post-doctoral Research Fellow** Santa Fe Institute
Universality & scaling in conflict dynamics. Metabolic scaling in biology.

2018–2019 **Santa Fe Institute Graduate Fellowship** Cornell University
Conflict dynamics, statistical physics of voting.

2015–2018 **National Science Foundation Graduate Research Fellow** Cornell University
Theoretical analysis of plastic deformation & experiments in virtual reality for exploring interpersonal coordination of motion.

grants, honors, awards (selected)

2017 **STIR grant from Army Research Office** \$60,000
“Determining the limits of human coordination” (drafted by me), PI Itai Cohen.

2015 **Dirksen Congressional Center Dissertation Grant** \$4,000
Influential voters in Congress.

NSF Graduate Research Fellowship
Competitive national competition to fund graduate education.

2011, 2012 **Kusaka Memorial Prize** \$2,000
For excellence in undergraduate research.

publications

Peer-reviewed

8. **Lee, E.D.**, Daniels, B.C., Myers, C.R., Krakauer, D.C. and Flack, J.C. Scaling theory of armed-conflict avalanches. *Phys. Rev. E* 102, 042312 (2020). DOI:<https://link.aps.org/doi/10.1103/PhysRevE.102.042312>.
7. **Lee, E.D.**, Katz, D.M., Bommarito II, M.J. and Ginsparg, P.H. Sensitivity of collective outcomes identifies pivotal components. *Journal of The Royal Society Interface* 17, (2020). DOI:<https://doi.org/10.1098/rsif.2019.0873>.
6. **Lee, E.D.**, Esposito, E., and Cohen, I. “Audio cues enhance coordination of motion when visual cues are scarce.” *Journal of the Royal Society Interface*, 16(154), (2019). DOI:<https://doi.org/10.1098/rsif.2018.0903>.
5. **Lee, E.D.** and Daniels, B.C. “Convenient Interface to Inverse Ising (ConIII): A Python 3 Package for Solving Ising-Type Maximum Entropy Models.” *Journal of Open Research Software*, 7(3):1–8 (2019). DOI:<https://doi.org/10.5334/jors.217>.

4. **Lee, E.D.** "Partisan Intuition Belies Strong, Institutional Consensus and Wide Zipf's Law for Voting Blocs in US Supreme Court." *Journal of Statistical Physics* 173(6):1722–1733 (2018). DOI:<https://doi.org/10.1007/s10955-018-2156-0>.
3. **Lee, E.D.**, Daniels, B.C., Krakauer, D.C., and Flack, J.C. "Collective Memory in Primate Conflict Implied by Temporal Scaling Collapse." *Journal of the Royal Society Interface*, 14:20170223 (2017). DOI:<http://dx.doi.org/10.1098/rsif.2017.0223>.
2. Sethna, J.P., Bierbaum, M.K., Dahmen, K.A., Goodrich, C.P., Greer, J.R., Hayden, L.X., Kent-Dobias, J.P., **Lee, E.D.**, Liarte, D.B., Ni, X., and Quinn, K.N. "Deformation of crystals: Connections with statistical physics." *Annual Review of Materials Research*, 47(14):1–13 (2017). DOI:<https://doi.org/10.1146/annurev-matsci-070115-032036>.
1. **Lee, E.D.**, Broedersz, C.P., and Bialek, W. "Statistical Mechanics of the US Supreme Court." *Journal of Statistical Physics*, 160(2):275–301 (2015). DOI:<https://doi.org/10.1007/s10955-015-1253-6>.

Working papers

4. **Lee, E.D.**, Kempes, C.P. & West, G.B. Dynamics of growth, death, and resource competition in sessile organisms. arXiv:2009.14699 [q-bio] (2020). <http://arxiv.org/abs/2009.14699>.
3. **Lee, E.D.**, Flack, J.C., and Krakauer, D.C. "Inference, memory, and the construction of optimal learning time scales for adaptation." Preprint available upon request.
2. **Lee, E.D.**, Chen, X., Daniels, B.C. "Geometry of model manifold identifies key neurons in *C. elegans*."
1. **Lee, E.D.**, Daniels, B.C., Myers, C.R., Krakauer, D.C., and Flack, J.C. "Emergent regularities and scaling in armed conflict data," arXiv:1903.07762, 2019. <https://arxiv.org/abs/1903.07762>.

research presentations (selected)

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| 2021 | "Emergent regularities and scaling in armed conflict data"
<i>Invited to minisymposium "Modeling collective human behavior in social systems" at SIAM Dynamical Systems.</i> | SIAM, Portland |
| 2019 | "Coarse-graining armed conflict" | March APS, Boston |
| 2018 | "Keeping it together: How humans coordinate motion with low information"
"Collective memory in primate conflict implied by temporal scaling collapse" | March APS, Los Angeles
BiFi, Zaragoza |
| | "Renormalization group & armed conflict" (invited)
"Statistical physics of collective behavior" (invited) | Santa Fe Institute
Santa Fe Institute |
| 2016 | "Voting in the Supreme Court, conflict in pigtailed macaques, & statistical physics" (invited)
"A Bethe-lattice-like mean-field model for the plastic deformation of amorphous solids" | Santa Fe Institute
Statphys, Lyon |

service & outreach

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|-----------|---|--------------------|
| | Reviewer for <i>Journal of Statistical Mechanics</i>, <i>PLoS Computational Biology</i> | |
| 2020 | Colloquium Committee Chair
STEM Santa Fe volunteer
<i>Math festival for middle-schoolers.</i> | Santa Fe Institute |
| 2019–2020 | Participant in Letters to Pre-Scientist
<i>Pen pal program with elementary school students.</i> | |

- 2018 **Cornell Center for Material Research outreach volunteer**
- 2017 **Physics Dept. colloquium committee student representative**
- 2015–2016 **Physics representative to Graduate & Professional Student Assembly**
- 2014 **Education Outreach Initiative** Wisconsin Institute for Discovery
Developed and taught curriculum on complex systems for middle school students in coordination with the Discovery Outreach Center.
- 2013 **Lecturer at Humanities Hackathon** Wisconsin Institute for Discovery
A weeklong course about using R for the digital humanities. I focused on audio analysis.
- 2012 **Volunteer physics tutor** Princeton High School
After school help sessions with students in physics.

media

- 2020 **Swing voter work covered in *Cornell Chronicle* and by SFI Press**
- 2019 **Conflict research covered in *Cosmos Magazine***
- 2018 **Supreme Court paper covered in the *Cornell Chronicle* and *Ars Technica***
- 2015 **Supreme Court paper covered in *Wired***