

Uttam Bhat

Ecology and Evolutionary Biology, University of California, Santa Cruz
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EDUCATION

2012–2017, Boston University
Ph.D, Department of Physics

2008–2012, Indian Institute of Technology, Bombay
B.Tech, Department of Physics

RESEARCH INTERESTS

- First principles modeling of complex systems using principles from statistical physics and probability theory
- Computational modeling, efficient simulations incorporating the right data structures and analytical results
- Machine learning, Neural networks, Gaussian process, empirical dynamical modeling and other data-driven approaches
- Random walks, Brownian motion, first passage processes and stochastic processes.
- Random graph models, clustering and densification properties of graphs.

RESEARCH EXPERIENCE

- **Postdoctoral Scholar, University of California, Santa Cruz, CA** Nov, 2019 - Present
Department: Ecology and Evolutionary Biology
Advisor: Stephan B. Munch
- Developing data-driven approaches to model-building, using time-delay embedding, dynamical theory, Gaussian process and neural networks
- **Postdoctoral Scholar, University of California, Merced, CA** Sept, 2017 - Oct 2019
Department: Life and environmental Sciences
Advisor: Justin D. Yeakel
- First principles modeling of population dynamics incorporating life-histories, and connected them to evolutionary dynamics
- **Graduate Student, Boston University, Boston, MA** Sept 2012 - Sept 2017
Department: Physics
Advisor: Sidney Redner
- Built new framework to study animal foraging, using statistical mechanics principles
- Analysed the effect of greed, sensing and memory on the fitness of a stochastic forager
- Analysed the effect of second order linking on clustering of networks

RESEARCH ARTICLES

Ecology

1. J. D. Yeakel, **Uttam Bhat**, and S. D. Newsome, *Caching in or falling back at the Sevilleta*, [arXiv:1907.06305](#) (accepted at Am. Nat)
2. **Uttam Bhat**, C. P. Kempes, and J. D. Yeakel, *Scaling of the risk landscape drives optimal life history strategies and the evolution of grazing*, PNAS Jan 21, 2020 117 (3) 1580-1586 [arXiv: 1905.01540](#)
3. L. Hébert-Dufresne, A. F. A. Pellegrini, **Uttam Bhat**, S. Redner, S. W. Pacala, and A. Berdahl, *“Edge fires drive the shape and stability of tropical forests”*, Ecology Letters, vol. 21, p. 794, 6, 2018
4. C. L. Rager, **Uttam Bhat**, O. Bénichou, and S. Redner, *“The Advantage of Foraging Myopically”*, Journal of Statistical Mechanics: Theory and Experiment, (2018) 073501 [arXiv: 1804.08045](#)
5. O. Bénichou, **Uttam Bhat**, P. Krapivsky, and S. Redner, *“Optimally Frugal Forager”*, Phys. Rev. E 97, 022110 9 February 2018 [arXiv: 1711.03610](#)
6. **Uttam Bhat**, S. Redner, and O. Bénichou, *“Starvation Dynamics of a Greedy Forager”*, Journal of Statistical Mechanics: Theory and Experiment, (2017) 073213 [arXiv: 1704.05861](#)

7. **Uttam Bhat**, S. Redner, and O. Bénichou, “Does Greed Help a Forager Survive?”, *Physical Review E*, vol. 95, p. 062119, Jun 2017. [arXiv: 1703.03434](#)
8. N. J. Dominy, J. D. Yeakel, **Uttam Bhat**, L. Ramsden, R. W. Wrangham, and P. W. Lucas, “How Chimpanzees Integrate Sensory Information to select Figs”, *Interface Focus*, vol. 6, no. 3, 2016.
9. J. D. Yeakel, **Uttam Bhat**, E. A. Elliott Smith, and S. D. Newsome, “Exploring the Isotopic Niche: Isotopic Variance, Physiological Incorporation, and the Temporal Dynamics of Foraging”, *Frontiers in Ecology and Evolution*, vol. 4, p. 1, 2016. [arXiv: 1510.00767](#)

Complex networks

10. **Uttam Bhat**, M. Shrestha, and L. Hébert-Dufresne, “Exotic Phase Transitions of k -cores in Clustered Networks”, *Physical Review E*, vol. 95, p. 012314, Jan 2017. [arXiv: 1607.08637](#)
11. **Uttam Bhat**, P. Krapivsky, R. Lambiotte, and S. Redner, “Densification and Structural Transitions in Networks that Grow by Node Copying”, *Physical Review E*, vol. 94, p. 062302, Dec 2016. [arXiv:1610.01662](#)
12. R. Lambiotte, P. Krapivsky, **Uttam Bhat**, and S. Redner, “Structural Transitions in Dense Networks”, *Physical Review Letters*, vol. 117, p. 218301, Nov 2016. [arXiv: 1607.03850](#)
13. **Uttam Bhat**, P. L. Krapivsky, and S. Redner, “Emergence of Clustering in an Acquaintance Model without Homophily”, *Journal of Statistical Mechanics: Theory and Experiment*, vol. 2014, no. 11, p. P11035, 2014. [arXiv: 1408.6596](#)

Random Walk, Brownian Processes, Lattice Gas

14. **Uttam Bhat**, C. De Bacco, and S. Redner, “Stochastic Search with Poisson and Deterministic Resetting”, *Journal of Statistical Mechanics: Theory and Experiment*, vol. 2016, no. 8, p. 083401, 2016. [arXiv: 1605.08812](#)
15. **Uttam Bhat** and S. Redner, “Intermediate-Level Crossings of a First-Passage Path”, *Journal of Statistical Mechanics: Theory and Experiment*, vol. 2015, no. 6, p. P06035, 2015. [arXiv: 1505.01184](#)
16. **Uttam Bhat** and P. L. Krapivsky, “Exclusion Processes with Avalanches”, *Physical Review E*, vol. 90, p. 012133, Jul 2014. [arXiv: 1406.1937](#)

CONFERENCE TALKS

- “Resource investment strategies in uncertain and patchy environments” (poster), Unifying ecology across scales, Gordon Conference, University of New England. July 21, 2018
- “Stochastic Search with Reset”, Statistical Mechanics Conference, Rutgers University. May 08, 2016
- “Transitive Linking in Networks”, Kinetic Networks: From Topology to Design, Santa Fe Institute. Sept 18, 2015
- “Emergence of Clustering in Friendship Networks”, Statistical Mechanics Conference, Rutgers University. Dec 15, 2013
- “Emergence of Clustering in Friendship Networks”, Greater Boston Area Statistical Mechanics Conference. Oct 12, 2013

OTHER TALKS

- “Linking the persistence of the Sevilleta rodent community to alternative caching and foraging strategies”, SEV-LTER Science Symposium, University of New Mexico. Sept 21, 2018
- “Surprises in Brownian Motion” *Departmental Seminar*, Department of Physics, Boston University. May 10, 2016
- “Little Knowledge is a Dangerous Thing” (on greedy forager dynamics), *Slice of Science Seminar*, Santa Fe Institute. Feb 9, 2016
- “Taming the Search-Space in Music” (on degrees of freedom in melodic music and their relation to aesthetics and human psychology), *Reckless Ideas Seminar*, Santa Fe Institute. Nov 6, 2015
- “Transitive Linking in Acquaintance Dynamics”, *Slice of Science Seminar*, Santa Fe Institute. Feb 10, 2015

PROGRAMMING AND MATH LANGUAGES

- In order of fluency: C++, C, Python, Julia, Mathematica, MATLAB

TEACHING AND MENTORING EXPERIENCE

- Mentoring a doctoral student. Guided the student to construct sound mathematical models and helped polish their research goals.
- Teaching Assistant for the Physics Lab for premedical students, Boston University. Fall 2012
- Head Teaching Assistant for the First Course in Probability and Statistics for Engineers, Indian Institute of Technology, Bombay. Spring 2012
- Teaching Assistant for the First Course in Probability and Statistics for Engineers, Indian Institute of Technology, Bombay. Spring 2011
- As a Student Facilitator for the Training and Selection Camp for Astronomy Olympiad in India, I helped prepare tutorial sessions, problems and solutions for camp tests and guide the students on academic and non-academic issues throughout the camp. May 2009, May 2010 and May 2012

INDUSTRY EXPERIENCE

Internship with **Finisar**, Malaysia. Aided in the implementation of a new quality assurance test called “Hitachi RDT Bit Error Rate Test”, and analysed data for the efficiency and effectiveness of the test in Summer, 2011

AWARDS AND PARTICIPATION IN INTERNATIONAL OLYMPIADS

- Bronze medal for the Indian team in the 2nd International Olympiad on Astronomy and Astrophysics (IOAA), Indonesia, 2008
- Silver medal for the Indian team in the 12th International Astronomy Olympiad (IAO), Ukraine, 2007

EXTRA-CURRICULARS

As an amateur musician, I am well-versed in playing flute and have basic skills on piano, guitar and bass (published work at <https://soundcloud.com/uttambhat13>). I won the ‘Cultural Citation’ award (2012) and the ‘Cultural Person of the Year’ award (2011) for my contributions to music as a performer and organizer at Indian Institute of Technology, Bombay. I also enjoy hiking, outdoor activities, photography and painting.