Ashivni Shekhawat

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Current Appointment

Fellow at the Miller Institute for Basic Research in Science at UC Berkeley. Affiliated with Prof. Robert Ritchie's group at Lawrence Berkeley National Lab.

Research Interests

Fracture mechanics, Nano and bio materials, Micro-mechanical modeling, Atomistic and ab-initio simulations, Statistical theories of fracture, Renormalization group and scaling in fracture, Extreme value statistics, Complex systems, Avalanches and critical phenomena, Nonlinear dynamics.

Education

- Ph.D., Theoretical And Applied Mechanics, Cornell University, 2013
  - Dissertation Title: *Fracture in Disordered Brittle Media*. Dissertation available online.
  - Advisor: Prof. James P. Sethna, Department of Physics, Cornell University
  - Minor Advisors: Prof. S. L. Phoenix, Prof. S. I. Resnick, Cornell University
- M.S., Aerospace Engineering, Texas A&M University, 2008
  - Thesis Title: *Nonlinear Dynamics of Hysteretic Oscillators.*
  - Advisor: Prof. Tamás Kalmár-Nagy
- B. Tech., Aerospace Engineering, Indian Institute of Technology Kanpur, 2004
  - Senior Project Title: *Analysis and Control of a Shimming Wheel*
  - Advisor: Prof. Dayanand Yadav

Academic Experience

- Miller Fellow – UC Berkeley and LBNL, Sep. 2013 - Present
  - Modeling and experimental studies of fracture in a broad range of materials including high entropy alloys, and bio-inspired materials such as nacre.
- Graduate Assistant – Cornell University, 2008 - 2013
  - Research on fracture in disordered materials.
- Teaching Assistant – Cornell University, 2008 - 2010
  - Mathematics courses at the junior and sophomore level; Dynamics courses at graduate level.
- Graduate Assistant – Texas A&M University, 2006 - 2008
  - Research on modeling of dynamical response of shape memory alloys; optimal trajectory generation for omni-directional vehicles.
- Research Assistant – Indian Institute of Technology Bombay, 2004 - 2005
  - Research on dynamics and control of liquid slosh in launch vehicles; flight stability and bifurcation analysis of shuttle-like re-entry vehicles.

Publications

- *Fracture strength: Stress concentration, extreme value statistics and the fate of the Weibull distribution*, Zsolt Bertalan, Ashivni Shekhawat, James P. Sethna, Stefano Zapperi, Under review, http://arxiv.org/abs/1404.4584.
- *Imaging atomic rearrangements in two-dimensional silica glass: watching silicas dance*, Pinshane Y. Huang, Simon Kurasch, Jonathan S. Alden, Ashivni Shekhawat, Alexander A. Alemi, Paul L. McEuen, James P. Sethna, Ute Kaiser, and David A. Muller, Science 11 October 2013, Vol. 342 No. 6155 pp. 224-227.

- *From damage percolation to crack nucleation through finite size criticality*, Ashivni Shekhawat, Stefano Zapperi, James P. Sethna, Physical Review Letters, 110, 185505 (2013), http://arxiv.org/abs/1210.0989.

- *Fracture strength of disordered media: Universality, interactions and tail asymptotics*, Claudio Manzato, Ashivni Shekhawat, Phani K. V. V. Nukala, Mikko J. Alava, James P. Sethna, Stefano Zapperi, Physical Review Letters, 108, 065504 (2012), http://arxiv.org/abs/1108.4679v1.

- *Dielectric breakdown and avalanches at non-equilibrium metal-insulator transitions*, Ashivni Shekhawat, Stefanos Papanikolaou, Stefano Zapperi, James P. Sethna, Physical Review Letters 107, 276401 (2011), http://arxiv.org/abs/1009.4735v3.

- *Nonlinear dynamics of oscillators with bilinear hysteresis and sinusoidal excitation*, Tamás Kalmár-Nagy, Ashivni Shekhawat, Physica D 238 (2009) 1768-1786.

Invited Talks

- *What has fracture got to do with magnets and the liquid-gas critical point?*, Ashivni Shekhawat, James P. Sethna, Institute seminar at the Institute for Mathematical Sciences, Chennai, India, January 6, 2014.

- *Fracture and critical phenomena*, Ashivni Shekhawat, James P. Sethna, Departmental seminar at the Department of Applied Mechanics, Indian Institute of Technology, Delhi, December 17, 2013.

- *Fracture, magnets, and critical points*, Ashivni Shekhawat, James P. Sethna, Departmental seminar at the Department of Mechanical and Aerospace Engineering, University of Florida, Gainsville, November 12, 2013.

- *Statistics of fracture: Weibull, Gumbel and other questions*, Ashivni Shekhawat, Claudio Manzato, Phani K. V. V. Nukala, Mikko J. Alava, Stefano Zapperi, James P. Sethna, 2012 TMS Annual Meeting & Exhibition, Orlando, Florida, March 11-15, 2012.

- *Fracture statistics: Universality vs nucleation*, Ashivni Shekhawat, Claudio Manzato, Phani K. V. V. Nukala, Mikko J. Alava, Stefano Zapperi, James P. Sethna, American Physical Society March Meeting, February 27 - March 2 2012. Presentation available online.

- *Fracture and reliability in engineering materials*, Ashivni Shekhawat, Claudio Manzato, Phani K. V. V. Nukala, Mikko J. Alava, Stefano Zapperi, James P. Sethna, 50th Aerospace Sciences Meeting, Nashville, Tennessee, January 9-12, 2012.

Theses

- *Fracture in disordered brittle media*, Ashivni Shekhawat, Ph.D. Dissertation, Department of Theoretical and Applied Mechanics, Cornell University, 2013. Dissertation available online.

- *Nonlinear dynamics of hysteretic oscillators*, Ashivni Shekhawat, MS. Thesis, Department of Aerospace Engineering, Texas A&M University, 2008. Thesis available online.

- *Analysis and control of a shimming wheel*, Ashivni Shekhawat, B. Tech. Thesis, Department of Aerospace Engineering, Indian Institute of Technology Kanpur, 2004.

Awards And Honors

- 2013 Miller Fellow in Material Science And Engineering, UC Berkeley
  - This fellowship is awarded to about 10 scholars across all sciences every year by the Miller Institute at University of California Berkeley. I am the third person to get this fellowship in the Material Science and Engineering Department in over 50 years.
- 2011 AIAA graduate research award in *Fracture and reliability in engineering materials*
  - This award is given annually to up to 4 graduate students selected by the Foundation and Technical Committees of the American Institute of Aeronautics and Astronautics.
- Best Paper In Session at the 44th Annual Technical Meeting of the Society of Engineering Science
  - Award for the presentation of the paper titled *Dynamics of a hysteretic oscillator: A hybrid systems approach*
- 1999 Rajasthan talent search scholar
  - This award is given by the Department of Science and Technology of the state of Rajasthan (India) to 20 scholar annually on basis of performance in a competition with about 30,000 participants.

Conference Presentations/Posters

- *Statistics of brittle fracture*, Ashivni Shekhawat, Claudio Manzato, Phani K. V. V. Nukala, Mikko J. Alava, Stefano Zapperi, James P. Sethna, Average methods for multiscale phenomena in engineering materials workshop, Carnegie Mellon University, Pittsburgh, Pennsylvania, April 2-4, 2012. Poster available online.
- *Fracture: Percolative, critical or nucleated?*, Ashivni Shekhawat, Stefano Zapperi, James P. Sethna, Gordon Conference on Soft Condensed Matter Physics, New Haven, New Hampshire, August 13-19, 2011.
- *Theory of phase transition and avalanches in non-equilibrium Mott transition*, Ashivni Shekhawat, Stefanos Papanikolaou, Stefano Zapperi, James P. Sethna, 103rd Statistical Mechanics Conference, Rutgers, New Jersey, May 9-11, 2010.
- *Universal properties of fuse network fracture strength distributions*, Ashivni Shekhawat, Claudio Manzato, Stefano Zapperi, James P. Sethna, 104th Statistical Mechanics Conference, Rutgers, New Jersey, December 19-21, 2010.
- *Response of oscillators with bilinear hysteresis and sinusoidal excitation*, Tamás Kalmár-Nagy, Ashivni Shekhawat, 12th Conference on nonlinear vibrations, dynamics and multibody systems, Blacksburg, Virginia, June 1-5, 2008.
- *Near-optimal trajectory generation for omni-directional vehicles by constrained dynamic inversion*, Ashivni Shekhawat, Tamás Kalmár-Nagy, John Valasek, Janos Turi, AIAA Guidance, Navigation and Control Conference and Exhibit, Hilton Head, South Carolina, August 20-23, 2007.
- *Dynamics of a hysteretic oscillator: A hybrid systems approach*, Ashivni Shekhawat, Tamás Kalmár-Nagy, Dimitri C. Lagoudas, 44th Annual Technical Meeting, Society of Engineering Science, College Station, Texas, October 21-24, 2007.
- *Modeling and stability analysis of coupled slosh-vehicle dynamics in planar atmospheric flight*, Ashivni Shekhawat, Chetan Nichkawde, Narayan Ananthkrishnan,

44th AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, January 9-12, 2006.

Workshops And Seminars

- Gordon research seminar on soft condensed matter physics, New Haven, New Hampshire, August 13, 2011.
- Cornell nanoScale science & technology facility (CNF) short course: Technology & characterization at the nanoscale, Cornell University, Ithaca, New York, June 7-10, 2011.
- KIM (Knowledgebase of Interatomic Models) Inaugural meeting, San Diego, California, February 26-27, 2011.
- NNIN/NCN fall workshop, Cornell University, Ithaca, New York, November 14, 2010.
- Programming the GPU: Introduction to CUDA, national nanotechnology infrastructure network computation (NNIN/C), Harvard University, Cambridge, Massachusetts, August 12-14, 2009.