

## Niladri Gomes

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Github: <https://github.com/niladri18>

**Current position:** Graduate research assistant in department of Physics at University of Arizona.

**Research Interest:** Theory of low dimensional correlated electron systems, Carbon based organic materials.

### Education:

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|--|------------------------------|
| 1. University of Arizona : PhD (Physics)                 | Fall 2011- current, GPA: 3.9 |
| 2. Indian Institute of Technology Bombay: M.Sc (Physics) | 2008-2010, GPA: 8.63/10      |
| 3. St Xavier's College, Kolkata, (India): B.Sc (Physics) | 2005-2008, GPA: 65.1%        |

### Research accomplishments:

- Research on correlated electron superconductivity in organic charge transfer solids: (ET)-salts, Pd(dmit)<sub>2</sub>-salts under Prof. Sumit Mazumdar, (University of Arizona) (Spring 2012-current)
  - Study of relationship between different broken symmetries, magnetism and superconductivity
- State of the art numerical calculations on Hubbard model: Path Integral Renormalization Group (PIRG), collaboration with Dr. R. Torsten Clay & group (Mississippi State University)(2013)
  - Implemented PIRG algorithm (involves numerical renormalization and optimization of basis sets) and simulated interacting-electron systems using the code (application to superconducting materials)
  - Worked on parallel version of the PIRG code to be run in the NERSC supercomputers (DOE research lab, California) and high performance computing facility at University of Arizona
  - Calculation of many body ground states of Hubbard model using Lanczos (exact diagonalization) and Constrained Path Monte Carlo (CPMC)
- Implemented 'Single Configuration Interaction' (SCI) theory(University of Arizona)(2012)
  - Used the code to calculate optical absorption spectrum in conjugated polymers

### Other experience(s):

- Intern in Cymer Technologies: Simulation of optical pulse amplification in CO<sub>2</sub> fast-axial flow amplifiers, (2016)
  - Evaluated the model code efficiency
  - Developed parallel version of the code and optimized performance, speed, accuracy
  - Designed a user friendly interface (app), and generated documentation
- Teaching assistant:(Physics 141) Classical mechanics, University of Arizona, (Fall 2011)
- Junior Research Fellow in The Institute of Mathematical Sciences (IMSc), Chennai, India, (2010-2011)
  - Calculation of Entanglement entropy of tetrahedral Kitaev Model
- Monte Carlo approach for Atoms and Molecules, Master's thesis, IIT Bombay, India, (2009-2010)
  - Developed code to simulate quantum mechanical systems like hydrogen atom, harmonic oscillator using Monte Carlo approach
- Preparation of TiO<sub>2</sub> nanoparticles and to observe the photocatalytic effect, under Prof. Sangam Banerjee, SINP Kolkata, (Summer 2009)
- Low temperature experimental techniques, measurement of transport properties, under Prof. Prabhat Mandal, SINP Kolkata, (Winter 2008)

### Scholastic Achievements:

- Fanfare Travel Award, Department of Physics, University of Arizona (2016, 2017).
- Galileo Circle Scholar, College of Science, University of Arizona (2014).
- Technology and Research Initiative Fund (TRIF) fellowship, College of Optical Sciences, University of Arizona( April 2013).
- All India Rank 08 in National Eligibility Test, Council for Scientific and Industrial Research, Govt. of India (December 2009).
- All India Rank 27 in Joint Admission Test, Indian Institute of Technology (2008).

## Publication(s):

1. Niladri Gomes, R. T. Clay, S. Mazumdar. Absence of superconductivity and valence bond order in the Hubbard--Heisenberg model for organic charge-transfer solids. J. Phys. Condens. Matter. **25:** 385603 (2012).
2. Niladri Gomes, W. Wasanthi De Silva, R. T. Clay, S. Mazumdar. Coulomb enhanced superconducting pair correlations in the frustrated quarter-filled band, Phys. Rev. B. **93,** 165110 (2016).
3. W. Wasanthi De Silva, N. Gomes, R. T. Clay, S. Mazumdar. Coulomb enhancement of superconducting pair-pair correlations in a  $\frac{3}{4}$ -filled model for k-(BEDT-TTF)<sub>2</sub>X. Phys. Rev. B. **93,** 205111 (2016).
4. R. T. Clay, A. B. Ward, N. Gomes, S. Mazumdar. Bond patterns and charge order amplitude in 1/4-filled charge-transfer solids, Phys. Rev. B. **95,** 125114 (2017)

## Skills:

- Fortran, Python, Matlab, Pandas, C++ , MPI (parallel programming), OPENMP, LINUX, Git
- High performance computing/ supercomputing

## Seminars/talks:

1. "Quarter-filled systems with frustration: Candidate for correlated electron superconductivity": Niladri Gomes, APS March meeting, Session: R25.00003, 2016
2. Attended and presented poster in 34<sup>th</sup> Jerusalem Winter School in Theoretical Physics, Israel 2016
3. "The effective half-filled band model is inappropriate for the dimerized 2D organic superconductors": Niladri Gomes, APS March meeting, Session: N35.00009, 2013
4. "Is there a spin gap in the frustrated Hubbard metal and Quantum spin liquid?": Niladri Gomes, APS Four Corners meet, 2011
5. Presented several research talks to diverse audiences in the Department of Physics, University of Arizona.

## Synergistic Activities:

1. Directed two short films and selected as Campus finalist: Campus Movie Fest 2013, 2014.
2. Photographer and editor of a documentary on Prof V. Hruby, Dept of Chemistry, Univ of Arizona.
3. Volunteer in Tucson Book Festival in 2012 and 2013.
4. Volunteer in Mentor Arizona Assurance Scholars in 2012 and 2013.
5. Served as a Travel Grants Judge for GPSC in 2012 (UofA).
6. Publicity organizer for Science Day 2011 at Institute of Mathematical Sciences, Chennai.
7. Department Cultural Secretary, MSc Physics IIT Bombay, 200910.

## Referees:

Dr. Sumit Mazumdar  
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