

ABHIJEET ALASE

PERSONAL DATA

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RESEARCH INTERESTS

- **Theoretical condensed matter physics:** Topological insulators and superconductors, Majorana fermions, surface physics.
- **Mathematical physics:** Bulk-boundary correspondence, integrable systems.
- **Quantum information and computation:** Topological quantum computation, fermionic entanglement.

EDUCATION

- 09/2013 - present **Dartmouth College, USA**
Ph.D. in Physics (expected Winter 2019)
Dissertation: “Boundary physics and topology in fermionic lattice systems”
Advisor: Prof. Lorenza Viola
- 08/2009 - 05/2013 **Indian Institute of Technology, Bombay, India**
B. Tech. in Engineering Physics
CGPA: 9.35/10 (Department rank 4)

PUBLICATIONS

- E. Cobanera, A. Alase, G. Ortiz, and L. Viola, “Generalization of Bloch’s theorem for arbitrary boundary conditions: Interfaces and topological surface band structure”, (manuscript in preparation).
- A. Alase, E. Cobanera, G. Ortiz, and L. Viola, “Generalization of Bloch’s theorem for arbitrary boundary conditions: Theory”, *Phys. Rev. B.* **96**, 195133 (2017). Selected as **Editor’s suggestion**. Featured as a Synopsis in *Physics*.
- E. Cobanera, A. Alase, G. Ortiz, and L. Viola, “Exact solution of corner-modified banded block-Toeplitz eigensystems”, *J. Phys. A* **50**, 195204 (2017). Selected for **Highlights collection**.
- A. Alase, E. Cobanera, G. Ortiz, and L. Viola, “Exact solution of quadratic fermionic Hamiltonians for arbitrary boundary conditions”, *Phys. Rev. Lett.* **117**, 076804 (2016).

TALKS AND POSTER PRESENTATIONS

- “Characterizing and engineering Majorana excitations via generalized Bloch theorem”, poster presentation in the conference “Majorana states in condensed matter: Towards topological quantum computation, Mallorca, Spain, May 2017.
- “Uncovering Majorana modes through a boundary matrix approach”, talk in American Physical Society March Meeting, Baltimore, MD March 2016.
- “Generalized entanglement as a unifying framework for fermionic entanglement”, poster presentation in APS Fall meeting, New England section, November 2015.

RESEARCH PROJECTS

- 03/2014 - present **Boundary physics and topology in fermionic lattice systems**
Advisor: Prof. Lorenza Viola, Dartmouth College.
- 06/2013 - 03/2014 **Unification of entanglement in fermionic systems via generalized entanglement**
Advisor: Prof. Lorenza Viola, Dartmouth College.
- 08-2012 - 05/2013 **Remodeling Grover's algorithm using generalized search operator**
Advisor: Prof. Avatar Tulsi
Indian Institute of Technology, Bombay.
- 05/2012 - 07/2012 **Implementation of controlled qubit gates on NMR using geometric phase assuming the role of qubit**
Advisor: Prof. David G. Cory
Institute for Quantum Computing, Waterloo, Canada.
- 05/2011 - 06/2011, 12/2011 **Classical capacity of a qubit channel under thermal bath**
Advisor: Prof. Sibasish Ghosh
The Institute of Mathematical Sciences, India.

TEACHING ASSISTANTSHIP

- **Undergraduate courses:** Introductory physics (2 terms), Introduction to condensed matter physics (2 terms), Introduction to quantum computation
- **Graduate courses:** Intermediate quantum mechanics, Advanced statistical mechanics, Microscopic theory of solids, Quantum information science

HONORS AND AWARDS

- Awarded **National Talent Search Scholarship** by Government of India in 2007.
- One of the 40 students selected from all across India for Physics nurture camp 2009 on the basis of performance in **National Physics Olympiad**.
- One of the 70 students selected for **National Initiative for Undergraduate Science** camp held in Homi Bhabha Centre for Science Education, India in 2010.
- Secured all India rank 845 in Indian Institute of Technology Joint Entrance Examination (IIT-JEE) among over one million applicants.

PROFESSIONAL SOCIETIES AND SERVICE

- Reviewer since September 2017 for the journal **Mathematical Reviews** published by American Mathematical Society.
- Member of **American Physical Society**.
- Organizer of **Condensed matter journal club** at Dartmouth College.
- Organized science day demonstrations in Dartmouth college and Indian Institute of Technology, Bombay.

COMPUTER SKILLS

Matlab, Mathematica and C++.

LANGUAGES

English, Hindi, Marathi

INTERESTS

Chess, Indian classical music, sports (badminton, squash, frisbee), hiking and traveling.