

# RAVI MOHAN

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## EDUCATION

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### Doctor of Philosophy, Physics

University of Texas at Austin, Texas, United States.

September 2015 - Present

### Integrated Masters in Physics

Indian Institute of Technology Roorkee, Uttarakhand, India.

August 2009 - May 2014

## PUBLICATIONS & PREPRINTS

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- S. Bera, R. Mohan<sup>1</sup>, and T. P. Singh, “Stochastic modification of the Schrödinger-Newton equation,” *Phys. Rev. D* **92** (Jul, 2015) 025054, [arXiv:1504.05892](https://arxiv.org/abs/1504.05892) [quant-ph].
- S. Bhattacharyya, A. De, S. Minwalla, R. Mohan, and A. Saha, “A membrane paradigm at large D,” [arXiv:1504.06613](https://arxiv.org/abs/1504.06613) [hep-th].

## RESEARCH

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**Condensed Matter Physics** “Quantum mechanical scattering and Feshbach resonance” January-June 2014  
Dissertation with advisor Prof. Gauri Shankar Singh at IIT Roorkee. *Thesis, Presentation*

- Developed a theoretical two-channel harmonic-oscillator model of Feshbach resonance.

**Quantum Computing** Summer Research Fellowship awarded by IAS.

May-July 2012

Worked with of Prof. Anil Kumar at IISc Bangalore. *Thesis*

- Designed a quantum circuit to implement Grover’s search algorithm for an unstructured 3 qubit database.
- Worked out NMR pulse sequence to realise the circuit.

## AWARDS & ACADEMIC HONOURS

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- **INSPIRE:** Annual scholarship awarded for academic excellence. 2009-2014
- First prize for the talk “Decoherence and transition from Quantum to Classical”. March 2013
- **IAS Fellowship:** To support research at IISc Bangalore. 2012

## TALKS

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**Decoherence and transition from Quantum to Classical** IDEAS, Cognizance 2013, IIT Roorkee.

March 2013  
*Presentation*

- Presented a talk on transition from quantum physics to classical physics, supporting many-universe interpretation of quantum mechanics.
- Discussed John von Neumann’s postulate to explain the measurement process and how system-detector-environment correlation chain can be used to demonstrate the emergence of “classicality” from “quantumness”.

## TEACHING

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Delivered a series of introductory blackboard lectures at Physics Journal Club, IITR.

- Linear Algebra *Notes*
- Postulates of Quantum Mechanics *Notes*
- Interpretations of Quantum Mechanics and Quantum Measurements

## SELF STUDY PROJECTS

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**Quantum Computing** Self study and research with Dr. Ajay Wasan at IIT Roorkee.

June 2013

- Studied realisation of quantum computers using linear ion-trap and laser beams.

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<sup>1</sup>S. Bera and R. Mohan contributed equally to this work.

- Surveyed article by J. I. Cirac and P. Zoller (Phys. Rev. Lett. 74, 4091 (1995)) and learnt to realise  $(C)^N - NOT$  gate using laser pulses.
- Discussed advantages/disadvantages of ion-traps over Nuclear Magnetic Resonance (NMR) spectroscopy for quantum computation.

**Precursor to Quantum Computation** *Self study and research with*  
*Dr. Rajdeep Chatterjee at IIT Roorkee.*

*December 2011*  
*Project report*

- Studied the principles of quantum mechanics and learnt to apply them in quantum computation.
- Surveyed *Feynman Lectures volume III*, part I and II of *Quantum Computation and Quantum Information* by Nielsen & Chuang.
- Surveyed EPR paper (Phys. Rev. 47, 777–780 (1935)) and discussed the concepts of reality, locality and entanglement.

## PROJECTS

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**Robotics** *Worked at hobbies-club workshop to create:*

*January-March 2010*

- Hovercraft:
  - 80×80 cm of plywood base, capable of levitating 10-12 cm above ground.
  - Powered by remote controlled 12V brushless DC motor running on lithium polymer battery (LiPo).
  - Worked in a team of three students, as team leader and robot designer.
- Mechanical rope walking monkey:
  - A simple 30×20 cm wooden robot, powered by a 9V DC motor, capable of walking on rope with its two arms rotating in a overhead vertical circle.
  - Worked in a team of three to arrange and assemble the components.
  - Won third prize in Shrishti (annual festival organised by Hobbies Club).

**Open-source** *Wrote unrealscript mods, for Unreal Tournament G.O.T.Y, compiled in*  
*Unreal Engine I, using WOTGreal IDE.*

*2009-2012*

- **ACEManager**: A server controller add-on with graphical user interface (GUI), supplementary to anti cheat engine (ACE), used to ban players on a game server based on hardware ID (obtained by ACE).
- **SmartDM & SmartCTF**: Mutators to enhance gameplay, calculate additional ingame statistics and display them on custom scoreboard for DeathMatch and Capture the Flag gametypes. SmartCTF has been developed in collaboration.
- Other mutators include **FlagAnnouncements** and **Denied** which are small hacks to produce desired effects in the game.

## SKILLS

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**Programming & Utility software:** java, latex, c++, mathematica, matlab, unreal engine 1, mendeley, gimp and drupal.

**Operating Systems:** linux (ubuntu) and windows family.

## SERVICE

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- Taught basic arithmetic to underprivileged children as a member of [NSS team](#), IITR.
- Proposed [course structure](#) for the Integrated M.Sc. Physics programme which led to modifications in the curriculum.