

# Ankit Kumar

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## Research

- ▶ Many-body physics using time-dependent **many-body perturbation theory**, non-equilibrium Green's functions, Kadanoff-Baym equations, and Dynamical Mean Field Theory
- ▶ Theoretical analysis of time- and momentum-resolved pump-probe spectroscopy i.e. **Reflectivity, ARPES, Optical conductivity**.
- ▶ Study of **light-matter interaction** in low dimensional systems.
- ▶ Band structure calculations using **Density Functional Theory**.

## Employment History

- 2018 – . . . . ▶ **Research Assistant** Department of Physics, NCSU, Raleigh, NC.
- 2017 – 2018 ▶ **Course Teaching Assistant** Department of Physics, NCSU, Raleigh, NC.
- 2016 – 2017 ▶ **Research Assistant** Department of Physics, NCSU, Raleigh, NC.
- 2015 – 2016 ▶ **Undergrad Lead Lab Instructor** Department of Physics, NCSU, Raleigh, NC.
- 2014 – 2015 ▶ **Undergrad Lab Instructor** Department of Physics, NCSU, Raleigh, NC.
- 2013 – 2014 ▶ **Undergrad Lab Instructor** Department of Physics, IISER, Mohali, India.

## Education

- 2014 – 2020 ▶ **PhD, North Carolina State University, Raleigh NC, USA.**  
Thesis title: *Dynamics of Correlated Electrons out of Equilibrium*  
Supervisor: *Professor Alexander F. Kemper*
- 2008 – 2013 ▶ **BS-MS, Five years Interdisciplinary Course in Physics, Indian Institute Of Science Education and Research, Mohali India.** Specialization in nonlinear dynamics, network of coupled complex dynamical systems.  
Thesis title: *Complex Dynamical Networks*.  
Supervisor: *Professor Sudeshna Sinha*

## Skills

- Programming Languages ▶ C++, C - Advanced user (Parallelization using OpenMP, OpenMPI), Massive parallel computation on cluster SLURM, Quantum Espresso, Python, Julia, Matlab, Octave, Mathematica, LabView - Programming and Data acquisition, Markdown, `SHELL`, `AWK`, `LUA SCRIPTING`, `LATEX`, Vim, Emacs.
- Data Analysis ▶ SAS, Python - Pandas, Numpy.
- Machine Learning ▶ Supervised and unsupervised machine learning in condensed matter systems.
- Admin ▶ `ARCH-LINUX`, `NETWORK PROTOCOLS`, Apache Web Server, Dok-uWiki, Wordpress.
- Spoken Languages ▶ English (Second language), Hindi (Mother tongue).

## Research Publications

### In preparation

- 1 Kumar, A. & Kemper, A. F. (2019b). *Higgs mode in the presence of supercurrent*.
- 2 Kumar, A. & Kemper, A. F. (2019c). *Transient optical conductivity of metals*.

### Under Review

- 1 Dan, N., Alex, B., **Kumar, A.**, Samanvitha, S., Jordan, F., Shaun, O., ... Daniel, B. D. (2018). *Ultrafast thermalization and decay in the upper hubbard band of  $\alpha$ - $\text{RuCl}_3$*  [Submitted to PRL].

### Journal Articles

- 1 Kumar, A. & Kemper, A. F. (2019a). Higgs oscillations in time-resolved optical conductivity. *Physical Review B*, 100(17), 174515. doi:10.1103/PhysRevB.100.174515
- 2 Revelle, J. P., **Kumar, A.** & Kemper, A. F. (2019). Theory of Time-Resolved Optical Conductivity of Superconductors: Comparing Two Methods for Its Evaluation. *Condensed Matter*, 4(3), 79. doi:10.3390/condmat4030079
- 3 **Kumar, A.**, Johnston, S. & Kemper, A. F. (2019). Identifying a forward-scattering superconductor through pump-probe spectroscopy. *EPL (Europhysics Letters)*, 124(6), 67002. doi:10.1209/0295-5075/124/67002
- 4 **Kumar, A.**, Agrawal, V. & Sinha, S. (2015). Spatiotemporal regularity in networks with stochastically varying links. *The European Physical Journal B*, 88(6), 138. doi:10.1140/epjb/e2015-50338-9

### Other

- 1 **Kumar, A.** (2013). Effects of Nonlinear Coupling on Spatiotemporal Regularity. (p. 14).   
<http://arxiv.org/abs/1309.4555>

## Conferences and Schools

- 2019 ► **Contributed talk** Annual Meeting of the APS Southeastern Section 2019, Wrightsville Beach, NC, USA.
- **Contributed talk** APS March Meeting 2019, Boston, MA, USA.
- 2018 ► **Poster presentation** Gordon Research Conference on Ultrafast Phenomena in Cooperative Systems, Galveston, TX, USA.
- **Contributed talk** 2<sup>nd</sup> Future of Materials Workshop, Raleigh, NC, USA.
- 2017 ► **Contributed talk** 84<sup>th</sup> Annual Meeting of the APS Southeastern Section 2017, Milledgeville, GA, USA.
- 2016 ► **Poster presentation** MRS/ASM/AVS Meeting, Raleigh, NC, USA.
- 2014 ► **Participated** Bangalore School on Statistical Physics, RRI, Bangalore, India.
- **Poster presentation** Accepted, XXXIII Dynamics Days 2014, Georgia, USA.
- 2013 ► **Poster presentation** CNSD, International Conference on Nonlinear sciences, Indore, India.
- 2011 ► **Participated** Indian Conference on Cosmology and Galaxy formation, IISER mohali, INDIA.
- 2010 ► **Participated** School in Radio Astronomy, NCRA Pune, India.

## Conferences and Schools (continued)

- ▶ **Participated** International Conference on NMR at the Interface of Physics, Chemistry and Biology, IISER Mohali, INDIA.

### Awards and Achievements

- 2019 ▶ **Travel Award** GERA at APS March Meeting 2019, Boston, MA, USA.
- 2018 ▶ **Travel Award** Gordon Research Conference on Ultrafast Phenomena in Cooperative Systems, Galveston, TX, USA.
- 2016 ▶ **Teaching Award** Graduate Teaching Award, NCSU, Raleigh, NC, USA.
- 2013–2014 ▶ **Research Fund** Indian Government – CSIR Junior Research Fellowship.
- 2013 ▶ **National-level Competition** GATE (rank 107), NET (rank 159), JEST (rank 46).
- 2008–2013 ▶ **Research Fund** Indian Government – INSPIRE Fellowship.
- ▶ **Research Fund** Indian Government – KVPY Fellowship.
- 2011 ▶ **Research Fund** India Academy of Science – Summer Research Fellowship.
- 2009 ▶ **Physics Olympiad** 2<sup>nd</sup> Stage State Level
- 2008 ▶ **National-level Competition** IIT-JEE, AIEEE.

## Miscellaneous Experience

### Teaching and Mentoring

- 2018 ▶ **Mentoring** I have been mentoring two undergrad students working on transient-optical response of superconductors and higher-order harmonics generation in solids.
- ▶ **Teaching** I have worked as a substitute teacher for Prof. Lex Kemper and taught a few lectures to undergrads.
- ▶ **Teaching** I have worked as a teaching assistant for graduate course QFT I, II.
- 2016 ▶ **Teaching** I have worked as the lead lab instructor for physics labs for undergrads and engineers.
- 2015 ▶ **Teaching** I have worked as a lab instructor for physics labs for undergrads and engineers.

### Outreach

- 2018 ▶ **Physics Demonstrations for High School Students** Raleigh Charter School, Raleigh, NC.

### Services

- 2015–2018 ▶ Member of Food Bank, Raleigh, NC.
- 2009–2012 ▶ Member & Co-founder, DRAMA club at IISER Mohali.
- ▶ Member & Co-founder, YATN (Youths Attempt To Nurture) at IISER Mohali: To teach underprivileged kids.

### Other

- 2016–.... ▶ Active member of badminton and running groups at NCSU.
- 2012–2013 ▶ **Table tennis** Bronze medal two times at IISER Mohali annual sports event.
- ▶ **Chess, Badminton** Gold and Silver medal at IISER Mohali annual sports event.

## References

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**Dr. Alexander F. Kemper**

Assistant Professor

Department of Physics,  
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**Dr. Lubos Mitas**

Distinguished University Professor

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**Dr. Daniel Dougherty**

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