Kyungmin Lee

Curriculum Vitae

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Education

2009–2016 **Ph.D. in Theoretical Physics**, *Cornell University*, Ithaca, NY.

- Advisor: Prof. Eun-Ah Kim (Dept. of Physics, Cornell)

2002–2009 **B.S. in Physics and B.S. in Computer Science and Engineering**, *Seoul National University*, Seoul, Korea.

- Graduated with *summa cum laude*
- Military service from 2005 to 2007.

List of Publications

[P1] Prakash Sharma, **Kyungmin Lee**, Hitesh J. Changlani, "Multimagnon dynamics and thermalization in the $S = 1$ easy-axis ferromagnetic chain", `arXiv:2107.09105`.

[P2] **Kyungmin Lee**, Arijeet Pal, Hitesh J. Changlani, "Frustration-induced emergent Hilbert space fragmentation", *Phys. Rev. B* **103**, 235133 (2021).

[P3] **Kyungmin Lee**, Jesse Choe, Davide Iaia, Juqiang Li, Junjing Zhao, Ming Shi, Junzhang Ma, Mengyu Yao, Zhenyu Wang, Chien-Lung Huang, Masayuki Ochi, Ryotaro Arita, Utpal Chatterjee, Emilia Morosan, Vidya Madhavan, and Nandini Trivedi "Metal-to-insulator transition in Pt-doped $TiSe_2$ driven by emergent network of narrow transport channels," *npj Quantum Mater.* **6**, 8 (2021).

[P4] **Kyungmin Lee**, Ronald Melendrez, Arijeet Pal, Hitesh J. Changlani, "Exact three-colored quantum scars from geometric frustration," *Phys. Rev. B* **101**, 241111(R) (2020).

[P5] J. Zhao, **Kyungmin Lee**, J. Li, D. B. Lioi, D. J. Gosztola, G. P. Wiederrecht, G. Karapetrov, Nandini Trivedi, U. Chatterjee, "Spectroscopic fingerprints of many-body renormalizations in $1T$–$TiSe_2$," *Phys. Rev. B* **100**, 045106 (2019).

[P6] **Kyungmin Lee**[†], Tamaghna Hazra[†], Mohit Randeria and Nandini Trivedi, "Topological superconductivity in Dirac honeycomb systems," *Phys. Rev. B* **99**, 184514 (2019).

[P7] Jesse Choe, **Kyungmin Lee**, C.-L. Huang, Nandini Trivedi, and E. Morosan, "Magnetotransport in Fe-intercalated TS_2: Comparison between T = Ti and Ta," *Phys. Rev. B* **99**, 064420 (2019).

[P8] **Kyungmin Lee**, Junping Shao, Eun-Ah Kim, F. D. M. Haldane, Edward H. Rezayi, "Pomeranchuk Instability of Composite Fermi Liquids," *Phys. Rev. Lett.* **121**, 147601 (2018) *(Editors' Suggestion)*.

- Steven Kivelson, "Nematic Quantum Hall Fluid Without Stripes", Journal Club for Condensed Matter Physics. `https://www.condmatjclub.org/?p=3437`

[P9] **Kyungmin Lee**, Eun-Ah Kim, "Emergent topological superconductivity at nematic domain wall of FeSe," `arXiv:1702.03294`.

[P10] **Kyungmin Lee**, Steven Kivelson, Eun-Ah Kim, "Cold-spots and glassy nematicity in underdoped cuprates," *Phys. Rev. B* **94**, 014204 (2016).

[P11] Zhao Liu, Abolhassan Vaezi, **Kyungmin Lee**, Eun-Ah Kim, "Non-Abelian phases in two-component $\nu = 2/3$ fractional quantum Hall states: Emergence of Fibonacci anyons," *Phys. Rev. B* **92**, 081102(R) (2015).

[P12] Milan P. Allan[†], **Kyungmin Lee**[†], Andreas W. Rost[†], Mark H. Fischer, Freek Massee, Kunihiro Kihou, Chul-Ho Lee, Akira Iyo, Hiroshi Eisaki, Tien-Ming Chuang, J.C. Davis, Eun-Ah Kim, "Identifying the 'Fingerprint' of Antiferromagnetic Spin-Fluctuations in Iron-Pnictide Cooper Pairing," *Nat. Phys.* **11**, 177-182 (2015).

[P13] **Kyungmin Lee**, Abolhassan Vaezi, Mark H. Fischer, Eun-Ah Kim, "Superconducting proximity effect in topological metals," *Phys. Rev. B* 90, 214510 (2014).

[P14] **Kyungmin Lee**, Mark H. Fischer and Eun-Ah Kim, "Signatures of unconventional pairing in near-vortex electronic structure of LiFeAs," *New J. Phys.* **15**, 053048 (2013).

Invited Talks

2020 **APCTP Seminar**, *Asia Pacific Center for Theoretical Physics*, Pohang, Korea.

- Talk: Exact three-colored quantum scars from geometric frustration

2017 **Order, Fluctuations, and Strong Correlations: New Platforms and Developments**, *Kavli Institute for Theoretical Physics*, Santa Barbara, CA.

- Talk: Pomeranchuk instability of composite Fermi liquid

2014 **Energy Materials Nanotechnology Summer Meeting**, Cancun, Mexico.

- Talk: Identifying the 'Fingerprint' of Antiferromagnetic Spin-fluctuations in LiFeAs

Contributed Talks & Poster Presentations

2019 **APS March Meeting**, Boston, MA.

- Talk: Emergent interacting two-fluids in a disordered Hubbard model

2018 **APS March Meeting**, Los Angeles, CA.

- Talk: Pomeranchuk instability of composite Fermi liquid
- Talk: Pairing instabilities at the edge and the bulk of a topological insulator

2016 **Gordon Research Conference on Correlated Electron Systems**, South Hadley, MA.

- Poster: Cold-spots and glassy nematicity in underdoped cuprates

2015 **Gordon Research Conference on Superconductivity**, Hong Kong, China.

- Poster: Reconciling the existence of cold spots with short range charge order

2015 **APS March Meeting**, San Antonio, TX.

- Talk: Non-abelian phases in two-component $\nu = 2/3$ FQHS: Emergence of Fibonacci anyons
- Talk: What is the role and importance of short range order in cuprates?

2014 **APS March Meeting**, Denver, CO.

- Talk: Superconducting Proximity Effect in Topological Metal

2013 **APS March Meeting**, Baltimore, MD.

- Talk: Prediction for fingerprints of bosonic modes through self-energy effects in LiFeAs

2012 **APS March Meeting**, Boston, MA.

- Talk: Local electronic structure near a vortex in LiFeAs within self-consistent BdG

2011 **Gordon Research Conference on Superconductivity**, Waterville Valley, NH.

- Poster: Nematicity in 3-band Hubbard model of cuprate superconductors

2011 **APS March Meeting**, Dallas, TX.

- Talk: Nematicity in 3-band Hubbard model of cuprate superconductors

Research Experience

2019 – Present **Postdoctoral Scholar**, *National High Magnetic Field Laboratory*, Tallahassee, FL.

2016 – 2019 **Postdoctoral Researcher**, *The Ohio State University*, Columbus, OH.

- Advisor: Prof. Nandini Trivedi (Dept. of Physics, OSU), Prof. Mohit Randeria (Dept. of Physics, OSU)

2010 – 2016 **Graduate Research Assistant**, *Cornell*, Ithaca, NY.

- Advisor: Prof. Eun-Ah Kim (Dept. of Physics, Cornell)

2008 **Undergraduate Research Participation**, *Quantum Field Laser Lab, Optics Group, SNU*, Seoul, Korea.

- Assisted experiments on Single Atom Trapping of ^{85}Rb using Magneto-Optical Trap.
- Conducted independent research.
  (Topic: Motion of trapped atom under misaligned beams)
  Advisor: Prof. Kyungwon An (Dept. of Physics and Astronomy, SNU)

2005 **Quantum Information Science Undergraduate Research Program**, *KIAS*, Seoul, Korea.

- Worked as RA for Quantum Information Processing and Quantum Communication Research.
- Participated in problem solving sessions
  Advisor: Prof. Jaewan Kim (School of Computational Sciences, KIAS)

2004 **Experimental Physics Summer Camp for Undergraduate Students**, *Research Center for Oxide Electronics, SNU*, Seoul, Korea.

- Designed and conducted independent research.
  (Topic: Research on Ferromagnetism in Nanoscale using Atomic Force Microscope)
  Advisor: Prof. Tae Won Noh (Dept. of Physics and Astronomy, SNU)

Teaching Experience

2009 **Teaching Assistant for *Fundamentals of Physics I***, *Cornell*, Ithaca, NY.

2008 **Assistant Teacher for College of Engineering Students**, *SNU*, Seoul, Korea.

- Assisted undergraduate students with regular curriculum (3 hours/week).
- Prepared lectures and assignments.

2008 **Assistant Teacher for Basic Physics Class**, *SNU*, Seoul, Korea.

- Assisted international undergraduate students in basic physics (4 hours/week).
- Prepared lectures and assignments.

Other Academic Experience

2014 **Boulder School 2014: Modern Aspects of Superconductivity**, Boulder, CO.

2012 **International Summer School: New Trends on Computational Approaches for Many-Body Systems**, *Université de Sherbrooke*, Sherbrooke, Québec, Canada.

2005 **Lindau Nobel Laureate Meetings**, Lindau, Germany.

- Selected as Korean delegate for the 55^{th} *Meetings of Nobel Laureates at Lindau*
- Attended lectures and discussions with Nobel Laureates

2004 **KIAS-SNU Theoretical Physics Winter Camp**, *KIAS and SNU*, Seoul, Korea.

- Attended lectures and conducted group research project on theoretical physics.
  (Project Topic: Quantization of Magnetic Monopole)
- Received best research group award.

Awards and Scholarships

2015 **Douglas Fitchen Memorial Award**, *Cornell*, Ithaca, NY.

2003–2008 **Undergraduate Student Scholarship Program**, *KFAS*, Seoul, Korea.

2001 32^{nd} **International Physics Olympiad – Silver Medal**, Antalya, Turkey.

2000 31st **International Physics Olympiad – Honorary Mention**, Leicester, UK.

Other Experiences

2005–2007 Military Service

2004 35th International Physics Olympiad – Staff

Certifications

2021 **Machine Learning**, *offered by Stanford University on Coursera.*

2021 **Deep Learning Specialization**, *offered by DeepLearning.AI on Coursera.*

- Neural Networks and Deep Learning
- Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization
- Structuring Machine Learning Projects
- Convolutional Neural Networks
- Sequence Models

Languages

Korean Native

English Fluent

Japanese Intermediate

Technical Skills

Projects Developer and maintainer of

- `LatticeTools.jl`, Toolkit for construction and symmetry analysis of tight binding models in Julia
- `QuantumHamiltonian.jl`, Exact diagonalization for a generic many body Hamiltonian in Julia
- `HartreeFockBogoliubov.jl`, Hartree-Fock-Bogoliubov solver for electronic systems in Julia
- `PiTensor`, Python wrapper for ITensor.

Programming Languages C, C++, Fortran, Haskell, Java, Javascript, Julia, Mathematica, Matlab, Python, PHP, SQL

Tools and Libraries Docker, Git, CircleCI, Travis CI, Node.js, MPI, PETSc/SLEPc