JUNKAI DONG

337 Lyman Hall, Harvard University
(+1)6073795651 ⋄ junkaidong@g.harvard.edu ⋄ junkaidong.github.io

EDUCATION

Doctor of Philosophy in Physics Expected May 2026
Harvard University, Cambridge, MA
Advisor: Ashvin Vishwanath

Master of Arts in Physics May 2024
Harvard University, Cambridge, MA

Bachelor of Arts in Physics and Mathematics, *summa cum laude* May 2021
Cornell University, Ithaca, NY
Thesis: *Averaging over deformed WZW models*

RESEARCH EXPERIENCE

- **Author of 12 peer-reviewed publications and 6 preprints**, with 4 in *Phys. Rev. Lett.* and 1 in *Phys. Rev. X*.
- **Presented 9 invited and 3 contributed talks** at scientific conferences and seminars.
- **Submitted a total of 33 referee reports** for *Phys. Rev. Lett.*, *Phys. Rev. X* and other journals.

RESEARCH ACHIEVEMENTS

- Predicted the existence of zero-field composite Fermi liquids in twisted $MoTe_2$, which was subsequently verified in experiments.
- Proposed the concept of anomalous Hall crystals to explain experimental phenomenology in rhombohedral graphene samples.
- Discovered a previously unknown kineo-elastic term present in elastic theory.

HONORS AND AWARDS

- KITP Graduate Fellow, Kavli Institute for Theoretical Physics, University of California Santa Barbara, 2024
- Gertrude and Maurice Goldhaber Prize, Harvard University, 2024
- Certificate of Special Recognition, Harvard Undergraduate Association, 2023
- Purcell Fellowship, Harvard University, 2021
- Shou-Cheng Zhang Fellowship, Stanford University, 2021 (Declined)
- First-year Fellowship, Massachusetts Institute of Technology, 2021 (Declined)
- Donald R. Yennie Prize in Physics, Cornell University, 2021
- Bethe Thesis Prize in Physics, Cornell University, 2021

MANUSCRIPTS

First or Co-First Author

11. J. Dong*, O. E. Sommer*, T. Soejima, D. E. Parker, and A. Vishwanath, "Phonons in Electron Crystals with Berry Curvature", *arXiv:2503.16390*. (Accepted by *PNAS*)

10. T. Soejima*, J. Dong*, A. Vishwanath, and D. E. Parker, "A Jellium Model for the Anomalous Hall Crystal", *arXiv:2503.12704*.

9. T. Soejima*, J. Dong*, T. Wang, T. Wang, M. P. Zaletel, A. Vishwanath, and D. E. Parker, "Anomalous Hall Crystals in Rhombohedral Multilayer Graphene II: General Mechanism and a Minimal Model", *Phys. Rev. B* **110**, 205124 (2024). *arXiv:2403.05522*. (Editor's Suggestion)

8. J. Dong*, T. Wang*, T. Wang*, T. Soejima, M. P. Zaletel, A. Vishwanath, and D. E. Parker, "Anomalous Hall Crystals in Rhombohedral Multilayer Graphene I: Interaction-Driven Chern Bands and Fractional Quantum Hall States at Zero Magnetic Field", *Phys. Rev. Lett.* **133**, 206503 (2024). *arXiv:2311.05568*. (Featured in PRL's Collection of the Year 2024, Journal Club for Condensed Matter Physics, Nature News and Physics World.)

7. J. Dong, J. Wang, P. J. Ledwith, A. Vishwanath, and D. E. Parker, "Composite Fermi Liquid at Zero Magnetic Field in Twisted $MoTe_2$", *Phys. Rev. Lett.* **131**, 136502 (2023). *arXiv:2306.01719*. (Editor's Suggestion, Featured in *APS Physics*)

6. J. Dong, P. J. Ledwith, E. Khalaf, J. Y. Lee, and A. Vishwanath, "Many-Body Ground States from Decomposition of Ideal Higher Chern Bands: Applications to Chirally Twisted Graphene Multilayers", *Phys. Rev. Research* **5**, 023166 (2023). *arXiv:2210.13477*.

5. J. Dong, J. Wang, and L. Fu, "Dirac electron under periodic magnetic field: Platform for fractional Chern insulator and generalized Wigner crystal", *arXiv:2208.10516*.

4. J. Dong, T. Hartman, and Y. Jiang, "Averaging over moduli in deformed WZW models", *J. High Energ. Phys.* **2021**, 185 (2021). *arXiv:2105.12594*.

3. J. Dong, V. Juricic, and B. Roy, "Topolectric circuits: Theory and construction", *Phys. Rev. Research* **3**, 023056 (2021). *arXiv:2008.11202*.

2. J. Dong and E. Mueller, "Exact Topological Flat Bands from Continuum Landau Levels", *Phys. Rev. A* **101**, 013629 (2020). *arXiv:1910.08429*.

1. J. Dong, Y. Chen, D. Xu, and Z.-Q. Yin, "Greenberger-Horne-Zeilinger test for multi-dimension and arbitrary time nodes entangled histories", *Sci. Bull.* **62**(18), pp.1235-1238 (2016). *arXiv:1610.04296*.

Others

8. M. Uzan, W. Zhi, M. Bocarsly, J. Dong, S. Dutta, N. Auerbach, N. S. Kander, M. Labendik, Y. Myasoedov, M. E. Huber, K. Watanabe, T. Taniguchi, D. E. Parker, and E. Zeldov, "hBN alignment orientation controls moiré strength in rhombohedral graphene", *arXiv:2507.20647*.

7. T. Soejima, J. Dong, O. E. Sommer, D. E. Parker, and A. Vishwanath, "Topological constraint on crystalline current", *arXiv:2507.18611*.

6. R. Fan, J. Dong, and A. Vishwanath, "Simulating the non-unitary Yang-Lee conformal field theory on the fuzzy sphere", *arXiv:2505.06342*.

5. P. J. Ledwith, J. Dong, A. Vishwanath, and E. Khalaf, "Nonlocal Moments in the Chern Bands of Twisted Bilayer Graphene", *Phys. Rev. X* **15**, 021087 (2025). *arXiv:2408.16761*.

4. Q. Li, J. Dong, P. J. Ledwith, and E. Khalaf, "Constraints on real space representations of Chern bands", *arXiv:2407.02561*.

3. M. Fujimoto, D. E. Parker, J. Dong, E. Khalaf, A. Vishwanath, and P. J. Ledwith, "Higher vortexability: zero field realization of higher Landau levels", *Phys. Rev. Lett.* **134**, 106502 (2025). *arXiv:2403.00856*. (Editor's Suggestion.)

2. Q. Gao, J. Dong, P. J. Ledwith, D. E. Parker, and E. Khalaf, "Untwisting moiré physics: Almost ideal bands and fractional Chern insulators in periodically strained monolayer graphene", *Phys. Rev. Lett.* **131**, 096401 (2023). *arXiv:2211.00658*. (PRL cover)

1. J. Dong, V. Elser, G. Gyawali, K. Y. Jee, J. Kent-Dobias, A. Mandaiya, M. Renz, and Y. Su, "Glass phenomenology in the hard matrix model", *J. Stat. Phys.* **2021**(9), 093302 (2021). *arXiv:1912.07558*.

PRESENTATIONS

Invited Talks

- *Anomalous Hall Crystal and its Phonons*, Invited Talk, MRS Spring Meeting and Exhibit, Apr 2025.
- *Phonons in Electron Crystals with Berry Curvature*, Talk, APS March Meeting, 2025.
- *Anomalous Hall Crystals in Rhombohedral Multilayer Graphene*, Invited Talk, Joonho Lee Group Meeting, Harvard University, Mar 2025.
- *Stripping off the Magnetic Field from the Lowest Landau Level*, Invited Talk, KITP Locals Lunch, August 2024.
- *Anomalous Hall Crystal in Rhombohedral Multilayer Graphene*, Invited Talk, KITP Condensed Matter Meeting, July 2024.
- *Anomalous Hall Crystal in Rhombohedral Multilayer Graphene*, Invited Talk, Quantum Theory Seminar, Cornell University, April 2024.
- *Composite Fermi Liquid at Zero Magnetic Field in Twisted $MoTe_2$*, Talk, APS March Meeting, 2024.
- *Composite Fermions Form and Flow without a Magnetic Field*, Invited Talk, Physical Review Journal Club, American Physical Society, November 2023.
- *Composite Fermi Liquid at Zero Magnetic Field in Twisted $MoTe_2$*, Invited Talk, Special AEP Seminar, Cornell University, August 2023.
- *Composite Fermi Liquid at Zero Magnetic Field in Twisted $MoTe_2$*, Invited Talk, Thouless Institute for Quantum Matter Seminar, University of Washington Seattle, June 2023.
- *Exact Many-Body Ground States from Decomposition of Ideal Higher Chern Bands: Applications to Chirally Twisted Graphene Multilayers*, Talk, APS March Meeting, 2023.
- *Exact Many-Body Ground States from Decomposition of Ideal Higher Chern Bands: Applications to Chirally Twisted Graphene Multilayers*, Invited Talk, Quantum Matter in Mathematics and Physics, Center of Mathematical Sciences and Applications, Harvard University, MA, Dec 2022.

Posters

- *Anomalous Hall Crystals in Rhombohedral Multilayer Graphene*, Poster, Thouless Institute for Quantum Matter Winter Workshop, WA, Jan 2024.
- *Composite Fermi Liquid at Zero Magnetic Field in Twisted $MoTe_2$*, Poster, Thouless Institute for Quantum Matter Winter Workshop, WA, Jan 2024.
- *Anomalous Hall Crystals in Rhombohedral Multilayer Graphene*, Poster, National High Magnetic Field Laboratory Theory Winter School, FL, Jan 2024.
- *Composite Fermi Liquid at Zero Magnetic Field in Twisted $MoTe_2$*, Poster, National High Magnetic Field Laboratory Theory Winter School, FL, Jan 2024.
- *Composite Fermi Liquid at Zero Magnetic Field in Twisted $MoTe_2$*, Poster, Princeton Summer School on Condensed Matter Physics 2023, Princeton University, July 2023.
- *Exact Many-Body Ground States from Decomposition of Ideal Higher Chern Bands: Applications to Chirally Twisted Graphene Multilayers*, Poster, Spring 2023 meeting of the Simons Collaboration on Ultra-Quantum Matter, CU Boulder, CO, May 2023.
- *Exact Many-Body Ground States from Decomposition of Ideal Higher Chern Bands: Applications to Chirally Twisted Graphene Multilayers*, Poster, National High Magnetic Field Laboratory Theory Winter School, FL, Jan 2023.

- *Exact Topological Flat Bands from Continuum Landau Levels*, Poster, ARO/AFOSR MURI Program Review Meeting, UMass Amherst, MA, Oct 2019.

Journal Clubs

- *Thermodynamic Quantities from Capacitive Measurements for 2D Materials*, Journal Club, Condensed Matter Experiments for Theorists, Oct 2023.

TEACHING EXPERIENCE

Teaching Fellow, Spring 2025
Led office hours, supervised presentations, and gave lectures for PHYSICS 195B (Introduction to Quantum Materials and Devices).
Teaching Fellow, Fall 2023
Held sections, led office hours, and graded homework and exams for PHYSICS 195A (Introduction to Solid State Physics).
Teaching Assistant, Fall 2019
Held one-hour study halls for PHYS 7651 (Quantum Field Theory 1) every week.
Teaching Assistant, Fall 2020
Graded homework and answers questions online for PHYS 7681 (Quantum Information Processing).

SERVICE

APS March Meeting Session Chair, 2025
Chaired session J27: Emergent Phases and Transport Phenomena in Twisted and Multilayer Graphene Systems.
APS March Meeting Session Chair, 2024
Chaired session Z07: Magnetic Topological Semimetals III.
Journal Referee, 2023-2025
Provided peer review for:

- Physical Review X ($\times$7)
- Physical Review Letters ($\times$1)
- Physical Review Research ($\times$3)
- Physical Review B ($\times$22)
- Journal of Physics: Condensed Matter ($\times$3)

Cornell Alumni Admissions Ambassadors Network Volunteer, 2024
Met with prospective applicants to discuss details about undergraduate experience at Cornell.
Harvard Organ Society Recital Coordinator, 2022-2024
Revived the Busch Midday Recital Series after the COVID pandemic. Invited and hosted professional organists. Doubled audience size during tenure.

SKILLS

Languages Chinese (native), English (fluent)
Programming Languages Julia, Python, C++
Software bash, slurm, OpenMP, MPI, MATHEMATICA, LaTeX