Abdulkadir Canatar

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Education

- **Harvard University, Cambridge, MA** *2016–2022*
  Ph.D. in Physics
  Thesis: *Statistical mechanics of generalization in kernel regression and wide neural networks*
- **Sabancı University, Istanbul, Turkey** *2015–2016*
  M.Sc. in Physics
  Thesis: *Fabrication and characterization of suspended graphene devices*
- **Sabancı University, Istanbul, Turkey** *2010–2015*
  B.Sc. in Electronics Engineering

Research & Professional Experience

- **Flatiron Institute – Simons Foundation, New York, NY** *2022 – Present*
  Flatiron Research Fellow
  Supervisor: Prof. SueYeon Chung
- **Harvard University, Cambridge, MA** *2017 – 2022*
  Teaching & Research Assistant
  Supervisor: Prof. Cengiz Pehlevan
- **Sabancı University, Istanbul, Turkey** *2012 – 2016*
  Undergraduate & Masters Researcher
  Supervisor: Prof. İsmet İnönü Kaya

Publications

1. **Sample-Size-Invariant Measure of Dimensionality**
   Chanwoo Chun,* ***Abdulkadir Canatar****, *SueYeon Chung and Daniel D. Lee* — ***2025 (In Submission)***
   (*Equal Contribution)
2. **Spectral Analysis of Representational Similarity with Limited Neurons**
   Hyunmo Kang,* ***Abdulkadir Canatar**** *and SueYeon Chung* — ***NeurIPS, 2025***
   (*Equal Contribution)
3. **Estimating Neural Representation Alignment from Limited Inputs and Features**
   Chanwoo Chun,* ***Abdulkadir Canatar****, *SueYeon Chung and Daniel D. Lee* — ***CCN, 2025***
   (*Equal Contribution)
4. **Statistical Mechanics of Support Vector Regression**
   Abdulkadir Canatar *and SueYeon Chung* — ***Physical Review E, 2025***
5. **A Spectral Theory of Neural Prediction and Alignment**
   Abdulkadir Canatar*, *Jenelle Feather*, Albert Wakhloo, and SueYeon Chung* — ***NeurIPS, 2023 (Spotlight)***
   (*Equal Contribution)
6. **Bandwidth Enables Generalization in Quantum Kernel Models**
   Abdulkadir Canatar*, Evan Peters, Cengiz Pehlevan, Stefan M. Wild and Ruslan Shaydulin* — ***TMLR, 2023***

7. **A Kernel Analysis of Feature Learning in Deep Neural Networks**
   Abdulkadir Canatar *and Cengiz Pehlevan* — ***58th Annual Allerton Conference, 2022***

8. **Asymptotics of representation learning in finite Bayesian neural networks**
   Jacob Zavatone-Veth, ***Abdulkadir Canatar****, Benjamin S. Ruben and Cengiz Pehlevan* — ***NeurIPS, 2021***

9. **Out-of-Distribution Generalization in Kernel Regression**
   Abdulkadir Canatar*, Blake Bordelon and Cengiz Pehlevan* — ***NeurIPS, 2021***

10. **Spectral Bias and Task-Model Alignment Explain Generalization in Kernel Regression and Infinitely Wide Neural Networks**
    Abdulkadir Canatar*, Blake Bordelon and Cengiz Pehlevan* — ***Nature Communications, 2021***

11. **Strong localization in suspended monolayer graphene by intervalley scattering**
    Cenk Yanik, Vahid Sazgari, ***Abdulkadir Canatar*** *and İsmet İ. Kaya* — ***Physical Review B, 2021***

12. **Spectrum Dependent Learning Curves in Kernel Regression and Wide Neural Networks**
    Blake Bordelon, ***Abdulkadir Canatar*** *and Cengiz Pehlevan* — ***ICML, 2020***

Conference Talks/Posters

- **Spectral Analysis of Representational Similarity with Limited Neurons**
  COSYNE 2025 (Poster)
- **A Spectral Theory of Neural Prediction and Alignment**
  COSYNE 2024 (Poster)
- **Out-of-Distribution Generalization in Kernel Regression**
  INFORMS 2023 (Invited Talk)
- **Statistical Mechanics of Generalization in Kernel Regression and Wide Neural Networks**
  APS March Meeting 2022 (Talk)
- **Statistical Mechanics of Generalization in Kernel Regression**
  DeepMath 2020 (Talk)
- **A theory of generalization in kernel regression and wide neural networks**
  Neuromatch 2020 (Talk)

Teaching

- **APMATH 50 - Introduction to Applied Mathematics** – **Teaching Assistant**
  Harvard University (Spring 2020–2021, Spring 2021–2022)
- **APMATH 226 - Neural Computation** – **Teaching Assistant**
  Harvard University (Fall 2020–2021, Fall 2021–2022)
- **PS 2 - Mechanics, Elasticity, Fluids, and Diffusion** – **Teaching Assistant**
  Harvard University (Fall 2019–2020)
- **PS 12a - Mechanics from an Analytic and Numerical Perspective** – **Teaching Assistant**
  Harvard University (Spring 2018–2020)
- **PHYS 232 - Advanced Electromagnetism** – **Teaching Assistant**
  Harvard University (Fall 2017–2018)

Technical Skills

- **Programming:** Python (PyTorch, JAX, NumPy, SciPy, Pandas), Mathematica, SLURM
- **Research:** Statistical physics, computational neuroscience, machine learning theory

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Awards & Scholarships

- **Derek Bok Center (Harvard)** – **Certificate of Distinction in Teaching Awards** (Multiple Terms)
- **Harvard University** – **Purcell Fellowship** (2016–2017)
- **Sabancı University** – **Dean's High Honor List & Honors Scholarship** (2010–2016)
