# **BLAKE BORDELON**

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## EDUCATION

Harvard University	July 2019-Present
Program: PhD in Applied Mathematics Advisor: Cengiz Pehlevan	GPA: 4.0/4.0
Washington University in St. Louis	August 2015 - May 2019
Majors: Systems Engineering and Physics. Minor: Computer Science	GPA: 4.0/4.0

## **REFEREED CONFERENCE PRECEEDINGS**

Influence of Learning Rule on Representation Dynamics in Wide Neural Networks, Bordelon, Pehlevan. International Conference of Learning Representations (ICLR) 2023. notable-top 25% The Onset of Variance-Limited Behavior for Networks in the Lazy and Rich Regimes, Atanasov<sup>\*</sup>, Bordelon<sup>\*</sup>, Sainathan, Pehlevan. ICLR, 2023.

Self-Consistent Dynamical Field Theory of Kernel Evolution in Wide Neural Networks *Bordelon*, Pehlevan, 2022. *Neurips* 2022.

Neural Networks as Kernel Learners: The Silent Alignment Effect Atanasov<sup>\*</sup> Bordelon<sup>\*</sup>, Pehlevan ICLR, 2022

Capacity of Group-invariant Linear Readouts from Equivariant Representations, Farrell<sup>\*</sup>, *Bordelon*<sup>\*</sup>, Trivedi, Pehlevan, *ICLR*, 2022

Learning Curves for SGD on Structured Features, Bordelon, Pehlevan, ICLR, 2022 Out-of-Distribution Generalization for Kernels, Canatar, Bordelon, Pehlevan, Neurips 2021 Efficient Online Inference for Nonparametric Mixture Models, Shaeffer, Bordelon, Khona, Pan, Fiete Uncertainty in Artificial Intelligence 2021

Spectrum Dependent Learning Curves in Kernel Regression and Wide Neural Networks, Bordelon, Canatar, and Pehlevan, International Conference of Machine Learning (ICML), 2020.

# JOURNAL PUBLICATIONS

Population Codes Enable Learning from Few Examples By Shaping Inductive Bias Bordelon, Pehlevan, eLife. 2021.

Spectral Bias and Task-Model Alignment Explain Generalization in Kernel Regression and Infinitely Wide Neural Networks, Canatar, *Bordelon*, Pehlevan, *Nature Comms.* 2021.

Dispersive optical model of Pb-208 generating a neutron-skin prediction beyond the mean field, Atkinson, Mahzoon, Keim, Bordelon, Pruitt, Charity, and Dickhoff, Phys. Rev. C, 2020

Pre-Synaptic Pool Modification (PSPM): A supervised learning procedure for recurrent spiking neural networks, Bagley, *Bordelon*, Moseley, Wessel, *PLOS ONE*, 2020

#### UNDER REVIEW

A Theory of NTK Alignment and Its Influence on Training, Shan<sup>\*</sup>, Bordelon<sup>\*</sup>, 2021. Preparing submission.

Integration of flexible nanoelectronics with artificial intelligence-driven circuits for longterm stable and self-programmable brain decoding, Guo, Zhao, Tang, *Bordelon*, Partarrieu, Lee, Pehlevan, Liu, 2021. Under Review at *Nature Machine Intelligence*.

# PRESENTATIONS AND INVITED TALKS

Dynamical Field Theory of Feature Learning in Wide NNs, DeepMath 2022 (Poster)
Field Theory of Deep Feature Learning Two Sigma Research Symposium 2022 (Invited Talk)
Infinite Neural Networks: Lazy and Rich Regimes Google Brain 2022 (Invited Talk)
Statistical Mechanics of Kernel Regression and Wide Neural Networks, APS 2022
When are Neural Networks Kernel Learners?, APS 2022.
Structured Neural Codes Enable Generalization Through Code-Task Alignment, APS 2022.
How many objects can be classified under all possible views?, Cosyne 2022
Learning Curves for SGD on Structured Features, Deepmath 2021 (Invited Talk)
Neural Populations Learn from Few Examples through Code-Task Alignment, Cosyne 2021.
Statistical Mechanics of Generalization in Kernel Regression Deepmath 2020

## AWARDS

NSF Simons Harvard Center Quantitative Biology Fellowship	June 2021-2022
McKelvey School of Engineering Valedictorian	May 2019
Nishi Luthra Senior Prize in Physics	May 2019

## TEACHING EXPERIENCE

Teaching Fellow for Introduction to Applied Math	Spring 2022
Teaching Fellow for Neural Computation (Certificate of Distinction)	Fall 2020
Teaching Assistant for Engineering Math	August 2017-May 2018

# PROGRAMMING LANGUAGES

Strong Proficiency in Python (numpy, scipy, JAX, Pytorch, etc). Proficient in Matlab and C++.