Workshop II: Theory and Practice of Deep Learning

Monday October 14, 2024

8:00–8:55 *Check-in/Breakfast (hosted by IPAM)*

8:55–9:00 *Welcome and Opening Remarks*

9:00 *SESSION CHAIR: Jacob Foster*

9:00–9:50 **Boris Hanin** (Princeton University)
Neural Network Scaling Limits

10:00–10:15 *Break*

10:15–11:05 **Wu Lin** (Vector Institute)
Structured Matrix Inverse-free Adaptive Methods for Large Neural Networks

11:15–11:30 *Break*

11:30–12:20 **Nikos Tsilivis** (New York University)
The Price of Implicit Bias in Robust ML

12:30–2:30 *Lunch (on your own)*

2:30 *SESSION CHAIR: Jacob Foster*

2:30–3:20 **Elvis Dohmatob** (Facebook AI Research)
The Mathematics of Scaling Laws and Model Collapse in AI

3:30–3:45 *Break*

3:45–4:15 *Lightning Poster Session*

4:15–6:30 *Poster Session & Reception (Hosted by IPAM)*

Tuesday October 15, 2024

8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*

9:00 *SESSION CHAIR: Boris Hanin*

9:00–9:50 **Cengiz Pehlevan** (Harvard University)
Asymptotic theory of in-context learning by linear attention

10:00–10:15 *Break*

(Tuesday schedule continued on next page)

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10:15–11:05 **Gintare Karolina Dziugaite** (Google DeepMind)
The dynamics of memorization and generalization in deep learning

11:15–11:30 *Break*

11:30–12:20 **Vidya Muthukumar** (Georgia Institute of Technology)
Comparison and transfer between tasks in overparameterized learning

12:30–2:30 *Lunch (on your own)*

2:30 *SESSION CHAIR: Boris Hanin*

2:30–3:20 **Sam Smith** (Google DeepMind)
How to train an LLM

3:30–4:00 *Break*

4:00–4:50 **Patrick Shafto** (Rutgers University)
Common Ground in Cooperative Communication

Wednesday October 16, 2024

8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*

9:00 *SESSION CHAIR: Patrick Shafto*

9:00–9:50 **Daniel Roy** (University of Toronto)
The Size of Teachers as a Measure of Data Complexity: PAC-Bayes Excess Risk Bounds and Scaling Laws

10:00–10:15 *Break*

10:15–11:05 **Shaowei Lin** (Topos Institute)
Singular Learning, Relative Information and the Dual Numbers

11:15–11:30 *Break*

11:30–12:20 **Paul Riechers** (Beyond Institute for Theoretical Science)
Sometimes fractal and sometimes quantum: Universal geometric representations of beliefs about the far future in deep neural networks pretrained on next-token prediction

12:30 *Group Photo*

12:30–2:30 *Lunch (on your own)*

2:30 *SESSION CHAIR: Patrick Shafto*

2:30–3:20 **Blake Bordelon** (Harvard University)
Infinite limits and scaling laws of neural networks

3:30–4:00 *Break*

4:00–4:50 *Discussion*

Thursday October 17, 2024

8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*

9:00 *SESSION CHAIR: Misha Belkin*

9:00–9:50 **Mauro Maggioni** (Johns Hopkins University)
On exploiting compositional structure: one bit of theory and one application.

10:00–10:15 *Break*

10:15–11:05 **Dmitry Krotov** (Massachusetts Institute of Technology)
Generative AI models through the lens of Dense Associative Memory

11:15–11:30 *Break*

11:30–12:20 **Fanny Yang** (ETH Zurich)
Surprising phenomena of max-lp-margin classifiers in high dimensions

12:30–2:30 *Lunch (on your own)*

2:30 *SESSION CHAIR: Misha Belkin*

2:30–3:20 **Oliver Eberle** (Technische Universität Berlin)
Interpretability for Deep Learning: Theory, Applications and Scientific Insights

3:30–4:00 *Break*

4:00–4:50 **Mayank Mehta** (University of California, Los Angeles (UCLA))
Dynamics of brain's deep network

Friday October 18, 2024

8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*

9:00 *SESSION CHAIR: Monty Abbas*

9:00–9:50 **Adityanarayanan Radhakrishnan** (Broad Institute)
How do neural networks learn features from data?

10:00–10:15 *Break*

10:15–11:05 **Leena Vankadara**
Beyond muP: Scaling Insights from Infinite-Width Theory for Next Generation Architectures and Learning Paradigms

11:15–11:30 *Break*

11:30–12:20 **Misha Belkin** (University of California, San Diego (UCSD))
Emergence and grokking in simple architectures

12:30–2:30 *Lunch (on your own)*

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