Universität Greifswald, Institut f. Mathematik u. Informatik, 17487 Greifswald

Institut für Mathematik und Informatik

Prof. Dr. Joscha Diehl

+49 3835 420 4639
joscha.diehl@uni-greifswald.de

Friday 5th June, 2020

Master thesis

We are looking for a strong candidate for a **Master thesis in random matrix theory (noncommutative probability) and machine learning**. The thesis will be written under the supervision of Prof. Dr. Joscha Diehl and Dr. Malte Gerhold.

In recent work by Jeffrey Pennington, techniques from random matrix theory have been applied to gain insights into the large-scale behaviour of neural networks.

> Pennington, Jeffrey, Samuel S. Schoenholz, and Surya Ganguli.
> *The emergence of spectral universality in deep networks.*
> `https://arxiv.org/abs/1802.09979`

> Pennington, Jeffrey, and Pratik Worah.
> *Nonlinear random matrix theory for deep learning.*
> `http://papers.nips.cc/paper/6857-nonlinear-random-matrix-theory`

These works are aimed towards data scientist. The first step of the Master thesis is to understand the underlying mathematics and to lay out the details for a mathematical audience.

Afterwards, the thesis can move into implementational (programming) details and/or consider mathematical generalizations of the setting of these papers.

For more information please contact `joscha.diehl@uni-greifswald.de` or `mgerhold@uni-greifswald.de`.