

MDL Short Final Report - MDL programme, 1 July - 17 December 2021

Overall, we felt that the MDL programme has been a great success. Due to the pandemic the shape of events and the form of participation (on-site or online) in the programme among the participants varied. This resulted on the one hand in a bit of a divide between on-site participants and online MDL members but on the other hand it helped us widen participation in the programme, allowing more researchers to join our events, profit from them and contribute.

The core programme consisted of six workshops, a weekly reading group and two weekly seminar talks, three short courses on core MDL topics, and the Kirk and Rothschild distinguished lectures. The topics of the workshops were “Theory of deep learning”, “Deep learning and inverse problems”, “Deep learning and partial differential equations”, “The power of women in deep learning”, and “Interpretability, safety and security in AI”. In particular, the workshop on “The power of women in deep learning” was a highlight with presentations of successful female researchers in this area and various interactions between the mostly female audience and those role models. The workshops were all well visited (always more than 50 participants on zoom and about 30 participants in the room).

The last workshop (the London Mathematical Society Invited Lectures) happened in February 2022 as a first follow-up event already and drew in close to 200 participants (about 80 on site). It consisted of a lecture series on “The mathematics of deep learning” by Gitta Kutyniok (LMU), covering an even larger range of topics than in the previous workshops even including topics such as robustness and limitations of deep learning.

The short courses were given by some of the leading researchers in the field of MDL, including Michael Bronstein (Oxford), Weinan E (Princeton) and Lexing Jing (Stanford). In addition to these we had an engagement event with the Fraunhofer ITWM which presented current topics of research interests of the Fraunhofer Institute and encouraged collaboration.

The reading group was led by MDL participants and was the event that possibly drew in both online and on-site participants equally well in active discussions. It was very nice to observe how in particular the young participants engaged themselves vividly in the discussions. This was in fact also one main purpose of our programme, namely to provide young researchers an entry into this highly topical and often game-changing research field.

We also held a weekly drinks meeting at 5pm on Fridays for the on-site participants. We initially tried to involve online participants as well but this did not really work.

Both the Kirk and the Rothschild distinguished lectures were excellent and attracted interest also from the wider Cambridge community. The Kirk lecture was given by Rebecca Willett from University of Chicago on “Machine-Learning Enabled Imaging: From Microscopy to Medical Imaging to Astronomy”. The Rothschild lecture was given by Helmut Bölcskei from ETHZ on “The mathematical universe behind deep neural networks”.