

# Proposed Research Programme in Deep Learning

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## Overview

We propose an Informatics Research Programme in Deep Learning while retiring the defunct Research Programme in Machine Learning, which Chris Williams originally proposed, and CW then AS managed. The latter became less appropriate as a research programme: with machine learning becoming diverse and ubiquitous, there was insufficient focus. On the other hand, continuing and fast moving developments in Deep Learning provide a clear focus for research programme activity across Informatics. Dissemination of recent developments is critical, as is learning from one another about implementation niceties. Deep Learning is used across informatics, and is the focus of a number of recent grant applications and projects. The programme would provide the basis for efficient and speedy knowledge transfer between researchers in an area which is, currently, exceedingly fluid. Alongside that, the potential for collaboration between PhD students and development of grant proposals will be increased: given the speed of work in this field at the moment, collaboration is increasingly necessary. The programme title makes the focus clear, and provides an outward facing Deep Learning research presence in Informatics.

## Research Areas

Deep Learning approaches are fairly widely used across Informatics, having revolutionised Computer Vision, and of great importance in Machine Translation and Speech Recognition. Deep Learning methods are also used in Language Models, Robotics, and are a subject of interest in Compiler Optimization. There is a crossover of interest with Neuroinformatics. There is a lack of theoretical underpinning in deep learning which could provide fertile ground for a more systematic analytic. Furthermore there is interest outside Informatics – in Engineering, in Medical Imaging, in Signal Processing. Collaborative interactions within the University would benefit from such a programme. The Research Programme will also link with SICSA Data Science and SICSA AI themes for broader Scottish involvement, and involve many members of the CDT in Data Science.

## Typical Activities & Expected Outcomes (subject to available resources)

- The fourth Edinburgh Deep Learning Workshop, which typically attracts 80 Edinburgh Informaticians, along with another 100 attendees from worldwide. End of March 2017, and part of DataFest.
- A call across the School for each group to identify the 3 most salient recent advances in their area. This will be combined with some recent local work in a workshop in June/Sep summarising Advances in Deep Learning Applications.
- A tutorial in October for new graduate students (and others): getting up to speed with Deep Learning on DICE.
- A smaller event later in the year focused on delineating problems that deep learning approaches do and don't work for?
- An annual poster showcase.
- A quarterly management meeting of a core team responsible for identifying important activities that the programme should be involved with.

## People

The research programme will maintain a mailing list of interested parties, and a core team (TBC) who meet quarterly to decide the programme.