

# High resolution weather modelling with deep learning

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The ML-AusWeather project aims to provide an Australian-region model at the highest resolution possible, based on neural networks. High-resolution (space and time), rapidly-updated weather models are critical to safety during severe weather events and underpin many of the Bureau's most important and valuable services. Research into high-resolution, limited area models is one of the fastest growing areas into Neural Earth System Model (NESM) research. NESM research is also often referred to as data-driven modelling or machine learning modelling. Another approach to producing high-resolution model is to develop a hybrid-resolution model, where additional neural network layers are added to a global model over the region of interest. This latter approach is the one being taken by the ECMWF. ML-AusWeather leaves open the prospect of pursuing either (or both) approaches to achieving high resolution and accuracy – limited area or layer-addition. This is exploration into the unknown and we will be guided by the research. The Bureau of Meteorology's BARRA2 Reanalysis will provide data for the experiments. BARRA-2 (1979 – 2022) provides a 12km deterministic reanalysis and a 4.4km convective-scale downscaled reanalysis. By contrast, ACCESS-A provides a 1.5km grid. Perhaps one day we will try to meet such a target, as more training data becomes available, or techniques for using machine learning for high-resolution data assimilation become more tractable. Engagement with open source and open research remains critical to the research process into the next generation of NESM models. As a small research group, we must be community-minded if we are to bring these benefits to Australians as efficiently as possible.