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# Climate Informatics: Recent Advances and Challenge Problems for Machine Learning in Climate Science\*

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## Abstract

Despite the scientific consensus on climate change, drastic uncertainties remain. Crucial questions about changes in regional climate, trends of extreme events such as heat waves, heavy precipitation, and mega-storms, and understanding how climate varied in the distant past, must be answered in order to improve predictions, assess impacts and vulnerability, and aid mitigation and adaptation efforts. Machine learning can help answer such questions and shed light on climate change. Similar to the case of bioinformatics, the study of climate change provides a data-rich scientific domain in which cutting-edge tools from machine learning can make a major impact. Further, such questions give rise to new challenges for the design of machine learning algorithms. I will give an overview of challenge problems in climate informatics, and present recent work from my research group in this nascent field, with a particular focus on improving predictions of climate change trends from ensembles of climate simulations, and improving predictions of extreme events.

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