UNIVERSITY of HAWAI'I MĀNOA

Department of Atmospheric Sciences Seminar Announcement

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SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY

Applications of Artificial Neural Networks in Atmospheric Sciences

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Date: **Wednesday, October 28, 2015**
Seminar Time: **3:30pm**
Location: **Marine Sciences Building, MSB 100**

Abstract:

Artificial Neural Networks (ANNs) are nonlinear statistical models motivated by the physiological architecture of the human's nervous system. They involve a cascade of simple nonlinear computations that can implement robust and complex nonlinear functions. ANNs are considered to be "universal approximators" since they have the ability to calculate any function depending on the network configuration. Because of this remarkable quality, ANNs have been used for function approximation, pattern classification and prediction in atmospheric sciences since the early 1990's. The work to be presented includes an overview of ANNs known as multi-layer perceptrons and simple toy data example of non-linear regressions, as well as a detailed application of an ANN to optimize a CMIP5 multi-model ensemble and an overview of other recent ANN applications in atmospheric sciences.

The ANN used to create an optimized multi-model ensemble mean based on a suite of individual CMIP5 ensemble members that reproduce the observed mass weighted vertical integrand of atmospheric total energy derived from a reanalysis product as a control run. Our multi-model ensemble consists of ten CMIP5 models' historical simulation monthly means data from 1950-2005, and an equally weighted multi-model ensemble average (MMEA). The ANN is trained from 1950-2000, and the remaining data is used as an independent testing dataset. Over the central North Pacific the trained ANN improves the root mean square error by 36% relative to the MMEA, and the Pearson Correlation for the ANN is 0.87, while the MMEA is only 0.63. The trained ANN is also able to capture the dominant climate modes such as the Pacific Decadal Oscillation better than the MMEA.