# Deep Learning from 3D Multiphysics Simulation for Operational Optimization and Control of PEM Fuel Cell

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**Abstract:** (Abstract is limited to 300 words).

Polymer electrolyte membrane (PEM) fuel cells are electrochemical devices that directly convert chemical energy into electricity at an efficiency as high as 65%. They are widely regarded as a promising power source for portable, transportation and stationary applications. The maximum achievable power of a PEM fuel cell under specific operating temperature is important to its application. Machine learning and artificial intelligence (AI) have received increasing attention in material/energy development. In this talk, I will introduce a method that integrates an artificial neural network (ANN) with the genetic algorithm (GA) to predict the performance of a PEM fuel cell and identify its maximum powers and corresponding conditions for operational control purpose. A three-dimensional (3D) multiphysics model will be introduced, which will be used, along with experimental results, for generating a data set to train the ANN. The ANN-GA integrated method can be extended to other areas of research, including material/structure optimization. In addition, a brief review of machine learning approach in PEM fuel cells will be provided.

***Keywords: PEM fuel cell, modeling, machine learning.***

Author's biography:
Yun Wang received his B.S. and M.S. degrees in Mechanics and Engineering Science from Peking University in 1998 and 2001, respectively. He went to the Pennsylvania State University where he earned his Ph.D degree in Mechanical Engineering in 2006. Dr. Wang has produced over 90 publications in PEM fuel cell, Li-air battery, and other energy systems. Several of his seminal works are highly cited in major energy/power journals. Dr. Wang is currently Professor at the UC Irvine and ASME and RSC fellows.