UMass Dartmouth
COLLEGE OF ENGINEERING

Computer and
Information Science
Department

MASTER'S THESIS (SPRING 2016)

TOPIC: ***Towards Structured Deep Neural Network for Predictive Analytics***

PRESENTOR: Amol S. Gade

ADVISOR: Dr. Haiping Xu

DATE & TIME: Friday, April 29, 2016, 10:00 AM (CIS Day)

LOCATION: Woodland Commons, CR3

COMMITTEE MEMBERS: Dr. Firas Khatib and Dr. Iren Vavola

ABSTRACT

With the rapid growth of global data, predictive analytics has become ever important. Predictive analytics can help people in many different ways including making better decisions, understanding market trends, and improving productivity. Conventional machine learning techniques used for predictive analytics, such as regression techniques, are typically not sufficient to handle complex data associated with structured knowledge. Deep learning, also called deep structured learning, has received great attentions in recent years for modeling high-level abstractions in data with complex structures. In this thesis, we propose a systematic approach to deriving a layered knowledge structure and designing a structured deep neural network based on it. Neurons in a structured deep neural network are structurally connected, which makes the network time and space efficient, and also requires fewer data points for training. Furthermore, the proposed model can significantly reduce chances of overfitting, which has been one of the most common and difficult to solve problems in machine learning. The structured deep neural network model has been designed to learn from the most recently captured data points; therefore, it allows the model to adapt to the latest market trends. To demonstrate the effectiveness of the proposed approach for predictive analytics, we use a case study of predicting house selling prices. A deep neural network has been designed to match with a knowledge structure for house price prediction, with a significantly reduced number of connections comparing to a fully connected neural network. Our experimental results show that a specialized structured deep neural network may outperform conventional multivariate linear regression models, as well as fully connected deep neural networks.