

Workshop title: Deep Learning and Computer Vision

Abstract: Deep learning is an area of machine learning that has become ubiquitous with computer vision. The complex, brain-like structure of deep learning models is used to find intricate patterns in large volumes of data. These models have heavily improved the performance of general supervised models, time series, speech recognition, object detection and classification, and sentiment analysis.

Computer vision technologies are being used in new applications and are being incorporated across industries to solve both familiar and unfamiliar problems. For some tasks, computer vision models have surpassed human accuracy.

In this workshop, participants will learn the pivotal aspects of a deep learning model (it's not all about the hidden layers), the building blocks of a convolutional neural network, and how to apply a computer vision model to solve image classification tasks. The importance of recent advancements in the field of computer vision will be engaged during the model building process.

Demonstrations will use SAS Cloud Analytic Services (CAS) to take advantage of the in-memory distributed environment. CAS provides a fast and scalable environment to build complex models and analyze big data by using algorithms designed for parallel processing. Graphics Processing Units (GPUs) are leveraged for larger models demonstrated in this session. Most demonstrations are provided in SAS, Python and R for the participant's convenience.

Workshop description and target audience:

This tutorial is based on a professional foundation course taught to practitioners in the field of computer vision by SAS. This workshop is also scheduled to be delivered as a continuing education series at the Joint Statistical Meetings conference in Denver, 2019.

The workshop will cover the basics of computer vision. Both application and theory are covered in the session. Each participant will need access to the internet. The instructor will provide AWS server information that will contain the software and course data needed to complete the demonstrations. Participation in the demonstrations is encouraged for pedagogical reasons, but not required.

Outline:

- **Review: Traditional Neural Networks**
- **Introduction to Deep Learning**
- **Applications**
 - **Demonstration: Loading and Preparing Image Data**
- **Input Layers**
- **Convolutional Layers**
- **Padding**
- **Pooling Layers**
- **Traditional Layers**
- **Types of Skip-Layer Connections**
- **Improving Model Performance**
- **Image Preprocessing and Data Enrichment**
 - **Demonstration: Building and Training a Convolutional Neural Network**

Presenter / Proposer

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Background:

Robert researches, consults, and teaches machine learning with an emphasis on deep learning and computer vision for SAS. Robert has authored several professional courses on topics including neural networks, deep learning, and optimization modeling. Before joining SAS, Robert worked under the Senior Vice Provost at North Carolina State University, where he built models pertaining to student success, faculty development, and resource management. Prior to working in academia, Robert was a member of the research and development group on the Workforce Optimization team at Travelers Insurance. His models at Travelers focused on forecasting and optimizing resources. Robert graduated with a master's degree in Business Analytics and Project Management from the University of Connecticut and a master's degree in Applied and Resource Economics from East Carolina University.

Previous venues:

- SAS Global Forum; audience size ~125
- Analytics Experience; audience size ~75
- Association for Institutional Research Conference; audience size ~45
- Open Data Science Conference; audience size ~65

Forthcoming venues:

- Joint Statistical Meeting (2019)
 - Workshop: A First Step into Deep Learning and Computer Vision

Requirements for technical equipment:

- Projector with HDMI port
- Microphone
- Whiteboard

Proposed length:

- Four hours

Reference list:

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