EPRI

GridEd

The Center for Grid Engineering Education

Machine Vision in the Electric Industry: a Hands-On Training for Practitioners– 20 PDH's

Course Description

This course is one in a series of several courses developed and offered through GridEd to help workforce readiness through training and education of personnel with needed skill sets to design and develop Machine learning and Deep learning systems for the power utility industry.

This 20 Hour course focuses on some key aspects of Machine Vision development that utility Computer Vision engineers deal with in their everyday jobs. This includes remedying various data related issues and model development challenges. Further, assessment of Computer Vision models using relevant metrics will be discussed. The applications discussed in the course relate to Visual Inspection of Assets in the Transmission sector, concepts of which can be easily extended to various sectors. Some key problem statements covered in the course are as follows:

1. Insulator make will be classified using Image Classification (Model development and assessment)
2. Insulator defect detection will be conducted using Object Detection (Model development and assessment)

Who Should Attend

This course is intended for professionals and practitioners interested in developing deep learning models for computer vision applications. Prior knowledge of Python is required, and a basic understanding of data science and deep learning are suggested. A basic familiarity with open source libraries such as TensorFlow, PyTorch, and Scikit-Learn are also recommended but not required.

Participants will learn how to build image classification and object detection models for utility applications and assess model performance. They will learn how to tackle specific issues faced by utility data scientists while applying different algorithm techniques.

Registration Information

Two days a week for four weeks

Each session is one to two hours.

PDH's Available: 20 hrs

Participants who attend the full 10 hour live-online course and 10 hours of lab time will receive a Certificate of Attendance with the appropriate number of Professional Development Hours for this course. Participants who attend the full 10 hour live-online course, 10 hours of lab time, and pass homework assignments will be provided a Certificate of Completion.

Registration Fee: $2000

- 20% discount for organizations sending three or more staff
- 25% discount for government workers (non-utility)
- 25% discount for college professors*
- 75% discount for graduate students*

*University ID required

Location: Online - Live sessions will be recorded and available following the live web conference.

EPRI Contacts

Course Instructors:

Pratik Kulkarni, pkulkarni@epri.com
Myles Dunlap, mdunlap@epri.com

Course Coordinator:
Amy Feser, afeser@epri.com

Meet the Instructors

Pratik Kulkarni is a Data Scientist working for EPRI for the past year and half. Mr. Kulkarni specializes in Computer Vision, working on various tasks like labeling, curating and releasing Image datasets, automating and accelerating Image labeling and answering key AI related questions as
it relates to the utilities by performing various feasibility studies using Data Analysis and Machine Learning. Mr. Kulkarni holds a Master's degree in Electrical and Computer Engineering from the University of North Carolina at Charlotte.

Myles Dunlap is a Senior Technical Leader working in the Nondestructive Evaluation (NDE) department at EPRI. His research involves modeling and simulation, technique development, data analysis, and algorithm development pertaining to industrial NDE methods such as ultrasonics, eddy current, and radiography. Dr. Dunlap received his Ph.D. degree in Biomedical Engineering from the Virginia Tech – Wake Forest University School of Biomedical Engineering and Sciences. Dr. Dunlap is a certified TensorFlow Developer and a Kaggle Competitions Expert.

Participants will need access to an internet connection from a standard desktop/laptop computer equipped with speakers, microphone and common web browser, i.e. Internet Explorer, FireFox, Google Chrome, etc. Students will join live, synchronous web conference sessions via WebEx.

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Electric Power Research Institute
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Week	Activities
01	***Topic*** Image Classification – Model Development
	Hands-on problem Insulator make detection using multi-class classification
	Dataset: EPRI-owned insulator images belonging to 4 classes
	Day 1 (2hrs total) - 1hr presentation + 1hr code walkthrough - Classification overview and types of image classification techniques - Types of algorithm techniques - Data preprocessing - Classification architectures: MobileNetV2, Transfer learning - Problem in context - Assignment walk-through
	Day 2 (1hr) Assignment Q&A and discussion
	Assignment (3hrs) Build a multi-class classifier for a dataset *Complete sections of code to train a baseline model*
02	***Topic*** Image Classification – Model Assessment
	Hands-on problem Visualize performance and compute performance metrics for training and assessing classification models
	Dataset: Held back test dataset
	Day 1 (1hr) - Saving and loading models - Metrics to assess performance - Performance assessment of models using loss curves - Interpreting loss curves - Assignment walk-through
	Day 2 (1hr) Assignment Q&A and discussion
	Assignment (2hrs) Run inference on a test dataset and submit a submission file *The submission file will be evaluated*
03	***Topic*** Object Detection – Model Development
	Hands-on problem Insulator defect detection
	Dataset: Publicly released IDID V1.2 dataset
	Day 1 (2hrs total) - 1hr presentation + 1hr code walkthrough - Object detection architectures, APIs, and benchmark algorithms - YOLO overview - Problem in context - Assignment walk-through
	Day 2 (1hr) Assignment Q&A and discussion
	Assignment (3hrs) Build an object detection model *Complete the sections of code to train a baseline model*
04	***Topic*** Object Detection – Model Assessment
	Hands-on problem Visualize performance and compute performance metrics for training and assessing object detection models
	Dataset: Held back test dataset
	Day 1 (1hr) - Metrics - Visualize and log results - Baseline YOLOv5 results - Assignment walk-through
	Day 2 (1hr) - Assignment Q&A and discussion
	Assignment (2hrs) Run inference on a test dataset and submit a submission file *The submission file will be evaluated*