Machine Learning & Deep Learning for Computer Vision Using MATLAB

Prerequisites for the hands-on workshop:

1. Participants need to come with their own laptops with **MATLAB (version R2017b or later) installed,** preferably R2018a (latest).

   PES participants can use the existing campus license. External participants can **download a free trial version of MATLAB with the required toolboxes for deep learning** from this https://www.mathworks.com/campaigns/products/trials/targeted/dpl.html.

   (It includes MATLAB and a full set of products for deep learning: Neural Network Toolbox™, Statistics and Machine Learning Toolbox™, Parallel Computing Toolbox™, Image Processing Toolbox™, Computer Vision System Toolbox™, Image Acquisition Toolbox™, and Signal Processing Toolbox™.)

2. **Download and Install** pre-trained network **Alexnet** in MATLAB (https://in.mathworks.com/matlabcentral/fileexchange/59133-neural-network-toolbox-model-for-alexnet-network or directly within MATLAB from Add-ons button)

Agenda:

10:00 AM – 11:15 AM	**Introduction to Machine Learning for Computer Vision Applications Using MATLAB** Hands-on exercises: • Image processing apps for pre-processing • Train and compare classifiers using Classification Learner App The presenters will also discuss the following topics during the workshop: • What's new in MATLAB for image processing & computer vision • Working with live videos using MATLAB • Feature extraction and machine learning for image recognition
11:15 AM – 11:45 AM	**Break**
11:45 AM – 1:00 PM	**Introduction to Deep Learning for Computer Vision Applications Using MATLAB** Hands-on exercises: • Use a pretrained network for image classification • Build a deep learning network from scratch The presenters will also discuss the following topics during the workshop: • Object detection and semantic segmentation using deep learning
1:00 PM – 2:00 PM	**LUNCH**
2:00 PM – 4:00 PM (Can take break in between as needed)	**Addressing Challenges in Deep Learning Workflows Using MATLAB** Hands-on exercises: • Understanding network behaviour using visualizations • Perform transfer learning • Accelerating the labelling process using automation algorithms The presenters will also discuss the following topics during the workshop: • Labelling large amount of images • Hyperparameter tuning of deep neural networks • Scaling up training to GPUs, multi-GPUs and clusters • Deployment workflows for desktop, web, and cloud • Deployment workflows using automatic code generation for embedded platforms (NVIDIA GPU, Intel CPU, ARM CPU)

The URLs to MATLAB trial and Alexnet libraries are shared below as hyperlinks. So the Participants, are requested to use the below links to get prepare and come for the session.

MATLAB Trial - https://in.mathworks.com/campaigns/products/trials/targeted/dpl.html
Alexnet Libraries – Either Directly within MATLAB from Add-ons
or https://www.mathworks.com/matlabcentral/fileexchange/59133-neural-network-toolbox-model-for-alexnet-network

Speaker Bio: Dr. Amod Anandkumar is the senior team lead for signal processing and communications in the Application Engineering group at MathWorks India. Prior to this, he was a lead engineer with the Advanced Technology group at Samsung Research India, Noida where he developed physical layer techniques for LTE wireless communications systems and novel healthcare applications for smartphones. He was also a post-doctoral research fellow at the Biomedical Signal Analysis Lab, GE Global Research Bangalore, working on advanced beamforming techniques for ultrasound imaging and novel signal processing solutions for ICU patient monitoring systems, resulting in one US patent filing. Amod holds a B.Tech degree from National Institute of Technology Karnataka and a Ph.D. degree from Loughborough University, UK. His research interests include applied signal processing, next-generation wireless networks, computer vision, game theory, and convex optimization. He has published and reviewed papers in numerous international conferences and journals.