# INT248:ADVANCED MACHINE LEARNING

L:2 T:0 P:2 Credits:3

**Course Outcomes:** Through this course students should be able to

CO1 :: Define and select various constructors, functions, parameters and their types in the implementation of different neural networks using tensorflow.

CO2 :: Describe and compare the different models for solving the problems of regression and classification using keras tensoflow.

CO3 :: Apply deep neural networks model to solve the classification problem of images by proper planning .

CO4 :: Develop and select various constructors, functions, parameters and their types in the implementation of autoencoder based problems.

CO5 :: Analyze the model of the deep neural networks to solve the problem of sequential data using recurrent neural network approach and evalute its performance.

CO6 :: Categorize the models of deep neural networks to solve the problem of sequential data using generative adveserial neural network approach and evalute its performance.

**Unit I**

**Building models with TensorFlow** : Introduction to TensorFlow, Installation of TensorFlow, TensorFlow ranks and tensors, TensorFlow's computation graphs, variables in TensorFlow, building a regression model, multi-layer Perceptron learning for classification, tensorflow optimizers, transforming tensors as multidimensional data arrays

**Unit II**

**Building models with Keras** : Introduction to keras, Keras installation, keras layers and models, image classification with keras, building text classification model, implementing linear regression model, overfit and underfit, save and load model, hyperparameter tuning

**Unit III**

**Classifying images with deep convolutional neural networks** : building blocks of convolutional neural networks, determining the size of the convolution output, performing a discrete convolution in 2D, subsampling, putting everything together to build a CNN, Implementing a deep convolutional neural network using TensorFlow, Transfer learning with pre-trained CNN, Data Augmentation, Image segmentation

**Unit IV**

**Autoencoders and Pre-trained CNN** : Introduction to autoencoders, need for autoencoders, architecture of autoencoder, properties and hyperparameter, types of autoencoders, data compression using autoencoders, variational autoencoders

**Unit V**

**Modeling sequential data using recurrent neural networks** : modeling sequential data, understanding the structure and flow of an RNN, computing activation in an RNN, challenges of learning long-range interactions, implementing a multilayer RNN for sequence modeling in TensorFlow, text classification with an RNN, text generation with an RNN, time series forecasting, LSTM units, sequence classification with LSTM, stacked LSTM for sequence classification

**Unit VI**

**Generative Adversarial Networks** : Introduction to generative models, overview of GAN structure, discriminator, generator, building GAN, problems with GANs, CycleGAN

**List of Practicals / Experiments:**

**Parallelizing neural network training with TensorFlow**

- classifying handwritten digits on MNIST dataset
- developing a simple model with the low-levelTensorFlow API
- training neural networks efficiently withhigh-level TensorFlow APIs
- developing a multilayer neural network withKeras

**The mechanics of TensorFlow**

- TensorFlow's computation graphs
- building a regression model
- transforming tensors as multidimensional data arrays
- visualizing the graph with TensorBoard

**Text Books:**

1. PYTHON MACHINE LEARNING by SEBASTIAN RASCHKA, VAHID MIRJALILI, PACKT PUBLISHING

**References:**

1. ADVANCED MACHINE LEARNING WITH PYTHON by JOHN HEARTY, PACKT PUBLISHING