INT422:DEEP LEARNING

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

Course Outcomes: Through this course students should be able to

CO1 :: describe e the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.

CO2 :: compare detection and recognition tasks using convolution and adversarial neural networks.

CO3 :: use dropout regularization, gradient descent, Batch normalization, and optimization algorithms with convergence

CO4 :: examine recurrent neural networks for modelling sequential data.

CO5 :: assess the different learning models and prioritize their appropriate hyper parameters.

CO6 :: construct artificial neural networks with Tensorflow and Keras.

Unit I

Building Models with TensorFlow : Introduction to TensorFlow, Installation of TensorFlow, TensorFlow ranks and tensors, TensorFlow's computation graphs, variables in TensorFlow, TensorFlow optimizers, transforming tensors as multidimensional data arrays, visualization with Tensorboard, Introduction of Deep Learning, Applications of Deep Learning

Unit II

Building Models with Keras : Introduction to keras, Keras installation, keras layers and models, building a regression model, image classification with keras, multi-layer Perceptron learning for classification, building text classification 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, Adversarial FGSM

List of Practicals / Experiments:

Practicals

- Program to perform different operations on tensors in TensorFlow.
- WAP to perform Image classification using dense layers.
- WAP to perform text classification using keras.
- WAP to perform regression using Keras.
- WAP to identify and avoid underfitting and overfitting in DNN and improving model performance using hyperparameter tuning.
- WAP to save and load trained model in keras

- WAP to perform image classification using CNN.
- WAP to perform transfer learning and fine tuning.
- WAP to perform data augmentation.
- WAP to perform text classification using RNN.
- WAP to perform image denoising using autoencoders.
- WAP for anamoly detection using autoencoders.
- WAP to generate images using neural style transfer.
- WAP to implement GAN.

Text Books:

1. DEEP LEARNING by AMIT KUMAR DAS, Pearson Education India

References:

1. ADVANCED DEEP LEARNING WITH TENSORFLOW 2 AND KERAS by ROWEL ATIENZA, PACKT PUBLISHING