March 2024: END SEMESTER ASSESSMENT (ESA) **M TECH DATA SCIENCE AND MACHINE LEARNING_ SEMESTER II** **UE20CS935: Introduction to Deep Learning and Applications**		
Time: 3 Hrs	Answer All Questions	Max Marks: 100

Instructions

1. Answer all the questions.
2. Section A should be handwritten in the answer script provided.
3. Section B and C are coding questions to answered in the system and uploaded.

		SECTION-A (20 marks)	
1	a)	What are causes of overfitting in a deep learning model? Name 2 methods which can be used to resolve the overfitting issue in such architecture.	4
	b)	What is the usage of Convolution layer, pooling layer and dense layer in Convolution Neural Network (CNN) architecture?	4
	c)	What is the Vanishing Gradient Problem in deep learning models? How to get rid of this?	4
	d)	List down various performance metrics used for object detection. What is the use of non maximal suppression in Object detection algorithms?	4
	e)	What is the requirement of an activation function in deep neural network architecture? Define the following activation functions and their usage, Tanh(), ReLU() and Softmax().	4
		SECTION-B (40 marks)	
2		Build a Convolution Neural Network to classify the 6 different types of food types. Dataset_Folder Name: **Food Classification** Conditions to consider: • Parameters should not cross 200000 • Should not use more than 4 layers (except input and output, including convolution and dense layers) • Use Adam Optimizer	20
3		Improve the baseline model (model build in question2) performance and save the weights of improved model. Conditions to consider: • Apply Data Augmentation if required	20

		· Keep learnable parameters less than 20000	
		· Can use any number of layers	
		· Use any optimizers of your choice	
		· Use early stopping and save best model callbacks	

SECTION C – 40 MARKS

4		Use the Transfer learning technique to improve the previous section model's classification performance. The pre-trained models weights are given to you. The architecture of pre-trained model till convolution layers and its corresponding weights are already saved under the folder 'base_model'. The given model convolution layers already freezed. (Note: This pre-trained model provided is MobileNet). Load these weights along with architecture using the following syntax: **cust_model = tf.keras.models.load_model("base_model")** **"base_model"** is the folder name under all the required models files are exist. Design the remaining layers of network in your own way (from flattening to output layer) and train only its weights with the dataset given.	20
5		Develop a Semantic segmentation model using Unet architecture on the given dataset. Dataset contains the Chest X-ray images of Pneumothorax diseases and the corresponding masks. Find the dataset under the folder **"Unet_Dataset"**. Students can make use of pre-trained Unet segmentation model using the library **import segmentation_models as sm** **Hints :** 1. Load all the images in one array of size 96x128x128x1 Where 96 is total number of trained images 128x128x3 is each image size 2. Load all the masks in one array of size 96x128x128x1 3. Scale both the above two arrays 4. Split the data into train and test 5. Define the pre-trained segmentation model. Use encoder_weight=None, If internet access is not available. 6. Compile with appropriate loss and metric and fit the data into it. 7. Reduce the batch_size to 1 or 2, if you get any memory related error **Run the model for minimum 2 epochs and present your result. The solution will be evaluated based on approach only as it take lot of epochs to produce good result.**	20