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|  | **PES University, Bengaluru**  (Established under Karnataka Act No. 16 of 2013) | | **UE20CS935** |
| **MODEL QP: END SEMESTER ASSESSMENT (ESA)**  **M TECH DATA SCIENCE AND MACHINE LEARNING\_ SEMESTER II**  **UE20CS935- INTRODUCTION TO DEEP LEARNING & ITS APPLICATIONS** | | | |
| Time: 3 Hrs | | Answer All Questions | Max Marks: 80 |

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|  |  | SECTION-A (20 marks) |  |
| 1 | a) | Explain the convolutional neural network architecture in detail. | 4 |
| b) | Explain overfitting in neural networks? How to overcome the problem? | 4 |
| c) | What are the activation functions in neural networks? What is the use of these activation functions? | 4 |
| d) | What is the difference between single stage and multi stage object detection models? | 4 |
|  | e) | Briefly explain GANs? What are their advantages? | 4 |
| SECTION-B (30 marks) | | | |
| 2 |  | Create a convolutional neural network from scratch. Please consider it as a baseline. Dataset is available under the folder “3\_food\_classes”. Conditions to consider: --Parameters should not cross 20000 --Should not use more than 3 layers (except input and output) --Use optimizers like Batch Gradient descent, mini-batch or stochastic | 10 |
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| 3 |  | Improve the baseline model performance and save the weights of improved modelConditions to consider: --Apply Data Augmentation  --No parameter limit  --Can use more than 3 (except input and output)  --Use any optimizers of your choice  --Use callbacks to save the best model weights | 20 |
| SECTION C – 30 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. 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. | 15 |
| 5 |  | Develop a Semantic segmentation model using Unet architecture on the given dataset.  Dataset contains the images and the corresponding masks. Find the dataset under the folder “Unet\_Dataset”. Note that the masks are binary. Define the architecture accordingly.  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 150x128x128x3  Where 150 is total number of trained images  128x128x3 is each image size  2. Load all the masks in one array of size 150x128x128x1  3. Scale both the above two arrays  4. Split the data into train and test  5. Define the pre-trained segmentation model  6. Compile with appropriate loss and metric and fit the data into it.  Run the model for minimum 5 epochs and present your result. The solution will be evaluated based on approach only as it take lot of epochs to produce good result. | 15 |
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