

AI61201: Visual Computing with AI/ML

Programming Assignment 6: Image Visual Recognition with CNNs (20 Marks)

Due Date: November 11 (by 9 PM IST)

Instructions: Complete the 10 questions given, keeping the following points in mind:

- Implement the code using PyTorch
- Show the step-by-step output of all questions in the Jupyter Notebook .ipynb file.

Question 1 - 1 Mark

Load the Oxford-IIIT Pets dataset from Torchvision datasets (both train and test partition).

Question 2 - 1 Mark

Randomly shuffle the train partition and split the train partition further into training and validation sets (80% training, 20% validation).

Question 3 - 1 Mark

Show the class distribution on the training partition.

Question 4 - 2 Marks

Define transform to resize the images to size 224 x 224. Define Dataloaders for training, validation, and test sets that use this transform.

Question 5 - 2 Marks

Load the pretrained ResNet-18 model with the default weights (trained on ImageNet)

Question 6 - 5 Marks

Extract the features after the GAP layer of the ResNet-18 model. Replace the final FC layer of the model with one or more 1x1 convolutional layers, where the number of 1x1 convolutional filters in the last layer should be the number of classes of this dataset.

Question 7 - 3 Marks

Train the model using SGD and a suitable learning rate.

Question 8 - 1 Marks

Show the training and validation losses as a function of the number of epochs.

Question 9 - 2 Marks

Report the classification performance on the test partition of the dataset. Show the confusion matrix, accuracy, and F1 score.

Question 10 - 2 Marks

Use Grad-CAM to visualize the class activation maps on a few test images (randomly sample 5). You can use the torchcam library for this question

Submission Guidelines

1. *The content that you submit must be your individual work.*
2. *Submit your code in .py and .ipynb file format. Both these file submissions are required to receive credit for this assignment.*
3. *Ensure your code is well-commented and easy to follow. You can write your answers and explanations using text cells in the Jupyter Notebook files wherever required.*
4. *The files should be named as "<roll_number>_assignment_5". For example, if your roll number is 23AI91R01, the code the required file names will be 23AI91R01_assignment_5.py and 23AI91R01_assignment_5.ipynb. You should place all these files within a single zip file and upload it to Moodle as 23AI91R01_assignment_5.zip.*
5. *All submissions must be made through Moodle before the deadline. The submission portal will close at the specified time, and submissions via email will not be accepted.*

TA for this assignment: Km Poonam

If you have any queries regarding Assignment 5, please email at poonamk@iitkgp.ac.in
