

# E9 246 Advanced Image Processing

## Assignment 01

**Due Date: 3 Feb, 2023**

**Total Marks: 25**

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### Instructions:

- To extract deep features, you can use any open-source deep learning libraries like PyTorch, TensorFlow, Keras, etc.
  - Try to use Google Colab to avoid computational issues on your laptops.
  - Along with your code, also submit a report with all the results and inferences.
  - Put all your files into a single zip file and submit the zip file. Name the zip file with your name.
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#### 1. SIFT

**(10 Marks)**

- Implement the first step of SIFT i.e. scale-space extrema detection for the given images *books.png* and *building.png*.
- Modify the images by (a)Rotation (b)Upscale (c)Downscale (d)Gaussian blur (e)Add Gaussian noise. Now re-do the keypoint detection step.
- Qualitatively analyze the keypoints that are detected.

#### 2. Image Classification

**(15 Marks)**

- k-NN : Use an ImageNet pre-trained ResNet-18 model to extract deep features for the given images. Evaluate image classification accuracy using k-NN classifier using these features. Extract the features from the last/second-last fully connected layer.
- Fine tuning: Replace the ImageNet trained classifier in ResNet-18 with a new classifier for the given dataset. Fine-tune only the classification layer using the training data given (and additional data if you want) and report the performance on test data.
- Create a simple network from scratch and train using the same set of classes with cross-entropy loss. Report the accuracy of your model on the test images.

### **You should include the following things in your report:**

- Details of your implementation. Give examples of images to support your analysis. Any learnings or problems faced?
- Comparison between the different parts of Q2.
- You should give the link to codes used, and other details. There is no need to include descriptions of SIFT and the pre-trained model.