

NUI Galway CT5107 Part 2, 2018-2019

Assignment 2

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Task Using Keras for tasks in image recognition, face recognition, and embedding.

1. (Part 1) Program a network in Keras with a triplet loss function. HINT: I've provided some skeleton code in Blackboard which you may use if you wish. I made it by taking my own solution, removing the crucial/conceptual parts and adding comments XXX to tell you where to add/edit.
2. Train the network on the MNIST data.
3. Report the value of the loss function over time, eg using a plot. I haven't programmed any of this in the skeleton.
4. Program a recognition function: given a new image, it should recognize the image as a digit (and which digit) or report (e.g. if the image is a letter, instead of a digit) that it is unknown. I haven't programmed this in the skeleton.
5. Test the network with (unseen) images of letters (not numbers), to demonstrate that it works in this case.
6. (Part 2) Find any pre-trained deep convolutional neural network face model on the internet which uses an embedding, a Siamese network, or a similar approach which allows you to carry out the final tasks as follows.
7. Use the output model (possibly after removing some final layers) to make face clusters, i.e. run a clustering algorithm so that multiple pictures of the same person are in the same cluster. This can run on any face dataset, whether open/public or your own. CLARIFICATION: you can use e.g. a Scikit-learn clustering algorithm, or a hand-written one. For each image in the dataset you're going to cluster, you should pre-compute its embedding, and then work only with the embeddings. That is, don't run all the images through the network at every step of the clustering algorithm.
8. Demonstrate the clustering by showing on-screen or saving to disk a visualisation of 3 faces from each cluster, for at least 3 clusters.

Teams 1 or 2 people per team – you decide, and you form the team. If you can't find a partner, you can request me to put you on a waitlist for random team allocation, but there's no guarantee any partner will appear. The tasks and grading are the same for 1- or 2-person teams.

Due date Friday Week 11 5pm.

Deliverables Submit code and a 2-page pdf report to Blackboard. The code should be in a single .py file: submit it to Assignment 2 - Code. I've provided a few letter images so you don't need to upload any files. The report should describe your approach, results and remaining obstacles for Part 1 and Part 2, including any graphs/outputs you need to show. Brief bullet points are sufficient, no need for high-quality prose. No need to explain background/motivation. Submit it to Assignment 2 - Report.

Weighting 15% (Assignment 1 was also 15%, and the exam is 70%).