Exam image/video analysis

2022-01-12

About this exam

- The exam consists of three questions. You can earn 100 points in total. Each question states how many points you can earn with it.
- The deadline for the exam is 17 January 2021, 17.00. If you submit your exam late, you lose 10 points for every day you submit late (with the first day starting at 17.01). If there's a valid reason you are unable to submit the exam on time, contact us *before* the deadline.
- You are expected to work on this exam alone. We will be strict on submitting non-original work. This applies to the textual answers as well as to the code.
- Using code from the manual is allowed.
- Using some functions from the other sources (e.g. from StackOverflow) is also fine with us, but then you have to add a short comment with the source (url) and the reason you need that function.
- You'll both be graded on your code as well as on the quality of your interpretations and your ability to reflect on the used methods.
- We don't expect you to perform *statistical* analyses we haven't discussed in this course to interpret the results. If you're unsure whether a result would be statistically significant, just include that in your answer.
- Each question has a general guideline on how much you should write. There is no minimum number of words, and if you need less (or more) than the guideline to answer the question, that is no problem.
- The questions must be submitted in 3 separate files on Blackboard. Make sure your Jupyter Notebooks are well-ordered, your textual answers are written in markdown, and you do not print the complete tokenized corpora (so make sure to check the file size of your notebooks before submitting). Submitting messy files can result in a deduction of 15 points in total (5 per question).

Question 1

`30 points` A researcher has performed a network analysis on the dataset of exercise 6.2 (similar to your analysis) and now likes to know whether we can find different types of video thumbnails in different communities. In order to answer that question, she wants to categorize the video thumbnails using image classification.

Design a classification scheme (with clear definitions and examples) for categorizing video thumbnails in `nodes.csv` [column `video_thumbnail`]. Make sure that your classification scheme could be used by someone who hasn't seen the data before.

Then discuss 1) why this classification scheme would be relevant to use in the context of the analysis of exercise 6.2 (e.g. what will it learn us about this data, what kind of questions can we answer with it), 2a) whether and why you think this classification model could be computationally reproduced (by a Resnet50, for example) and 2b) where there could be potential bottlenecks in reproducing this classification scheme.

Your answer must consist of the following:

- An overview of the classification scheme (ca. 250 words)
- Discussion (ca. 350 words)

No code or labelled data is needed for the exercise – only text (and some example images)! [Submitting a docx/pdf is therefore fine.]

Question 2

`35 points` Google Images can uncover interesting cultural representations. For example, if you search for "CEO", you will mainly see pictures of middle-aged white males; if you search for "big data", you will see an abundance of dark blue, cyberspace-like images.

Come up with a Google Images query you want to research, explain your choice, and collect **at least** 50 images from this query.

Then analyze the images using **one** of the methods we explored in week 4, 5 or 6. Make sure to motivate your choice of method: why are the image features you chose relevant in the context of your query? Interpret the results and discuss what other features could be relevant to analyze.

[Note, you can grab the 50 images by yourself, but you can also use the Python library Google Images Download (or another library, of course).]

Your answer must consist of the following:

- Motivation for your query and method (ca. 200 words)

- The complete code to answer the question with a short comment for every step (max 2 sentences per step)

- Conclusion and discussion (ca. 200 words)

Question 3

`35 points` Use the subsets of movie trailers from 1920-1940, 1960-1980 and 2000-2020 from exercise 6.1, but instead of comparing the shot types and shot lengths, use one of the (pre-trained) image feature extraction methods we discussed in exercise 5.2 to compare the subsets, and explain your choice. [Note: you are not allowed to use the same method you used in Q2. So if you analyzed gender in Q2, you have to pick something else for this question.]

Make a plan for tackling the dimensionality of the data: each subset consists of multiple videos, each video consist of multiple frames/seconds/shots, and each frame/second/shot could contain multiple faces/genders/emotions/objects/texts/colors. How are you going to compare the subsets? Explain the choices you make carefully. Then implement your plan and interpret the results.

Your answer must consist of the following:

- Explanation of choice for features, plan for tackling the dimensionality (ca. 350 words)

- The complete code to answer the question with a short comment for every step (max. 2 sentences per step)

- Interpretation and conclusion (ca. 200 words)