

Assignment 1

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Background

Nowdays, everyone is fond of taking photos and making videos. However, these take a lot of storage space and the speed of the device will also reduce. We know that there are many compression techniques available to handle the above issue. Linear algebra plays an important role in compression techniques. Particularly, SVD is extensively used in image compression process resulting in saving computer's memory.

Problem 1

2.5 marks

- Take any colour image (Preferably 100×100 , take larger images if your PC can support it. Beware that larger images could crash your system.)
 1. Use the SVD algorithm and write a python code to compress an image and store the relevant data.
 2. Next, you need to reconstruct the compressed image to obtain the original image such that the quality of image is retained to the maximum.
 3. Study the tradeoff between the number of singular values used for reconstruction of image and the quality of the image.
 4. Devise a mechanism to compute the minimum number of singular values required such that the reconstructed image is 0.1 close to original image.
- Take any colour video.
 1. Use the SVD algorithm, and write a python code to compress a video and store the relevant data.
 2. Study the tradeoff between the number of singular values used for reconstruction of image and the quality of the image.

Background

We know that recently, there are a lot of online user-centric applications such as movie recommender systems where users are recommended with further movies to watch. The challenge lies in finding and recommending many suitable movies that would be liked and selected by users. There are many techniques used for this task and SVD is one of those techniques.

Problem 2

2.5 marks

- Take any movie recommendation dataset (e.g. MovieLens dataset https://docs.google.com/spreadsheets/d/1DSYeRhZ_v2MZAXAMen6kcaN9Hx4i6M1o/edit?usp=sharing&ouid=112733797681736302&rtpof=true&sd=true or you can use any other dataset of your choice).
 1. Use the SVD algorithm and write a python code to design a movie recommender system.
 2. Given a new user, devise a mechanism to recommend movies to that user.

What to Submit?

You need to submit a detailed **Report** which has the following

1. Answers to Problems 1 and 2 written in L^AT_EX.
2. Find the compression percentage (i.e., the ratio of number of elements in the original image to the number of elements required to reconstruct the image after compression).
3. For problem 2 describe the complete mechanism followed, in the report.
4. Any relevant plots which will help you to visualize the results must be neatly shown in the report.

Where to Submit?

In google classroom before the due date and time.