Candidate Investigation/Study/Survey Topics

EECS 274 Spring 2018
(version 1.0 3/15/18)

1. Texture analysis

We've covered color as a visual attribute of images. How about texture which can loosely be thought of as spatial patterns.

Task: Learn about image texture. Give an introduction/overview to the class.

Sources: Chap. 6 of F&P and elsewhere.

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2. Tracking

Tracking is the problem of characterizing the motion of an object in a video (sequence of images).

Task: Learn about tracking. Give an introduction/overview to the class.

Sources: Chap. 11 of F&P and elsewhere

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3. Optical Flow

Optical flow characterizes the movement in the scene usually between adjacent frames in a video. It is useful for a range of applications including tracking, video classification, etc.

Task: Learn about optical flow. Give an introduction/overview to the class.

Sources: Section 10.6 of F&P and elsewhere

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4. Markov Random Fields

Markov random fields are used to characterize the dependencies between pixel values at a local level, usually neighboring pixels. They can be used for noise reduction, segmentation, texture analysis, etc.

Task: Learn about Markov random fields. Give an introduction/overview to the class.

Sources: Section 3.7.2 of Szeliski and elsewhere

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5. Image Registration

Image registration is the problem of finding the geometric transformation that relates on image to another. It is used to create image mosaics such as panoramas.

Task: Learn about image registration. Give an introduction/overview to the class.

Sources: Chap. 12 of F&P and elsewhere

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6. Bag of Visual Words Representations

Local feature extraction usually results in a lot of interest points (patches) and their descriptions (feature vectors) per images. Bag of visual words (BOVW) is a way to summarize these sets using one fixed length feature vector per image. This feature vector can then be used for image classification, retrieval, etc.

Task: Learn about bag of visual words representations. Give an introduction/overview to the class.

Sources: Section 16.1.3 of F&P and elsewhere

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7. Face Detection

Task: Learn about face detection. Give an introduction/overview to the class.

Sources: Sections 17.1.1 of F&P and 14.1.1 of Szeliski and elsewhere.

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8. Object X Detection

Researchers have worked on detecting a variety of different objects in images: pedestrians, cars, humans, etc.

Task: Focus on some particular type of object detection. Give an introduction/overview to the class.

Sources: Varies.

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9. Content Based Image Retrieval

CBIR is the problem of finding relevant images in an image database based on the image content such as color, texture, shape, etc. This is usually done by comparing the target images to a query image and retrieving the images that are most similar.
Task: Learn about CBIR. Give an introduction/overview to the class.

Sources: Chapter 21 and elsewhere.

Here are a number of other candidate topics. Contact me if you are not sure what they are.

10. Annotating Images with Words

11. Image Super Resolution

12. Image Inpainting

13. Hyperspectral Image Analysis

14. Gesture Analysis

15. Image Geolocalization

16. Remote Sensing