

Visual Recognition and Features

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In the past decade there has been a substantial progress in feature extraction visual recognition tools. The increase of computational power and amount of available memory made it possible to implement computationally intensive algorithms that provide acceptable solutions in many application areas. Image classification, object detection and image retrieval are typical task in computer vision and are addressed by similar systems. Such systems are usually based on local features, visual vocabulary, and depending on the application either kernel based classifiers or fast similarity search.

The aim of this course is to provide an introduction to the state-of-the-art visual recognition components. It will consist of a 3h lecture and 1h practical exercise session using Matlab.

The lecture will cover the processing pipelines for image classification, detection and retrieval. During the practical session the attendees will implement a feature extraction algorithm, build a visual vocabulary and kernel for classification. Alternatively, a small image retrieval system will be implemented.

The main focus of the lecture will be on local descriptors. Such descriptors are by nature robust to occlusion and clutter since a good match between objects or scenes can be achieved on a subset of detected descriptors. A part of the lecture will be devoted to invariant features, which can match objects seen from different angles and distances. The features are often high dimensional therefore a discriminative method for reducing the number of dimensions will be presented.

Second part of the lecture will cover different techniques for constructing a visual vocabulary as well as computing image representation for detection and classification.

In the context of image retrieval from large databases fast search strategies and data structures will be reviewed.

At the end, performance measures used in the context of matching, visual recognition and retrieval as well as the databases used for evaluations will be discussed.