1. Identification of digits in noisy car number plates. Images of digits and possibly also letters from car number plates are acquired by a digital camera. For each plate a series of images with more and more noise (dirt) is acquired. Find a pattern recognition method to identify the digits, evaluate its performance, particularly with regard to how much noise can be tolerated

2. Face detection.
Try to find faces in images. See Samuel Englund's masters thesis for references and suggestions. Use also Google and search for "face detection" and "face databases".

3. Face recognition.
Try to recognize faces in a suitable face database available from internet (or in a database that you construct by use of a digital camera). Use Google to search for "face recognition" and "face databases".

4. Identification by use of ear images.
See http://bias.csr.unibo.it/maltoni/handbook/chapter_1.pdf , particularly pages 8-12 for use of ear images for identification by use of different methods including use of ear images.

5. Analyse fingerprint images from FVC (Fingerprint Verification Competition).
Download fingerprint images from FVC2000: The First International Fingerprint Verification Competition: http://bias.csr.unibo.it/fvc2000/ . For example data set DB1_B: DB1_B.zip (5.4MB) which consists of 8 images (of size 300x300) of each of 10 fingers.

6. Discrimination of fingerprints.
Discrimination of fingerprints with given classes (10 classes in dataset DB1_B). Try for instance to discriminate by use of suitable features.

7. Identification of handwritten digits.
Use for instance the MNIST handwritten digit database of Yann LeCun and Corinna Cortes, Courant Institute, NYU, available from yann.lecun.com/exdb/mnist/

8. Person recognition by use of iris images.
Iris recognition is considered to be one of the most effective ways of person identification, see for instance the home page of John Daugman, http://www.cl.cam.ac.uk/~jgd1000/ , where the use of complex-valued Gabor wavelets is described. For the purpose of this course a first step could be to acquire eye images by a digital camera and then to delineate the iris. It is further suggested that features computed by Fourier or wavelet methods are tested.

9. Real time gestures.
The object is to recognize and track hand gestures acquired by a web camera in real time as an alternative input device to a computer.

10. Traffic sign detection and recognition in Google Street View.

11. Road geometry extraction from Google Earth images.

12. Road Barriers Detection from Google Street View.

13. Diabetic Retinopathy Detection.
Identify signs of diabetic retinopathy in eye images. This project is based on a KAGGLE competition, see http://www.kaggle.com/c/diabetic-retinopathy-detection

14. Driver distraction detection (Kaggle competition).

15. Analysis of Rock Art images.
Several promising methods have been introduced for obtaining highly accurate images of rock art, in particular optical laser scanning and Structure from Motion (SfM), see Ling & Bertilsson (2015). The idea of the present project is to combine such images that reveal the three-dimensional structure of rock carvings with modern mathematical and computational techniques based on recently developed machine learning methods. Relevant such methods are deep learning algorithms using convolutional neural nets, see Le Cun et al. (2015) and Brownlee (2016). By applying deep learning algorithms it seems possible to get information about (i) chronology of carvings (ii) different cuttings techniques and perhaps also identification of individual artists (iii) separation of cuttings from different periods in rock art sceneries with many individual items. A requirement for successful application of deep learning techniques is that one has available fairly extensive data sets. For rock art that should now be the case due to recent extensive acquirements of high quality rock art images. This project is suitable as a masters project, but several aspects of it could be covered as projects in the Statistical Image Analysis course, such as for instance (A) Comparing different rock art image acquisition techniques. (B) How can one partition rock art images into subimages. (C) How can one find the 3D structure of a rock carving by use optical laser scanning. (D) How can one describe differences and similarities between images of objects of the same kind, for instance ship images. References Brownlee, J (2016) 8 inspirational applications of deep learning http://machinelearningmastery.com/inspirational-applications-deep-learning/
LeCun, Y, Bengio, Y & Hinton G (2015) Deep learning. Nature 521, 436-444. Ling, J & Bertilsson, U (2015) Biography of the Fossum panel, Adoranten 2015. Contact Johan Ling for data.

16. Temperature modelling.
Download a dataset of temperature measurements and design a number of geostatistical models (with different explanatory variables for
example) to interpolate the data. Test the model using cross-validation. A possible dataset is http://www.image.ucar.edu/GSP/Data/US.monthly.met/

17. Road detection.
Take images from Google Streetview and design a method that find the road in the images.

18. Identification of traffic signs.
Use Google Streetwiew to extract images with and without traffic signs. Design a method to detect the traffic signs with speed limits. If the method finds one, identify the speed limit.

19. Identification of traffic signs with names of places.
An alternative to the previous projecet. Use Google Streetwiew to extract images with and without traffic signs with names of cities. Design a method to detect the traffic signs. If the method finds one, identify the name of the city.

20. Tracking the football in a series of images of soccer football.
Try to follow the football in a series of images. Start perhaps by manually identifying the football in the first image. In the sequel use for instance the last image (or the last two or even the last three images) to find the the football in the following image.

21. Identification of houses with swimming pools.
Use images from Google Earth and statistical image analysis methods to identify houses with swimming pools.

22.Identification of handwritten signatures.
Let a number n of test persons write m signatures each. Think of a suitable design for acquiring these nm signatures. Use pattern recognition methods to identify the persons from the signatures.

23. Identification of tram numbers.
Take photos with and without trams. Design a method to detect trams and classify which number it has.

24. Extract individual sweat glands from a video of sweating.

25. Segmentation of focused ion beam scanning electron microscope (FIB-SEM) images.

26. Point processes related project.