Machine Learning – CAB420
Final Project Ideas

For the final project, you can propose your own project ideas. In that case, please contact me in advance to see whether the proposed project can a be good fit to be a final project for CAB420.

You can also have a look at Kaggle competitions. Kaggle is an online community of data scientists and machine learners, owned by Google LLC. The most interesting point of Kaggle is that it provides datasets and organises many competitions in machine learning tasks. It manages a leaderboard where the participants can publish their results. You can have a look at the competitions there to see if you are keen.

There are a number of project ideas (Courtesy: Eric Xing – CMU) below you can choose from.

1. Enron E-mail Classification

The Enron E-mail data set contains about 500,000 e-mails from about 150 users. The data set is available here: http://www.cs.cmu.edu/~enron/
Can you classify the text of an e-mail message to decide who sent it?

Related Paper: http://cs229.stanford.edu/proj2011/Nguyen-classificationOfCorporateAndPublicText.PDF

2. Object Recognition

The Caltech 256 dataset contains images of 256 object categories taken at varying orientations, varying lighting conditions, and with different backgrounds.
http://www.vision.caltech.edu/Image_Datasets/Caltech256/
You can try to create an object recognition system which can identify which object category is the best match for a given test image.

Apply clustering to learn object categories without supervision.

3. Movie Rating Prediction

Movielens dataset is in the form movie, user, rating for the 9000 most rated movies, by 700 users. The data is available here:
https://grouplens.org/datasets/movielens/

Can you predict the rating a user will give on a movie from the movies that user has rated in the past, as well as the ratings similar users have given similar movies?
Can you discover clusters of similar movies or users?

Related Papers:
http://cs229.stanford.edu/proj2013/Bystrom- MovieRecommendationsFromUserRatings.pdf
https://karthkk.wordpress.com/2016/03/22/deep-learning-solution-for-netflix-prize/
http://cs229.stanford.edu/proj2008/KammHuangSathi-TheNetflixChallenge.pdf

4. WebKB prediction

This dataset contains webpages from 4 universities, labeled with whether they are professor, student, project, or other pages.
http://www-2.cs.cmu.edu/~webkb/

Learn classifiers to predict the type of webpage from the text Related Papers: http://www-2.cs.cmu.edu/~webkb/ http://www.cs.berkeley.edu/~taskar/pubs/rmn.ps

5. Unsupervised Learning of Visual Representation from Videos

Understanding temporal sequences is important for solving many problems in the AI-set. Videos, as a typical kind of temporal sequences, are an abundant and rich source of

visual information and can be seen as a window into the physics of the world we live in, showing us examples of what constitutes objects, how objects move against backgrounds, what happens when cameras move and how things get occluded. Being able to learn a representation that disentangles these factors would help in making intelligent machines that can understand and act in their environment. Additionally, learning good video representations is essential for a number of useful tasks, such as recognizing actions and gestures. Supervised learning has been extremely successful in learning good visual representations that not only produce good results at the task they are trained for, but also transfer well to other tasks and datasets. Therefore, it is natural to extend the same approach to learning video representations. However, videos are much higher dimensional entities compared to single images. Therefore, it becomes increasingly difficult to do credit assignment and learn long range structure, unless we collect much more labelled data or do a lot of feature engineering (for example computing the right kinds of flow features) to keep the dimensionality low. The costly work of collecting more labelled data and the tedious work of doing more clever engineering can go a long way in solving particular problems, but this is ultimately unsatisfying as a machine learning solution. This highlights the need for using unsupervised learning to find and represent structure in videos. Moreover, videos have a lot of structure in them (spatial and temporal regularities) which makes them particularly well suited as a domain for building unsupervised learning models. In this project, we expect you to explore possible machine learning solutions (CNN, sparse coding) for unsupervised learning on video sequences and evaluate the learned visual representations using different computer vision tasks.

Related Papers:
Unsupervised Learning of Video Representations using LSTMs. ICML 2015 Unsupervised Visual Representation Learning by Context Prediction. ICCV 2015 Sparse Output Coding for Scalable Visual Recognition. IJCV 2015

You can also find some other project ideas here:

http://cs229.stanford.edu/projects2013.html

http://cs229.stanford.edu/projects2014.html.