# Multidimensional Digital Signal Processing Project

## Example Project Proposals

Due 12/08

Suggested project topics are:

- Kinect-based video processing
- Intel Perceptual Computing
- Face detection and recognition
- Emotion recognition
- Video stabilization
- Pedestrian detection/tracking
- Intersection safety assessment
- License plate recognition
- Object detection/recognition
- Vehicle detection

1. Kinect-based video processing
   Use the Microsoft Kinect SDK to build gesture recognition and interaction systems.

   `http://www.microsoft.com/en-us/kinectforwindows/`

2. Intel Perceptual Computing
   Use Intel's Percptual Computing SDK to develop close range human computer interaction (HCI) systems (e.g. controlling your laptop with Minority report styled hand gestures).

   `http://software.intel.com/en-us/vcsource/tools/perceptual-computing-sdk`

   OpenCV Object Detection

3. Emotion Recognition
   Examine features of the face to understand the emotion of a person. Optionally, one could look at how tired a person is (PERCLOS) or driver distraction.

   `http://mplab.ucsd.edu/wordpress/?page_id=79`

4. Video Stabilization
   Estimate the background motion in a video to compenstate for camera motion.

   `http://googleresearch.blogspot.com/2012/05/video-stabilization-on-youtube.html`

5. Pedestrian Detection in Traffic Video
   Dalal and Triggs histogram of oriented gradients for detection of people.

   `http://pascal.inrialpes.fr/soft/olt/`

6. Intersection Safety Assessment
   Examine vehicle/pedestrian movements at intersections to score the intersection safety (can be based on number of illegal maneuvers, how often pedestrians and vehicles are in conflict, number of red lights run, etc.).

   `http://n.saunier.free.fr/saunier/#resources`

7. License Plate Recognition (LPR)
   Detect license plate regions of cars and read the number.

   `http://www.licenseplaterecognition.com/`

8. Object Detection and Recognition
   Be able to detect and recognize a wide variety of objects. This project will utilize a number of public datasets such as VOC and Caltech 101.

   `http://pascallin.ecs.soton.ac.uk/challenges/VOC/`

9. Vehicle Detection
   Detect surrounding vehicles from a car mounted camera. Camera may be facing forward to detect rear of lead vehicles (and optionally do lane detection), to the rear for front vehicle detection, or to the sides for profile detection.

   `http://cvrr.ucsd.edu/publications/2011/sivaraman_mva_2011.pdf`

10. Mobile Image/Video Processing
    Use the camera on a smart phone for onboard processing. For example, image-based barcode scanner.

11. Unsupervised Motion Analysis with Latent Topic Models
    Use techniques from web document and search techniques to characterize scene motion.

    `http://www.ee.cuhk.edu.hk/~xgwang/papers/topicmodel.pdf`

12. Panoramic Stictching

    Automatically build panoramas using multiple images. Sample images can be provided from high altitude ballon launch.

13. Vehicle Make and Model Recognition

    Match cars based on make and model rather than using license plate technology.

    `http://research.wstkt.pl/?page_id=2`

14. Off-the-Shelf Convolution Neural Network CNN

    Modern detection and classification using CNN trained on ImageNet

    `http://arxiv.org/abs/1403.6382`

15. Fine-Grained Classification

    Make distinctions between variants within a class - e.g. different dog breeds or boats

    `https://sites.google.com/site/fgcomp2013/`

16. Video Coding for Compression/Transmission

    How to deliver high quality video in limited bandwidth

    `http://jetcas.polito.it/CFP-Screen_Content_Video_Coding_and_Applications.pdf`

17. Satellite Image Processing

    E.g. detect homes that have swimming pools in Google Earth, make predictions using weather satellite.

18. Visual Tracking of Sky/Clouds

    Use sky viewing camera to track clouds or stars.

19. Parking Lot Analysis

    Determine number of open spots in a parking lot.