OVERVIEW

- Course Syllabus
- Grading Explanation
- Software Note
Instructor

- Professor Brendan Morris
- Office: SEB 3216, Virtual meeting hours
- Email: brendan.morris@unlv.edu

Website

- http://www.ee.unlv.edu/~b1morris/ecg782/
- Has schedule, lectures, homework, etc.
- Bookmark it!
Required Textbook

- Digital Image Processing 3E, Gonzalez and Woods
- Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow 2E, Géron

Recommended References

- Computer Vision: Algorithms and Applications, Szeliski [online]
  - http://szeliski.org/Book/
Theory and applications of multidimensional (M-D) digital signal processing. M-D signals and systems. M-D z-transform. M-D DFT and FFT. Design and implementation of M-D FIR and IIR filters. Applications to image processing such as image enhancement and restoration. Advanced topics chosen according to class interests.

- Emphasis will be on Image Processing, Computer Vision, and Deep Learning
- Less on traditional signal processing
GRADING I

- Final 25% W 05/12
- Midterm 20% TBD ~ Spring Break
- Homework 15% First half of class
- Project 25% Second half of class
- Presentation 10% Paper presentation
- Participation 5% In-Class
GRADING II

- **Project**
  - Each student will do a computer vision project
    - Programming using OpenCV, Matlab, Keras/TensorFlow (or another language of choice)
  - Grading based on presentation and report (IEEE conference style)

- **Homework**
  - Approximately 5 assignments + paper reading
  - Will be due via Webcampus and no late assignments accepted
  - Permitted to work with and help one another
    - All assignments must be turned in individually (no copying)
  - Must use Latex for formatting [linux, win]
TOPICS

- Imaging properties and mathematics
- Spatial image filtering
- Frequency domain processing
- Morphology
- Feature Detection and Representation
- Segmentation

- Motion estimation
- Object detection
- Object recognition
- Tracking
- Introduction to deep learning
- Convolutional neural networks
Traditionally taught using Matlab/OpenCV
- Suggest using Python in place of Matlab due to license difficulty → probably better in the long run

**OpenCV**
- Open source and cross platform (Python!) → standard in community for many years
- Can be tricky to get setup and familiar with initially
- Lots of documentation is online → be sure to match your version of OpenCV

**Deep learning frameworks**
- Popular choices are [TensorFlow](https://www.tensorflow.org), [Keras](https://keras.io), [PyTorch](https://pytorch.org)
- Due to platform variability, use of [Docker](https://www.docker.com) or notebook ([Jupyter](https://jupyter.org), [PyCharm](https://www.jetbrains.com/pycharm), [Colab](https://colab.research.google.com)) may be good choices

We will start with Matlab/OpenCV before transitioning
- Note: almost all CV and ML research using Linux making Window slightly more difficult