ECG782: MULTIDIMENSIONAL DIGITAL SIGNAL PROCESSING

COURSE INFORMATION

http://www.ee.unlv.edu/~b1morris/ecg782

OVERVIEW

- Course Syllabus
- Grading Explanation
- Software Note

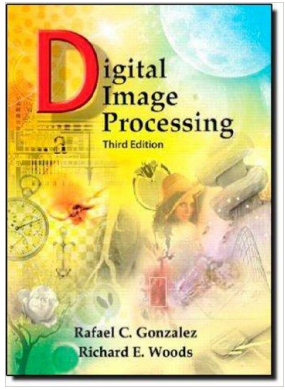
COURSE INFORMATION I

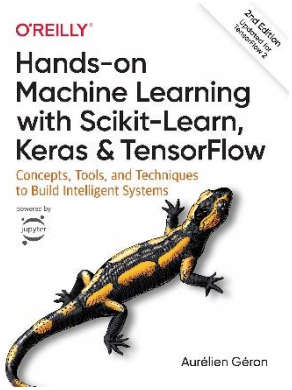
- Instructor
  - Professor Brendan Morris
  - Office: SEB 3216, Virtual meeting hours
  - Email: brendan.morris@unlv.edu

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

COURSE INFORMATION II

- 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/
  - Image Processing, Analysis, and Machine Vision, 4th Edition, Sonka, Hlavac, and Boyle, 2008

CATALOG DESCRIPTION

- 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

SOFTWARE NOTE

- 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, Keras, PyTorch
  - Due to platform variability, use of Docker or notebook (Jupyter, PyCharm, Colab) 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