**Topics in Image Processing**

**College of Biomedical Engineering and Instrument Science**

**Zhejiang University**

**Summer 2022**

**Course Syllabus**

* **Meeting Times**

To be determined. Lectures will be given online.

* **Instructor**

Prof. Mark D. Butala ([markbutala@intl.zju.edu.cn](mailto:markbutala@intl.zju.edu.cn))

* **Course Material**

Course notes and sample code: provided in lecture and posted online

Textbook (suggested, but not required): *Digital Image Processing* by Gonzalez and Woods

* **Course Description**

Concepts and applications in image processing; introduction to multidimensional signal

processing: sampling, Fourier transform, filtering, and restoration Both the theoretical foundations and practical application are emphasized.

* **Prerequisite**s

Some prior exposure to linear system theory and signal processing is preferred, but not necessary. Illustrative examples will be provided in the Python programming language and some coding experience (in Python, Matlab, or similar) is preferred but not necessary. Examples will be provided that will illustrate the use of image processing operations in Python that should be clear to anyone with some prior programming experience.

* **Lecture Schedule**

The course will consist of 10 lectures. The first week will focus mainly on the mathematical definition of an image and frequency domain analysis. The second week will focus on image processing operations and their efficient computational implementation.

* + Week 1
    1. Introduction and overview
    2. Multidimensional signals
    3. Fourier transform; discrete space Fourier transform (DSFT)
    4. Properties of the DSFT; 2-D discrete Fourier transform
    5. 2-D Fourier transform; sampling; aliasing; Nyquist condition
  + Week 2

1. Point operations; contrast enhancement
2. 2-D systems; linear shift-invariant (LSI) systems
3. Frequency response of LSI systems
4. Edge enhancement; image denoising
5. Inverse filtering / image restoration