Summer of Science 2024

Computer Vision and Image Processing

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Objective

My objective is grasp the fundamentals of computer vision and image processing, understand the underlying algorithms so that I'll be able to work on a useful project by the end of Summer of Science.

Timeline (Tentative)

- **Week 1 :** Fundamentals of Digital Image Processing and its applications, Image Alignment.
- **Week 2 :** Image Enhancement, Exploring some examples and exercises using MATLAB.
- **Week 3 :** Edge and Corner Detection, Image Segmentation.
- **Week 4 :** Fourier Analysis, Face Recognition, **Midterm Report Submission**.
- **Week 5 :** Singular Value Decomposition(SVD), Image Restoration.
- **Week 6 :** Image Compression, Color Image Processing, Introduction to Inverse Problems in Image Processing.
- **Week 7 :** Sparse Representations, Low-Rank Matrix Recovery, Dictionary Learning.
- **Week 8 :** **Endterm Report Submission**.

Resources

1. Digital Image Processing, *Third Edition* [Rafael C. Gonzalez, Richard E. Woods]
2. Algorithms for Image Processing and Computer Vision, *Second Edition*, [J.R. Parker]
3. Image Processing, Analysis and Machine Vision, *Fourth Edition*, [Milan Sonka, Vaclav Hlavac, Roger Boyle]
4. Concise Computer Vision: An Introduction into Theory and Algorithms, *Fifth Edition*, [Reinhard Klette]
5. TensorFlow Tutorials, https://www.tensorflow.org/tutorials/images
6. OpenCV Image Processing Tutorials, https://docs.opencv.org/4.x/d2/d96/tutorial_py_table_of_contents_imgproc.html