Winter Semester 14/1/2024-8/4/2024

Course number: 336027
Course’s name: Introduction to Medical Image Processing

Course teaching staff

Main teacher:
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Teacher Assistance:
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Syllabus and Details

Academic Credits: 2.5
Teaching Language: Hebrew
Pre-required courses:
1. אורות והצררכות 044131
2. אלגברה 1מ 104016
3. סטטיסטיות 094423
4. הסתברות 104034

Syllabus:
Introduction to the field of medical image processing and its applications, 2D signal processing, 2D discrete Fourier transform and its application in medical imaging (MRI and CT reconstruction), Image enhancement (histograms, denoising, sharpening), Image quantization, Image Restoration, compression, DICOM format, Deep-learning methods for medical images, Python programming language for medical image processing.

Teaching Methods

Lecture weekly day and hours: Monday, 13:30-15:30
Exercise weekly day and hours: Thursday 10:30-11:30 / Tuesday 9:30-10:30
## Assessment Methods

Final exam/middle tests/project/other (specify a date for submitting the project or dates of exams)

### Exams:

Date of Session A: **1/5/2024**  
Date of Session B: **3/6/2024**

### Grade structure:

Final exam % of final grade: 50%-100%  
*Due to special circumstances, assignments can be considered up to 50% of the final grade.

### Notes if needed:

#### Tentative schedule

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<tr>
<th>Date</th>
<th>Class number</th>
<th>Lecture topic</th>
<th>Assignment</th>
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<tbody>
<tr>
<td>15/1/24</td>
<td>1</td>
<td>Intro/ Intensity transformations, histogram equalization</td>
<td>HW0 warm-up</td>
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<tr>
<td>22/1/24</td>
<td>2</td>
<td>Filtering (mean/median), bilateral, sharpening/Gibbs artifact/morphological</td>
<td>HW1 histogram equalization, mean filter, bilateral filter</td>
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<td>29/1/24</td>
<td>3</td>
<td>Edge detection</td>
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<td>5/2/24</td>
<td>4</td>
<td>Hough transform</td>
<td>HW2 Hough transform and edge detector</td>
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<tr>
<td>12/2/24</td>
<td>5</td>
<td>Geometrical transformations/interpolation</td>
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<td>19/2/24</td>
<td>6</td>
<td>2d Fourier/Separability/Convolution theorem/Nyquist sampling</td>
<td>HW3 bilinear interpolation and Fourier</td>
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<td>26/2/24</td>
<td>7</td>
<td>Fourier-based image filtering/processing</td>
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<td>4/3/24</td>
<td>8</td>
<td>Image restoration (mle/map/tv)</td>
<td>HW4 image restoration</td>
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<tr>
<td>11/3/24</td>
<td>9</td>
<td>Compression - Huffman/DCT</td>
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<td>18/3/24</td>
<td>10</td>
<td>compression - image quantization/k-means/EM</td>
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<td>25/3/24</td>
<td>11</td>
<td>Gaussian/Laplacian pyramids/wavelets</td>
<td>HW5 k-means and EM</td>
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<td>1/4/24</td>
<td>12</td>
<td>TBD</td>
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### Assignments

- The assignments in this course will include both theoretical questions and programming assignments in Python. Submitting assignments 1-5 is optional; each assignment will account for 10% of the final grade. Assignments can be submitted in pairs or individually (per assignment).
- Usage of AI (ChatGPT, etc.) tools: Using AI tools to completely solve the assignments is not permitted. However, we may ask you specifically to leverage AI tools to enhance your solutions.
- Students who are in active reserve duty (proof required) can submit their assignments by the end of the first exam period (3.5.24).