# BLG202E Numerical Methods in Comp. Eng.

Spring 2024 - Term Project

Due: May 5, 2023

By turning in this assignment, I agree by the ITU honor code and declare that all of this is my own work.

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## Important Notes

- Upload your solutions through **Ninova**. Projects sent via e-mail and late submissions **will not be accepted**.
- Please make sure that you write your **full name** and student identification **number** to **every file** you submit.
- Cheating is highly discouraged. It will be punished by a negative grade. Also disciplinary actions will be taken. Please do your homework on your own. Team work is not allowed. Pattern of your **solutions must belong only to you**.
- All codes and reports will be run through **plagiarism check**s. Please **do not copy any text or code** from other sources.
- If you have any questions, please contact with **Nursena BÖLÜK** (boluk21@itu.edu.tr).
- Remember, there are only 10 types of people in the world – those who understand binary, and those who don't.

# Project No 3: SVD-Based Digital Image Watermarking Scheme

**Please read the following prerequisites.**

- Install a Conda environment if you do not have it already.
- Install Jupyter Notebook.
- The project should be done in Jupyter Notebook.
- Do not forget to format your code and leave comments for non-trivial sections.
- You are expected to use matplotlib, numpy, SciPy, and pandas(for data reading).

**Instructions.**

- Re-implement the **SVD-based digital image watermarking scheme.** as described in the paper "Pattern Recognition Letters Volume 26, Issue 10, 15 July 2005, Pages 1577-1586". Apply the scheme on your dataset.
- Method Implementation and Experimental Setup:
  - You are required to implement the Singular Value Decomposition (SVD) algorithm from scratch. The use of built-in libraries or methods for SVD, such as 'numpy.linalg.svd', 'scipy.linalg.svd', 'sklearn.decomposition', etc., is strictly prohibited.
  - Implement the "watermark embedded" and "watermark extractor" functions in accordance with the procedures described in the referenced paper.
  - You are expected to write code and show image results. Submissions without a working code will not be graded.
  - Calculate the Peak Signal-to-Noise Ratio (PSNR) between the host and watermarked images to evaluate watermarking quality using any available library.
- Report:
  - Write a maximum of 3 pages report using IEEE Latex Template. State the problem, implementation details, dataset and experiments.
- Submission
  - Submit a zip file that includes your Jupyter Notebook, images (the host image, the watermark image, the image after watermarking, and the image with the watermark extracted), and report until the deadline through Ninova.
  - Upload your project report until the deadline through Ninova.