TDS3651 Visual Information Processing

Trimester 1, 2023/2024

Project (40%)

1 Introduction

1.1 Objective

To develop, implement and test/demonstrate visual image processing algorithms.

1.2 Description

Students are required to work in *groups of 3-4 students* to complete this project. The project can be an analysis/evaluation/comparison of existing techniques relating to visual image processing through a literature review, and then followed by either experimental evaluations or a practical application implementation.

Each group can either choose or propose a topic of interest in the area of visual information processing, and is required to submit a written *project proposal and final report in a two-column IEEE conference paper format* as well as give a 10 minutes oral presentation. Every member needs to contribute in at least one technical visual processing component of the project, not only report writing or app development.

2 Directions/Topics

- Topics can be something your group is interested in or that may help your FYP work/research with the condition that the topic is not exactly the same as the FYP of any group member.
- Original/New algorithm development is not a requirement, but the project should include:
  - Review of relevant papers in literature.
  - Some implementation/application of the relevant techniques.
  - Re-implementing an existing work on the same dataset with the same parameters is insufficient for the completion of this project.
- Investigations can be done on topics that were covered briefly in class, or related to some topics of the course.

- Example of topics:
  - Imaging applications
    - Cartooning an image / Drawing from Photo
    - Changing the background of the subject in an image
    - Photo organization app
    - Gender/age classification app
    - Image steganography app for secret embedding
    - Image colorization app
    - Flower classification and characterization app
  - Non-app based projects
    - Retail Product recognition for blind people assisted shopping.
    - Photograph popularity/aesthetics classification
    - Medical image (X-ray, MRI) segmentation
    - Satellite Images of Natural Disaster (hurricane, flood) Damage Classification
    - Image haze/fog/rain/reflection removal
- Recommended technical lectures for project ideas:
  - Upscaling Images with Neural Networks
  - Two Minute Papers in YouTube
  - Top 20 Imaging Projects
- Browse existing datasets for project ideas:
  - Visual Data Discovery: https://www.visualdata.io/discovery

3 Deliverables

3.1 Project Proposal

Project proposal should be prepared and submitted to Teams by 15th January 2024, 11.59 p.m.

The proposal should include the following details:

- Project members
- Project title
- Project description:
  - What is the computer vision problem that you will be investigating? Why is it interesting?

- What image data will you use? If you are collecting new datasets, how do you plan to collect them? (if relevant)
- What method or algorithm are you proposing? If there are existing implementations, will you use them and how? If you plan to improve or modify such implementations, how do you plan to do that?
- Which reading will you examine to provide context and background?
- How will you evaluate your results? Qualitatively, what kind of results do you expect (e.g. plots or figures)? Quantitatively, what kind of analysis will you use to evaluate and/or compare your results (e.g. what performance metrics or statistical tests)?

- Task distribution among members
- Declaration of FYP (if applicable)
- Reference

3.2 Final Report, Source Code, and Presentation

The report and source code of the project should be submitted in a *zip file* to Microsoft Teams by 9th February 2024, 11.59 p.m. Virtual presentation session to present and demonstrate the finding and results of the project will be arranged on from 19th and 23rd February 2024.

3.2.1 Report

The following structure is suggested for your report:

- ***Title, Authors***
- ***Abstract***: Not more than 300 words.
- ***Introduction***: Introduce the motivation, problem, and overall plan for approaching problem.
- ***Background/Related Work***: Discuss the relevant literature of the project.
- ***Approach***: Detail the project framework. Provide specific information which may include equations, figures, plots, etc.
- ***Experiment***: Explain the type of experiments done, what dataset(s) were used, and what measurements were used to evaluate results. Then show detailed results of experiments, including both quantitative results (numbers, figures, tables, etc.) as well as qualitative results (images, examples, observations, etc.)

- ***Conclusion***: Takeaways from the project and future ideas.
- ***References***: Compulsory component.

3.2.2 Source code

Source code of application/implementation in Python. Please ensure the code can be used in different machines and they can be in Python scripts or Jupyter Notebook. If any special instructions are needed for building or running the software, please provide a readme file.

4 Honor Code

You may consult any papers, books, online references, or publicly available implementations for ideas and code that you may want to incorporate into your strategy or algorithm, so long as you clearly cite your sources in your code and your report. However, under no circumstances may you look at another group's code or incorporate their code into your project.

5 Project Rubrics

The following table shows the mark distribution for this project:

Proposal (5%)		5
Final Report (10%)	Clarity, structure, language, reference	2
	Background literature survey, good understanding of the problem	4
	Good insights and discussions of methodology, analysis, results	4
Technical (10%)	Correctness	4
	Depth	3
	Innovation	3
Evaluation and Results (8%)	Sound evaluation metric	1
	Thoroughness in analysis and experimentation	2
	Results and performance	5

Presentation (5%)	5
Peer Evaluation (2%)	2
TOTAL	40 marks (40%)
Bonus (max. 2%) – for exceptional achievement in results.	

End of Project Guideline