

DSAI 308 Final Projects – Spring 2025

Main Rules

- Each student team (2 students per team) will select one topic from the provided list of eight project topics.
- Maximum number of teams per topic are 5 teams
- All topics will be assigned on a first-come, first-served basis. This ensures diversity in topics across the class.
- Teams must submit their topic preference by 15/03/2025, 12.00 AM with final confirmation from the assigned TA's.
- Discussion will be at week 13
- All datasets are publicly available online; teams must mention the source and include preprocessing scripts in their submission.
- Collaboration within team members is mandatory, and both students must contribute equally, as evaluated during the presentation Q&A.

List of topics

1. Parkinson's Disease Detection

- Description: Students will develop a deep learning model to classify Parkinson's disease..
- Expected Outcome: A speech-based model that accurately classifies individuals as healthy or having Parkinson's disease. Moreover student should have a decision of severity rate of this disease too

2. Underwater Object Detection in Sonar Images

- Description: Students will build a model to detect and classify underwater objects from sonar imagery. This involves segmentation and deep feature extraction techniques.
- Expected Outcome: A trained model capable of identifying and classifying underwater objects with high precision.

3. AI-Based Crop Disease Detection

- Description: Using images of crops, students will train a model to classify plant diseases. They will explore CNN architectures for robust classification.
- Expected Outcome: A classification model that can identify different plant diseases from leaf images.

4. Real-Time Road Anomaly Detection for Autonomous Vehicles

- Description: Students will design a model to detect road anomalies (e.g., potholes, debris) using dashcam images and sensor data.
- Expected Outcome: A system capable of detecting road hazards in real-time.

5. Human Activity Recognition Using Wearable Sensor Data

- Description: Using accelerometer and gyroscope data, students will develop a deep learning model to classify human activities like walking, running, and standing.
- Expected Outcome: A model capable of accurately predicting human activities from sensor data

6. Pneumonia Detection from Chest X-Rays

- Description: Students will develop a deep learning model to classify X-ray images as normal or pneumonia-affected.
- Expected Outcome: A CNN-based model for automatic pneumonia detection with high accuracy.

7. Anomaly Detection in ECG for Heart Conditions

- Description: Students will analyze ECG signals and train a model to detect irregular heartbeats or anomalies such as atrial fibrillation.
- Expected Outcome: A model capable of classifying normal vs. abnormal heart rhythms with high sensitivity.

8. Panoramic Scene Understanding

- Description: Students will work with panoramic images to classify and segment different regions (e.g., sky, buildings, roads) using deep learning.
- Expected Outcome: A scene understanding model that provides object detection in 360-degree images.

Project Rubric

Criterion	Criterion	Points
Problem Understanding	Clear problem definition, objectives, and understanding of dataset and requirements.	1 Point
Preprocessing	Data cleaning, augmentation, and preparation for training.	1 Point
Model Architecture	Choice and justification of model architecture, including innovative modifications.	2 Points
Training and Evaluation	Proper model training, parameter tuning, and clear evaluation using appropriate metrics.	2 Points
Result Interpretation	Presentation of results with visualizations and comparison against baseline or existing techniques.	2 Points
Report and Presentation	Well-documented report covering methodology, challenges, and conclusions, along with an oral presentation.	2 Points

Project submission requirements:

1. Source Code:

Upload the complete source code of your project implementation via classroom before the final discussion session, with a deadline of within 1 complete day (24 hours) prior to the discussion. This deadline ensures that all submissions can be reviewed prior to our final discussion and allows time for any necessary preparations.

2. PDF Report:

Prepare a PDF report that contains a brief description of each stage of your project. Each team will upload his/her PDF at the same time of uploading the source code.

3. Bonus task according to the previous topics (5 Points)

- Teams that successfully deploy their project as a fully functional web application will receive an additional 5 bonus points.
- Expected Outcome:
 - A user-friendly interface for interacting with the deep learning model.
 - Deployment using Flask/Django or Streamlit.
 - Live demonstration of the model in a web environment.

Important precaution:

- I am aware that some of you may rely on existing projects, as these topics are well-known. Accordingly, if a team bases their project on an existing project or code found online, they must clearly specify the source and explicitly outline their contributions and modifications. Copying and pasting without proper attribution and original contributions will not be permitted.
- As a reminder, the use of AI tools to complete this project is strictly prohibited. Any student found violating this policy will receive a zero for the affected assignment and the final course work. This policy is in place to ensure that each student gains a comprehensive understanding of the subject matter through their own efforts and learning. Please adhere to this policy to maintain academic integrity and fair assessment.
- If plagiarism is found between two teams working on the same topic, their work will not be permitted for evaluation, and they will both receive zero points. It is crucial to ensure originality in all submissions

Best regards

Assoc. Prof. Dr. Mohamed Maher Ata

Bonus Additional Project (Question Answering System – Web/Mobile Application) (5 to 10 Points)

- **Description:** Students will implement a question-answering (QA) system as a web application for **zewailcity admission**. The system will utilize a **Siamese Neural Network** combined with **transformer-based embeddings** to compare question similarities and retrieve the most relevant answer from a predefined dataset.

- **Sample:**

What are the admission requirements for Zewail City?	Applicants must have a high school diploma (Thanaweya Amma or equivalent) with a strong academic record in relevant subjects. Additional requirements include passing entrance exams and an interview.
How can I apply to Zewail City?	You can apply through the official Zewail City website by filling out the online application form, uploading required documents, and paying the application fee.
What are the available programs at Zewail City?	Zewail City offers programs in Engineering, Computer Science, Nanotechnology, Biomedical Sciences, and other advanced scientific fields.
Is there a scholarship program at Zewail City?	Yes, Zewail City offers merit-based and need-based scholarships for outstanding students who meet specific academic and financial criteria.
What is the tuition fee for undergraduate programs?	Tuition fees vary by program. The latest fee structure is available on the official Zewail City website.
What is the deadline for admission applications?	Admission deadlines are announced on the university's website and social media channels. It is advised to apply early.
Do international students qualify for admission?	Yes, international students can apply and must meet equivalent academic and English proficiency requirements.
What entrance exams are required for admission?	Students may be required to take an aptitude test in mathematics, physics, or other subjects depending on their chosen program.
How do I contact the admission office?	You can contact the admission office via email at admissions@zewailcity.edu.eg or by phone through the numbers listed on the university website.
Is there student accommodation available?	Yes, Zewail City provides on-campus accommodation for students, subject to availability.

- **Expected Outcome:**

- A fully functional web-based question-answering system.
- The system should process user queries, compare them against a dataset of known questions, and return the most relevant answer.
- Implementation using Siamese Networks with contrastive or triplet loss for learning question similarities, aided by transformer-based for enhanced representation.
- Deployment using Flask/Django with a simple and interactive front-end for the web application, or using Flutter/React Native for cross-platform mobile development (Android/iOS) with an intuitive user interface.
- Students who successfully implement and deploy the QA system as a web application will receive 5 extra points.
- If the system is further developed and deployed as a mobile application (Android/iOS), an additional 5 points will be awarded, making the total bonus 10 points.

- **Important note regarding this bonus project:**

This bonus task is **optional, individual**, and students are not required to complete it. However, if you choose to participate, you have the flexibility to implement the web application, the mobile application, or both. Once you decide to take on this bonus project, you must complete at least one of the two options. Failure to submit any implementation after opting in will result in a deduction of 5 points from your course work. Therefore, please make a careful and informed decision before committing to this task, as your choice comes with both opportunities and consequences.