University :**Alexandria National university**
Faculty: **Computers and data science**
Dr Yasser Fouad

Smart system Final Project

Choose your project : **https://forms.office.com/r/bg1VTVzCZs**

Not more than 6 teams in every project : Teams Sheet

Due: 15/5/2025

Teams: 3 - 5 students

Objectives

Each team should choose a project to work on using one of the studied algorithms

Deliverables:

- Detailed report of your work and steps to reach output
- Testing results and example input and output on real images, audio, text (if possible).
- Team names and ID and their contributions to the project.

1. Exam Scheduling System

Optimize university exam schedules to reduce student conflicts and evenly distribute workload using genetic algorithms.

Dataset: https://www.kaggle.com/datasets/smrezwanulazad/exam-schedule/data

Output: Optimized exam timetable with minimal student conflicts and even distribution of workload.

2. Feature Selection for Machine Learning

Apply GA to select relevant features that maximize model performance while reducing complexity

Dataset:

https://www.kaggle.com/datasets/mehmetertas/customer-churn-prediction

Output: Subset of the most relevant features selected by GA, improving the performance of a classifier (e.g., accuracy, F1 score).

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3. Personalized Recommendation Systems

Optimize movie recommendation strategies based on user data (such as browsing history, previous ratings, and preferences) from the MovieLens dataset using Genetic programming. The project focuses on generating personalized movie recommendations that improve user satisfaction by evolving optimal recommendation strategies.

Dataset:

https://grouplens.org/datasets/movielens/

Output: Personalized list of recommended movies for example user.

4. Image Registration

Apply Particle Swarm Optimization (PSO) to the problem of image registration in medical imaging. The goal is to align and register medical images from different sources or time points (e.g., CT scans, MRIs) to enable a comprehensive analysis,The system will take two medical images (say, a CT scan and an MRI scan) and use PSO to optimize the alignment process, minimizing the differences between corresponding features in the images.

Dataset:https://www.kaggle.com/competitions/rsna-pneumonia-detection-challenge/data?select=stage_2_detailed_class_info.csv

Output: Optimized transformation parameters (e.g., rotation, scaling, translation) that align one image to the other for a group of example images.

5. Vehicle Routing Problems (VRP)

The goal of this project is to apply Ant Colony Optimization (ACO) to solve a Vehicle Routing Problem (VRP) for a manufacturing company with multiple warehouses and delivery trucks. The company needs to efficiently assign trucks to orders and plan the optimal routes for each truck to minimize the overall delivery cost.

Dataset:
https://www.kaggle.com/datasets/mexwell/large-scale-route-optimization

Output: Optimized routes for each truck and item-to-truck assignments that minimize total delivery cost and distance.

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6. Text Summarization

This project applies Ant Colony Optimization (ACO) to generate concise and informative summaries from lengthy documents. The goal is to select the most relevant sentences from a document, ensuring that the summary captures the main points while maintaining coherence.

Dataset: https://huggingface.co/datasets/Harvard/gigaword

Output: Concise summaries containing the most important sentences that represent the core meaning of an example document.

7. Voice Emotion Recognition

The goal of this project is to classify emotions (e.g., happy, sad, angry, neutral, etc.) from human speech using audio features. By analyzing the tone, pitch, intensity, and other vocal attributes, you can determine the emotional state of the speaker.You may need to preprocess the raw voice data by splitting it into frames, extracting features, and then using machine learning algorithms (SVM) to train a model that can recognize different emotions.

Dataset: https://www.kaggle.com/datasets/parulpandey/emotion-dataset

Output: Predicted emotional category for example audio clip (e.g., happy, sad, angry, neutral).

8. Plant Disease Classification

Use KNN to classify plant diseases based on leaf images or other features such as temperature, humidity, and soil conditions.You have a plant leafs images or environmental features, train a KNN model to classify plant diseases based on input features. This can assist in agricultural settings where diagnosing plant health quickly is crucial for preventing crop damage.

Dataset: https://www.kaggle.com/datasets/emmarex/plantdisease

Output: Predicted plant disease category or diagnosis (e.g., bacterial spot, early blight, healthy) for example plant data.