



SKIH 3013 (PATTERN RECOGNITION & ANALYSIS)

A231 – Project (20 %)

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“Raise your words, not voice. It is rain that grows flowers, not thunder.” [Rumi]

This is a GROUP project. Only programming and toolkits (if any) are allowed:

Consider the following topics. Select one topic to be chosen as your project.

- Emotion Recognition from Facial Expressions / Voices: Develop a system that can accurately recognise and interpret human emotions from facial expressions/voices using pattern recognition and analysis algorithms.
- Sentiment Analysis for Social Media: Create a tool to analyse and categorise sentiments expressed in social media posts to understand public opinion on specific topics.
- Personalized Education Recommender System: Build a platform that uses pattern recognition and analysis to recommend personalised educational resources and courses based on individual learning styles and preferences.
- Fake News Detection: Develop a system that can automatically detect and filter out fake news and misinformation from online sources using natural language processing and pattern recognition and analysis techniques.
- Behavioral Analysis for Mental Health Prediction: Design a software tool that utilises pattern recognition and analysis to analyse and predict mental health conditions based on an individual's online behaviour and social media activities.
- AI-powered Virtual Counselling Assistant: Create an AI-driven virtual assistant that can provide basic counselling and emotional support to individuals, utilising natural language processing and sentiment analysis techniques.
- Community Health Prediction and Analysis: Build a predictive model that uses pattern recognition and analysis to analyse community health data and predict potential health risks in specific regions, aiding in developing targeted healthcare interventions.

- **Social Network Analysis for Community Building:** Develop a platform that applies pattern recognition and analysis algorithms to analyse social network data and provide insights for fostering more robust and cohesive communities.
- **Predictive Policing for Crime Prevention:** Implement a system that utilises pattern recognition and analysis to predict crime hotspots and patterns, aiding law enforcement agencies in proactive crime prevention strategies.
- **AI-driven Job Matching for Disadvantaged Communities:** Create a platform that uses pattern recognition and analysis methods to match job seekers from disadvantaged communities with suitable employment opportunities, considering their skills, preferences, and local market demand.
- **AI-based Language Translation for Indigenous Languages:** Develop a tool that leverages pattern recognition and analysis to provide accurate translations for indigenous languages, preserving and promoting cultural diversity and inclusivity.
- **Social Media Influence Analysis for Marketing Campaigns:** Build a system that uses pattern recognition and analysis to analyse social media influence and engagement, helping businesses design more effective marketing campaigns targeting specific audience segments.
- **AI-assisted Decision Support System for Humanitarian Aid:** Create a decision support system that employs pattern recognition and analysis algorithms to assist humanitarian organisations in making data-driven decisions for efficient allocation of resources during crises and natural disasters.
- **Automated Personal Finance Management for Low-Income Families:** Develop a software tool that uses pattern recognition and analysis algorithms to provide automated financial advice and management strategies tailored to the specific financial constraints and goals of low-income families.
- **AI-driven Assistive Technology for Persons with Disabilities:** Design an AI-powered assistive technology solution that leverages pattern recognition and analysis approach to improve accessibility and enhance the quality of life for individuals with disabilities.

INSTRUCTIONS:

In general, based on your selection, you are required to:

- Form a group of 2-3 people (Note: You can do this alone too).
- Describe your data (attributes/features) through suitable visualisation approaches.
- Identify possible missing values (if any, you need to explain how to overcome this issue)
- You are required to analyse your preferred data by using at least **THREE (3)** methods.
- Perform some experiments (through hyper-parameter settings) to obtain the best classification results (at least 80 per cent)
- Your solution should have a working prototype with adequate graphical user interfaces.
- Evaluate your results based on appropriate methods (e.g., Confusion Matrix / RMSE / ROC-AUC)
- Conclude your findings based on your experimental results.

IMPORTANT QUESTIONS:

These questions give you a critical checklist to ensure the correctness of your deployed solution.

Before Starting the Pattern Recognition & Analysis Project Checklist

- What question are you asking/answering, and for whom?
- What data are you using?
- What techniques are you going to try?
- How will you evaluate your methods and results?
- What do you expect the result to be?

What Techniques Are You Going to Try?

- What methods/techniques should I use?
- Why do I think these are the correct methods/techniques for this problem and data set?
- Are there similar projects/references/papers that have already done this that I can learn from before I get started?
- Are these techniques that I would want to use/do in a predictive analytic job?

How will you evaluate your methods and results?

- How will I know I did the analysis and project correctly?
- What are critical parts of the project that will tell me that I am doing things incorrectly?
- What numbers/results/insights will I sense check?

What do you expect the result to be?

- What do I expect the result to be?
- Why do I expect the result to be this?
- Does this result match the results/experiences of other people with similar methods and techniques on similar data?

REPORT:

- **Introduction**
 - Why is your task important? Why should one care? What task are you attempting to cover? How are you covering them? Is there a particular technical challenge/problem you attempted to solve?

- **Background**
 - What methods or ideas have you built on? Any background on the domain topic that one might need to know to understand the application?
- **Data**
 - What did you use? How much was there? Were their labels? Include descriptive statistics where helpful. Anything else we should know?
- **Methods**
 - How did you do it? Which methods? Which setting / hyper-parameters? Be sure to make clear how the frameworks and concepts were used.
- **Evaluation/Results**
 - What were your results? How accurate were they? What insights were derived? Did you analyse what sort of mistakes it made? Examples of output? Anything to demonstrate unique aspects of the approach? Be sure to think of tangible ways to present the results. Each figure should have a point it is trying to convey. Your figures/tables should tell a logical story from first to last.
- **Conclusion**
 - Summarise the takeaways.
- **Reflection (1 paragraph)**
 - What did you learn from this project? What do you wish you had known before you started? What would you do differently? What advice would you offer to future students embarking on this project?
- **References**
 - Be sure to cite and add references (at least THREE (3) references to others' work) for any ideas, data, or tools you are using or building from. **All figures, quotes, or rephrases from articles, websites, and research papers (anyone else) should be cited, or you may receive a 0 for plagiarism.**
- **Format:** refer to the Springer-Nature article format.

GRADING RUBRICS:

Your final project will be graded as the following:

- **Task definition:** is the task precisely defined, and does the formulation make sense?
- **Approach:** was a baseline, an oracle, and an advanced method described clearly, well justified, and tested?
- **Data and experiments:** have you explained the data clearly, performed systematic experiments, and reported concrete results?
- **Analysis:** did you interpret the results and explain why things worked (or did not work) the way they did? Do you show concrete examples?
- **Extra credit:** does the project present interesting, complicated datasets, programming, and novel ideas (i.e., would this be publishable at a good conference)?

Policy:

All grading of deliverables will be based on standards indicated for each deliverable. Deliverables may not be turned in late, and no cheating! For this class, cheating will include plagiarism (using the writings of another without proper citation), copying of another (either current or past student's work), working with another on individually assigned work, or in any other way presenting as one's work that which is not entirely one's work. The occurrence of plagiarism will result in removal from the course with a failing grade.