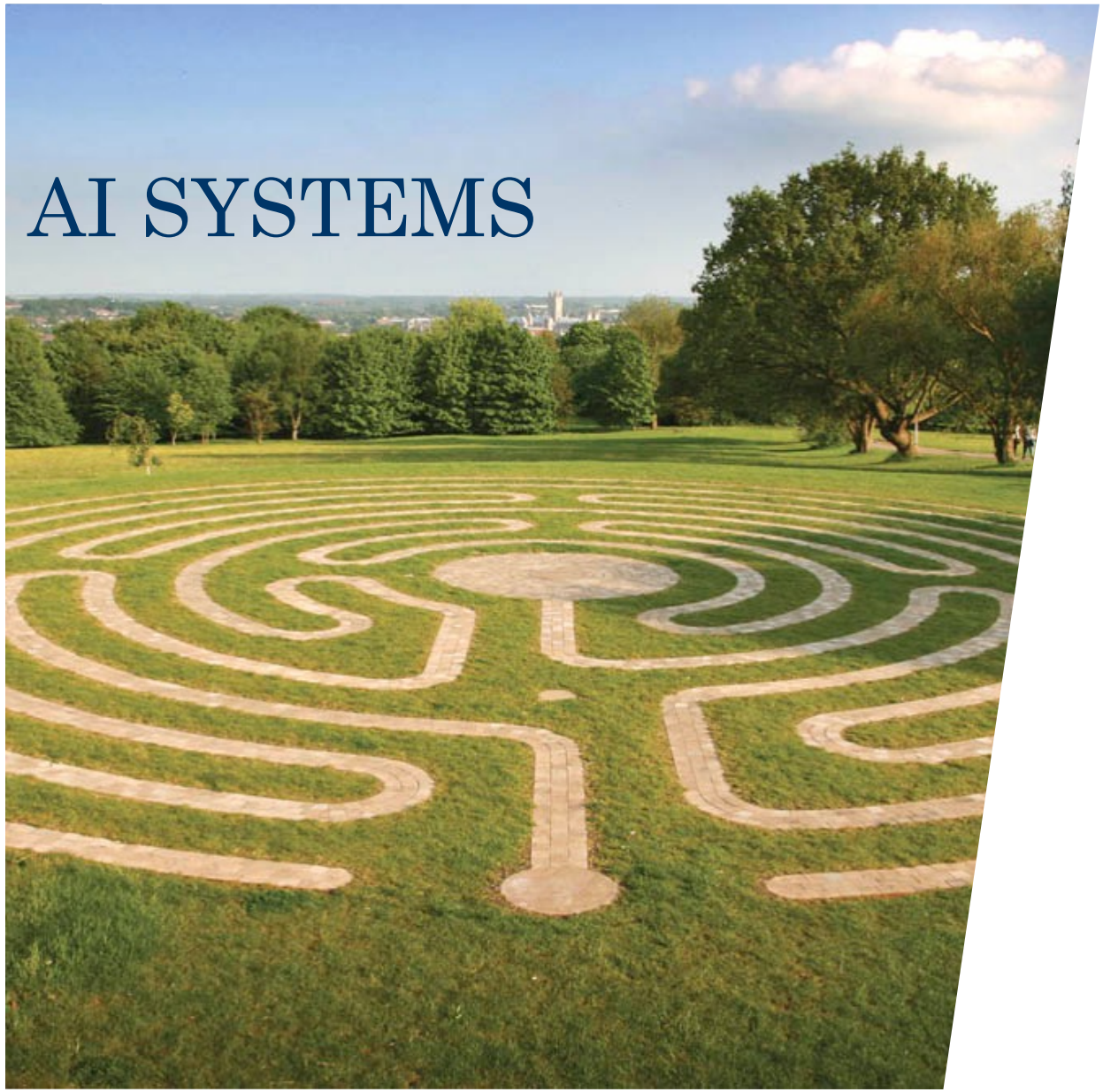


University of Kent

COMP5850
COMP8260

Module Overview

AGENDA

- Team
- What is this module about (2)
- Assessments (3)
- Structure (2)
- Facilities (2)
- Project (4)
  - Groups
  - Ideas
  - Example of Projects
  - Presentations

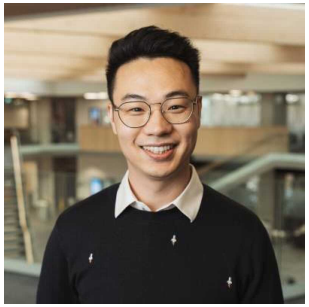
TEACHING TEAM

- Dr. Matteo Migliavacca (module convenor)
  - Distributed systems, Genetic Algorithms
- George Ramzi
  - signal processing for hearing loss, emotional modelling, text generation

Teaching Assistants:

- Md Rezwan Hasan
  - biometric security and privacy, face recognition and intelligent video surveillance
- Zhao Liu
  - virtual reality technologies to screen people with dementia



COURSE MOTIVATION

- Practical module on designing and implementing an AI System
  - you chance to get your hands dirty on using, understanding and building AI
  - you are in this module because either
    - You are doing an AI-focused university program
    - You picked this module as option (Postgraduate)

- Focus on implementation and evaluation
  - need to be able to program an AI system and test how it is working
  - but theory is important to undestand alternatives, fixing problems etc…
  - need to be able to at least understand what is inside the black box

- Relationship with other modules
  - Introduction to AI (Intro to many AI techniques including searching, GAs)
  - Programming for AI (Python + libraries, Numpy, Pandas, Matplotlib, Keras)
  - Deep Learning, Cognitive Neural Networks (more on theory of NN models)
  - Data Mining (more on classification, Decision Trees etc..)

ASSESSMENTS

- In-Class tests (1.5 hours each)
  - Assess individual capabilities to apply AI techniques to a simple problem
  - Week 17: Classification (20%)
  - Week 20: Neural Networks (20%)

- Group project (60%)
  - Assess skills to implement an AI System of medium complexity
  - Week 24: Deadline and Group presentation

COURSE STRUCTURE

- Lectures
  - Presents main techniques used in implementing AI Systems
  - An eye on theory (how they work) and an eye on implementation in SkLearn (how to use them)
  - Thursdays 12-2pm in Jennison Lecture Theater
  - Only in the first half of term but 2 hours instead of 1 hour
  - Allows to cover more ground in the first weeks to help you see more techniques for your project
  - Leaves more time in the second half to concentrate on project
- Classes
  - Two hours classes each week
  - COMP5850 Fridays 2-4pm Multimedia Lab 1
  - COMP8260 Mondays 4-6pm in Elliot Computer Terminal room 1
  - in the first half of term focus on familiarisation with the practical AI techniques discussed in lectures
  - second half of term put in practice the aspects of developing an AI system

SCHEDULE

Teaching Week	Lecture	Lecture	Class	Class	Coursework
	Thursdays *12-1pm* *Jennison Lecture Theatre*	*Thursdays* *1-2pm* *Jennison Lecture Theatre*	*8260 Mondays* *4-5pm* *Elliot Computer Terminal Room 1*	*5850 Fridays* *2-4pm* *Multimedia Lab 1*	
TW13	Module Overview / Project	Features	/	Features and Group formation	Project Set
TW14	Classification 1	Classification 2	Features and Group formation	Class on Classification	Email Groups (Thursday)
TW15	CNN 1	CNN 2	Class on Classification	Class on CNNs	
TW16	RL	GAs and Neuroevolution	Class on CNNs	Project Meetings	Project Brief Submission (Thursday)
TW17	Hyperparameters and Scalability	What's Next	**In Class Test: Classification** **Monday 4-5pm** **Elliot Computer Terminal Room 1**	**In Class Test: Classification** **Monday 4-5pm** **Kennedy PC Room 3**	
TW18			Project Meetings	Project Meetings	
TW19	project week	project week	project week	project week	
TW20			**In Class Test: CNNs** **Monday 4-5pm** **Elliot Computer Terminal Room 1**	**In Class Test: CNNs** **Monday 4-5pm** **Kennedy PC Room 3**	
TW21			Project Meetings	Project Meetings	
TW22			Project Meetings	Project Meetings	
TW23			Project Meetings	Project Meetings	Project due (Friday)
TW24			**Group Presentations**	**Group Presentations**	

TOPICS

- Features
- Classification
- Metrics
- Classification Trees
- Ensembles, Random Forests
- Convolutional Neural Networks
- Reinforcement Learning
- Genetic Algorithms
- Neuroevolution
- Hyperparameters Training
- Distributed / Parallel ML

FACILITIES

- Jupiter Server
  - accessible at https://jupyter.kent.ac.uk/
  - You should have an account already set up (usual student username and password)
- The server will be used for the classes
- The server will be used also for the in-class tests so get familiar with using it
  - a tip for the in-class tests: Save soon and save often!
  - at the end of the test you have to upload your Jupiter file on Moodle
- The server can also be used for the project, but you don't need to. (You can use a different development environment if you wish
- (NEW!) From this year you should be able to install local packages on the server which would make development easier for the projects

PROJECT

- It is one of the key outcome of the module, worth 60% of the final mark

- It should tackle a problem of reasonable complexity
  - You can propose a project idea
  - Project brief has to be submitted and approved by the Team to ensure appropriate size and complexity
  - Not to easy not unreasonable, try for something reasonably challenging
  - Consider basic version + extension approach

- The focus is on implementation and evaluation
  - You need to report results in depth and compare different approaches

PROJECT - TOPICS

- Typical examples
  - classification using tree-based approaches or neural networks
  - AI for games using RL and Neuroevolution
  - other possible (e.g. regression etc..)

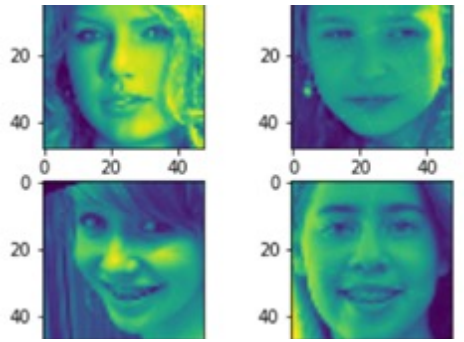
- Project should involve some of the techniques covered in lecture / classes
  - frontloading lectures should help to learn the techniques before applying them to the projects
  - the project can involve techniques beyond the one presented but comparison with the presented techniques is usually required

- It is important to decide early not only which problem and techniques will be used but also to identify a suitable available dataset

PROJECT EXAMPLES - I

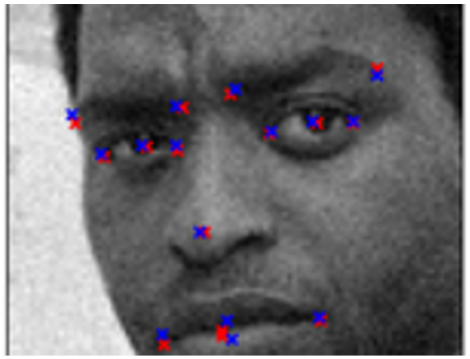
Face recognition

- Classification of low-resolution face images to determine age, gender, and ethnicity of individuals



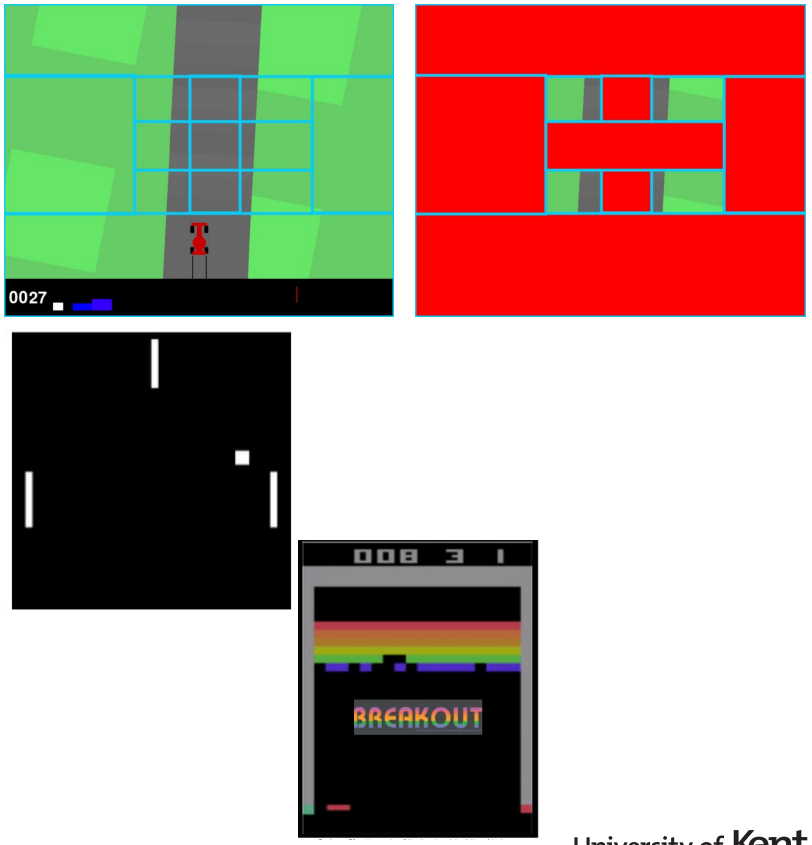
Face keypoint detection

- predict keypoint positions on face images



PROJECT EXAMPLES - II

- AI systems to play games
- Car Racing
  - Using evolutionary approaches from top-down view and using imitation learning
- Pong
  - Playing games of pong with different environments (obstacles)
- Other games
  - Breakout, Tetris, etc…



PROJECT EXAMPLES - III

- Variety of classification and prediction problems from discrete datasets
- Predict flight or hotels cancellations

- Predict used car sale prices

PROJECT – GROUP FORMATION AND MANAGEMENT

- Groups of 4 or 5 students
  - COMP5850 27 Students: 3 groups of 5, 3 groups of 4
  - COMP8260 58 Students: 10 groups of 5, 2 groups of 4
- Group formation is proposed by you
  - First come first served
  - If are not in a group by end of the week we will put you in a group
  - We might need to ask some groups of 4 to take additional members to even out the groups
- Work should be split between group members fairly
- Early warning system (Yellow/Red card) for when things are not working well…

YELLOW/RED CARD SYSTEM

- A Student missing attendance to a "Project meeting" class is put on Yellow Card for the group project. A Yellow card can also be issued by other members of the group in cases of loss of communication or non-contribution.
- A Student on Yellow card has a 25% penalty on project mark. A yellow card can be lifted at the next Project Meeting class if the student demonstrates to the Teaching Team an improvement in their performance.
- A Student on Yellow card missing a Project meeting class is put on Red Card, removed from the group and receives a mark of 0 for the project component.

PROJECT TIMELINE AND DEADLINES

- TW13: Form groups, discuss application domain and overall project ideas. **Email group members login at mm53@kent.ac.uk and G.Ramzi@kent.ac.uk by Thursday 23rd January**
- TW16: Research existing approaches, high level design, techniques and technology exploration, feasibility study.
  Submission ^by Thursday 6th February 23:55 – Submit a 1-page overview to instructors on Moodle for project approval. It should include: PM, members, and a project brief composed of project goals, requirement list, feasibility analysis, project plan.
- TW16-19: *(First sprint)* Fully working pipeline draft for proof-of-concept.
- TW20-23: *(Second sprint)* Refinement of PoC, comparison with baseline, report writing and presentation.
- TW24: **Final submission on Friday 28th March 2025 23:59** - Submission of report, presentation, and source code. Look on Moodle for submission instructions.
  Presentation/Demo on Monday 31st March / Friday 4th April 2024 (class hours)