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Overview

- Staff Information
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- Course Content
- Assessment
- Lecture Schedule
- Relevant Resources



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Staff Information

- **A/Prof Bao Vo (Lecturer, Convenor)**
 - Email: bvo@swin.edu.au,
- **Tutors:**
 - **Hy Nguyen**
 - Email: hynguyen@swin.edu.au
 - **Dr Qinyuan Li**
 - Email: qli@swin.edu.au
 - **Mukesh Malani**
 - Email: mmalani@swin.edu.au



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Lectures/Tutorials

- **Lectures**
 - **When:** Monday 14:30-16:30
 - **Where:** Video recordings of the lectures will be posted on Canvas BEFORE the lecture time.
 - During the lecture time, we will EITHER run an interactive session on Collaborate Ultra (on Canvas) to allow you to ask questions and discuss about the subject matter OR deliver the lecture face-to-face on Hawthorn campus. Arrangements for each week will be posted on Canvas.



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Lectures/Tutorials

- **Tutorials**
 - Tuesday 8:30-10:30 (ATC627) – Hy Nguyen
 - Tuesday 10:30-12:30 (ATC627) – Mukesh Malani
 - Thursday 14:30-16:30 (BA408) – Dr Qinyuan Li
 - Friday 12:30-14:30 (BA405) – Dr Qinyuan Li
- **Consultation**
 - By email appointment



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Unit Learning Outcomes

- **Aim:** to introduce students to a range of artificial intelligence techniques
- **Learning Outcomes**
 - **Understand** a range of techniques of **intelligent systems**
 - across artificial intelligence (AI) and intelligent agents (IA);
 - from theoretical & practical perspective
 - **Apply** different AI/IA algorithms to solve practical problems
 - **Design/build** simple intelligent systems based on AI/IA concepts



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Recommended Reading

- **Reading**
 - **Russell, S. & Norvig, P.** *Artificial Intelligence: A Modern Approach*. Prentice Hall, 3rd edition/4th edition, 2009
 - **Negnevitsky, M.**, 2005. *Artificial intelligence: a guide to intelligent systems*. Pearson education, 3rd edition.
 - **Wooldridge, M.** *An Introduction to Multi-Agent Systems*. John Wiley & Sons, 2002
 - Lecture slides posted on Canvas + online Internet resources...



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Content

- **Topics**
 - Introduction to Intelligent Systems
 - Intelligent agents and multi-agent systems
 - Knowledge representation and reasoning
 - Learning and adaptation
 - Neural networks
 - Evolutionary computing
 - Collective intelligence
 - (Agent methodologies and applications)



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Lecture Schedule (Provisional)

Week	Lecture Topic	Date
1	Topic: Overview. Definition and scope of IS (AI and IA). Philosophical aspects of AI and IA. Tutorial: Getting to know your tutor and team mates; Setting up your computing environment. Java and JADE	Mon 31/07 14:30-16:30 Collaborate Ultra
2	Topic: Problem-Solving Agents: Search and Constraint Satisfaction Problem. Tutorial: Choco (Constraint Solver) and JADE.	Mon 7/08
3	Topic: Multi-agent systems. Agent interactions (encounters, games). Agent communication. Reaching agreements (negotiations). Tutorial: JADE	Mon 14/08
4	Topic: Introduction to machine learning (ML) Tutorial: Introduction to Python & Machine Learning with Python practicals.	Mon 21/08
5	Topic: Machine learning (ML) algorithms (DT, RF, KNN, PCA) Tutorial: Machine Learning with Python practicals & Project assignment.	Mon 28/08
6	Topic: Artificial neural networks and Deep Learning (DL) Tutorial: ML/DL with Python practicals & Project assignment.	Mon 4/09

Lecture Schedule (Provisional)

Week	Lecture Topic	Date
7	Topic: Computational intelligence. Genetic algorithm and evolutionary computing. Tutorial: ML/DL with Python practicals & Project assignment.	Mon 18/09
8	Topic: Computational intelligence. Fuzzy systems. PSO/ACO. Tutorial: EC/GA with PyGad & Project assignment	Mon 25/09
9	Topic: Advanced topic 1: Reinforcement learning. Tutorial: Project assignment.	Mon 2/10
10	Topic: Advanced topic 2: Knowledge Representation and Reasoning (KRR) & Expert Systems (ES) or Distributed Constraint Optimization Problems (DCOP). Tutorial: Project assignment.	Mon 9/10
11	Topic: Advanced topic 3: Natural Language Processing (NLP). Tutorial: Project assignment.	Mon 16/10
12	Topic: Future directions of AI and IA – selected topics and examples. Review of the subject. Sample examination. Tutorial: Project assignment.	Mon 23/10 (Project Assignment due Sunday 29/10)

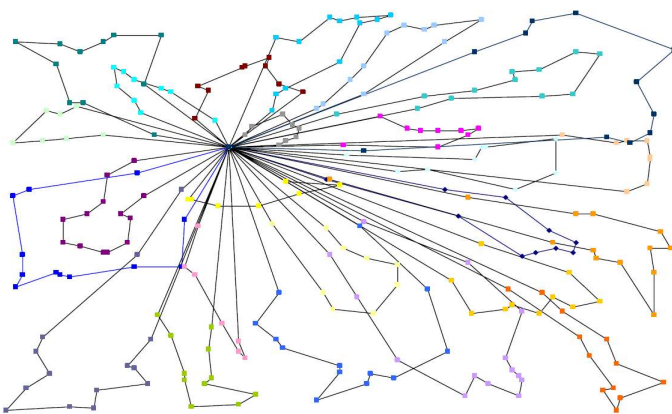
Assessment

- **Project:** Design and implementation of a simple intelligent system to solve a practical problem
 - **Agent-based or Machine Learning system** – built using IS principles/algorithms
 - **Working software** - demonstration
 - **Short project report** (summary of work, architecture, interaction, algorithm/s, result analysis, example)
 - **Video if applicable** (s/w demo)
 - **Assignment Release:** on Canvas
 - **Assignment Progress:** will be **checked** by your tutor **starting Week 3!**
 - **If you choose Option B, you will have Weekly Tasks due in Week 3!**
- **Continuous Oral Defense:** Individual Q&A (about the subject matter covered in the lectures)

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Project Option A/Topic 1 – Delivery Vehicle Routing System

- **Project:** Design and implementation of a simple delivery vehicle routing system involving delivery agents and a master routing agent whose job is to find the optimal routes for the delivery vehicle agents to get their parcels to the receivers.

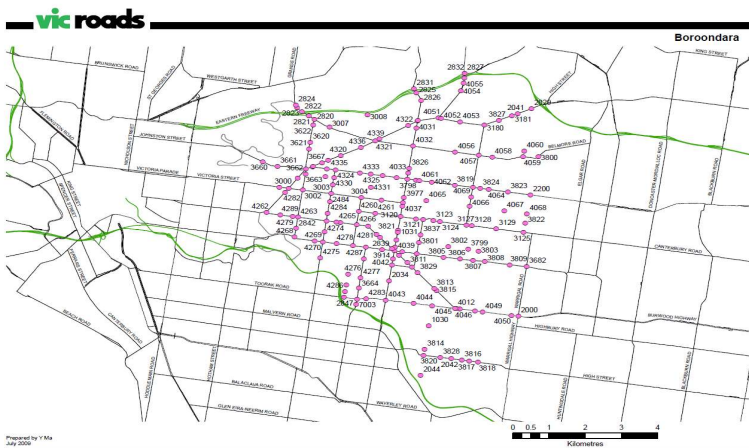


- Interaction Protocols
- Search/optimization
- Dynamic adaptation
- Automated negotiation

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Project Option A/Topic 2 – Traffic Flow Prediction System

- **Project:** Design and implementation of a simple machine learning system for predicting traffic flow using real-world datasets from VicRoads or other road and traffic management authorities



- Machine learning
- Deep learning
- Traffic flow prediction

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Project Option B – Stock Price Prediction System

- **Project:** Design and implementation of a simple machine learning system for predicting stock price of companies on the stock market using real-world datasets.
- You are going to work in a project led by a teaching staff. The project leader will give you starting code for this project. It is quite poor (in terms of programming and performance). We will give you weekly tasks to do to improve this code base (and in the process, you will learn about things such as data processing and deep learning).

- Machine learning
- Deep learning
- Stock price prediction

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Project Option C –

Machine Reading Comprehension (MRC) based on generative AI



Project: With the advent of many powerful large language models (LLMs), including OpenAI's GPT-4 and Google's Bard AI, we would like to build a MRC system by fine-tuning a pretrained LLM for a specific domain or dataset. Subsequently, the developed system will be able to answer questions related to an input document, or a set of input documents.

- If you join this project, you will work under the supervision of your project leader, the unit convenor Bao Vo, and within a team of students (between 3 and 5 students).

- Machine learning
- NLP
- Large language Models
- Generative AI

Other Resources

- **Google OR-Tools/Vehicle Routing Problem:**
<https://developers.google.com/optimization/routing/vrp>
- **Larry's page on Traffic Flow Prediction with Neural Networks(SAEs, LSTM, GRU):**
<https://github.com/xiaochus/TrafficFlowPrediction>
- **Google Machine Learning Crash Course:**
<https://developers.google.com/machine-learning/crash-course/>
- **AUTOMATED NEGOTIATING AGENT COMPETITION (ANAC):**
<https://www.ijcai-18.org/anac/index.html>
<http://web.tuat.ac.jp/~katfujii/ANAC2018/>
- **JADE tutorials, documentation and guidelines** from
<https://jade.tilab.com/documentation/tutorials-guides/>



TODO this week (for you)

- **Form a team (if you choose Option A)**
 - **Team members can be from different tutorials**
 - To help your tutor easily recognise the members of the team, please fill in the **Team Page** on Canvas.
 - If you can't find a team for yourself, please talk to us ASAP
 - Feel free to use the **Discussion Board** on **Canvas**
 - Discuss within your team to choose a topic
 - Teams are to be finalised next week (or Week 3 the latest)
 - Topic is to be finalised in Week 3 (with your tutor's approval)!
- **You can also choose Option B: You will work in a team with your tutor and complete weekly Tasks (first Task is due in Week 3).**

TODO this week (for you)

- **If you want to register for Option C:**
 - **Send an email to bvo@swin.edu.au to register your intention in Week 1**
 - No registration email can be sent after Week 1.
 - If you are not selected, you will be informed within 72 hours of your email so that you can decide on Option A and Option B.
 - If you are selected, you will be informed no later than Sunday 6 August 2023 of your team and the next steps.