



Prescription

This course addresses evolutionary approaches in machine learning and optimisation. The course will cover both evolutionary algorithms and swarm intelligence as well as some other population-based techniques for problem solving. It will include a range of real-world application domains such as classification, regression, clustering and optimisation.

Course learning objectives

Students who pass this course should be able to:

1. Explain advanced concepts of evolutionary computation and population-based learning, and the advantages and limitations compared to other learning paradigms.
2. Use Evolutionary Algorithm techniques such as genetic algorithms or genetic programming to solve typical regression, classification, clustering, computer vision or numeric/combinatorial optimisation problems.
3. Apply an understanding of the principles of multi-objective optimisation to solve problems with multiple conflicting objectives and multi-criterion decision making.
4. Use swarm intelligence techniques such as particle swarm optimisation or differential evolution to solve typical numeric/combinatorial optimisation problems.
5. Apply estimation of distribution and cooperative co-evolution algorithms to solve complex and large scale problems effectively.
6. Explain the basics of neuroevolution and use evolutionary algorithms to automated design deep learning models and (NN) architectures for machine learning tasks such as computer vision and reinforcement learning.

Course content

2022: The course is primarily offered in-person, and there are components such as tests which require in-person attendance. There will be remote alternatives for all the components of the course, but these are only available to students studying from outside the Wellington region. The remote option for tests will use a Zoom-based system for online supervision of the tests.

Students taking this course remotely must have access to a computer with camera and microphone and a reliable high speed internet connection that will support real-time video plus audio connections and screen sharing. Students must be able to use Zoom; other communication applications may also be used. A mobile phone connection only is not considered sufficient. The computer must be adequate to support the programming required by the course: almost any modern windows, macintosh, or unix laptop or desktop computer will be sufficient, but an Android or IOS tablet will not.

Withdrawal from Course

Withdrawal dates and process:

<https://www.wgtn.ac.nz/students/study/course-additions-withdrawals>

Lecturers

Dr Yi Mei (Coordinator)

yi.mei@vuw.ac.nz 04 886 5331

CO 353 Cotton Building (All Blocks), Gate 7, Kelburn Parade, Kelburn

Dr Aaron Chen

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AM 405 Alan Macdiamid Building, Gate 7, Kelburn Parade, Kelburn

Fangfang Zhang

fangfang.zhang@vuw.ac.nz

Teaching Format

This course will be offered primarily in-person for students in Wellington and can attend on campus, the primary teaching format will be in-person. For students who cannot attend on campus (such as enrolled from overseas), there will be web/internet based resources such as lecture notes, recorded lecture videos and assessments provided online.

Two lectures per week, with associated projects and a final exam.

Student feedback

Student feedback on University courses may be found at:
www.cad.vuw.ac.nz/feedback/feedback_display.php

Dates (trimester, teaching & break dates)

- Teaching: 11 July 2022 - 14 October 2022
- Break: 22 August 2022 - 04 September 2022
- Study period: 17 October 2022 - 20 October 2022
- Exam period: 21 October 2022 - 12 November 2022

Class Times and Room Numbers

11 July 2022 - 21 August 2022

- **Monday** 15:10 - 16:00 – LT102, Murphy, Kelburn
- **Thursday** 15:10 - 16:00 – LT102, Murphy, Kelburn

05 September 2022 - 16 October 2022

- **Monday** 15:10 - 16:00 – LT102, Murphy, Kelburn
- **Thursday** 15:10 - 16:00 – LT102, Murphy, Kelburn

Set Texts and Recommended Readings

Required

There are no required texts for this offering.

Mandatory Course Requirements

There are no mandatory course requirements for this course.

If you believe that exceptional circumstances may prevent you from meeting the mandatory course requirements, contact the Course Coordinator for advice as soon as possible.

Assessment

This course will be assessed through two projects and a final exam.

Assessment Item	Due Date or Test Date	CLO(s)	Percentage
Project 1 (40-45 hours)	End of mid-trimester break	CLO: 1,2,3,4	25%
Project 2 (40-45 hours)	End of week 12	CLO: 5,6	25%
Final exam (2 hour duration)	Assessment week	CLO: 1,2,3,4,5,6	50%

Extensions

There will be 3 late days (72 hours) that can be used freely cross the projects. Besides, individual extensions will only be granted in exceptional personal circumstances, and should be negotiated with the course coordinator before the deadline whenever possible. Documentation (e.g., medical certificate) may be required.

Submission & Return

All work should be submitted through the ECS submission system, accessible through the course web pages. Marks and comments will be returned through the ECS marking system, also available through the course web pages.

Workload

The student workload for this course is 150 hours, which is 10 hours per week on average.

- 2 hours lectures
- 8 hours review and work on projects

Teaching Plan

See https://ecs.wgtn.ac.nz/Courses/AIML426_2022T2/LectureSchedule

Communication of Additional Information

All online material for this course can be accessed at https://ecs.wgtn.ac.nz/Courses/AIML426_2022T2/

Links to General Course Information

- Academic Integrity and Plagiarism: <https://www.wgtn.ac.nz/students/study/exams/integrity-plagiarism>
- Academic Progress: <https://www.wgtn.ac.nz/students/study/progress/academic-progress> (including restrictions and non-engagement)
- Dates and deadlines: <https://www.wgtn.ac.nz/students/study/dates>
- Grades: <https://www.wgtn.ac.nz/students/study/progress/grades>
- Special passes: Refer to the Assessment Handbook, at <https://www.wgtn.ac.nz/documents/policy/staff-policy/assessment-handbook.pdf>
- Statutes and policies, e.g. Student Conduct Statute: <https://www.wgtn.ac.nz/about/governance/strategy>
- Student support: <https://www.wgtn.ac.nz/students/support>
- Students with disabilities: https://www.wgtn.ac.nz/st_services/disability/
- Student Charter: <https://www.wgtn.ac.nz/learning-teaching/learning-partnerships/student-charter>
- Terms and Conditions: <https://www.wgtn.ac.nz/study/apply-enrol/terms-conditions/student-contract>
- Turnitin: <http://www.cad.vuw.ac.nz/wiki/index.php/Turnitin>
- University structure: <https://www.wgtn.ac.nz/about/governance/structure>
- VUWSA: <http://www.vuwsa.org.nz>

Offering CRN: [33068](#)

Points: 15

Prerequisites: AIML 420 or COMP 307

Duration: 11 July 2022 - 13 November 2022

Starts: Trimester 2

Campus: Kelburn