

UNIVERSITY OF OTAGO

**INFO411 – MACHINE LEARNING AND DATA MINING**

COURSE OUTLINE

SEMESTER 2, 2021

## OVERVIEW

Today's world is faced with unprecedented opportunities and challenges of data mining. In this paper, various machine learning algorithms for a wide range of data mining tasks will be explored, including data visualisation, feature extraction and selection, clustering, classification, anomaly detection, prediction, model selection etc. Besides conventional machine learning approaches, new artificial neural network models and computational intelligence methods will also be discussed. The interrelationship between these methods will be addressed, and new online and distributed learning approaches will be examined. Research papers from selected journals and conferences will be used as extended readings and assignment references.

The paper is taught through formal lectures, student presentations, laboratories, and guest lectures. In-class discussion is encouraged.

## LEARNING OUTCOME

1. Acquire knowledge about a wide range of machine learning algorithms, understanding their theoretical setup, differences and connections;
2. Gain experience and competitive skills in solving data mining problems in science, engineering and business;
3. Develop skills for effective prototyping of machine learning solutions.

## COURSE MATERIAL

- **References:**

- E. Alpaydin, *Introduction to Machine Learning*, 3<sup>rd</sup> Ed., MIT Press, 2014. [E-book available from UO Library]
- Antonello Lobianco, *Julia Quick Syntax Reference: A Pocket Guide for Data Science Programming*, Apress, 2019. [E-book available from UO Library]
- Duda, Hart & Stork, *Pattern Classification*, 2<sup>nd</sup> Edition, John & Wiley, 2001.
- Selected journal articles

- **Resources**

All course material, including lecture slides/notes, readings, Julia notebooks etc., will be distributed through the Piazza website: [piazza.com/otago.ac.nz/semester22021/info411](https://piazza.com/otago.ac.nz/semester22021/info411).

## COURSE DELIVERY

- **Staff:**

- Assoc. Prof. Jeremiah Deng. Office: OBS 8.10, Ext.: 8090 | Office Hours: TUE/THU 3-4pm | Email: [jeremiah.deng@otago.ac.nz](mailto:jeremiah.deng@otago.ac.nz)
- Guest lecturers (*tbc*)
- Tutor: Jean Li, Office: 8.08, Email: [jean.li@postgrad.otago.ac.nz](mailto:jean.li@postgrad.otago.ac.nz)

- **Lectures:** MON/TUE 11:00-11:50, **Rooms TBC**

- **Laboratories:** FRI 9:00-10:50am, OBS 327; online THU 5:00-5:50pm, link *tbc*

- **Online Tutorials:** WED 5 - 6pm. Zoom link *tbc*

## ASSESSMENT PACKAGE

- Internal assessment - 60%
  - Lab assignments 25%
  - Presentation 5%
  - Assignment 1 15%
  - Assignment 2 15%
- Final Exam (3 hours) - 40%

There will be 10 labs, each worth 2.5 marks.

## COURSE REQUIREMENTS

To pass the paper, students *must* gain at least **40%** in the final exam.

## ASSESSMENT POLICY

Student work is assessed individually in the assessed labs and participation in these labs is compulsory. Lab reports are due usually one day before the next lab is held.

Assignments and the Presentation are group work and members in a group are all expected to make significant contributions to the group work, in both coding and writing/presentation.

Unless approved by the staff at least *two days before* the specified submission deadline, late submissions will not be accepted.

## ACADEMIC INTEGRITY

**Students should ensure that *all* submitted work is their own.** Plagiarism is a form of dishonest practice. It is defined as copying or paraphrasing another's work and presenting it as one's own. Any student found responsible for dishonest practice in any piece of work submitted for assessment shall be subject to the University's dishonest practice regulations, which may result in serious penalties, including forfeiture of marks for the piece of work submitted, a zero grade for the paper, or in extreme cases, exclusion from the University. The University of Otago reserves the right to use plagiarism detection tools.

Students are advised to inform themselves about University policies concerning dishonest practice and take up opportunities to improve their academic and information literacy. If necessary, seek advice from academic staff, or the Student Learning Centre. The guideline for students is available at this link: <http://www.otago.ac.nz/study/academicintegrity/>

The Library resource on ethical use of information is available via this link: <http://oil.otago.ac.nz/oil/module8.html>

## STUDENT FEEDBACK

We encourage and value your feedback. This can be in the form of contacting staff, participating in course evaluation surveys and communicating with class representatives.

Your class representative's name and contact details will be notified early in the semester.

## COURSE SCHEDULE<sup>1</sup>

Wk	Week Starting	Lecture A	Lecture B	Practical
1	12/7	Introduction	Metrics	Lab 1. Getting started
2	19/7	Clustering I	Clustering II	Lab 2. Clustering
3	26/7	Clustering III	Clustering IV	Lab 3. Online clustering
4	2/8	Dimension reduction I	Dimension reduction II	Lab 4. Dimension reduction Assignment 1 starts
5	9/8	Classification I	Classification II	Lab 5. Classification I
6	16/8	Classification III	Performance evaluation	Lab 6. Classification II
7	23/8	Feature selection I	Feature selection II	No labs Assignment 1 due
Mid-semester Break 28/8 – 5/9				
8	6/9	Regression I	Regression II	Presentation Assignment 2 starts
9	13/9	Model selection	Ensembles	Lab 7. Performance evaluation
10	20/9	Deep learning I	Deep learning II	Lab 8. Regression
11	27/9	Deep learning III	Deep learning IV	Lab 9. Ensemble methods
12	4/10	Transfer learning I	Transfer learning II	Lab 10. Deep learning Assignment 2 due
13	11/10	Guest Lecture	Review	No labs

## COVID-19 CONTINGENCY PLANS

Hopefully the COVID-19 alert level will not escalate, but we must be prepared. We have planned to use cloud-based portals for course delivery and carry out computing labs. This ensures that you can continue to study as usual and do the lab work if computing labs, including OBS327, are closed. Here are our plans:

- All lectures are recorded, so we can easily switch to online-only if necessary. Lectures may be moved to a different room in order to meet physical distancing requirements.
- Face-to-face labs are not feasible at Alert Level 2 or higher. Instead, you will work on lab exercises in your own time, and we will provide scheduled help sessions via Zoom.
- If you have problems with your lab or assignment work, post your questions to Piazza, which will reach all teaching staff promptly; request Zoom chats if necessary.
- Additional Zoom sessions can be organised as needed. We will provide further details and instructions should any of these plans need to be activated.

---

<sup>1</sup> Subject to potential changes.

## STUDENT SUPPORT CONTACTS

- Campus Watch | (24/7) 0800 479 5000
- Career Development Centre | 0 479 8244
- Chaplains | [chaplains@otago.ac.nz](mailto:chaplains@otago.ac.nz)
- Counselling – need to talk? | Free text/ all 1737
- Disability Information and Support | 03 47 8235
- Department course advisors | (Drs. Nigel Stanger & Tony Savarimuthu)
- Emergency Psychiatric Service | 0800 467 846
- Graduate Research School | 03 479 5737
- HEDC – Student Learning Development | 03 479 880
- International Office | [international.support@otago.ac.nz](mailto:international.support@otago.ac.nz)
- Librarians | [ask.library@otago.ac.nz](mailto:ask.library@otago.ac.nz)
- Locals Collegiate Community | [locals@otago.ac.nz](mailto:locals@otago.ac.nz)
- Manager Facilitation and Mediation | 03 47 5679
- OUSA Clubs and Societies | 03 479 5960
- OUSA Student Support | 03 479 5449, [help@ousa.org.nz](mailto:help@ousa.org.nz)
- Silverline | [silverline@otago.ac.nz](mailto:silverline@otago.ac.nz)
- Social Impact Studio | [volunteer@otago.ac.nz](mailto:volunteer@otago.ac.nz)
- Student Accommodation Centre | 03 479 4166
- Student Development | 0800 808 098 (AskOtago)
- Student Health | 0800 479 821
- Student Job Search | [sjs.co.nz](http://sjs.co.nz)
- Te Whare Tāwharau: Sexual Violence Support and Prevention Centre | 03 479 3790
- Unipol | 03 479 5888, [recreation@otago.ac.nz](mailto:recreation@otago.ac.nz)

### **Kaiāwhina – OBS Māori Student Support**

Ko Te Atua o Taiehu te Mauka, Ko Ōtākou te Tai, Ko Ōtākou te Marae, Ko Kai Tahu , Taranaki ka iwi. Ko Taikawa Brett Taiaroa Karetai Tamati-Elliffe ahau.

Papaki kau ana ngā tai o mihi, ko Taikawa ahau. He wheako ōku kia poipoi, akiaki ia koutou nga tauira o Te Kura Pākihi.

Taikawa Tamati-Elliffe (Kai Tahu, Taranaki) is the Kaiāwhina Māori (Māori student support) for Te Kura Pākihi (Business School). He can help with questions about your academic studies as well as providing information on scholarships, pastoral, financial and other campus services. Taikawa also offers support to those studying away from their whanau, hapū and iwi, to feel safe and supported.

Tel: 03 479 5342

Email: [kaiarahi.obs@otago.ac.nz](mailto:kaiarahi.obs@otago.ac.nz) | [taikawa.tamati-elliffe@otago.ac.nz](mailto:taikawa.tamati-elliffe@otago.ac.nz)

### **OBS Pacific Student Support Facilitator (Part-time)**

Mary Jane's role is to liaise with Academic Departments and Student Services relating to Pacific students and their course of study. Mary Jane is based in the Pacifica room on the OBS Ground Floor. As she works part time, it is best to email her to make an appointment.

Email: [mary-jane.kivalu@otago.ac.nz](mailto:mary-jane.kivalu@otago.ac.nz)

Contact AskOtago if you're not sure where to start, or need help with anything else. 0800 80 80 98 | [ask.otago.ac.nz](http://ask.otago.ac.nz)