Faculty of Computing & Informatics

Department of Informatics, Journalism and Media Studies

Trends in Artificial Intelligence and Machine Learning(**TAI911S**)

Statement About Academic Honesty And Integrity

All staff and students of the Namibia University of Science and Technology (NUST), upon signing their employment contracts and registration forms, commit themselves to abide by the policies and rules of the institution. The core activity of the NUST is learning, and in this respect, academic honesty and integrity is very important to ensure that learning is valid, reliable and credible.

The NUST, therefore, does not condone any form of academic dishonesty, including plagiarism and cheating on tests and assessments, amongst other such practices. The NUST requires students to always do their own assignments and to produce their own academic work, unless given a group assignment.

Academic Dishonesty includes, but is not limited to:

- Using the ideas, words, works or inventions of someone else as if it is your own work.

- Using the direct words of someone else without quotation marks, even if it is referenced.

- Copying from writings (books, articles, webpages, other students' assignments, etc.), published or unpublished, without referencing.

- Syndication of a piece of work, all or part of an assignment, by a group of students, unless the assignment was a legitimate group assignment.

- The borrowing and use of another person's assignment, with or without their knowledge or permission.

- Infringing copyright, including documents copied or cut and pasted from the internet.

- Asking someone else to prepare an assignment for you or to write or sit an assessment for you, whether this is against payment or not.

- Re-submitting work done already for another course or programme as new work, so-called self-plagiarism.

- Bringing notes into an examination or test venue, regardless of whether the notes were used to copy or not.

- Receiving any outside assistance in any form or shape during an examination or test.

All forms of academic dishonesty are viewed as misconduct under the NUST Student Rules and Regulations. Students who make themselves guilty of academic dishonesty will be brought before a Disciplinary Committee and may be suspended from studying for a certain time or may be expelled. All students who are found guilty of academic dishonesty shall have an appropriate endorsement on their academic record, which will never be erased.

Course Information

Course Code and Title:	$TAI911S$, *Trends in Artificial Intelligence and Machine Learning*
Department: Programme:	Informatics, Journalism and Media Studies $09MADS$, Master of Data Science
Contact Hours: NQF Level and Credit: Course Description: Pre-requisites:	200 hours NQF Level 9, credits: 20 The aim of this course is to expose the students to *statistically-driven* approaches to understand and predict phenomena. *None*
Course Delivery Methods: Course Format:	The delivery of the course is by theory and practical sessions. The practicals will be based on a student-centered approach. It will also involve a group of students carrying out a group project. • 60 hours face-to-face contact with the lecturer • 110 hours directed self-learning and self-directed learning • 30 hours assessment
Effective Date:	Wednesday, 12 February 2025

Lecturer Information

Lecturer's name: José G. Quenum
Email: jquenum@nust.na
Office Phone: 207 2235
Office Location: Lower Campus, Science & Technology Bld.
Office hours: 08:00 – 16:30
Consultation hours: Thursdays (10:30 – 12:30)

Student Readiness

Technology & Equipment
Readiness:

This course will only utilize already
existing Polytechnic equipments

Student Commitments
and Contact Times:

1. Attend all classes and make appropriate notes.
The presentations used in class will be made available.
If a student fails to attend a class, it is their
responsibility to catch up on what was covered.

2. After every class, and before the start of the next class,
the student should sort, complete and annotate own lecture
notes, and select further reading in case any particular item
was not understood on first attempt.

3. Student must fully utilize their notational hours on revising,
practicing or/and completing homework for the course.

4. Consult recommended material to further broaden knowledge
and understanding of the subject.

Course Resources:

Presentation slides, laboratory materials and additional materials
will be made available to the student.

The prescribed book is Russell, Stuart J.and Norvig, P. (2020). *Artificial Intelligence:
A Modern Approach Fourth Edition*. Pearson Education.

The following books are also recommended:

- Kubat, M. (2015). *An Introduction to Machine Learning*. Springer Publishing
  Company, Incorporated, 1st edition

- Skansi, S. (2018). *Introduction to Deep Learning: From Logical Calculus to Artifi-
  cial Intelligence*. Springer Publishing Company, Incorporated, 1st edition

- Goodfellow, I. J., Bengio, Y., and Courville, A. (2016). *Deep Learning*. MIT Press, Cambridge, MA, USA. `http://www.deeplearningbook.org`

- Strang, G. (2023). *Introduction to Linear Algebra*. CUP, 6 edition

- Stewart, J. (2008). *Calculus : early transcendentals*. Thomson Brooks/Cole, Belmont, CA, sixth edition

- Stark, H. and Woods, J. W. (2002). *Probability and Random Processes with Applications to Signal Processing*. Prentice Hall

- Oppenheim, A. V., Willsky, A. S., and Nawab, S. H. (1996). *Signals & systems (2nd ed.)*. Prentice-Hall, Inc., USA

- Strogatz, S. H. (2000). *Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry and Engineering*. Westview Press

- Proceedings of the following conferences:

  `IJCAI`: International Joint Conferences on Artificial Intelligence;

  `AAMAS`: International Conference on Autonomous Agents and Multiagent Systems;

  `NEURIPS`: Neural Information Processing Systems;

  `ICML`: International Conference on Machine Learning;

  `AAAI`: American Association for the Advancement of Artificial Intelligence;

  `EMNLP` Conference on Empirical Methods in Natural Language Processing;

  `ACL`: Meeting of the Association for Computational Linguistincs;

  `CVPR`: Conference on Computer Vision and Pattern Recognition;

  `ICLR`: International Conference on Learning Representation;

  `KDD`: International Conference on knowledge Discovery and Data Mining;

Learning Outcomes

Upon successful completion of the course, students will, through assessment activities, show evidence of their ability to:

1. Differentiate between supervised, unsupervised, and semi-supervised learning contexts;

2. Analyse Machine Learning techniques and select the appropriate one given a problem;

3. Develop a model to understand a phenomenon or predict future events;

4. Integrate several models for understanding or predicting a more complex phenomenon.

Course Content

- *Linear Models*

- *Support Vector Machine*

- *Clustering*

- *Dimensionality Reduction*

- *Artificial Neural Networks and Deep Learning*

- *Ensemble Methods*

- *Applications of ML and DL*

- *New Developments in AI*

Course Schedule

Note that the dates scheduled below (Table 1) are subject to change based on the needs of the students and at the lecturer's discretion. Students will be informed of any change ahead of time.

Table 1: Topic Details

Week	Dates	Topic
1	2025-02-12	*Course outline and organisation*
2	2025-02-19	*Introduction to Artificial Intelligence*
3	2025-02-26	*Linear Models*
4	2025-03-05	*Tutorial on Julia and Pluto notebook*
5	2025-03-12	*Support Vector Machine*
6	2025-03-19	*Clustering* (K-Means and hierarchical Clustering)
7	2025-03-26	*Dimensionality Reduction*
		Mid-Semester Break
8	2025-04-09	*Artificial neural networks and deep learning* (ANN-DL)
9	2025-04-16	ANN & DL (CNN, RNN, *Transformers* Part I)
10	2025-04-16	*Transformers* (Part II)
11	2025-04-23	*Decision Trees Methods* & *Ensemble Methods* (Part I - Random Forest)
12	2025-04-30	*Ensemble Methods* (Part II - Bagging, Boosting and Stacking)
13	2025-05-07	*Applications of DL* (Recommender Systems; Natural Language Processing)
14	2025-05-14	*Applications of DL* (LLMs & Natural Language Processing)
15	2025-05-21	*LLMs*

Important Dates

Date	Important Information
Wednesday, 12 March 2025	*Assignment* 1
Wednesday, 26 March 2025	*Assignment* 2
Wednesday, 30 April 2025	*Paper Review*
Wednesday, 9 April 2025	*Assignment* 3
Wednesday, 21 May 2025	*Test*

Assessment and Evaluation

The course will be assessed using a *continuous assessment*. The continuous assessment includes three assignments, a test and a paper review.

The minimum pass requirement for this course is 50%. The final course mark allocation comes as follows:

Assessment	Weight
Assignment 1	20%
Assignment 2	20%
Assignment 3	40%
Test	15%
Paper Review	5%
Total	100%

Course Policies

General Academic Policies

It is the student's responsibility to be familiar with and adhere to the NUST's Policies. These Policies can be found in the NUST Prospectus or online at `www.nust.na/prospectus`.

Supplementary Policies

Late submissions will not be accepted after the due date and time and thus marked as 0%. Moreover, the students who missed an evaluation for genuine reasons that

may be supported by relevant documentation (e.g., in the case of sickness) may seek a supplementary test. The latter shall not be requested to replace a failed project.

Date revised: February 2025

Failure to pay fees

A student who fails to pay his or her fees may have his or her results withheld until all outstanding fees have been paid in full.

Important Student Services at NUST

There are a variety of services which you can use at the NUST. These services are to your advantage – Use them!!! They include the following:

- Student Counseling and Career Development - Dean of Students' Office

- Writing Centre and student academic problems - Teaching & Learning Unit (TLU)

- Campus Health and Wellness Centre (CHWC) - Dean of Students' Office / NUST Clinic

Authorization:

This course is authorized for use by:

_____   _____

Head of Department   Date

1 ACKNOWLEDGEMENT BY STUDENT

(To be completed by all students on the course, detached from the course outline and kept on record in the department)

I, _____, student number, _____, hereby acknowledge that I have received this course outline for *Trends in Artificial Intelligence and Machine Learning* (TAI911S) in Semester 1 (2025), and that I have familiarised myself with its content, in particular the statement about academic honesty and integrity. I agree to abide by the Policies and arrangements spelt out in this course outline.

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Signature of student   Date