DEEP LEARNING

MACHINE LEARNING

ARTIFICIAL INTELLIGENCE

Department of Electrical Engineering | CPD Course

Introduction to Applied Machine Learning and Artificial Intelligence
(with a focus on LLMs like CHATGPT)

Online, 6 – 10 November 2023

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA · UNIVERSITEIT VAN KAAPSTAD

SPES BONA

Objectives

Over the last few years the field of machine learning (ML) and artificial intelligence (AI) has become very active mainly because of two major innovations, viz the invention of deep learning algorithms and the strides in computational hardware that have allowed for practical use of these algorithms. Recent developments in LLMs have taken the world with surprise. Some experts think we are on the verge of singularity. Now, every industry and organisation needs some basic understanding of AI algorithms, especially LLMs. They need to prepare, reorganise and change-manage to face this new tsunami. This course aims to empower local industries with the basics of AI and LLMs so that African industries are not left behind.

This course is for you, if you

- are managing a team or project and are curious about the potential use of ML or AI;
- have read a lot about AI and ML in media and want to dive a bit deep;
- have a challenge which you think can be solved by ML or AI, but are not sure which algorithms to try first;
- want to know how do large language models (LLMs) like chatGPT or Bard work;
- want to know how may you use chatGPT or Bard APIs in your projects;
- are a researcher planning to use ML or AI algorithms in your work but are overwhelmed with the massive amount of resources available online and want to get started.

Outcomes

During the course you will:

- Become familiar with terminology and concepts used in the field, understand the types of problems that could be solved with machine learning and how to evaluate your models.
- Understand the structure of neural networks and how backpropagation is used to train them.
- Tackle real-world problems by implementing various machine learning algorithms from Nearest Neighbours algorithms to Convolutional Neural Networks.
- Learn about the latest innovations and open questions in the field. Learn to spot the marketing claims and ask questions that matter
- Learn about future trends in ML and AI and appreciate the open challenges in this domain. This will enable the learner to limit their expectations from ML and AI algorithms.

At the end of the course you will:

- Understand the basics of machine learning
- Appreciate the working of a single artificial neuron and a basic neural network
- Implementation of machine learning algorithms using modern machine learning libraries
- Understand some of the major developments in the domain of ML and AI
- Understand the basic architecture that empowers LLMs like chatGPT
- Utilise chatGPT API.
- Understand the strengths and weaknesses of current machine learning algorithms

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Course Format

The course is intensive and will take place online over five days and consists of lectures as well as simulation-based lab modules. You will **need to have access to a computer or laptop for this course as well as a stable internet connection and data**.

As **loadshedding** is expected to continue for the foreseeable future, participants are required to ensure that their laptop batteries are fully charged and that they have a secondary source for obtaining wifi and/or data.

Who Should Attend?

Working engineers and software developers interested in the emerging field of machine learning and to gain some hands on using SciKit Learn and Google's TensorFlow toolboxes.

Course Content

Topics (including lab sessions)	Contact Hours
Introduction to machine learning and pattern recognition • Learning the terminology and concepts • Statistics and linear algebra refresher • Model evaluation	4 - 5

Supervised Learning Algorithms
• Nearest Neighbour Algorithms
• Artificial Neural Networks
• Perceptron
  o Structure of an artificial neural network
  o Deep Neural Networks
  o Convolutional Neural Networks
  o Recurrent Neural Networks
    ▪ Transformers
    ▪ Supervised Learning Algorithms
    ▪ Nearest Neighbour Algorithms
	10 - 12

Unsupervised Learning Algorithms • Clustering • Autoencoders • Generative Adversarial Networks	5 - 6
Machine Learning Strategies • No Free-lunch Rule • Resampling techniques • Classifier design and validation • Feature selection and scaling LLMs • Transformer networks • LLMs and their evolution • Using LLMs through APIs	15 - 20

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Course Presenters

Prof. Amit Kumar Mishra has been working in the field of statistical signal processing and radar system development for the past 16 years. He is a Professor with the Department of Electrical Engineering, University of Cape Town. He is a Senior Member of IEEE and has more than 150 papers in ISI listed journals and peer-reviewed conference-proceedings. He is also an inventor/co-inventor in eight patent applications.

Mr. Jarryd Son is a Lecturer research scholar with the Department of Electrical Engineering, University of Cape Town. He is working on some fascinating brain-inspired AI algorithms.

Mr. Stephan Cilliers is the founder and CTO of Onset Carbon and alum of the Department of Electrical Engineering, University of Cape Town. He is an enthusiastic follower of the cutting edge developments in the field of large language models and is working on various software applications involving them.

Course Overview

Name	Introduction to Applied Machine Learning and Artificial Intelligence
Dates	6 – 10 November 2023
Venue	Online
CPD points	ECSA: 40 hours, 4 CPD points, ECSA validation number: UCTMLAI2023
Fees	Standard delegate R12 600 UCT staff and students R6 300 Students from other tertiary institutes R9 450

*Company discounts are available for 6 or more attendees from the same company. Please contact the course administrators for further information: ebe-cpd@uct.ac.za

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Registration and Cancellation

- [Register for this course](#)
- Registration covers attendance of all sessions of the course, and course material.
- Registrations close one week before the start of the course. Confirmation of acceptance will be sent on receipt of a registration form.
- Cancellations must be received one week before the start of a course, or the full course fee will be charged.
- For more information on application and registration procedures, please visit our website: www.cpd.uct.ac.za

Certificates and CPD Points

A certificate of attendance will be awarded to CPD participants. Participants need to attend 80% of the lectures to qualify for an attendance certificate.

The course is to be registered with the Engineering Council of South Africa for the award of CPD points. The ECSA course code is UCTMLAI23.

CPD participants can also request a formal university transcript, which will show this course as part of a Professional Development Career.

Contact details

For more information or details on CPD courses, visit our website or contact us.

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