FACULTY OF
ENGINEERING &
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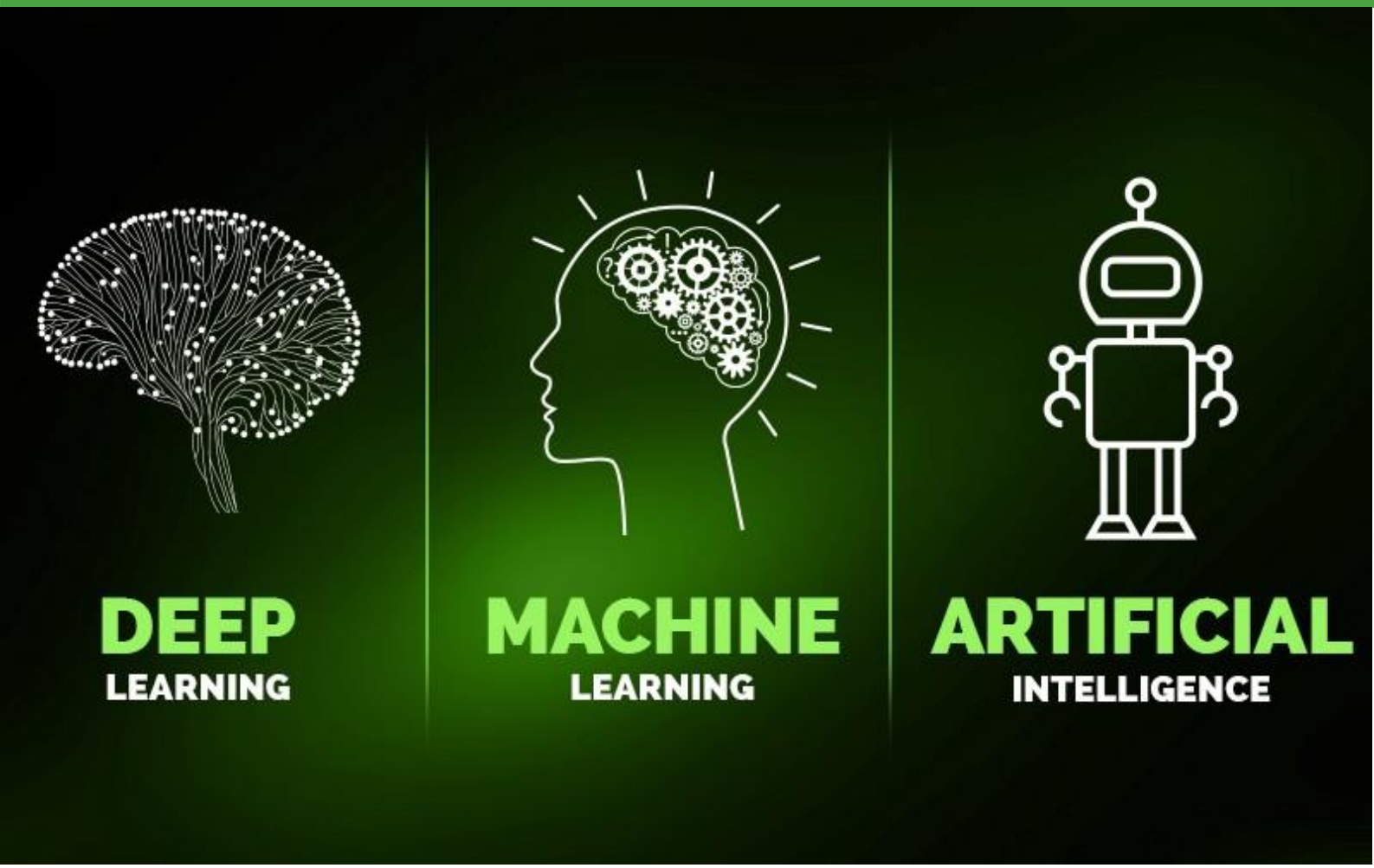

Department of Electrical Engineering | CPD Course

Introduction to Applied Machine Learning and Artificial Intelligence

22 – 26 November 2021

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

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 machine learning have been able to solve numerous problems across multiple domains from space data analysis, medical diagnosis, agricultural crop management, all the way to enhancing consumer products.

New startups are venturing into interesting uses of machine learning and established industries are investigating how they can benefit as well. This short course is intended to expose the audience to the basics of ML and AI to get them started with this field.

This course is for you, if you

- are managing a team or project and are curious about the potential use of ML or AI;
- are a manager and some of your engineers want to use ML/AI to solve some problems and you want to be sure if they are over-estimating the abilities of ML/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;
- 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 such as Tensorflow and Pytorch.
- Understand some of the major developments in the domain of ML and AI
- Understand the strengths and weaknesses of current machine learning algorithms

Course Format

The course is intensive and will take place over five days and consists of lectures as well as simulation-based lab modules. It is highly advised that the attendees come with their own laptop (at least one per groups of two).

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
• Linear and Logistic Regression
• Nearest Neighbour Algorithms
• Artificial Neural Networks
  ○ Perceptron
  ○ Structure of an artificial neural network
  ○ How Backpropagation works
  ○ Deep Neural Networks
  ▪ Convolutional Neural Networks
  ▪ Recurrent Neural Networks
  ▪ Transformers
	15 - 16

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 • Regularization • Data augmentation	10 - 20

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.

Course Overview

Name	Introduction to Applied Machine Learning and Artificial Intelligence	
Dates	22 – 26 November 2021	
Venue	Online	
CPD points	ECSA: 5 CPD points, ECSA validation number: UCTMLAI2021	
Fees	Standard delegate UCT staff and students Students from other tertiary institutes	R15 000 R7 500 R11 250

Registration

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 UCTMLAI21.
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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