

Fundamentals of Artificial Intelligence

Code: IST26TE5

Location: In-person or online

Duration: One day onsite • 4 online sessions

Level: FHEQ Level 3

Prerequisites: Some elementary knowledge of probability and statistics would be useful.

Description: This course aims to explain exactly what we mean by AI as it stands today, its connection with deep learning and strong roots in machine learning. It explores Large Language Models (LLMs) and necessary elements such as tokenization and the Transformer neural network architecture that gives such systems their capabilities. It also touches on prompt engineering, retrieval-augmented generation and the role of reinforcement learning as both a competing and complementary method. The course wouldn't be complete without factoring in ethical considerations and what has and might go wrong. Upon completion, course participants should have a much clearer understanding of what AI actually is and be better able to critically assess such systems for themselves.

Instructor: The course lead is Dr Richard Saldanha. Dr Saldanha is a [Visiting Lecturer](#) in machine learning at Queen Mary University of London on its master's degree programme in the School of Economics and Finance, a member of the [AI for Control Problems Project](#) at The Alan Turing Institute, and a practical user of AI/ML commercially with [Oxquant](#). Dr Saldanha holds a doctorate (DPhil)

in Statistics from the University of Oxford. He is a Fellow and Chartered Statistician (CStat) of the Royal Statistical Society; a Science Council Chartered Scientist (CSci); and a Fellow (FIScT) and Advanced Practitioner in Artificial Intelligence (APAI) of the Institute of Science and Technology.

Introduction to Artificial Intelligence

Code: IST26TE10

Location: In-person or online

Duration: Three days onsite • 12 online sessions

Level: FHEQ Level 5

Prerequisites: Some basic knowledge of probability and statistics would be useful. Prior knowledge of interpreted languages such as R or Python would be advantageous but is not essential.

Description: This course is designed to introduce course participants to the role of machine learning in an AI context. It describes supervised and unsupervised learning methods and reviews basic regression and classification models. Model training, testing and objective assessment are key elements of this course as are, often overlooked, ethical considerations. As well as looking in detail at selected AI/ML methods, the course examines specific case studies where things have gone wrong and what steps might have been taken to avoid catastrophic results. The course covers the technical knowledge requirement for those wishing to gain the IST's RTechAI professional accreditation.

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Intermediate Concepts in Artificial Intelligence

Code: IST26TE20

Location: In-person or online

Duration: Three days onsite • 12 online sessions

Level: FHEQ Level 6

Prerequisites: This course builds upon the topics introduced by TE10. Some knowledge of probability and statistics is essential. Course participants should also be familiar with linear algebra and basic calculus. Prior knowledge of interpreted languages such as R or Python would be a definite advantage.

Description: This course is designed to introduce course participants to the essential ingredients of an AI system. It covers the role of mathematical optimization as the practical implementation of learning, common AI/ML methods such as neural networks and tree-based methods, the bias-variance trade-off,

parameter estimation, model assessment and choice. The course covers the technical knowledge requirement for those wishing to gain the IST's RPAI or APAI professional accreditation.

Instructor: The course lead is Dr Richard Saldanha. Dr Saldanha is a [Visiting Lecturer](#) in machine learning at Queen Mary University of London on its master's degree programme in the School of Economics and Finance, a member of the [AI for Control Problems Project](#) at The Alan Turing Institute, and a practical user of AI/ML commercially with [Oxquant](#). Dr Saldanha holds a doctorate (DPhil) in Statistics from the University of Oxford. He is a Fellow and Chartered Statistician (CStat) of the Royal Statistical Society; a Science Council Chartered Scientist (CSci); and a Fellow (FIScT) and Advanced Practitioner in Artificial Intelligence (APAI) of the Institute of Science and Technology.

Large Language Models

Code: IST26TE22

Location: In-person or online

Duration: Two days onsite • 8 online sessions

Level: FHEQ Level 6

Prerequisites: Some knowledge of probability and statistics is essential. Course participants should also be familiar with linear algebra and basic calculus. Prior knowledge of Python would be a definite advantage.

Description: This course is designed to teach participants about how LLMs are put together. It starts with a simple bigram language model, showing how parameters may be estimated based on given data and the model used to generate new examples. The neural network model is then introduced and the model extended to

language generation with the aid of the attention mechanism. Whilst we do not have the resources to put together a fully-fledged LLM, the course is designed to describe all the necessary ingredients giving participants the knowledge necessary to explore online LLM code repositories. This course aims to separate the fact from the fiction with regard to LLMs, as well as highlight often overlooked ethical considerations.

Instructor: The course lead is Dr Richard Saldanha. Dr Saldanha is a [Visiting Lecturer](#) in machine learning at Queen Mary University of London on its master's degree programme in the School of Economics and Finance, a member of the [AI for Control Problems Project](#) at The Alan Turing Institute, and a practical user of AI/ML commercially with [Oxquant](#). Dr Saldanha holds a doctorate (DPhil) in Statistics from the University of Oxford. He is a Fellow and Chartered Statistician (CStat) of the Royal Statistical Society; a Science Council Chartered Scientist (CSci); and a Fellow (FIScT) and Advanced Practitioner in Artificial Intelligence (APAI) of the Institute of Science and Technology.

Deep Learning

Code: IST26TE24

Location: In-person or online

Duration: Two days onsite • 8 online sessions

Level: FHEQ Level 6

Prerequisites: Some knowledge of probability and statistics is essential. Course participants should also be familiar with linear algebra and basic calculus. Some prior knowledge of Python is essential.

Description: This course is designed to teach participants about deep learning models. The course covers deep learning basics including computation and training; model components and architectures; prediction in terms of various applications and individual real-world case studies.

Instructor: The course lead is Dr Richard Saldanha. Dr Saldanha is a [Visiting Lecturer](#) in machine learning at Queen Mary University of London on its master's degree programme in the School of Economics and Finance, a member of the [AI for Control Problems Project](#) at The Alan Turing Institute, and a practical user of AI/ML commercially with [Oxquant](#). Dr Saldanha holds a doctorate (DPhil) in Statistics from the University of Oxford. He is a Fellow and Chartered Statistician (CStat) of the Royal Statistical Society; a Science Council Chartered Scientist (CSci); and a Fellow (FIScT) and Advanced Practitioner in Artificial Intelligence (APAI) of the Institute of Science and Technology.

Data Science I

Code: IST26TE50

Location: In-person or online

Duration: Three days onsite • 12 online sessions

Level: FHEQ Level 6

Prerequisites: Some knowledge of probability and statistics is essential. Course participants should also be familiar with linear algebra and basic calculus. Prior knowledge of R would be a definite advantage.

Description: This course examines the subject of data science from basic data cleaning and manipulation; data exploration and visualization; data cleaning, standardization and normalization;

common algorithms such as linear regression, logistic regression and decision trees; and model training and evaluation. The course also looks at model deployment and important ethical considerations. The sessions are interactive interspersed with short exercises that aid learning. Recommended resources for further learning are also given throughout. The course provides a solid foundation in data science, covering essential topics and practical skills.

Instructor: The course lead is Dr Richard Saldanha. Dr Saldanha is a [Visiting Lecturer](#) in machine learning at Queen Mary University of London on its master's degree programme in the School of Economics and Finance, a member of the [AI for Control Problems Project](#) at The Alan Turing Institute, and a practical user of AI/ML commercially with [Oxquant](#). Dr Saldanha holds a doctorate (DPhil) in Statistics from the University of Oxford. He is a Fellow and Chartered Statistician (CStat) of the Royal Statistical Society; a Science Council Chartered Scientist (CSci); and a Fellow (FIScT) and Advanced Practitioner in Artificial Intelligence (APAI) of the Institute of Science and Technology.

Data Science II

Code: IST26TE52

Location: In-person or online

Duration: Three days onsite • 12 online sessions

Level: FHEQ Level 6

Prerequisites: Some knowledge of probability and statistics is essential. Course participants should also be familiar with linear algebra and basic calculus. Some knowledge of R and/or Python or another interpreted language.

Description: This course covers deep learning and neural networks; plus advanced machine learning techniques including ensemble methods; generative adversarial networks; and reinforcement learning. The course provides advanced data science skills, covering essential topics and practical skills.

Instructor: The course lead is Dr Richard Saldanha. Dr Saldanha is a [Visiting Lecturer](#) in machine learning at Queen Mary University of London on its master's degree programme in the School of Economics and Finance, a member of the [AI for Control Problems Project](#) at The Alan Turing Institute, and a practical user of AI/ML commercially with [Oxquant](#). Dr Saldanha holds a doctorate (DPhil) in Statistics from the University of Oxford. He is a Fellow and Chartered Statistician (CStat) of the Royal Statistical Society; a Science Council Chartered Scientist (CSci); and a Fellow (FIScT) and Advanced Practitioner in Artificial Intelligence (APAI) of the Institute of Science and Technology.
