Krisolis
EMPOWER / INNOVATE / EVOLVE

# CPD Certificate in Foundations of Artificial Intelligence

Programme Outline

**Empower / Innovate / Evolve**

# 1 OVERVIEW

This 12 week online course introduces the most important ideas, techniques, and applications of Artificial Intelligence (AI). It is specifically targeted at those with an interest in, and aptitude for, working with AI but who do not necessarily have a background in AI or a related area. AI can enhance operational efficiency, and leaders who are knowledgeable in this area can identify opportunities to streamline processes and increase productivity. This programme provides students with the fundamental skills and knowledge required to start a career in AI, pursue higher education, or gain advanced insights that complement their current role. Additionally, this programme would be suitable for those returning from a career break or simply seeking to upskill in AI.

## Is this Programme for You?

This programme is targeted at people interested in transitioning into working with AI, who do not already have a background in AI or a related area. Learners do not need significant existing technical skills and will be provided with the foundational skills and knowledge to begin a career as an AI specialist, or to continue into further education in AI. This programme is delivered in partnership with TU Dublin and Technology Ireland ICT Skillnet.

## Learning Outcomes

At the end of this programme, participants will have established a foundation in artificial intelligence demonstrated by being able to:

LO 1. Describe what Artificial Intelligence is and outline the component parts of the domain.

LO 2. Explain the importance and considerations of ethics and social justice in designing and developing Artificial Intelligence solutions.

LO 3. Design and validate use cases for applying Artificial Intelligence to create effective solutions.

LO 4. Curate, organise and analyse data for Artificial Intelligence projects.

LO 5. Research and document findings about Artificial Intelligence developments.

LO 6. Complete a Capstone Project that encapsulates learning from the content covered on the certificate programme. The capstone project will be an AI or data project that is linked to a practical industry application.

## Learning Components

The table below outlines the sections that will be covered in the programme and when they will be addressed. It also outlines the contact hours per section and the recommended independent study hours.

| Week | Programme Content | No. of Teaching Sessions | No. of Contact Hours | Independent Study Hours |
|---|---|---|---|---|
| **0** | Programme Orientation | 1 | 2 | n/a |
| **1** | Introduction to Artificial Intelligence | 2 | 5 | 12 |
| **2** | Using an Agile Framework and Designing and Architecting AI Solutions | 1 | 2.5 | 6 |
| **2** | AI Tools and Ecosystems | 1 | 2.5 | 6 |
| **3** | Data Visualisation | 2 | 5 | 12 |
| **3** | First 121 Mentoring Session | 1 | 0.5 | n/a |
| **4 & 5** | Introduction to Programming (Python) | 3 | 7.5 | 12 |
| **6 & 7** | Maths, Statistics and Machine Learning with Python | 4 | 10 | 18 |
| **8 & 9** | Machine Learning with Python | 3 | 7.5 | 30 |
| **9** | Second 121 Mentoring Session | 1 | 0.5 | n/a |
| **10** | Maths, Stats and ML recap | 1 | 2.5 | n/a |
| **10** | Data Management and Ethical Practice in Artificial Intelligence, Data Science and Analytics | 1 | 2.5 | 6 |
| **11, 12** | Capstone Project Support | 4 | 10 | 25 |
| Sub Total | | **25** | **58** | **127** |
| **TOTAL LEARNING HOURS** | | **210** | | |

Given the background of the participants for this iteration come from an actuarial background we would propose the following content:

| Week | Programme Content | No. of Teaching Sessions | No. of Contact Hours |
|---|---|---|---|
| **0** | Programme Orientation | 1 | 2 |
| **1** | Introduction to Artificial Intelligence | 1 | 2.5 |
| **1** | Creating and AI Strategy | 1 | 2.5 |
| **2** | Using an Agile Framework and Designing and Architecting AI Solutions | 1 | 2.5 |
| **2** | AI Tools and Ecosystems | 1 | 2.5 |
| **3** | Data Visualisation | 2 | 5 |
| **3** | First 121 Mentoring Session | 1 | 0.5 |
| **4 & 5** | Introduction to Programming (Python) | 4 | 10 |
| **6 & 7** | Machine Learning with Python | 4 | 10 |
| **8** | Deep Learning | 2 | 5 |
| **9** | NLP | 2 | 5 |
| **9** | Second 121 Mentoring Session | 1 | 0.5 |
| **10** | Data and AI Governance | 1 | 2.5 |
| **10** | Ethical Practice in Artificial Intelligence, Data Science and Analytics | 1 | 2.5 |
| **11, 12** | Capstone Project Support | 4 | 10 |

## Assessment

The programme will be assessed using the assessment components listed below. The final mark will be calculated as a weighted average of the assessment components. To pass the programme you are required to achieve an overall of 40% average across all components.

a) **Continuous assessment in the form of MCQs and group work (30%):** At the end of each of the sections in the programme, you will complete an assessment based on the learning material covered. The assessment will comprise online multiple-choice questions, written assignments and technical assignments. Some of these assignments will be group based while others will be individual.

b) **Personal Learning Reflections (30%)**: You will keep a log where you reflect on the learnings from each section and your additional readings. The writing should be in academic style in alignment with specified referencing guidelines. It is expected that you

will read beyond the assigned material for each section. The reflection can be used to personalise the learning to your own areas of interest and to demonstrate critical thinking.

c) **Capstone Project (40%):** The Capstone project will require you to use what you have learnt over the course of the programme to create a solution that leverages AI in a defined problem space. The solution must demonstrate the application of responsible and ethical AI design. You may also choose to work on a data science project. You will be allowed to propose their own project or select from a supplied list. The project will address a specific problem, follow an appropriate analysis, and design process, craft a solution, and demonstrate the key components of the solution using a basic prototype. The Project Initiation Document (PID) will be developed as each section of the programme progresses and will be submitted in advance of the main work on the project commencing. The PID will be assessed and will contribute 5% of the total marks for the programme.

## 2 DEVELOPMENT & DELIVERY TEAM

This programme was expertly designed and developed by Aoife D'Arcy and Dr. Brian Mac Namee, who collectively bring over 40 years of extensive experience in industry and academic research. Their deep expertise spans data science, artificial intelligence, machine learning, and advanced analytics, ensuring that the programme is built on a strong foundation of both theoretical knowledge and practical application. Having worked across multiple sectors, including finance, healthcare, and technology, they have a proven track record of delivering innovative data-driven solutions. Their combined experience enabled them to create a programme that is not only academically rigorous but also highly relevant to real-world business challenges, equipping participants with the skills and knowledge required to succeed in today's data-driven landscape.

The programme will be delivered through a collaborative approach, with Aoife, Brian, the core Krisolis team, and expert faculty members contributing their specialised knowledge in key subject areas, ensuring a comprehensive and high-quality learning experience.

### Aoife D'Arcy: CEO and Co-Founder

Aoife is a business founder, author, and mother with a deep passion for developing data-driven solutions that propel business success. With over 20 years of experience in the field, she has cultivated a strong expertise in data science, machine learning, and artificial intelligence, and has earned a distinguished reputation for delivering high-quality training and mentorship to professionals and organisations alike.

In 2009, Aoife founded Krisolis to bring her vision of developing in-house data talent to life. She firmly believes in the power of cultivating internal expertise, and through Krisolis, she partners with businesses to help them build world-class data science, machine learning, and AI teams. Aoife's approach combines training, consultancy, and mentoring to create customised solutions that empower organisations to effectively harness the full potential of data. Her work is focused not only on advancing technology but also on equipping teams with the skills and knowledge necessary to drive sustainable business growth.

Aoife is also a co-author of the textbook Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples & Case Studies, published in 2015 by MIT Press. Now in its second edition, the book has been translated into Chinese, Korean, Japanese, and Russian, and has sold over 30,000 copies globally.

Aoife's qualifications include an M.Sc. Financial and Industrial Mathematics from Dublin City University and a B.Sc. (Honours) Statistics and Computer Science from Maynooth University.

## Dr Brian Mac Namee: Director of Training and Co-Founder

Brian is a highly experienced academic, entrepreneur, author, and passionate educator with a deep commitment to advancing the fields of data science and artificial intelligence. With a broad range of research interests, Brian specialises in artificial intelligence, machine learning, predictive analytics, and data visualisation. His deep understanding of these areas, combined with his entrepreneurial mindset, allows him to bring innovative solutions to complex problems.

Brian is a respected academic, leveraging his extensive experience to apply research and theory to real-world scenarios. He has a proven track record of translating cutting-edge research into practical, commercial applications, helping organisations harness the power of data to make more informed, strategic decisions.

As a co-founder of Krisolis, Brian has devoted his career to fostering knowledge sharing and teaching, making a significant impact on both his students and the organisations he works with. His leadership and expertise are integral to the development of Krisolis's training programs, ensuring that each course is grounded in the latest academic research and reflects the most current trends in technology and data analytics.

Brian co-authored 'Fundamentals of Machine Learning for Predictive Data Analytics', published in 2015 by MIT Press. The widely used textbook, now in its second edition, has been translated into Chinese, Korean, Japanese, and Russian and has sold over 30,000 copies worldwide.

Brian holds a PhD and BA (mod) in Computer Science from Trinity College Dublin.

## Kieran Towey: Expert Faculty – Head of AI Strategy

Kieran Towey is a visionary and entrepreneurial leader in Data Science and Artificial Intelligence (AI), with over 25 years of experience in setting and executing analytics and AI strategies across various sectors. His career spans major national and international companies, including leadership roles at global management consulting firms such as KPMG and Accenture. Kieran has a proven track record of commercial success, built on a practical approach that centres business value while maximising the return on investment from technology.

Kieran has pioneered the commercial deployment of AI solutions, particularly in high-impact areas such as law enforcement, financial services, and public health. Notable projects include leading KPMG's Applied Intelligence team, which grew from a startup operation to a 140+ member team, delivering significant revenue and supporting critical initiatives like the HSE COVID-19 response. At Accenture, Kieran was instrumental in transforming HSBC's Anti-Money Laundering (AML) operations, delivering substantial efficiency gains and regulatory compliance.

Throughout his career, Kieran has consistently acted as the bridge between business operations and technology, working with diverse organisations to tailor fit-for-purpose strategies. His deep technical expertise is complemented by his ability to communicate complex concepts to non-technical stakeholders, ensuring successful adoption and execution of analytics and AI initiatives.

Kieran holds a Master's degree in Statistics and a Bachelor's degree in Statistics and Mathematics, both from University College Dublin. His commitment to continuous learning and innovation has kept him at the forefront of advancements in data science and AI, enabling him to deliver world-class solutions that drive measurable business outcomes.

## Dr Eoghan Staunton – Senior Training Consultant

With over 12 years' experience, Eoghan is a highly experienced researcher with a deep passion for developing data-driven intelligent systems, visualisation techniques, and applying mathematical principles to solve complex challenges. He has built a reputation for his ability to simplify intricate concepts in data science, mathematics, and technology, making them both engaging and accessible to a wide variety of audiences, from beginners to experts. His skill in breaking down complex ideas ensures that his work resonates across disciplines, fostering understanding and appreciation for these vital subjects.

With an impressive research background in areas such as dynamical systems, network analytics, artificial intelligence, and machine learning, Eoghan has contributed to numerous high-impact research papers. His work seamlessly blends academic rigor with practical application, allowing him to provide innovative solutions to complex problems. This combination of theoretical knowledge and hands-on experience

enables Eoghan to push the boundaries of research while ensuring that the solutions he develops are grounded in real-world applicability.

At Krisolis, Eoghan brings his extensive research expertise to enhance client engagements, helping businesses and organisations not only advance their technological capabilities but also build robust, data-driven strategies. His approach goes beyond technological advancement; he is also committed to training and mentoring teams, empowering them to harness the full potential of data in achieving their strategic objectives. Through his guidance, organisations are equipped to make informed decisions, optimise processes, and achieve sustainable growth.

Outside of his professional commitments, Eoghan is actively involved in coaching sports teams, a role that enriches his approach at Krisolis. Eoghan holds BSc, MSc and PhD degrees in Applied Mathematics from the University of Galway.

## Dr. Mark Belford – Training Consultant

Mark is a dedicated educator, mentor, and expert with a deep passion for Computer Science and Artificial Intelligence (AI). With a distinguished career that spans both academia and industry, he has developed a unique ability to bridge these often separate worlds, offering practical, insightful perspectives in his teaching, mentoring, and consultancy work. Mark's versatility allows him to effectively navigate the complexities of both academic theory and industry application, ensuring that his work remains grounded in real-world relevance while maintaining a strong academic foundation.

Mark holds extensive expertise in Natural Language Processing (NLP) and Machine Learning, two cutting-edge fields in which he published numerous peer-reviewed papers. His academic achievements in these areas, combined with his industry experience, enable him to deliver innovative solutions to complex problems and facilitate effective client engagement. Mark's blend of academic rigor and practical insights fosters the development of robust, data-driven strategies for businesses and organisations seeking to leverage AI technologies.

At Krisolis, Mark plays a key role in shaping the next generation of talent in data science and AI. He is deeply committed to skills development, focusing on more than just knowledge transfer; his goal is to inspire a deep, lasting understanding in his clients. Mark works tirelessly to ensure that those he mentors are not only equipped with the necessary technical expertise but also prepared to thrive in a rapidly evolving technological landscape. Through his guidance, Krisolis clients are empowered to apply their newfound knowledge within their organisations, driving innovation, enhancing decision-making, and achieving strategic objectives.

Mark holds a B.Sc Hons and a PhD in Computer Science from University College Dublin.

## 2.1 EXPERT FACULTY – TRAINERS

### Dr Derek Greene: Expert Faculty - Trainer

Derek is a distinguished academic with over two decades of experience in machine learning and has an impressive record of scholarly contributions. Derek is deeply passionate about merging research with education, which is reflected in the comprehensive and engaging training courses he delivers at Krisolis, where he brings complex concepts to life with clarity and enthusiasm.

His research interests are broad and encompass areas such as machine learning, natural language processing, and social network analysis. Derek is particularly skilled at bridging the gap between cutting-edge research and practical application, making complex technologies accessible and impactful for businesses.

At Krisolis, Derek has taken the lead in the delivery, review and redesign of courses across a number of areas such as Python, SQL, and Network Analysis. Derek plays a key role in showcasing the real-world benefits of machine learning and AI. He helps clients understand how to leverage these technologies to drive their business forward, embodying Krisolis's commitment to delivering practical and actionable data science solutions that have a tangible impact.

Derek holds a BA (Mod) in Information and Communication Technology, as well as a Ph.D at the Department of Computer Science from University College Dublin.

### Anna Cargill: Expert Faculty - Trainer

Anna has had an impressive career spanning over two decades in statistics, data science, and machine learning, with her expertise extending across a wide range of industries. Renowned for her engaging and approachable teaching style, Anna is particularly skilled at breaking down complex topics into understandable and relatable lessons, making advanced concepts accessible to learners of all backgrounds.

At Krisolis, Anna brings her wealth of experience and passion for data to ensure that learning is not only educational but also interactive and enjoyable. She places a strong emphasis on making complex data science topics easily digestible, creating an environment where participants are actively engaged. Her innovative teaching methods, combined with her deep knowledge of data-driven technologies, significantly enhance Krisolis' training offerings.

Her ability to inspire a love for learning in others is one of the key reasons for her success in both her career and personal life. Anna's dedication to fostering growth, whether in the classroom or at home, exemplifies her passion for learning and her commitment to nurturing potential in all areas of her life.

Anna holds a BA in Mathematics from Leeds University and an MSc in Statistics from the University of Reading.

## Dr Jack O'Neill: Expert Faculty - Trainer

Jack has devoted his career to education, with a unique background that spans literature, philosophy, and computer science. His journey—from a student of the humanities to a software developer and lecturer in computer science—reflects his lifelong passion for both learning and teaching. Jack is a dedicated educator who works to inspire a sense of wonder and joy in every subject he teaches, believing in the power of education to transform minds and lives.

His research interests focus on human-in-the-loop machine learning systems and the application of educational theory to computer science. With a strong foundation in both technical and educational disciplines, Jack brings a multifaceted perspective to his work, ensuring his teaching and research remain both innovative and grounded in practical application.

At Krisolis, Jack plays a pivotal role in developing and delivering comprehensive courses in data science and machine learning. Drawing on his extensive knowledge and experience, he creates engaging and high-quality educational programs that not only teach technical concepts but also foster a deeper understanding of how these technologies can be used to solve real-world problems.

Jack holds a BA in English and Philosophy, a M.Sc. in Computing (Data Analytics) and a PhD from the School of Computer Science at Technological University Dublin.

## Dr Kevin Koidl: Expert Faculty - Trainer

Kevin is a prominent expert in the field of artificial intelligence, holding a PhD in AI-based Personalisation Systems from Trinity College Dublin. His academic journey also includes a Dual Masters in Business and Computer Science, as well as a Bachelor of Arts in Philosophy from the Technical University Darmstadt. Kevin's diverse academic background uniquely positions him to bridge the gap between technical innovation and strategic business insights.

Kevin's research primarily focuses on the applications of AI in social media, e-commerce, and other online environments, exploring how these technologies can enhance user experience and drive business growth. In addition to his research, Kevin has an extensive teaching portfolio, having taught a wide range of subjects from undergraduate to postgraduate levels. His expertise spans Natural Language Processing, Business Analytics, and Data Science, providing students and professionals with a robust foundation in both theory and practical application.

At Krisolis, Kevin draws upon his extensive experience in both academic research and industry skills development to enrich the learning experiences of clients. His ability to translate complex data-driven concepts into actionable strategies helps organisations navigate the ever-evolving landscape of AI and data science, empowering them to thrive in today's data-centric world.

Kevin holds a BA in Analytical Philosophy, a Dual Masters in Business Engineering and Computer Science, as well as a PhD in Computer Science from Trinity College Dublin.

## Dr Ellen Rushe – Expert Faculty - Trainer

Ellen is an accomplished AI researcher and with a strong interdisciplinary approach, she has gained extensive experience in applying machine learning techniques to solve real-world challenges. Her innovative work in anomaly detection in audio and gesture recognition in video highlights her ability to harness AI in dynamic and diverse environments, showcasing her expertise in tackling complex problems across different domains.

At Krisolis, Ellen plays a key role in the development and delivery of advanced machine learning and data science programs. She brings her deep knowledge in temporal data and novelty detection to design courses that are not only technically rigorous but also highly relevant to current industry challenges. Ellen works closely with clients to ensure that the solutions and training provided are tailored to their specific needs, empowering them to effectively leverage AI technologies and drive meaningful outcomes in their organisations.

Ellen's contributions extend beyond program development—she is dedicated to bridging the gap between cutting-edge AI research and practical application. Her ability to integrate her academic expertise with industry demands makes her an invaluable resource at Krisolis, helping clients navigate the complexities of AI while fostering innovation and growth within their teams.

Ellen holds a BA in Music Technology and Modern Irish, as well as a Master's and PhD in Computer Science from University College Dublin.

## Dr Anthony Ventresque – Expert Faculty - Trainer

Anthony brings extensive expertise and international experience to his role at Krisolis. Anthony's career has spanned across academia and industry, with notable experiences in Singapore, Ireland, and beyond. His broad international exposure has provided him with a deep understanding of both global technological trends and the unique needs of various industries, allowing him to effectively navigate and address the challenges professionals face in the fast-evolving tech landscape.

In his role at Krisolis, Anthony is a key player in the development and delivery of advanced training programs in computer science, software development, and Big Data. He has a particular focus on supporting the development of courses that bridge the gap between cutting-edge research and practical application. His training style ensures that professionals not only gain a deep understanding of complex technological concepts but also learn how to apply these concepts in real-world scenarios. By combining academic rigor with industry relevance, Anthony's courses empower learners to enhance their technical skills and stay ahead of industry trends.

Anthony is dedicated to ensuring that his training provides long-term value, equipping professionals with the skills they need to excel in a rapidly evolving technological landscape. His focus on Big Data and software development reflects the growing need for organisations to harness these technologies to remain

competitive. Anthony plays a key role in shaping the future of technological education and ensuring that Krisolis remains a leader in the field.
Anthony received his Ph.D. in Computer Science from the University of Nantes & INRIA, France, in 2008.