

# Artificial Intelligence, Object-Oriented Programming and Application of Machine Learning

Live Online / 12 weeks

## A unique live online short course diving into the world of AI, ML, and OOP.

This course, spread over 12 weeks with 36 live online classes, is taught by Zixun Guo and Proud Pulges in collaboration.

The course will equip students with the latest knowledge, hands-on techniques, and industry insights into the methodologies, workflows, and practical applications of AI, ML, and OOP.

The online course includes:

- 3 x 2hr live online classes/week
- All classes recorded for student use (during the course only)
- Interactive group challenges
- "Ask Me Anything" drop-in clinics
- Special guest webinar Q&A sessions
- U W T S D Certificate
- Special offer related to the course (e.g. software discounts, access to premium datasets, etc.)

### About the instructors

**Nicolas Zixun Guo** is a PhD candidate at Queen Mary, University of London. He was previously a Senior Research Assistant in Artificial Intelligence at the Singapore University of Technology and Design (SUTD). An alumnus of Nanyang Technological University (NTU) with Highest Distinction in Electrical and Electronics Engineering, Guo's research traverses music tonality modelling and AI-enhanced music techniques. He's notably earned accolades like the Defence Science & Technology Agency Gold Medal and has been recognized for academic excellence through the NTU Dean's List multiple times.

**Proud Avika Pulges** is a seasoned data analyst trained on Machine Learning at Bloomberg. She earned an MSc/MA in Creative Computing from the University of the Arts, UK, and has programmed professionally in Python, C++, C#, Javascript, Unity, and Unreal. Beyond her technical expertise, Avika has demonstrated proficiency in generative videography, data analysis, and investment banking in Thailand. .

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## Artificial Intelligence, Application of Machine Learning & Object-Oriented Programming

Week	Session	Date	Instructor	Content
1	1.1	06/11/2023 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Introduction to the Course, AI &amp; ML</li> <li>• Overview of AI and its history</li> <li>• Importance of Machine Learning</li> <li>• Course objectives and expectations</li> </ul>
	1.2	08/11/2023 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Basics of Neural Networks</li> <li>• Understanding neurons and layers</li> <li>• Activation functions</li> <li>• Training a neural network</li> </ul>
	1.3	10/11/2023 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Supervised vs Unsupervised Learning</li> <li>• Differences and use-cases</li> <li>• Examples of supervised algorithms</li> <li>• Examples of unsupervised algorithms</li> </ul>
2	2.1	13/11/2023 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Introduction to OOP</li> <li>• Principles of Object-Oriented Programming</li> <li>• Classes and objects</li> <li>• Inheritance, polymorphism, abstraction, and encapsulation</li> </ul>
	2.2	15/11/2023 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Practical OOP with Python</li> <li>• Defining classes in Python</li> <li>• Creating and using objects</li> <li>• Understanding `__init__`, methods, and attributes</li> </ul>
	2.3	17/11/2023 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Advanced OOP Concepts</li> <li>• Overloading and overriding</li> <li>• Protected attributes and methods</li> <li>• Static methods and class methods</li> </ul>
3	3.1	20/11/2023 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Machine Learning Workflow</li> <li>• Data collection and preprocessing</li> <li>• Feature selection and extraction</li> <li>• Model training and evaluation</li> </ul>

	3.2	22/11/2023 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Regression Analysis</li> <li>• Linear regression</li> <li>• Multiple regression</li> <li>• Polynomial regression</li> </ul>
	3.3	24/11/2023 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Classification Algorithms</li> <li>• Logistic regression</li> <li>• k-Nearest Neighbors (kNN)</li> <li>• Decision Trees and Random Forest</li> </ul>
4	4.1	27/11/2023 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Ensemble Methods in ML</li> <li>• Introduction to ensemble learning</li> <li>• Bagging and Boosting</li> <li>• AdaBoost, Gradient Boosting, and RandomForest</li> </ul>
	4.2	29/11/2023 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Support Vector Machines</li> <li>• Basics of SVM</li> <li>• Kernel trick and its importance</li> <li>• Applications of SVM</li> </ul>
	4.3	01/12/2023 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Clustering in Machine Learning</li> <li>• k-means clustering</li> <li>• Hierarchical clustering</li> <li>• DBSCAN</li> </ul>
5	5.1	04/12/2023 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Deep Learning Introduction</li> <li>• What is deep learning?</li> <li>• Neural Networks vs Deep Neural Networks</li> <li>• Applications and importance</li> </ul>
	5.2	06/12/2023 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Convolutional Neural Networks (CNNs)</li> <li>• Introduction to CNNs</li> <li>• Architecture and layers</li> <li>• Applications in image recognition</li> </ul>
	5.3	08/12/2023 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Recurrent Neural Networks (RNNs)</li> <li>• Basics of RNNs</li> <li>• Challenges: vanishing and exploding gradients</li> <li>• LSTM and GRU</li> </ul>

6	6.1	11/12/2023 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>Natural Language Processing (NLP)</li> <li>Introduction to NLP</li> <li>Tokenization, stemming, and lemmatization</li> <li>Text classification and sentiment analysis</li> </ul>
	6.2	13/12/2023 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>Transfer Learning and Pre-trained Models</li> <li>Benefits of transfer learning</li> <li>Popular pre-trained models (BERT, GPT, etc.)</li> <li>Applications and use-cases</li> </ul>
	6.3	15/12/2023 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>Ethics in AI and ML</li> <li>Introduction to ethical considerations</li> <li>Biases in datasets and algorithms</li> <li>Privacy concerns and potential misuse</li> </ul>
7	7.1	18/12/2023 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>Design Patterns in OOP</li> <li>Singleton, Factory, and Observer patterns</li> <li>Importance of design patterns</li> <li>Applications and examples</li> </ul>
	7.2	20/12/2023 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>Advanced Python OOP</li> <li>Magic methods and operator overloading</li> <li>Mixins and multiple inheritance</li> <li>Decorators and meta-classes</li> </ul>
	7.3	22/12/2023 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>Reinforcement Learning Basics</li> <li>Introduction to reinforcement learning</li> <li>Exploration vs exploitation</li> <li>Q-learning and Deep Q Networks</li> </ul>
8	8.1	02/01/2024 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>Feature Engineering and Selection</li> <li>Importance of good features</li> <li>Feature extraction vs feature selection</li> <li>Dimensionality reduction techniques</li> </ul>
	8.2	03/01/2024 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>Model Interpretability</li> <li>Why is interpretability important?</li> <li>SHAP values, LIME, and other methods</li> <li>Applications and use-cases</li> </ul>

	8.3	05/01/2024 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Deployment of ML Models</li> <li>• Introduction to deployment</li> <li>• Cloud platforms and local deployments</li> <li>• Monitoring and maintaining deployed models</li> </ul>
9	9.1	08/01/2024 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Advanced DL Architectures</li> <li>• Generative Adversarial Networks (GANs)</li> <li>• Transformers and attention mechanisms</li> <li>• Autoencoders and their applications</li> </ul>
	9.2	10/01/2024 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Hyperparameter Tuning</li> <li>• What are hyperparameters?</li> <li>• Grid search vs random search</li> <li>• Bayesian optimization</li> </ul>
	9.3	12/01/2024 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Time Series Analysis and Forecasting</li> <li>• Introduction to time series data</li> <li>• ARIMA, Prophet, and LSTM for forecasting</li> <li>• Applications and challenges</li> </ul>
10	10.1	15/01/2024 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Advanced NLP Tasks</li> <li>• Named Entity Recognition (NER)</li> <li>• Text summarization and generation</li> <li>• Question Answering systems</li> </ul>
	10.2	17/01/2024 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Multi-modal Learning</li> <li>• Combining text, images, and other data</li> <li>• Challenges in multi-modal learning</li> <li>• Applications and future directions</li> </ul>
	10.3	19/01/2024 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Advanced RL Techniques</li> <li>• Policy gradients and actor-critic methods</li> <li>• Monte Carlo Tree Search (MCTS)</li> <li>• Applications in gaming and robotics</li> </ul>
11	11.1	22/01/2024 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Advanced Python Topics</li> <li>• Asynchronous programming with asyncio</li> <li>• Memory management and optimizations</li> <li>• Python's GIL and multi-threading</li> </ul>

	11.2	24/01/2024 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> <li>•</li> </ul>
	11.3	26/01/2024 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Real-world ML Challenges</li> <li>• Dealing with imbalanced datasets</li> <li>• Online learning and streaming data</li> <li>• Challenges in deploying and monitoring models</li> </ul>
12	12.1	29/01/2024 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Group Project Overview</li> <li>• Introduction to the project</li> <li>• Expectations and deliverables</li> <li>• Timeline and milestones</li> </ul>
	12.2	31/01/2024 13:00:00	Nicolas Guo	<ul style="list-style-type: none"> <li>• Project Work</li> <li>• Working on individual or group projects</li> <li>• Mentor guidance and feedback</li> <li>• Progress check-ins and adjustments</li> </ul>
	12.3	02/02/2024 13:00:00	Proud Pulges	<ul style="list-style-type: none"> <li>• Project Presentations</li> <li>• Presenting final projects to peers and instructors</li> <li>• Feedback and evaluations</li> <li>• Course wrap-up and next steps</li> </ul>