

Subject Description Form

Subject Code	AMA573
Subject Title	Statistical Machine Learning
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To introduce students some fundamental building blocks in blockchain technology as well as its application in cryptocurrencies, stablecoins, and decentralized finance. Help students to develop practical programming, statistics and mathematical skills that are valued in the FinTech industry.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ul style="list-style-type: none"> (a) Have a good understanding of the basic theory and methods of modern statistical learning. (b) Recognize a wide variety of algorithms to data. (c) Develop skills to assess statistical uncertainties for conclusions based on data and statistical analysis. (d) Develop and implement new methods that are appropriate for specific data problems in applications.
Subject Synopsis/ Indicative Syllabus	<p><u>Introduction</u> Overview of statistical learning, review of nonparametric statistics, introduction to high-dimensional statistics</p> <p><u>Deep Neural Networks</u> Deep neural network functions, nonparametric regression using deep neural networks, error analysis for deep nonparametric regression</p> <p><u>Distribution Learning</u> Nonparametric density estimation, Generative learning: GANs and VAE, Diffusion models, error analysis of distribution learning, applications</p> <p><u>Learning and Optimization</u> Difference between learning and optimization, challenges in neural network optimization, stochastic gradient descent, applications</p>
Teaching/Learning Methodology	The subject will mainly be delivered through lectures and exercise-based tutorials. The teaching and learning approach is mainly problem-solving oriented. The approach aims at the development of financial modeling and quantitative skills and how the techniques can be applied to applications in

	financial technology. Students are encouraged to adopt a deep study approach by employing high level cognitive strategies, such as critical and evaluative thinking, relating, integrating and applying theories to practice.						
Assessment Methods in Alignment with Intended Learning Outcomes	Specific assessment methods/tasks		% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
				a	b	c	d
	1. Assignments/Project		20%	✓	✓	✓	✓
	2. Midterm Test		20%	✓	✓	✓	
	3. Examination		60%	✓	✓	✓	✓
	Total		100%				
	<p>Continuous Assessment comprises of assignments/project and one midterm test. A written examination is held at the end of the semester.</p> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <ul style="list-style-type: none"> - Assignments: help students understand the basic theory and methods of modern statistical learning. - Project: train students' skills to assess statistical uncertainties for conclusions based on data and statistical analysis. - Midterm test: a part of continuous assessment for the theoretical part covered in the subject. - Examination: an overall examination of the theory and statistical learning studied in the whole semester. 						
Student Study Effort Required	Class contact:						
	▪ Lecture		26 Hrs.				
	▪ Tutorial		13 Hrs.				
	Other student study effort:						
	▪ Assignments/Projects		58 Hrs.				
	▪ Self-study		40 Hrs.				
	Total student study effort		137 Hrs.				

**Reading List and
References**

References:

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Bartlett | P.L. | Neural Network Learning:
Theoretical Foundations. | Cambridge
University
Press, 2010 |
| T. Hastie and R.
Tibshirani,
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| C. Bishop | | Pattern Recognition and
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| M. Mohri, A.
Rostamizadeh
and A.
Talwalkar | | Foundations of Machine
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