Module Outline

Programme   : The NUS BBA
Module Code : FIN4721
Module Title : AI, Blockchain and Quantum Computing
Class Date   : From 14/8/2023   To 17/11/2023
Semester   : Semester 1, Academic Year 2023/2024
Location   : TBC
Faculty   : Prof David Lee Kuo Chuen (DL); Dr Lo Swee Won (LSW)
Department   : Finance
Email   : tbc
Note   : Emphasis on AI, videos, hands-on experiences, group presentations and applications.

Overview

This course provides a comprehensive framework and analysis of the latest technological advancements in the financial and insurance sectors, including emerging technologies like AI, Blockchain, Cloud & Cyber Security, Data Analytics, Environmental Friendly Technology, Financial Inclusion, 5G, and Quantum Computing (ABCDEFG-Q). It aims to enhance students' technology literacy and equip them with the tools to critically evaluate inclusive FinTech, Generative AI, and open metaverse projects in a trustless world. The class leverages technology to provide lectures through recorded videos, discussions, AI and quizzes.

Module Objectives

Upon completion of the course, students will be able to:

Grasp the underlying design principles behind technology.
Evaluate inclusive fintech projects with a critical eye.
Appreciate the social and business implications of technology.
Possess the technical skills necessary to address the needs of underserved communities.
Apply learned techniques to real-world scenarios.

Online Rules and Expectations

1. Students are expected to have their computers with them during lectures and actively engage in online chat.
2. Polls will be conducted, and all students must participate and be connected.
3. Video presentations may be shown, and questions can be addressed through the chat or during breaks in the video.
4. This course fosters a peer-to-peer and decentralised learning environment, encouraging maximum student interaction and collaboration.
5. To benefit from the course, regular and active participation in online discussions is crucial.
6. The two-track lectures on AI and Blockchain may run alternatively, depending on the professors' schedules.

Assessment

Assessment Components	Weightage
Weekly Learning Log (5), Weekly Group PPT (5), End of Class Quiz, Chat Discussion and Verbal Participation (5)	15
Group Project	30
Mid-Term Quiz	25
Final Quiz	15

Schedule and Outline

Lesson/ Week	Week Starting	Session (lesson summary or outline / learning objectives/preparation/cases & assignments/follow-up readings & resources) There may be guest speakers, hands-on and/or group discussions every lesson. The syllabus may be updated to the latest information in line with the market.	References (If you are unfamiliar with the technical terms, reading these materials will help you bridge the gap. If you can read it before the class, it will help.)
1	DL	**AI 1: The Why of Tech in Finance - Overview:** Unbundling and bundling of services, LASIC Model, 4Es. Case Study: Ant Financial & Robinhood (To Submit both Study Log and Group PPTs)	**IF: C1** **Reading: 1** **Case: 1**
2	DL	**AI 2: The AI Landscape and FinTech Competition:** US versus China, AI & FinTech Giants **The AI Landscape I and Techniques** Data Structure, Data Storage and Singapore IMDA Plan (To Submit both Study Log and Group PPTs)	**AIQC: C1-4** **AIDB: C1-2** **FFP: C3-4** **Case 2**
3	DL	**AI 3: The AI Landscape II and Business Applications** K-Mean, K Nearest Neighbours, Neural Network, Machine Learning, Deep Learning, CNN (To Submit both Study Log and Group PPTs)	**Lecture Notes** **ATF: C4-5** **FFT: 5-7** **Case 3**
4	DL	**AI 4: The AI Landscape III and Generative AI** GAN, VAE, the importance of Data Privacy Protection, Inclusiveness and Ethics (To Submit both Study Log and Group PPTs)	**Lecture Notes** **AFT I: C4-5** **Case 4**
5	DL	**AI 5: Latest Topcis in AI** ChaptGPT, Metaverse (To Submit both Study Log and Group PPTs)	**Lecture Notes** **Case 5**
6	DL	Mid-Term 25 Multiple Choice Questions Online Test, Open Book, Open Access in 75 minutes from **AI 1-5 lectures and Cases** **Guest Speaker**	
7	LSW	**Blockchain 1: Bitcoin Design Thinking** Hash, PKI, Digital Signature, UTXO, PoW, Byzantine General	**Lecture Notes** **BSC: C1-2** **FF: C15-18** **Case 6**
8	LSW	**Blockchain 2: Ethereum** PoS, Smart Contracts, EOA, Contract Account, MetaMask Wallet	**Lecture Notes** **BSC: C7** **Case 7**

9	LSW	**Blockchain 3: Fungible and Non-Fungible Tokens** ERC20, ERC721, ERC1155, ERC3525 and other tokens	**Lecture Notes** **Case 8**
10	LSW	**Blockchain 4: DeFi** DeFi Applications, Cross Chain, DAO and Voting	**Lecture Notes** **Case 9**
11	DL	**Quantum Computing and Valuation of Fintech** Quantum Hardware, Software, Algorithms and Applications Valuation Methods for Fintech and Asset Allocation	**AIQC: C11** **AIDB: C3-4** **BSC: C4-5** **ATF I: C7** **Case 10**
12	DL	**Presentations by Students (10 mins per group)**	
13	DL	Final Test of 30 Online MCQs, Open Book, Open Access in 1.5 hour for **Lectures from Blockchain 1-4, Quantum Computing and Cases.**	

General Guide & Reading

Main Text and Reading

1. "Inclusive FinTech: Blockchain, Cryptocurrency and ICO", David Lee Kuo Chuen and Linda Low, World Scientific. Topics 1 to 6, 8 and 9. (**IF**)
2. "AI and Quantum Computing for Finance and Insurance", Paul Schulte and David Lee Kuo Chuen, World Scientific. Topics 10, 11, and 12. (**AIQC**)
3. "Artificial Intelligence, Data and Blockchain in a Digital Economy", David Lee Kuo Chuen, World Scientific. Topics 2, 7, 8, and 11. (**AIDB**)
4. "Blockchain and Smart Contracts". Lo Swee Won, Cheryl Wang and David Lee Kuo Chuen, World Scientific, Topics 1-7 (**BSC**)
5. "Foundations for Fintech" David Lee Kuo Chuen, Joseph Lim, Phoon Kok Fai, Wang Yu, Global Fintech Institute – World Scientific Series on Fintech (**FF**)
6. "Applications and Trends in Fintech I", David Leek Kuo Chuen, David Lee Kuo Chuen, Joseph Lim, Phoon Kok Fai, Wang Yu, Global Fintech Institute – World Scientific Series on Fintech (**ATF**)
7. "Fintech for Finance Professionals", David Leek Kuo Chuen, David Lee Kuo Chuen, Joseph Lim, Phoon Kok Fai, Wang Yu, Global Fintech Institute – World Scientific Series on Fintech (**FFP**)

Reading (To Supplement and as ideas for Group Presentations)

1. "Emergence of FinTech and the LASIC Principles", David Lee Kuo Chuen and Ernie Teo, Journal of Financial Perspectives, Vol. 3, No. 3, 2015
   https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2668049
2. "Handbook of Blockchain, Digital Finance, and Inclusion: Cryptocurrency, FinTech, InsurTech, and Regulation"
   David Lee Kuo Chuen, RH Deng – 2018
3. "Handbook of Blockchain, Digital Finance, and Inclusion: ChinaTech, Mobile Security, and Distributed Ledger"
   David Lee Kuo Chuen, RH Deng – 2018 (**HB**)

4. "CRypto IndeX", 2015, by Wolfgang Hardle and Team and initiated by David Lee Kuo Chuen, https://thecrix.de/
5. Decentralisation and Distributed Innovation: Fintech, Bitcoin and ICO's, David Lee, 2018, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3107659
6. The New Money: The Utility of Cryptocurrencies and the Need for a New Monetary Policy, David Lee and Ernie Teo, 2019, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3608752
7. Blockchain Use Cases for Inclusive FinTech: Scalability, Privacy, and Trust Distribution, David Lee and Caroline Lim, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3629135
8. Fintech Tsunami: Blockchain as the Driver of the Fourth Industrial Revolution, David Lee, 2017, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2998093
9. Libra: It is a fine balance, David Lee and Ernie Teo, 2018, https://jupiterchain.tech/facebook-libra/
10. Blockchain and Inclusion, David Lee, 2018, https://vinaj.com/spotlight-series/interview-with-david-lee-kuo-chuen-professor-of-fintech
11. Digital Economy and Blockchain, David Lee, 2020, http://tfageeks.com/2020/05/31/digital-economy-and-blockchain-professor-david-lee-kuo-chuen-professor-of-finance-programme-singapore-university-of-social-sciences/
12. Other articles and cases assigned

Cases
1. Ant Financial: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3052318
2. Trusted Third Party: https://nakamotoinstitute.org/trusted-third-parties/
3. Social Scalability: http://unenumerated.blogspot.com/2017/02/money-blockchains-and-social-scalability.html
4. AI Ethics and Principles: https://www.mas.gov.sg/~/media/MAS/News%20and%20Publications/Monographs%20and%20Information%20Papers/FEAT%20Principles%20Final.pdf
5. ChartGPT Research: TBC
6. Satoshi Nakamoto White Paper (2008) https://bitcoin.org/bitcoin.pdf
7. Smart Contract: https://nakamotoinstitute.org/the-idea-of-smart-contracts/
8. DAO Governance and Voting: Digital Currency 2nd Edition
9. Central Bank Digital Currency: Reading 6
10. Crypto and Asset Allocation: ATF I, C7

Weekly Learning Log and Participation
Submit a 2-page summary in the given format, or complete a weekly group project or quiz (unless there's a short quiz/assignment at the end of class). If you miss a practice quiz for an official reason, submit a learning log to show your views on the lessons.
Each lesson will typically include a case study, and your participation and conclusions are important. Submit the summary/study log by the next lecture using the provided template. This must be done for all 11 lectures (unless the professor decides otherwise for the week) and indicate any absences in the top right corner.
Keep your webcam on during class to be counted as participation, but if not possible, reach out to the professor for permission.
Group Project
Each group will consist of x (class size divided by 10) students with a maximum of 10 groups, formed on **LUMINUS** by students by the second lesson. The presentation will involve a 10-minute PowerPoint presentation of not more than 15 slides (excluding the intro and ending page), followed by a hard copy submission of an essay of no more than 2000 words.
The students will choose a research or discussion topic on AI, Blockchain, and Quantum Computing, either from the course material or beyond, and must apply the concepts taught in the course. All references must be acknowledged on the slides and essay, including figures, diagrams, pictures, and quotes.

Grading will be based on content and presentation flow (20%), analysis and technical expertise (20%), original charts, diagrams, infographics, and figures (50% and most important), and conclusion (10%). Those who create viral-potential infographics can score a full 50 marks.

The video presentation must be pre-recorded and played during class by the professor. If unsure, a 100-word proposal can be submitted to the lecturer by the 8th lesson. Each student will present in the video played during the 12th lesson. During Group 1's presentation, Groups 2, 3, and 4 will comment or ask questions via chat. When Group N is presenting, Groups N+1, N+2, and N+3 will comment. The set is treated as a ring, so when Group 10 is presenting, Groups 1, 2, and 3 will comment.

(Submission: Softcopy of essay (in word only) and PPT (in PPT only) to be submitted the day before presentation in LUMINUS.)

Mid Term Quiz
There will be an open-book and open-access mid-term test.

Final Test
An open-book and open-access final will be at the end of the term.

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Academic Honesty & Plagiarism
Academic integrity and honesty is essential for the pursuit and acquisition of knowledge. The University and School expect every student to uphold academic integrity & honesty at all times. Academic dishonesty is any misrepresentation with the intent to deceive, or failure to acknowledge the source, or falsification of information, or inaccuracy of statements, or cheating at examinations/tests, or inappropriate use of resources.

Plagiarism is 'the practice of taking someone else's work or ideas and passing them off as one's own' (The New Oxford Dictionary of English). The University and School will not condone plagiarism. Students should adopt this rule - You have the obligation to make clear to the assessor which is your own work, and which is the work of others. Otherwise, your assessor is entitled to assume that everything being presented for assessment is being presented as entirely your own work. This is a minimum standard. In case of any doubts, you should consult your instructor.

Additional guidance is available at:

http://www.nus.edu.sg/registrar/adminpolicy/acceptance.html#NUSCodeofStudentConduct

Online Module on Plagiarism:

http://emodule.nus.edu.sg/ac/