Module Outline

Programme   : The NUS BBA
Module Code   : FIN4126/FIN4721
Module Title   : AI, Blockchain and Quantum Computing
Class Date   : From 2/8/2021   To 4/12/2021
Semester   : Semester 2, Academic Year 2021/2022
Location   : Virtual (All classes are online)
Faculty   : David Lee Kuo Chuen
Department   : Finance
Email   : Bizdlkc@nus.edu.sg
Note   : This is an online course due to the technology requirement.

Overview

The course offers a framework and analysis for the current technology landscape across inclusive financial and insurance sectors as well as emerging technologies such as AI, Blockchain, Cloud & Cyber Security, Data Analytics, Environmental Friendly Technology, Financial Inclusion, 5G and Quantum Computing (ABCDEFG-Q). The students will be able to develop critical views of emergent technologies, upgrade their technology literacy and use new approaches to evaluate inclusive FinTech and open metaverse projects in a trustless world. This course is a 100pc online class to take advantage of technology in AI and Blockchain.

Module Objectives

By the end of the course, the students are expected to
(1) understand the design thinking behind the technology;
(2) develop the ability to analyse inclusive fintech projects;
(3) comprehend the impact of technology on the society and business models;
(4) acquire technical knowledge to serve the underserved;
(5) Apply the techniques to real-world use cases.

Online Rules and Expectations

1. Students are expected to be active on the chat while the lecture is in progress via streaming or in person.
2. There will be polls, and all students must be present and connected.
3. Videos may be played, and questions will be answered either via chat or a break in the video.
4. The learning experience is peer-to-peer and decentralised so that maximum interaction and sharing among students are expected.
5. Your participation online is essential to benefit from this course.
6. Unless it is an inconvenience, students webcam is expected to be switched on at all times.

Assessment

Assessment Components	Weightage
Weekly Learning Log and Participation	15
Group Project	30
Mid Term Quiz	30
Final Test	25

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 speaker, handson and/or group discussions every lesson. The syllabus may be updated to the latest information in line with market.	References
1	Monday or Tuesday 3-6 pm	**The Why of Tech in Finance - Overview**: This lesson will give an overview of FinTech, including the definitions, the dynamics, the economics, the unbundling and bundling of services, LASIC Model, the types of FinTech and digital finance, the disruptive nature, and decentralisation. Case Study: Ant Financial	IF: C1 **Reading: 1** **Case: 1**
2		**The AI Landscape and FinTech Competition:** US versus China, AI FinTech Machines. **The AI Landscape I and Techniques** Data Structure, Neural Network and Singapore IMDA Plan	**AIQC: C1-4** **AIDB: C1-2** **Demo 1**
3		**The AI Landscape II and Business Applications** K-Mean, K Nearest Neighbours, Deep Learning and Business Applications	**Lecture Notes** **Demo 2 and 3**
4		**The AI Landscape III and Skynet** NLP, Deep Fakes, the importance of Data Privacy Protection, Inclusiveness and Ethics	**Lecture Notes** **Demo 4 and 5**
5		**The Product - Digital Currency, Bitcoin, and Cryptocurrency**: This lesson will cover the topics on Global Financial Crisis, the evolution of digital currency, nature and types of digital currency, eCash and pioneer cryptocurrencies, Bitcoin, mining, security, basic cryptography, payments, the impact of digital currency, risk, returns, complexity, and future of FinTech.	IF: C2 **Cases: 2**
6		**FinTech Valuation, Token Economics, Crowd Sales and Asset Allocation -** This lesson will cover different methods of valuation and analysis for FinTech projects such as TAM/SAM/SOM, 2Es, 3Cs, 6Ds, 7Ws, LASIC, PESTEL, SWOT, and crypto-token fund-raising methods including the most basic forms (ICO, IEO, STO), definitions, types, risk, returns, complexity, rights, designs, regulation, and other variants of Token Swaps and initial offerings. This lesson also covers the technical and statistical analysis of the drivers of returns, including philosophy, economics, incentives, behaviour, and	IF: C3, C4 **Main Reading: 2** **Reading: 4,5,6** **Case: 3**

		technology designs for the digital asset class. The challenges of asset allocation decisions of a class of nascent and emerging FinTech engineering products will be discussed.	
7		**The Financial Technology - Blockchain I**: This is the first of two lessons on the blockchain. This first lecture covers the cypherpunk's philosophical origin of blockchain, features, applications, government and enterprise perspectives, and use cases.	**HB: C7; IF: C5,6** **AIDB: 3-4**
8		**The Deeper Technology - Blockchain II**: This lesson is a technical introduction to blockchain and covers the characteristics of public, private, consensus algorithms, distributed ledgers, and blockchain cryptography for distribution of trust and protection of privacy. **(Mid-Term 30 Multiple Choice Questions Online Test, Open Book, Open Access in 1.5 hours from the beginning of the class)**	**HB: C7; IF: C5,6** **AIDB: 3-4**
9		**The Design Thinking – Blockchain III**: This lesson will cover the thinking process for corporate implementation for blockchain. The importance of ideas such as FOMO (Fear of Missing Out), sustainability, inclusive finance will be covered to understand the landscape for blockchain. Guest Speaker	**HB: C7; IF: C5,6** **AIDB: C3-4** **Reading: 7,8,9,10,11,12,13** **Case: 4**
10		**DCEP, 5G, and the Metaverse Created by Meta (Facebook):** Analysing Diem (Libra) Coin with JP Morgan Coin, Goldman Coin, Theta and other Corporate CryptoTokens. The Central Bank Digital Currency – DCEP: Analysing cryptocurrency issued by Government and in particular the Digital Payment and Electronic Payment Currency by the Chinese Government. The landscape in China, FinTech Chip and Cloud Wars: Case study on Huawei and the Global AI Chip War	**Reading: 9 - Paper by Professor to the European Parliament** **AIQC: C7-9, 12** **Case: 5**
11		**Quantum Computing** This lecture covers the potential of Quantum Computing in Finance and Insurance.	**AIQC: C11** **AIDB: C3-4**
12		**Presentations by Students (15 mins per group)**	
13		**Final Test of 25 Online MCQs, Open Book, Open Access in 1 hour.**	

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. "Cryptocurrency: A New Investment Opportunity?" David Lee Kuo Chuen, Li Guo, and Yu Wang, The Journal of Alternative Investments Winter 2018, 20 (3) 16-40; DOI: https://doi.org/10.3905/jai.2018.20.3.016. Topic 7. (**JOAI**)
3. "AI and Quantum Computing for Finance and Insurance", Paul Schulte and David Lee Kuo Chuen, World Scientific. Topics 10, 11, and 12. (**AIQC**)
4. "Artificial Intelligence, Data and Blockchain in a Digital Economy", David Lee Kuo Chuen, World Scientific. Topics 2, 7, 8, and 11. **(AIDB)**
5. "Blockchain and Smart Contracts". Lo Swee Won, Cheryl Wang and David Lee Kuo Chuen, World Scientific, Topics 1-7 **(BSC)**

Supplementary Reading

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. "Evaluating the Potential of Alternative Cryptocurrencies", B Ong, TM Lee, G Li, David Lee Kuo Chuen - Handbook of digital currency, 2015
5. "Bitcoin IPO, ETF, and Crowdfunding", ND Bhaskar, LP Nian, David Lee Kuo Chuen - Handbook of Digital Currency, 2015
6. "CRypto IndeX", 2015, by Wolfgang Hardle and Team and initiated by David Lee Kuo Chuen, https://thecrix.de/
7. Decentralisation and Distributed Innovation: Fintech, Bitcoin and ICO's, David Lee, 2018, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3107659
8. 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
9. 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
10. Fintech Tsunami: Blockchain as the Driver of the Fourth Industrial Revolution, David Lee, 2017, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2998093
11. Libra: It is a fine balance, David Lee and Ernie Teo, 2018, https://jupiterchain.tech/facebook-libra/
12. Blockchain and Inclusion, David Lee, 2018, https://vinaj.com/spotlight-series/interview-with-david-lee-kuo-chuen-professor-of-fintech
13. 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/
14. 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/
Social Scalability: http://unenumerated.blogspot.com/2017/02/money-blockchains-and-social-scalability.html

3. Central Bank Digital Currency: Readings to be given
4. Satoshi Nakamoto White Paper (2008) https://bitcoin.org/bitcoin.pdf
Libra 2.0: https://libra.org/en-US/white-paper/
Libra Technical Paper: https://developers.libra.org/docs/the-libra-blockchain-paper
5. Smart Contract: https://nakamotoinstitute.org/the-idea-of-smart-contracts/
6. Ethereum, DeFi and NFTs: Readings to be given.

Weekly Learning Log and Participation

Students are to submit a copy of the summary (not more than 2 full A4 pages of the same format given), a weekly group project or a quiz. It is important to have more of your own views after digesting the lessons. There will usually be a case study for each lesson, and the conclusions and participation are essential. The summary/study log (see the template) will have to be submitted latest by the next lecture. The summary/study log is needed for each of the lecture 1-11, and please state clearly on the right-hand top corner that you have been absent for the particular class.

As a general rule, the webcam should be on all the time to be counted as your class participation. If it is not convenient, send a message to the professor to seek permission and it is likely to be granted.

Full 15 marks will be given to those who participate fully in the lessons and discussions and submit the study log on time.

Group Project

Every group will consist of x (class size/10) students (maximum 10 groups and the groups will be formed on LUMINUS by students by the 2nd lesson), and a PowerPoint Presentation of not more than 15 slides (including the intro and ending page) are to be presented within 15 minutes during the 12th lesson. An essay of not more than 2000 words is to be submitted together with the PPT slides in hard copy. The students will choose the research or discussion topic on AI, Blockchain, and Quantum Computing either taught during the course or beyond. The essay and presentation must apply the concepts taught in the course. All references must be clearly acknowledged on the slides and documents, including figures, diagrams, pictures, or quotes. Marks are given for Content and presentation flow (20pc), Analysis and technical expertise (20pc), Original charts, diagrams, infographics and figures (50pc and the most important), and Conclusion (10pc). Those who can produce one or two infographics that have the potential to go viral online can score full the 50 pc. The video can be pre-recorded and played during the presentation by the professor. A proposal of not more than 100 words must be submitted to the lecturer by the 8th lesson. Every student is to present in the video or during the 12th lesson. When Group 1 is presenting, Groups 2,3,4 are to comment via the chat. When Group N is presenting, Groups N+1, N+2, N+3 will comment. You can treat the set as a ring so that when Group 10 is presenting, we start with 1+2+3.

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

Mid Term Quiz

There will be an open book term test of 30 multiple-choice questions (1 mark per question) during the 8th lesson. The materials tested will include those from Lessons 1-7, including the group discussions and the associated discussions papers.

Final Test

There will be an open book, open access final test of 25 multiple-choice questions (1 mark per question) during the 13th lesson. The materials tested will include those from Lessons 8-12, including group discussions and the associated discussion papers.

+++++++++++
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/