Module Outline

Program : The NUS BBA
Module code : FIN4721
Module title : AI, Blockchain & Quantum computing
Class date : 9-Jan-2023 to 22-Ap2023
Location : At the campus
Faculty : Sarat Mohanty
Department : Finance
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Overview

The course offers a framework and analysis for the current technology landscape across inclusive financial institution sectors as well as emerging technologies such as AI, Blockchain, Machine Learning, Cloud Computing, Cyber Security, Data Analytics, IoT, Banking as a Service, API Banking and Quantum Computing. The students will be able to develop critical views of emergent technologies, upgrade their technology literacy and use new approaches to evaluate inclusive FinTech projects in a trustless world.

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) application of technology in the financial industry
(4) comprehend the impact of technology on the society and business models;
(5) acquire technical knowledge to serve the underserved;
(6) Apply the techniques to real-world use cases.

Assessment

Assessment Components	Weightage
Weekly Learning Log and Participation	15
Group Project	40
Mid Term Quiz	20
Final Test	25

Schedule & Outline

Lesson/ Week	Week Starting Jan9/16/23/30 Feb 27 Mar 6/13/20/27 Apr 3/10	Session (lesson summary or outline / learning objectives / preparation / cases & assignments / follow-up readings & resources) There will be guest speaker, hands-on and/or group discussions every lesson.	References
1	Wed & Thu 6.30pm-9.30pm Jan 11 & 12	- **Introduction to the course module** - **Digital Transformation in Finance industry:** This lesson will give an overview of the digital transformation happening in the financial services industry.	Lecture notes Reading ref: RR-001
2	Wed & Thu 6.30pm-9.30pm Jan 18 & 19	**Introduction to Fintech, evolution of money, digital currency:** This lesson will give an overview of FinTech including the definitions, the dynamics, the economics, the model, types of FinTech and digital finance, the disruptive nature, and decentralization. Changing landscape of financial institution technology solution, emergence of banking as a service, API economy etc. **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, behavior, and 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. **Industry Guest Speaker: TBD**	Lecture notes Reading ref: RR-002 & RR-003

3	Wed & Thu 6.30pm- 9.30pm Jan 25 & 26	**AI - I** **Introduction to Artificial Intelligence (AI) & its application in Finance industry.** This lesson will help to understand the concept of AI, its usage in the Finance industry, importance of data science & analytics, predictive model etc. **The AI Landscape II and Business Applications** K-Mean, K Nearest Neighbors, Deep Learning and Business Applications **Industry Guest Speaker: TBD**	Lecture notes
4	Wed & Thu 6.30pm- 9.30pm Feb 1 & 2	**AI – II:** **The AI Landscape & business landscape** NLP, Deep Fakes, robo financial advisor, the importance of Data Privacy Protection, Inclusiveness and Ethics. Better decision making by leveraging AI for financial, learn how unstructured data can be integrated with structured data to enhance decision making such as improving financial forecast accuracy using various AI techniques. **Industry Guest Speaker: TBD**	Lecture notes Reading ref: RR-006
5	Wed & Thu 6.30pm- 9.30pm Feb 8 & 9	**Blockchain – I** **The Financial Technology - Blockchain I**: This is the first of two lessons on blockchain. This first lecture covers the origin of blockchain, features, applications, government and enterprise perspectives, and use cases. **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. **Industry Guest Speaker: TBD**	Lecture notes Reading ref: RR-007
6	Wed & Thu 6.30pm- 9.30pm Feb 15 & 16	**Blockchain - II:** **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. **The Design Thinking – Blockchain III:** This lesson will cover the thinking process for corporate implementation for blockchain. The importance of ideas such as FOMO	Lecture notes Reading ref: RR-008

		(Fear of Missing Out), sustainability, inclusive finance will be covered to understand the landscape for blockchain. **Industry Guest Speaker: TBD**	
Mid-Term Test	Mar 2 6.30-7.30pm	**(Mid-Term 30 Multiple Choice Questions Online Test, Open Book, Open Access in 1.5 hours from the beginning of the class)**	Lecture notes 2-6
7	Wed & Thu 6.30pm-9.30pm Mar 8 & 9	**API Economy In Financial Services:** This lesson will cover the open banking technology services, ease of integrating banking systems with external parties to facilitate real-time digital banking. Relevance to Fintech & a key success factors for digital transformation using Blockchain, AI etc. **Industry Guest Speaker: TBD**	Lecture notes Reading ref: RR-009
8	Wed & Thu 6.30pm-9.30pm Mar 15 & 16	**Cloud Computing:** This lesson will cover a) Introduction to cloud computing, b) benefits of cloud computing, c) types of cloud computing & d) different services offered in cloud computing. **Industry Guest Speaker: TBD**	Lecture notes
9	Wed & Thu 6.30pm-9.30pm Mar 22 & 23	**Cyber Security & AML:** Introduction to Cybersecurity, Cyberattacks a profession, importance of Passwords in Cybersecurity, dealing with real-time threats. **Industry Guest Speaker: TBD**	Lecture notes
`10	Wed & Thu 6.30pm-9.30pm Mar 29 & 30	**Quantum Computing** This lecture introduces the concept, fundamentals & application of Quantum Computing in the digital age of computing in Financial Institution. **Industry Guest Speaker: TBD**	Lecture notes Reading ref: RR-010
11	Wed & Thu 6.30pm-9.30pm Apr 5 & 6	**Group Project Assignment Presentations by Students (15 mins per group) – 1st batch**	
12	Wed & Thu 6.30pm-9.30pm Apr 12 & 13	**Group Project Assignment Presentations by Students (15 mins per group) – 2nd batch**	
Final Test	Apr 22 6pm to 7.30pm	**Final Test of 30 Online MCQs, Open Book.**	**Lecture materials 7-10**

General Guide & Reading

Main Text and Reading

1. Reading ref – RR-001
   Becoming more than a bank: Digital transformation at DBS
   https://www.mckinsey.com/industries/financial-services/our-insights/banking-matters/becoming-more-than-a-bank-digital-transformation-at-dbs

2. Reading ref: RR-002
   How a digital bank revolution is transforming banking and financial services in Asia by
   https://www.ocft.com.sg/digital-banking-solutions/

3. Reading ref: RR-003
   Finance, technology and disruption by Jiafu An &Raghavendra Rau
   https://www-tandfonline-com.libproxy1.nus.edu.sg/doi/full/10.1080/1351847X.2019.1703024

4. Reading ref: RR-004
   Patterns of digitization, a Practical Guide to Digital Transformation by Paul Mugge, Haroon Abbu, Timothy L. Michaelis, Alexander Kwiatkowski & Gerhard Gudergan
   https://www-tandfonline-com.libproxy1.nus.edu.sg/doi/full/10.1080/08956308.2020.1707003

5. Reading ref: RR-005
   The bitcoin innovation, crypto currencies and the Leviathan by Damodaran Appukuttan Nair
   https://www-tandfonline-com.libproxy1.nus.edu.sg/doi/full/10.1080/2157930X.2018.1502249

6. Reading ref: RR-006
   Fundamentals of Artificial Intelligence by K.R Chowdhari
   https://linc.nus.edu.sg/record=b4207140

7. Reading ref: RR-007
   Blockchain: Hype or Innovation by Tatiana Gayvoronskaya, Christoph Meinel
   https://linc.nus.edu.sg/record=b4258028

8. Reading ref: RR-008
   A Blockchain, Smart Contract and Data Mining Based Approach toward the Betterment of E-Commerce, by Tahmid Hasan Pranto, Abdulla All Noman, Mustafizur Rahaman, A. K. M. Bahalul Haque, A. K. M. Najmul Islam & Rashedur M. Rahman
   https://www-tandfonline-com.libproxy1.nus.edu.sg/doi/full/10.1080/01969722.2021.2018545

9. Reading ref: RR-009
   The Next Phase of the Banking Open API Journey, by HKMA & Accenture
   https://www.hkma.gov.hk/media/eng/doc/key-functions/ifc/fintech/The_Next_Phase_of_the_Banking_Open_API_Journey.pdf

10. Reading ref: RR-010
    Quantum Computing: An Applied Approach
    https://link-springer-com.libproxy1.nus.edu.sg/content/pdf/10.1007/978-3-030-83274-2.pdf

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. Ethereum, DeFi and NFTs: Readings to be given.

Weekly Learning Log and Participation (15%)
Students are to submit a copy of the summary (not more than 1 full A4 page) of the concepts' discussions and applications after each lecture. It is important to have more of your own views after understanding the lessons 1-10.

Group Assignment Project Presentation (40%)

Learning objective:
The final project is designed to reinforce concepts and understand the application of Blockchain, AI, Quantum computing by analyzing the trends and opportunities in a financial sector. You should combine research into Digital resources to create a compelling paper that explains adoption of new technologies.

Activity:
Your Final Project is a group work where all members in the group will contribute to the group work. Form a team of not more than 5. Highly recommend choosing your colleagues carefully before lesson 7 so you can complete the assignment on time and with everyone putting in a fair share of effort.

You are part of reputed digital consulting company. Your company has been hired by a large bank to make a recommendation on digital transformation. The has allotted 20 million USD to implement new digital technology transform into the new age digital solution. You are advising the CIO & CEO of the bank how your recommendation can transform the company's digital landscape.

Your group work should be built upon the topics covered during lesson 1-10. Groups should ensure that one student individually addresses each of the following areas:

Contents:
Problem statement (1 slide)
Technology innovation in digital banking (2 slides)
Recommendations on digital banking (3 slides)
Implementation (2 slide)
Risks & challenges (1 slide)
Conclusion (1 slide)

Scoring criteria		
Excellent Point: 9 - 10	Satisfactory Point: 6 - 8	Poor Point: 0 - 5
Very clearly articulated the approach, recommendation is compelling, state of the art in this field, CIO & CEO are fully convinced to implement the recommendation. Recommendations are in-line with the external reality, threat to banks from FinTechs, embrace the technology or close the door for business in future. Reader gains insights. Use of references: Compelling evidence is given to support claims and attribution is clear and fairly represented. All sections are well organized. A clear central theme is throughout and justified by references and logical connections. Experience with the FinTech industry is clearly shown. Meaning the team has gone out and found interesting content.	Meets expectations: - Clear understanding of the recommendations & implementation approach. - clear understanding of the group's perspective and viewpoint Information provides firm support for the thesis and displays evidence of a basic analysis of a sufficiently limited topic. Reader gains some insights. Use of references: References to support claims are present.	Unclear or difficult to follow the recommendation, justification & benefits. Difficult and missing pro's & cons of state of the art Paper does not successfully identify the thesis. Analysis is vague or not evident. Reader is confused or may be misinformed. Use of references: Although occasional references are provided, the writer over relies on unsubstantiated statements. The reader is confused about the source of the ideas.

Guidelines on presentation:

- Each group will be allotted 30 min (strictly)
- 20 min presentation
- 10 min challenge & feedback session by other groups

Point Weightage:

- 60% on presentation
- 40% on challenge, & constructive feedback to a group

Submission Instructions

- Submit to LuminNUS by 11:59am on the day of the presentation
- Submission File Name: GroupXX.PDF
- Submission Folder: Final Group Report

Mid-term quiz (20%):

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 2-6, including the group discussions and the associated discussions papers.

Final Test (25%)

There will be an open book, final test of 30 multiple-choice questions (1 mark per question). The materials tested will include those from Lessons 7-10, including group discussions and the associated discussion papers.

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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/