NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE | Nanyang Business School

FE8828
FE8828 Programming Web Applications in Finance

Academic Year	:	2018/2019	**Mini Term**	:	3
Pre-requisites	:	N/A			

Course Description and Scope

This course aims to teach how to build web-based applications for finance. It includes three parts:

1. How internet works, how to create a website with cloud computing infrastructure like Amazon Web Services.
2. How to use data manipulation and data visualization to carry out exploratory data analysis.
3. How to build finance application which combines data, model and analysis.
4. How to build data-driven reports and dashboard, interactive rich data visualization in browser.
5. Latest internet technology in cryptocurrency and payment system like Bitcoin and Blockchain.

Scope

- Students can pick up new programming languages quickly, new programming paradigm (reactive, object-oriented) quickly, new functional libraries quickly.
- Students can tackle problem solving in large and small scales, i.e., understanding the structure of web/browser and make use of it
- Student can plan to build application with different input and output to satisfy needs of analytics.
- Students can independently and confidently complete computing projects.

Course Learning Goals, Objectives & Assessment

Learning Goals[1]	**Course Learning Objective**[2]	**Assessment Method**[3] **(For each learning goal, briefly describe the assignment(s) to be used for assessing the achievement of the stated objectives)**	**NBS Standard Rubrics**[4] (For each learning goal, state the actual rubric to be used for grading the assignment(s) described)
Use cloud services to host data-driven web application	Understanding how internet and network protocol works.	Assignment: Learn and use various AWS services cohesively: Route53, EC and S3 to build a website	Use cloud services to host data-driven web application
Use programming language to process, manipulate and present data	Know how to program R to analyze data and build data-driven interactive applications	• Logic thinking of data processing technical. • Clarity in data visualization	Use programming language to process and present data Use programming language to build application

Build data-driven web-based application		• Dealing the complexity of handling user-interaction.	
Understand how Blockchain works	Able to prototype Blockchain-based application	1. Examine the needs for such technology 2. Analyze its current impact and value Deriving ideas for next-generation applications.	Understand how Blockchain works

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Acquisition of Knowledge	Pick up new knowledge and technology quickly. Active learning to related Able to prototype system	Assignment that needs students to interact with 3rd party service provider. Result is open-ended, so students can learn proactively.	
Quantitative Literacy Skills	Know how data and flow of data plays central role in current business world. There are three areas: • Logic thinking of data processing technical. • Clarity in data visualization • Dealing the complexity of handling user-interaction.	Two stages approach: 1. Step-by-step guided tutorial for the completeness of an application 2. Open-end assignment: given pieces of data, how to prototype a data service around it.	
Ethical Reasoning	Blockchain is an emerging technology that its use is wide-open. Students shall grow independent thinking about the application of such technology.	• Able to prototype Blockchain-based application • Deriving ideas for next-generation applications.	

	• Examine the needs for such technology • Analyze its current impact and value		
Oral Communication Written Communication Teamwork & Interpersonal Skills Motivation & Development of Self & Others	We are set in a business environment that is fast-paced and demands team works. Students are grouped to form a virtual "bank" at the beginning of the course. Both assignment and final project need the team to rotate their roles (lead, tech, business, sales, etc) and present the result.	I will assess the project based on: • Overall product • Each member's role-playing and individual contribution • Oral and written communication in presentation and writing.	

Learning & Teaching Methods

Stage	Objective	Teaching Method
Build the foundations	To bring eloquence to languages and tools	Lecture
Challenge for application building	To follow instructors' steps to build own applications	Guided exercise. Group-based. Presentation.
Extend to thought-provoking topics	To present various novel ideas that make Bitcoin and Blockchain working	Lecture and seminar-based. Group-based. Discussion.

Course Assessments

Components	Marks	Individual/Group
Assignment (1st to 4th week)	10 + 10 + 20 + 10	Individual
Class participation	10	Individual
Final project	40	Group
Total	**100**	

Readings and References

R for Data Science: Import, Tidy, Transform, Visualize, and Model Data (05 January 2017) by Hadley Wickham, Garrett Grolemund

Bonnie Eisenman. 2016. Learning React Native: Building Native Mobile Apps with Javascript (1st ed.). O'Reilly Media, Inc..

Other Resources

1. “Genesis” Nakamoto, Satoshi (24 May 2009). "Bitcoin: A Peer-to-Peer Electronic Cash System"
2. https://medium.com/@ConsenSys/a-101-noob-intro-to-programming-smart-contracts-on-ethereum-695d15c1dab4#.rahuuy8uh
3. https://bitsonblocks.net/2016/02/01/a-gentle-introduction-to-smart-contracts/
4. Hard fork of Ethereum after a hacker stole tens of millions of dollars worth of digital currency.
5. Bank of England: Staff Working Paper No. 605: The macroeconomics of central bank issued digital currencies - John Barrdear and Michael Kumhof

Course Instructors

Instructor	Office Location	Phone	Email
Yang Ye		+65 9382 6762	yy@runchee.com

*****Please indicate the course coordinator with a “#” next to instructor name (if applicable)

Proposed Weekly Schedule

Week	Topic	Learning Objectives	Readings/Activity
1/2	Foundation for Web-based Application	1. What’s internet and network protocols 2. Language: HTML/CSS/Markdown/JavaScript/R 3. Development tools and Cloud tools	Lecture/Reading/Hands-on
3/4	Intermediate R programming Data Manipulation, Visualization and Exploratory Data analysis	4. R programming skills 5. Master the use of tidyverse packages to carry out data analysis and visualization.	Lecture/Reading/Hands-on
5	Applications	6. Design web-based dashboard and	Lecture/Reading/Hands-on

		interactive application	
6	Blockchain and Bitcoin	7. How Blockchain works. 8. Blockchain's application	Lecture/Reading/Hands-on

Academic Integrity Policy

NTU's Student Academic Integrity Policy requires all members of the NTU community to uphold the values of academic integrity in all academic undertakings. The policy defines the following acts as academic dishonesty:

- plagiarism,
- academic fraud and
- facilitating academic dishonesty.

All students are expected to read and observe the policy guidelines detailed at this website: http://www.ntu.edu.sg/ai/Pages/academic-integrity-policy.aspx . The academic integrity website also highlights the penalties that will be imposed on students who are found to have violated the policy, and the processes that will be followed when we deal with cases of academic dishonesty.

Appendix
For instructor reference only
(Do not print for students)

Further description of each Assessment Plan component:

[1]NBS Learning Goals
Acquisition of Knowledge | Ethical Reasoning | Quantitative Literacy Skills | Oral Communication | Written Communication | Teamwork & Interpersonal Skills | Motivation & Development of Self & Others

[2]Course Learning Objectives
Related to the expected learning goal(s) | Are observable and measurable

[3]Assessment Method
Assignments specially designed to assess students' achievement of the stated objectives, e.g., the use of an article critique for assessing critical thinking skills, an analysis of a dilemma for assessing ethical reasoning, etc.

[4]NBS Standard Rubrics
Criteria in rubrics must relate closely to the stated objectives | Strongly encouraged to use the NBS standard rubrics, and you may add on other criteria relevant to your assessment | NBS Office of Accreditation (AO) can assist you with rubrics that are aligned to the NBS learning goals[1]