NAME OF SCHOOL: School of Economics

ACADEMIC PROGRAMME: Master of Science in Financial Economics (MSFE)

INSTRUCTOR: XIE Tian, Associate Professor
Email: tianxie@smu.edu.sg

LOCATION: online

CLASS HOUR:

SECTION A – FOR COURSE APPROVAL

COURSE CODE: **Econ.685**

COURSE TITLE: ***Machine Learning in Economics and Finance***

COURSE DESCRIPTION

This course provides an overview of Machine Learning (ML) principals. The goal of the course is to teach you the basics of the ML theory and practice of ML algorithms. The course will build upon the knowledge and skills you gained in econometrics and statistics courses. Students will learn how to interpret, design, and execute empirical projects using software and skill building in critical thinking and problem solving will also be emphasized. We will additionally explain important issues and topics that recently happened in the ML literature.

LEARNING OBJECTIVES

After completing this course, you will be able to:

- Carry out a simple empirical exercise using ML methods
- Summarize and interpret ML results
- Be able to discuss the differences between alternative methods commonly used in ML projects
- Be able to critically evaluate empirical analyses and carry out data-oriented research on your own
- Improve your understanding of how ML theory/algorithms are tested with data

PRE-REQUISITE/CO-REQUISITE/MUTUALLY EXCLUSIVE COURSE(S)

Please refer to the Course Catalogue on OASIS for the most updated list of pre-requisites / co-requisites for this particular course.

Do note that if this course has a co-requisite, it means that the course has to be taken together with another course. Dropping one course during BOSS bidding would result in both courses being dropped at the same time.

COURSE AREA

Elective

GRADING BASIS

Graded

FIRST OFFERING TERM

Academic Year: AY2020/2021

Academic Term: Term 2

SECTION B - COURSE OUTLINE/ASSESSMENT

ASSESSMENT METHODS

Assignments (40%)
Class Performance (10%)
Final exam (50%)

There will be two assignments handing out. You are allowed to **work in a group** of no more than 5 (including 5) students and submit one copy of your assignments. You must state all the group members' names clearly on the cover page. All group members will receive equal marks. It is your responsibility to make sure that all group members contribute in completing your assignments. You can switch groups between the assignments.

ACADEMIC INTEGRITY

All acts of academic dishonesty (including, but not limited to, plagiarism, cheating, fabrication, facilitation of acts of academic dishonesty by others, unauthorized possession of exam questions, or tampering with the academic work of other students) are serious offences.

All work presented in class must be the student's own work. Any student caught violating this policy may result in the student receiving zero marks for the component assessment or a fail grade for the course. This policy applies to all works (whether oral or written) submitted for purposes of assessment.

Where in doubt, students are encouraged to consult the instructors of the course. Details on the SMU Code of Academic Integrity may be accessed at http://www.smuscd.org/resources.html.

INSTRUCTIONAL METHODS AND EXPECTATIONS

There are many ways to learn. And different styles are more effective for some students than others. Therefore, we will utilize several different approaches: straight lectures, debates, student presentations, classroom discussions, problem sets, and exam preparation. Although the lectures we will provide in the classroom are central to your learning, they are only one source of information. Moreover, one of the skills you must learn is to teach yourself: What information do I need to answer the question at hand? Where do I find the information I need? How do I learn to evaluate the information I do have? What don't I know to be able to answer the question? Therefore, during most of our class time we will lecture, but it will be assumed that you will be an active participant in the discussion by answering questions that your classmates and instructors pose during class.

CLASS TIMINGS

This course will be taught in one 3-hour session each week. If the class falls on a public holiday, the university will schedule another time to conduct make-up lessons.

RECOMMENDED TEXT AND READINGS: (RT)

"Statistical Learning from a Regression Perspective" (2nd Edition) by Richard A. Berk.
ISBN-13: 978-3319440477
ISBN-10: 3319440470

SUPPLEMENTARY SUGGESTED READINGS: (SR)

"The Elements of Statistical Learning" (2nd Edition) by Trevor Hastie, Robert Tibshirani, and Jerome Friedman
ISBN-13: 978-0387848570
ISBN-10: 0387848576

WEEKLY LESSON PLAN

Week No.	Starts on	Learning Objectives	Concepts / Topics Covered Required Reading
1		Math Review and Introduction to R	
2		Splines and Smoothing	RT Chapter2, SR Chapter 3
3		Classification and Regression Trees	RT3, SR9
4		Bootstrap and Bagging Tree	RT4, SR9, SR11
5		Random Forest and Boosting Tree	RT5, SR11, RT6
6		Support Vector Machines and Hybrid Tree	RT7, SR12
7		Final Exam	