



MSc in Accounting (Data & Analytics)
ACCT653
Forecasting and Forensic Analytics
 Course Outline 2023/2024 Term 2

A. Instructor and general information

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Class hours: Mondays, 7-10:15pm, starting from 8 Jan 2024 (please take note that there are no classes on 12 and 26 Feb and there is one make-up class on 24 Feb)

Consultation hours: by appointment at <https://calendly.com/jiweiwang> or email me if you cannot find a suitable time slot through calendly.

B. Course Prerequisites

Applied Statistic for Data Analysis

R programming skill is a must and Python is optional. The instructor will provide code in R and some in Python. Students are required to [install R](#) on their laptops. R is a free statistical language widely used by data science professionals. Students are recommended to install [RStudio](#) on their computers, a free R editor.

For macOS users, you must install versions of R and RStudio which support your computer, especially for Apple silicon Macs (M1 and higher).

C. Course Description

This course explores how financial statement data and non-financial metrics can be linked to business strategy and future enterprise performance. Students will use analytics techniques acquired from prior courses to explore how data is used to assess what drives financial performance and to forecast future financial scenarios. By the end of this course, students will understand how financial data and non-financial data interact to forecast events, detect financial discrepancies and frauds, predict corporate default, optimize operations, and determine business strategy. Some cognitive analytics methods such as text analytics, neural networks and deep learning will also be introduced. This course has been designed to equip students with analytics mind-set to create strategy and make better business decisions.

D. Learning Goals, Course Objectives, and Skill Development

Students are expected to demonstrate the following technical competencies upon successful completion of this course:

- Understand the role of data and analytics in solving accounting and business problems, such as revenue prediction, bankruptcy prediction, and fraud detection.
- Demonstrate familiarity with statistical programming in the contexts of forecasting and forensics.
- Transform financial and nonfinancial data into useful insights for business.
- Communicate inferences from analysis through writing, speaking, and visuals.
- Develop an ability to independently learn and explore new methods in analytics in this ever-changing field.

Class activities are designed to further develop students' analytical, communication, and active learning skills, as well as students' professional ethics. Students must be prepared to go beyond seminar materials and prescribed readings.

E. Texts and Other Resources

There is no recommended textbook. Reading materials will be provided in class.

F. Assessment

The assessment components for this course are:

Class Participation	10%
Individual Assignments (including pop quizzes)	20%
Group Project	30%
Final Exam	40%
Total	100%

To pass this course, a student is required to attempt **all** the four components, obtain a minimum mark of 50% for the final exam component, and obtain a total mark of 50% or better.

Individual assignments will relate to material discussed in class, encouraging students to dig deeper into the covered material. The group project will focus on identifying and using financial and nonfinancial information to enhance analytics for traditional financial forecasting or forensics analysis. Class participation will be based on both in and out of class participation and professionalism. Assessment details are available at ANNEX A.

No questions verbatim from past year papers or published test banks will be used for the graded continuous assessments and examinations in the course.

G. Abridged Lesson Plan

The following topics will be covered in this course and detailed lesson plan is provided in ANNEX B.

- Forecasting sales and financial statements
- Identifying red flags for contracting
- Predicting default and bankruptcy
- Fraud detection
- Detecting changes
- Text as data for forecasting and forensics
- Introduction to machine learning and other recent advances in analytics

- Ethics in artificial intelligence

H. 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 (whether oral or written) submitted for purposes of assessment must be the student's own work. Penalties for violation of the policy range from zero marks for the component assessment to expulsion, depending on the nature of the offense. When in doubt, students should consult the instructors of the course. Details on the SMU Code of Academic Integrity may be accessed at <http://www.smuscd.org/resources.html>.

I. Accessibility

SMU strives to make learning experiences accessible for all. If you anticipate or experience physical or academic barriers due to disability, please let me know immediately. You are also welcome to contact the university's disability services team if you have questions or concerns about academic provisions: DSS@smu.edu.sg. Please be aware that the accessible tables in our seminar room should remain available for students who require them.

Digital Readiness for Teaching and Learning (DRTL)

As part of emergency preparedness, instructors may conduct lessons online via the Zoom platform during the term, to prepare students for online learning. During an actual emergency, students will be notified to access the Zoom platform for their online lessons. The class schedule will mirror the current face-to-face class timetable unless otherwise stated.

J. Copyright

Any copyrighted materials posted on the course website or distributed in class are for students learning purpose only. Such copyrights belong to the respective authors/publishers. Students' usage of the material is governed by law.

K. Other matters

Please check the course website regularly in order not to miss important announcements. Although major announcements will be made both in classroom and course website, it is the sole responsibility of the students to find out what has been announced during their absence from class.

I strongly encourage you to let me know of any course-related problems as soon as they arise. As each lesson builds on the previous lessons' material, it is important that you understand the material before moving on to new material. Furthermore, the level of difficulty of the course increases as it progresses; hence, it is important to address any confusion or difficulties upfront.

Annex A. Assessment Details

Class participation (10%): You can get participation points by participating or raising questions in class or online via eLearn discussions. Participation points may also be earned from certain out of class activities detailed in class. Furthermore, participation points will be awarded for providing constructive feedback about the course to the instructor in class or via email (suggestions, comments, corrections, etc.). Regarding professionalism, it is expected that you will 1) prudently use electronic devices in class (for instance, for taking notes or coding), 2) obtain prior permission before taking pictures or recordings, and 3) obtain permission from the professor in advance for planned absences. Points will be lost for absences without an approved explanation. The following outlines the rubrics for the assessment of class participation.

Mark	Comments
90-100%	<i>Outstanding Contributor</i> . This student was well prepared and contributed actively to both in class and outside class discussion/consultation. His/her presence significantly enhanced the learning experience for all students. During online sessions, the student keeps camera on at all times.
80%	<i>Good Contributor</i> . This student was well prepared and contributed occasionally to in class discussion, but was an active participant during in class small group learning and outside class consultation. During online sessions, the student keeps camera on at most times.
60-70%	<i>Average contributor</i> . This student attempted the in class exercises and participated, but to a lesser extent and/or of lower quality than outstanding and good contributors. During online sessions, the student keeps camera on for more than half of the class time.
50%	<i>Baseline contributor</i> . This student attended all classes only with very minimum or no participation in class discussion. During online sessions, the student keeps camera on for about half of the class time.
10-40%	<i>Poor contributor</i> . This student was absent in some sessions without permission, did minimal preparation and generally did not actively participate. During online sessions, the student keeps camera on for less than half of the class time.
0%	<i>Unsatisfactory contributor</i> . This student was absent in half or more of the class sessions without permission, unprepared and/or did not participate. During online sessions, the student keeps camera off at most times.

Individual assignments and pop quizzes (20%): Individual assignments encourage students to dig deeper into the materials covered in class. Furthermore, assignments will encourage the students to evaluate results from analytics and communicate their findings. Assignments are to be done individually and submitted electronically on eLearn. Pop individual quizzes may also be arranged in class.

Group project (30%): For the group project, students will be asked to explore using financial and nonfinancial information in financial forecasting or forensics analysis in a way beyond what was explicitly covered in class. Deliverables for the project will be both an in class presentation and a report detailing the work the group has done and the conclusions the group has drawn from their analysis. More details about the project will be released in class.

Final exam (40%): The final examination will cover content from the entire course.

Annex B. Detailed Lesson Plan

Class sessions are of three-hour duration per session and ten sessions in total. The following is a tentative lesson plan. Note that this schedule is subject to change. Alternative times or activities will be arranged should they become necessary.

<i>Session</i>	<i>Topic</i>	<i>Assignment</i>
0	Pre-course reading: Introduction to R Programming (on eLearn) As a minimum prerequisite, you are required to master fundamental R programming. It is your responsibility to review/study the R programming review materials on SMU eLearn.	You may also study the following tutorials at https://www.datacamp.com/ Introduction to R Intermediate R Introduction to the Tidyverse
1	Course Logistics Forecasting with Linear Regression <ul style="list-style-type: none"> • Unlocking the power of data and analytics • Identifying sales drivers (macro-economy; policy/regulatory; consumer behavior; environment; industry; etc) • Univariate statistics • Exploratory Data Analysis (EDA) • Normalization • Plotting and visualization • Panel data and Fixed effect • Training and testing data • Prediction accuracy (RMSE and MAE) • Forecasting sales of a Singapore company 	Individual Assignment 1: to be submitted within 7 days
2	Case: Forecasting Walmart Sales <ul style="list-style-type: none"> • Kaggle competition: Walmart Store Weekly Sales Forecasting • Missing values • Model evaluation metric: MAE vs RMSE • Introduction to the Group Project 	Introduction to Group Project
3	Forecasting with Logistic Regression <ul style="list-style-type: none"> • Logistic regression and coefficient interpretation • Advanced data visualization • Forecasting shipping delays using typhoon data 	Individual Assignment 2, to be submitted within 7 days

4	Logistic Regression for Bankruptcy <ul style="list-style-type: none"> • Process risks from contracting with suppliers (shortages/bankruptcy/shipping delays/etc) • Use logistic regression to predict these • Outliers • Altman Z-Score • Merton Distance-to-Default model • Confusion matrix • ROC and AUC • Predicting bankruptcy and credit rating downgrade 	
5	Detection of Corporate Fraud <ul style="list-style-type: none"> • Leveraging theory and research • Traditional linear models to predict corporate fraud • Lasso, Ridge and Elastic Net regressions • K-fold cross validation • Decision tree ensembles • Bagging with Random Forests • Boosting with XGBoost • Hyperparameter tuning for XGBoost • Visualizations • Predicting misstatements of US corporations 	Individual Assignment 3, to be submitted within 7 days
6	Textual Analysis <ul style="list-style-type: none"> • Why are numerical methods insufficient? • Extending numerical methods with other data • Structured and unstructured data • Natural language processing (NLP) • Analyzing textual properties in R • Readability and sentiment analysis of annual reports 	Supplementary Assignment, for your own practice and no submission required.
7	Topic Modeling and Anomaly Detection <ul style="list-style-type: none"> • Sets of documents (corpus) • Topic modelling with Latent Dirichlet Allocation (LDA) • Term document matrices (TDM) • Clustering without known groups (k-means) • Visualization with Principle Component Analysis (PCA) • Visualization with t-distributed Stochastic Neighbor Embedding (t-SNE) • Clustering with K-Nearest Neighbors (KNN) 	

8	Machine Learning and AI <ul style="list-style-type: none"> • Ensembles • AI and ethics • Data security 	
9	Neural Networks and Deep Learning <ul style="list-style-type: none"> • Summary ML platforms including TensorFlow • Why neural networks (NNs) are useful • Building blocks of NNs: Activation function; network topology; training algorithm • Image recognition using Keras and TensorFlow • Fraud detection with autoencoder • Other emerging topics in forecasting and forensics 	
10	TEAM PROJECT PRESENTATIONS Review & Exercise	TEAM PROJECT REPORTS DUE
11	Final Exam	

Prepared by Wang Jiwei, December 16, 2023