GRADUATE COUNCIL: NEW COURSE PROPOSAL

Originating Unit: NEELY (INSC)

Type of action: ☑ New course ☐ Full online course**

Semester and year course will take effect: Fall 2024

New course title: Machine Learning for Business

Appropriate computer abbreviation (30 spaces or less): Machine Learning for Biz

Course instructional methodology: Lecture

course component types: ugradcouncil.tcu.edu/forms/Course Component Types.pdf

New course number: INSC 70450

Prerequisites for new course: *include an attachment if additional space is needed*
Graduate standing.

Description of new course (catalog copy): *include an attachment if additional space is needed*

The course introduces basic concepts of machine learning and the methods and tools necessary to learn from data for computational data analysis, including pattern recognition, prediction, and visualization. The course is oriented heavily to applications in business giving students the tools needed in the modern data analytics space. Students finish the class with a basic understanding of how to use machine learning models and analytic algorithms to solve business problems.

Click here to attach a file
attached files can be seen and managed in Acrobat Pro by clicking on
View > Show/Hide > Navigations Panes > Attachments

Fully Online Courses**

All online courses, and /or distance learning offerings must meet State Compliance regulations as defined by specific state legislation. TCU Distance Learning is any for-credit instruction provided to a TCU student outside the State of Texas. This includes internships, clinical, video conferencing, online, or any other delivery format that crosses state lines. Contact the Koehler Center for Teaching Excellence for guidelines. Include a letter of support from the Koehler Center with this proposal.

Supporting evidence or justification: (For a new course, attach proposed syllabus, including course objectives, course outline, and representative bibliography.)

Describe the intended outcomes of the course and how they will be assessed: *include an attachment if additional space is needed*
See attached syllabus

Click here to attach a file   attached files can be seen and managed in Acrobat Pro by clicking on View > Show/Hide > Navigations Panes > Attachments

Additional resources required:

Faculty: None

Space: None

Equipment: None

Library: None

Financial Aid: None

Other: none

Change in teaching load: No

Does this change affect any other units of the University? ☐ Yes ☑ No
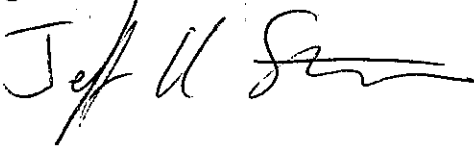*If yes, submit supporting statement signed by chair of affected unit.*

If cross-listed, provide evidence of approval by all curriculum committees appropriate to both the originating and the cross-listed units.

Chair of Originating Unit:

Name: Jeff Stratman

Unit: NEELEY - Information Systems and Supply Chain Management Departmҽ

Signature:

Neeley TCU
SCHOOL OF BUSINESS

INSC 70450: Machine Learning for Business
Course Syllabus

Instructor Name:
Semester and Year:
Number of Credits: 1.5
Class Location:
Class Meeting Day(s) & Time(s):
Zoom Access Information:
Office Location:
Office Hours:
Telephone:
Email:
Response Time:

Final Exam Date & Other Important Dates

The course's comprehensive final exam is held in accordance with the registrar's final exam schedule.

Rescheduling of Finals Policy: According to the *Faculty/Staff Handbook "Rescheduling of Finals"* section, rescheduling a final exercise must be made one week prior to the last day of classes. Rescheduling of finals is permitted for 1) graduating seniors whose faculty members must submit final grades by Wednesday 5pm of finals week, 2) students with more than two finals in a 24-hour period rule, and 3) students for whom a final examination conflicts with a major religious holiday or custom. Unless the student is graduating, the exam must be taken during final examination week.

Course Description

The course introduces basic concepts of machine learning and the methods and tools necessary to learn from data for computational data analysis, including pattern recognition, prediction, and visualization. The course is oriented heavily to applications in business giving students the tools needed in the modern data analytics space. Students finish the class with a basic understanding of how to use machine learning models and analytic algorithms to solve business problems.

Learning Objectives

After successfully completing this course, you will be able to:
1. Use the machine learning and advanced statistical models introduced in this class to resolve analytical questions assigned during this semester.
2. Interpret the implications of advanced data analysis results to business operations.
3. Use retrieval and manipulation tools for data extraction and reporting.
4. Describe different methods of predictive analytics.

5. Apply predictive analytic tools to diverse business problems
6. Identify the best statistical model for the business problem at hand.
7. Expose to practical applications of Python programming languages in business environment
8. Basic data processing and handling with Python/Pandas
9. Machine learning tools available in Scikit Learn
10. Testing and evaluating forecasts/predictions
11. Presenting/describing results
12. Introduction to time series applications using machine learning
13. Reading and storing data in various formats.
14. Visualization of data to deliver visual insights
15. Application of various machine learning techniques,
16. Analysis of the results of machine learning applications.

Required book and software (software freely available)

1. Introduction to Machine Learning with Python, Andreas Muller and Sarah Guido, ISBN=**13:**978-1-1449-36941-5 **Publisher:** O'Reilly Media; 1st edition (November 15, 2016).

2. Python 3.8 and the entire Anaconda suite of tools. (This is open source and runs on all major operating systems.)
   a. Download Anaconda and Jupyter notebook using the link below
   b. https://www.anaconda.com/
3. Student/Individual laptop or desktop with technical capabilities to install and run Python program, scripts, and algorithms.

Prerequisites
Graduate Standing

Course Policies and Requirements

Grading

Your grade for this course will be based on evidence of your accomplishment of the course objectives that I will gather from each of the following:

Graded Item	Description	Point and % of Final Grade	Date Due
Mid-semester exam	Mid-semester exam - Sunday evening at 11:59 PM. Multiple choice questions	150 (15%)	Posted on D2L
10 Python exercises/ assignments	10 hands-on machine learning models/exercises using Python and Jupyter notebook will be due Sunday evening at 11:59 PM	200 (20%)	Posted on D2L
5 Watch and Respond videos /class	**Watch and Respond videos/class discussions.** There are ten carefully selected short videos	150 (15%)	Posted on D2L

discussion	(10 to 20 minutes) that demonstrate the practical application of business analytics and machine learning in business operations.		
Group project	**Group project** – students will be divided/assigned into groups with 5 or 6 members each to solve strategic business problems using machine learning algorithms.	300 (30%)	Posted on D2L
Final Exam	Comprehensive final exam multiple choice questions	200 (20%)	Posted on D2L
	Total	**1,000 points 100%**	

Grading Scale: Final +/- Grade Scale:

Grade	Score	Grade	Score
A	94–100	C+	77–79.99
A-	90–93.99	C	74–76.99
B+	87–89.99	C-	70–73.99
B	84–86.99	F	0–69.99
B-	80–83.99		

Hands-on Python/machine learning Assignments

Twelve weekly Python/machine learning hands-on exercises/assignments will be assigned during the semester. Each assignment is a practical exercise designed to leverage machine learning modules using Python scripts to solve strategic business problems for companies from multiple industries such as financial, retail, movie entertainment, healthcare, home builders, and energy. Some of the use cases include customer churn prediction, loan approval decisions, medical spending prediction, sales/profit forecasting, movie performance prediction, housing prices prediction, and many others. Instructions for each assignment will be distributed at least one week prior to the due date. Students will be expected to complete and submit the assignments on or before the due date.

Watch and Respond videos/class discussions.

There are ten carefully selected short videos (10 to 20 minutes) that demonstrate the practical application of business analytics and machine learning in business operations. The purpose is to provide students with an opportunity to learn/understand how companies are developing and leveraging advanced statistical and machine learning models using Python programming to improve financial, operational, and competitive performance. In essence, practical application of machine learning in solving strategic business problems. To get full credit, in addition to their write-up, students are expected to be prepared to discuss each week's video topics in class.

Group project – students will be divided/assigned into groups with 5 or 6 members each. The project is designed to provide students with the opportunity to use (or practical applications) machine learning models and algorithms to help companies in diverse industries in solving strategic business problems:

1. **Banking industry:** *Initial Public Offering (IPO) analysis* – IPO performance prediction

2. **Oil and Gas industry** – oil prices and energy consumptions predictions
3. **Retail industry** – sales and profit forecasting
4. **Motion Picture industry** – assist the movie studio executives in using machine learning algorithms to predict and improve movie gross box office performance (revenue generated per movie).
5. **Wireless Industry:** *Customer Churn predictions* - With this exercise, students will have the opportunity to use machine learning algorithms to help the wireless industry reduce the probability of losing some of their customers.

See D2L for detailed instructions.

Exams: There are two exams: Mid-term exam and final exam. The Mid-term exam is multiple choice questions based on concepts and topics covered in class. The Final exam consists of two parts: (1) multiple-choice questions (2) Hands-on Python/machine learning exercises.

Instructor Expectations
The instructors will give each of you 100% of our commitment to help you successfully complete the class, however, it is expected that you provide 100% of your commitment to this class, which includes reading the textbook, using the resources available in D2L, watching posted videos, posting questions in the discussion board, completing your assignments, reviewing your graded assignments, and following up with questions to the instructor.

Student Responsibilities
It is the student's responsibility to ensure that assignments are submitted in the proper format as described in each assignment. Documents which the instructor is unable to open may result in zero credit. Students should submit assignments on due dates outlined on the course schedule, and may be deducted points for late submission. Please refer to the submission requirements in each assignment.

Late Work
Work must be submitted on time and via the method included in the assignment sheet. Late work will only be accepted with prior authorization and may result in a ½ percentage grade deduction.

Grading Concerns
I take grading **very** seriously and I strive to be as fair and as consistent as possible. However, if you decide to challenge a grade on an assignment or exam, please submit a written appeal to me **within seven days** after the graded item is handed back to the class. The originally graded work must be submitted with a detailed explanation for the reason for the appeal. Upon receipt of a grade appeal, I reserve the right to re-evaluate the entire assignment or exam in addition to the section in question.

Attendance
- Regular and punctual class attendance is essential, and no assigned work is summarily excused because of absence, no matter what the cause.
- If you are absent to represent the University (as in athletics, chorus, band, national or state meetings of organizations represented at TCU), for an Official University Absence

through the Campus Life Office, please notify me immediately and prior to the absence date.

Technology Policy
- You will be required to bring your laptop to class to work on technology assignments each day. Specific projects will be announced in class and are included in the course schedule.

TCU Email
    Email Notification: Only the official TCU student email address will be used for all course notifications. It is your responsibility to check your TCU email on a regular basis.

Netiquette: Communication Courtesy Code
All members of the class are expected to follow rules of common courtesy in all email messages, discussions, and chats. If I deem any of them to be inappropriate or offensive, I will forward the message to the Chair of the department and appropriate action will be taken, not excluding expulsion from the course. The same rules apply online as they do in person. Be respectful of other students. Foul discourse will not be tolerated. Please take a moment and read the following link concerning "netiquette." http://www.albion.com/netiquette/

Participating in the virtual realm, including social media sites and shared-access sites sometimes used for educational collaborations, should be done with honor and integrity: http://macaulay.cuny.edu/community/handbook/technology/honorable-technology/

TCU Syllabus Policies & Resources

Please use this **link** or scan the QR code with a mobile device camera to access policies and resources including support for TCU students, student access and accommodation, anti-discrimination and Title IX information, and other important information.

Course Schedule

Course Schedule

This calendar represents the current plans and objectives. As we go through the semester, those plans may need to change to enhance the class learning opportunities. Such changes will be clearly communicated in class, attendance and teamwork is essential to keep up with the demands of the class.

Date	Topic	Module	To-do list or Assignment

Week 1	**Module 1** • Introduction to the course • Introduction to business analytics • Fundamentals of machine learning	Module 1	(1). Student introduction via discussion board, **Install Anaconda and** Jupyter notebook
Week 2	**Module 2** • Basic Python / ML project	Module 2	**Exercise # 1 – Linear Regression model/ analysis** W&R #1 - Database, Data Warehouse, Data Lake
Week 3	**Module 3** • Supervised – regression	Module 3	**Exercise # 2 – Stock market prices prediction** W&R #2- Azure Data Lake
Week 4	• **Mid-term Exam (Modules 1 – 3)**		**Due date: 02/12**
Week 5	**Module 4** • Supervised – Classification	Module 4	**Exercise # 3 – Classification algorithms: Multiple model predictions – Medical/Housing** W&R #3 - Azure Machine Learning Studio (Automated ML)
Week 6	**Module 5** • Unsupervised machine learning in Python	Module 5	**Exercise # 4 – Clustering (analysis)** W&R #4 - AWS S3 Data Lake
Week 7	**Module 6** • Optimize Machine learning models, challenges, and data quality. • Put it all together: machine learning, Tableau, and business problems	Module 6	**Exercise # 5 – Advanced forecasting (sales and profits)** W&R #5 - AWS SageMaker
Week 8	**Final Exam (multiple choice questions) – Modules 1, 4, 5 & 6**	**Final Exam**	**Final Exam Group project due 03/06**