

**GSBA-510: Business Analytics**

**Fall 2020**

**1.5 units, Class time 3 hours/week**

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| **Instructor:** | *Stephen Coggeshall* |
| **Office:** | *TBD* |
| **Office Hours:** | *TBD* |
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| **COURSE DESCRIPTION** |

GSBA-510 is an introduction to and survey of Business Analytics, that is, analysis and modeling of data to provide practical solutions to real-world business problems. In this course the students will experience a wide variety of applications of data science methodology to simple and complex business problems, such as predictive models for risk management, marketing models, segmentation, forecasts and simulations. These application examples are made in a practical context using real-world examples of such endeavors from engagements with top tier companies in financial services, telecommunications and consumer products.

The course consists of lectures combined with discussions, where the students will break out into groups to design a solution framework approach to an applied business problem. Then the students will individually design a solution approach/framework for another problem as homework for the week.

There will be many such examples where a practical business problem is described and a solution approach is outlined and detailed. Several seemingly different business problems will have a common solution approach framework while others require very different and sometimes unusual solution designs.

We will explicitly describe how to frame these common business analytics problems:

* Credit score
* Fraud score
* Target marketing response score
* Collections score
* Attrition/Retention score
* Survival Analysis
* Customer Value Measure
* Lifetime Value Measures
* Marketing Segmentation
* ARIMA and nonlinear Forecasting
* Forecasts for stocks, bonds, derivatives
* Business Simulations

Note that many of these analytics applications require the building of predictive models (e.g., all the scores), but many are an analysis, simple or complex (e.g., segmentation) that may or may not require a predictive model.

Additionally, material will be presented to describe the fundamental steps in building predictive analytics models in a practical environment. This includes the problem design, data exploration and cleaning, creation of expert variables (feature engineering), training/testing and validation processes and model performance evaluation. We will describe at a high level various statistical/machine learning algorithms, including

* Linear/logistic regression
* Decision trees
* Clustering
* Neural nets (deep learning, RNN, CNN, LSTN)
* Support vector machines
* Bayesian networks
* K nearest neighbors
* Random forests
* Boosted trees
* Ensembles, stacking
* ARIMA

Note that in this class the emphasis is on the solution design process rather than the solution execution process. That is, students will be required to describe how they would set up/frame the solution approach for many different problem scenarios, but they will not be required to carry out the model building steps.

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| **COURSE OBJECTIVES** |

The goal of this course is to give students clear understanding of the application of data science in the business world (Business Analytics) along with knowledge of a wide scope of practical application approaches. Frequently the framing of the solution approach is nonobvious, yet arguably the most important step in building a practical solution to a complex business problem. Should one do a statistical analysis, build a machine learning predictive model, a forecast, a simulation? What are we trying to understand or predict? What is the objective function? What are the inputs? What are the entities? How do we treat time? After the experience of this class the students will be comfortable in a real-world working environment, and able to hear a complex problem described and to respond with a practical solution approach.

While there are no definitive ways to frame a business problem, there are typical and frequently-used frameworks that are used throughout industry. The student will learn these common approaches and be challenged with inventing alternative approaches, particularly when the problem becomes non-standard and more complex. Having seen a wide variety of solution framework approaches to many different practical business problems, the student will be better positioned to attack both common and unusual problems they will encounter in their careers.

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| **COURSE MATERIALS** |

The course material will generally be slides that are presented each week during class time. These slides will contain principals of business analytics solutions approaches as well as real examples of typical and unusual projects. The course material will be posted to Blackboard as the class progresses.

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| **GRADING** |

In the grading of assignments, points will be taken off for incomplete material, material that isn’t easily understandable by the grader, or material that doesn’t provide the solution to the requested assignment. Points will also be taken off for unprofessional presentation including incorrect grammar, spelling or bad formatting. It is expected that material turned in as assignments is of the caliber of work assignments in a typical professional business organization.

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| *Assignments* | ***% of Overall Grade*** |
| *Homework* | *100%* |
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| **CLASS PARTICIPATION** |

It is expected that all students will participate in open discussions during the classes.

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| **HOMEWORK** |

For the typical homework assignment the students will hear a business problem described and they will write a description of how they would frame the problem for solution. This generally consists of a description of the solution approach, what data is used and how, what is the output produced by the solution, and how it will be used by the business.

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| **EXAMS** |

No exam for this class.

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| **THE IMPORTANCE OF COURSE EVALUATIONS** |

It is strongly requested that the students provide feedback at the end of the course via the anonymous course evaluations in order for ongoing improvements of this class.

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| **STATEMENT ON ACADEMIC CONDUCT AND SUPPORT SYSTEMS** |

**Academic Conduct:**

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *USCampus* in Part B, Section 11, “Behavior Violating University Standards” [policy.usc.edu/scampus-part-b](https://policy.usc.edu/scampus-part-b/). Other forms of academic dishonesty are equally unacceptable.  See additional information in *SCampus*and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

**Students with Disabilities:**

USC is committed to making reasonable accommodations to assist individuals with disabilities in reaching their academic potential. If you have a disability which may impact your performance, attendance, or grades in this course and require accommodations, you must first register with the Office of Disability Services and Programs ([www.usc.edu/disability](http://www.usc.edu/disability)). DSP provides certification for students with disabilities and helps arrange the relevant accommodations.  Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to your TA) as early in the semester as possible. DSP is located in GFS (Grace Ford Salvatori Hall) 120 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776. Email: ability@usc.edu.

**Support Systems:**

*Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call*

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. <https://engemannshc.usc.edu/counseling/>

*National Suicide Prevention Lifeline - 1-800-273-8255*

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. <http://www.suicidepreventionlifeline.org>

*Relationship & Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call*

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. <https://engemannshc.usc.edu/rsvp/>

*Sexual Assault Resource Center*

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: <http://sarc.usc.edu/>

*Office of Equity and Diversity (OED)/Title IX compliance – (213) 740-5086*

Works with faculty, staff, visitors, applicants, and students around issues of protected class. https://equity.usc.edu/

*Bias Assessment Response and Support*

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. https://studentaffairs.usc.edu/bias-assessment-response-support/

*Student Support & Advocacy – (213) 821-4710*

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. https://studentaffairs.usc.edu/ssa/

*Diversity at USC – https://diversity.usc.edu/*

Tabs for Events, Programs and Training, Task Force (including representatives for each school), Chronology, Participate, Resources for Students

*USC Emergency Information*

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. [emergency.usc.edu](http://emergency.usc.edu)

*USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.*

Provides overall safety to USC community. [dps.usc.edu](http://dps.usc.edu/)

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| **COURSE OUTLINE AND ASSIGNMENTS** |

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|  | **Lecture Topics** | **Homework** | **Deliverables with Due Dates** |
| Week 1 10/7,8 | What is Business Analytics. Overview of predictive modeling. How to approach data. | Homework 1: How to solicit prospects | Solution framework. Due by Wednesday 10/14 noon. |
| Week 2 10/14,15 | Consumer data. Data preparation. | Homework 2 | Solution framework. Due by Wednesday 10/21 noon. |
| Week 3 10/21,22 | Attrition modeling, customer lifetime | Homework 3 | Solution framework. Due by Wednesday 10/28 noon. |
| Week 4 10/28,29 | Decision trees, clustering, marketing segmentation | Homework 4 | Solution framework. Due by Wednesday 11/4 noon. |
| Week 5 11/4,5 | Neural nets, SVM, Bayesian nets, KNN, credit scores, fraud, collections scores | Homework 5 | Solution framework. Due by Wednesday 11/11 noon. |
| Week 6 11/11,12 | Random forests, boosted trees, curse of dimensionality, feature selection | Homework 6: | Solution framework. Due by Wednesday 11/18 noon. |
| Week 7 11/18,19 | Ensemble models, stacking, ARIMA, measures of goodness, overfitting, forecasting, simulations | Homework 7 | Solution framework. Due by Wednesday 11/25 noon. |