

## INFO 3236-002: BUSINESS ANALYTICS

Fall 2022

Belk College of Business, The University of North Carolina at Charlotte

**Note:** The standards and requirements set forth in this syllabus may be modified at any time by the course instructor. Notice of such changes will be by announcement in class or/and canvas.

**Class Website:** Canvas will be the website and primary communication channel for all information about this course. Go to <http://canvas.uncc.edu> and log in with your Ninernet credentials.

**Instructor:** Dr. Dongsong Zhang, Belk Distinguished Professor in Business Analytics, UNCC

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**Phone:** 704-687-1893

**Email:** [dzhang15@uncc.edu](mailto:dzhang15@uncc.edu)

**Class time:** Tuesday & Thursday, 11:30am-12:45pm

**Classroom:** Friday 280

**Office hours:** Tuesday & Thursday, 9-9:50am, 1:15pm-2:15pm (Face to face or virtual meetings through zoom). If a student wants to set up an appointment with the instructor (normally 15 minutes/session) during office hours, please send an email request to the instructor in advance and inform the questions that he/she wants to discuss. The instructor will then confirm the appointment time. **The best way to contact the instructor is via email. The instructor will try to respond emails within 48 hours.**

### Important Information & Policies for Fall semester

**Niner Nation Cares:** All students must follow the updates and instructions related to Fall semester reopening posted on <http://ninernationcares.uncc.edu> and <https://ninernationcares.uncc.edu/students>. For your own health and safety and that of your friends and families, make sure to adhere to the health and safety guidelines posted on the above links. Please do not treat these guidelines lightly.

**Absenteeism during Covid-19:** Students are expected to attend every class and remain in class for the duration of the session when it is safe to do so in accordance with university guidance regarding COVID-19. Failure to attend a class or arriving late may impact your ability to achieve course objectives which could affect your course grade. An absence, excused or unexcused, does not relieve a student of any course requirement. Regular class attendance is a student's obligation, as is a responsibility for all the work of class meetings, including tests and written tasks. Any unexcused absence or excessive tardiness may result in a loss of participation points.

Students are encouraged to work directly with their instructors regarding their absence(s). For absences related to COVID-19, please adhere to the following:

- **Complete your [Niner Health Check](#)** each morning.
- **Do not come to class if you are sick.** Please protect your health and the health of others by staying home. Contact your healthcare provider if you believe you are ill.
- **If you are sick:** If you test positive or are evaluated by a healthcare provider for [symptoms of COVID-19](#), indicate so on your [Niner Health Check](#) to alert the University. Submit a copy of your Niner Health Check notification email to your instructors. Upon learning that you have tested positive or have been diagnosed for symptoms of COVID-19, either from your reporting or from Student Health Center testing or diagnosis, representatives from Emergency Management and/or the Student Health Center will follow up with you, and your instructors will be notified of the need for accommodations, as necessary.
- **If you have been exposed** to COVID-19 positive individuals and/or have been notified to self-quarantine due to exposure, indicate so on your [Niner Health Check](#) to alert the University. Representatives from Emergency Management and/or the Student Health Center will follow up with you as necessary. Submit a copy of your Niner Health Check notification email to your instructors. If you need any additional support verifying your absence after you have communicated with your professors, contact [Student Assistance and Support Services](#).

To return to class after being absent due to a period of **self-quarantine**, students should submit a copy of their Niner Health Check clearance email to their instructor(s). To return to class after being absent due to a COVID-19 **diagnosis**, students should submit an [online request form](#) to Student Assistance and Support Services (SASS). Supporting documentation can be attached directly to the request form and should be from a student's health care provider or the Student Health Center, clearly indicating the dates of absences and the date the student is able to return to class. Instructors will be notified of such absences. The final decision for approval of all absences and missed work is determined by the instructor.

**Prerequisites:** Junior or senior standing; and MIS, OSCM, Economics, or Marketing major or minor in good standing; or permission of department. Students are expected to be familiar with:

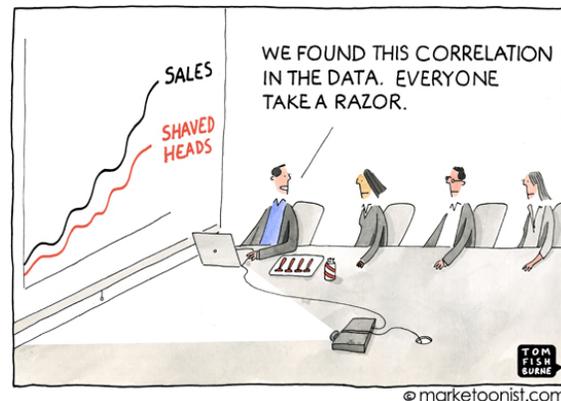
- 1) file downloading and uploading on the course Canvas website;
- 2) using Microsoft WORD, EXCEL, and PowerPoint;
- 3) taking a screenshot (e.g., pressing FN (Function) key and "Print Screen" key simultaneously) and then paste into a WORD document if you are using Microsoft Windows;

### **Catalog Description**

This course covers various machine learning and business intelligence methods, such as rule-based systems, decision trees, logistic regression, association rule mining, and clustering. In addition, this course also covers fundamentals of statistics, machine learning, online analytical processing (OLAP), artificial neural network, various issues relating to modeling, storing, and

sharing the organizational data resources, and how to perform data analytics using SAS Enterprise Guide and Miner.

**Learning objectives:** “Business analytics” refers to the extensive use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions (Davenport and Harris, 2007, *Competing on Analytics: The New Science of Winning*). This class will provide the conceptual foundations of business analytics and an overview of several analytics techniques and software tools.



The specific learning objectives are as follows:

1. To develop an understanding of business intelligence, analytics and decision support, as well as the principles of data management for analytics.
2. To understand basic concepts in statistics and be able to perform descriptive statistics (e.g., mean, standard deviation, variance, probabilities, odds, odds ratio, normal distribution, hypotheses testing).
3. To use SAS Enterprise Guide and Miner tools and data analytics techniques (e.g., decision trees, logistic regression, cluster analysis) for data management, building predictive models, and data clustering.
4. To apply the learned analytics techniques to a real-world business problem through a team course project.

### Course Materials & Software

**1) Reading Materials:** There is no required text book for this class. All reading materials will be posted or linked by the instructor on the Canvas course page (The instructional materials related to each lecture will be posted at least 24 hours in advance). Those materials may include, but not limited to, power-point slides, handouts, videos, and research articles, etc. You can print out the posted material before the class. Please note that the instructor will not provide printed copies of any of the posted materials.

**2) Software:** This class will use SAS Enterprise Guide and SAS Enterprise Miner Workstation software. Those software programs are required because students will go through SAS data management and analytics demos/exercises during lectures and use the software to complete 4 assignments and a team course project, which will be introduced later in the syllabus. You can

download the software to your personal computer from [software.uncc.edu](http://software.uncc.edu). If you plan to use computers in student labs on the campus, both programs are installed in the Friday building student labs.

For students who can't download the software on your computer, you may use one of the following remote access methods to use those two software programs:

- (1) SAS Miner and other SAS software are available from Apporto, a browser based virtual machine. Anyone can access Apporto by going to <http://apporto.uncc.edu>, sign-in with your Ninernet credentials, and launch the virtual desktop.
- (2) SAS Enterprise Miner is available via Citrix ([Citrix.uncc.edu](http://Citrix.uncc.edu))

### **Class Format**

This course will use in-class lectures as the primary learning format. Lectures will typically take the form of presentation of theoretical materials and class discussion. We will also use this time to demonstrate how to use SAS Enterprise Guide and Miner for data analytics. **I strongly encourage students to actively participate in class discussion.** Such participation brings additional perspectives to classroom discussion, enables more effective knowledge sharing, and makes the lectures more interesting. Any class-related questions are encouraged.

We should all show mutual respect for each other in the learning process. In this context, mutual respect includes beginning and concluding the class on time, not using computer/cell phones for anything irrelevant to the course, and allowing all students of the class to participate in a dialogue without interruption or distraction. Adopting these practices can help us minimize disruption to class discussion and dialogue and maximize the value of the class for all students.

### **Grading**

| <b>Components</b>               | <b>Points</b> | <b>Percentages and Weights of the Final Grade</b> |
|---------------------------------|---------------|---|
| Mid-term and Final exams        | 40 pts/each   | 40% (20% each)                                    |
| Assignments (4)                 | 10 pts/each   | 20% (5%/assignment)                               |
| Quizzes (2)                     | 10 pts/each   | 6% (3%/quiz)                                      |
| Course group project            | 29 pts        | 29%   |
| Attendance/Course participation | 5 pts         | 5%  |

A=90-100

B=80-89

C=70-79

D=60-69

F=Below 60

Grading reflects students' course performance. If students have questions about a grade of an exam or an assignment, please contact the instructor within one week after the grade is released. Students may communicate with the instructor to get feedback regarding their course

performance at any time during the semester. While I will always correct mistakes in my arithmetic computation of grades, if any, final letter grades are not negotiable. In general, no late deliverables will be accepted unless a student has requested for deadline extension prior to the due date with legitimate reasons and approved by the instructor.

- 1) Exams:** There will be a mid-term exam and a final exam. Both will be taken in the class within a designated time period. They may include true-false, multiple-choice, short essay questions, and questions on solving data analytics problems by using SAS software. **The exams may include questions related to any materials discussed in the class**, even though they may not appear in the PowerPoint slides or handouts. The instructor will keep all exams after grading. However, individual exam reviews are available during office hours or by appointment. Students requesting a review of their exams should do so within a week after the exam grades are posted. **No grade reviews or adjustments will be permitted beyond this one-week period.**

**Make-up exams** will NOT be granted except under extreme circumstances. In the event that a student has to miss an exam due to emergencies, she/he must request a make-up exam while providing appropriate supporting documents in advance to the instructor. The instructor will review all requests and authorize, at his discretion, eligible students to take makeup exams. A make-up exam should generally be arranged within one week after the original exam is given. It is the student's responsibility to be aware of and follow the make-up exam policies. No special accommodations will be made for any exceptions.

Exams take many time and effort to prepare and, as a form of intellectual property, belong to those who create them (i.e., professors). Consequently, students are **not allowed to copy or record any exam questions**. **Any violation of these requirements** will be considered theft of intellectual property and will result in an exam grade of zero automatically and warrant further disciplinary actions.

- 2)** There will be 4 individual assignments throughout the semester, each contributing 5% toward your final course grade. They are all related to using SAS Enterprise Guide or Miner software to manage and analyze data, which we will introduce in the class. All assignments, unless explicitly specified otherwise, **will be released on course Canvas website and due at 11:30am EST on the due dates**. Students have at least one week for completing each assignment. Students need to submit the required documents online through course canvas. The tentative due dates of all assignments are provided in Table 1 in this syllabus. The four assignments will be data management and analytics assignments using SAS.
- 3) Quizzes:** There will be two quizzes in the semester (see the tentative dates in Table 1). Each quiz will only consist of a dozen true/false and multiple-choice questions, aiming to reinforce students' learning and identify problems with concept understanding. Each quiz contributes 3% to the course grade. The instructor will inform the students about the coverage of each quiz and exams one week in advance. In general, there will be **NO MAKE UP** quizzes unless a student can request in advance with legitimate reasons and relevant support documents.

#### 4) Course group project

Students are required to complete a course group project by using the learned data analytics techniques and SAS Enterprise Guide/Miner to analyze a business dataset, which will be available to students on canvas a month or so after the semester starts. There will be detailed tasks and instructions for students to follow. Students should create project teams on their own no later than September 8. Each group should consist of **no more than 5 members**. The projects will be graded based on the following criteria:

- 1) Model variable selection for each task (20%)
- 2) Parameter settings in the model building process (10%)
- 3) Performance of the generated models (30%)
- 4) Report quality (e.g., required screenshots, appropriate interpretations of the models) (20%)
- 5) Project presentation (20%)

Once a group is formed, each group member is expected to contribute to the course group project and in-class group topic presentation (which will be introduced next) actively and equally. **The project report needs to contain information about which group member contributed what to the project and project report writing.** At the end of the semester, after the final project is completed, each student may be asked to fill out a questionnaire about the performance of each of her/his group members (in the scale of 1~10, with 10 being the full participation/contribution). Students can send the filled questionnaire to the instructor by email. The feedback received from the group for each team member will be averaged. The final course project grade for individual group members who have received unsatisfactory participation feedback will be decided as follows. Students whose receive an average participation score of less than 2 out of 10 will get a ZERO for the project, irrespective of the final project grade for the group. Students who receive average feedback score  $\geq 2$  and  $< 8$  will receive **(original group grade \* (average feedback score + 1)/10)**. Students who receive average feedback score  $\geq 8$  will receive 100% of the original group project grade. The feedback policy will be applicable only to the group project.

#### 5) In-class group topic presentation

In order to help students better understand the basic concepts introduced in the lectures and their practical applications in real-world settings, each course project team is expected to select one topic/date from the list in Table 2 at the end of the syllabus, search for a recent research paper/case study published after 2016 on the selected topic that focuses on the real world application of the selected topic, and presents the paper for 20 minutes in the class (e.g., if a group chooses the topic “Association Rule Mining”, the group is expected to find a recent journal paper (not a conference paper) on how association rule mining was actually used to solve a real-world problem). Each group should identify 4~5 candidate papers (you can easily search articles from digital libraries such as ScienceDirect, ACM digital library, and IEEE Xplore digital library on the UNCC library web portal using keyword search) that meet the following four criteria and send them to the instructor as email attachments for approval at least one week prior to the scheduled presentation date:

- (a) journal papers published after 2016;
- (b) papers focusing on data analytics for real-world applications, not a conceptual paper;
- (c) papers involved datasets, data analytics/modeling, and evaluation results; and most importantly
- (d) papers that the group feels interesting and comfortable with presenting (If you are not interested or can't understand, the audience will probably not either).

Once the instructor receives the candidate papers, he will take a look at them and provide you his recommendations in terms of which candidate paper seems more relevant and appropriate for the presentation (or in the worst case, when all candidate papers are inappropriate, the group will be asked to search for additional candidate papers). The in-class topic presentations must be prepared in PPT. Each group can select one or two members to present the paper on behalf of the group, or all members participate in the presentation. It is each group's decision.

- 6) **Class participation** not only includes class attendance, but also the contribution to the class discussion. Students are expected to attend every class and strongly encouraged to actively engage in class discussion, such as asking/answering questions and sharing real-life experiences related to the course material. **Missing a lecture without informing the instructor with a legitimate reason and receiving a permission in advance may result in losing a point in class participation** (up to losing 5 points). A student will lose up to 2 points in class participation if he/she engage little in class discussion during the entire semester (e.g., asking/answering questions in the class, sharing personal experiences related to a discussed topic, or answering other students' questions).

Class attendance is important and necessary for doing well in this course. It has been a common observation that students who miss more than 2 classes are most likely not to perform well in this class. Students are responsible for completing the work from all of the class meetings and for any material covered, announcements made, assignments distributed, and any other type of work you may miss due to the absence from class. Attendance will be taken in class during the semester and will be counted towards your class participation grade. Attendance will also be an important factor in making borderline grade decisions. The **Instructor will not answer questions already covered in the class but missed due to absenteeism**. A student who misses a class is responsible for obtaining any needed information from fellow students.

***Tardiness or early departure is strongly discouraged in this class. Recurrence of such behavior will be noted and may lead to deduction of points in class participation grade.***

### **Class conduct**

Disruptive behavior in class affects the ability of others to benefit from their in-class experience. Such disruptive behavior includes arriving late, leaving early, surfing the Internet during the class, side chat between two or more students during a lecture, disrespectful comments or unnecessary/irrelevant comments that add no value to class, and any activity that negatively

impacts the ability of other students to learn and/or follow in class. Such behavior will be considered inappropriate and will not be tolerated. Since it is the instructor's responsibility to provide an environment that is conducive to learning for everyone in the class, the instructor will deduct points from the grade of any student who chooses to repeatedly engage in disruptive behavior. In particularly egregious and/or recurrent cases, the instructor may have to have the student permanently removed from the class. Thank you for your understanding and help to maintain an effective and focused online learning environment.

### **Laptop Requirements**

All students taking business courses, which includes all students in this class, are required to have their own personal laptop computer, with a working webcam and microphone.

- It is each student's responsibility to have a working laptop that meets the minimum requirements in accordance with the Belk College Laptop Policy, has the required course software installed, and is ready for classroom usage.
- It is each student's responsibility to have their laptop charged and ready for usage prior to class time. Students should expect that charging of devices may not be possible during class time. Therefore, battery life should be sufficient to last through an entire class period.

### **Quality of Work**

The expectation is that all your submitted work will be of **professional quality** both in terms of **content and presentation**.

- Spelling, grammar, punctuation, clarity of expression, and presentation will count in every piece of work you do for this course. If you have trouble with spelling, grammar or punctuation, have someone proofread your package.
- Your grade will be based on what you say or write and how you present it. It becomes difficult to read for content if the mechanics are sloppy, and a superior job may not be recognized as such if presented in an error-laden package.
- Good ideas sloppily expressed will receive mediocre grades, as will flashy presentations that lack content.
- Students whose native language is not English must meet the same quality of writing and presentations expected of all students.

All work submitted for evaluation (including group and individual work) must be clearly marked with a title and names of students responsible for the work. The question being answered should be spelled out or identified so the instructor knows what is being answered. Work submitted online must have all files named appropriately by following the instructions so that the instructor can easily understand what the file represents. The instructor will not spend time going through all files in order to find your submitted work. Work that does not have proper identifications as described above will automatically get a deduction of 10% of the assigned grade for that work.

### **Instructor's help for assignments and project**

As students practice various sample problems in this class, you may invariably encounter programs that do not work. It is students' responsibility to pay attention to discussions in class.

If you are not able to identify the errors when practicing the **sample problems**, the instructor will be happy to go through them with students and help them identify the problems. But **to be fair to all students, the instructor cannot take a look at a student's assignments or project before the submission deadline to help him/her identify and/or correct bugs/errors or to assess how well the work meets the requirements**. The course TA will be available to provide some guidance or tips on SAS assignments and course project on a needed basis.

### **Team Work**

For group activities, each team is responsible for organizing itself, dividing up the work, and deciding how relative contributions should be measured. It is your responsibility to **promptly** inform the instructor of any dysfunctional team dynamics and to solicit his help.

All team members must

- participate in all team activities equally,
- strive to maintain positive working relationships with other team members,
- assist team members to resolve issues relating to group work, and
- freely express their ideas, thoughts, comments, and constructive criticisms to their team members, me, and the class.

It is the responsibility of the team to ensure that all team members understand all concepts related to the completed projects and presentations. The instructor may ask questions about any completed project to any team member and any incomplete or unsatisfactory answers will affect the team grade. *The instructor may announce additional measures to obtain feedback on group member contributions and institute appropriate grade penalty for lack of participation. However, this grade penalty will be limited to the course-work that is group-based.*

### **Extra Credits**

Extra-credit opportunities, if any, will be the instructor's decision and such opportunities will be presented to the whole class instead of individual students only. No extra-credit opportunities will be given after **Dec. 1, 2021**.

### **Incomplete grade policy**

An "incomplete" grade is not based on a student's failure to complete a given work or as a means of raising his/her grade by doing additional work after the grade report time. An incomplete grade can be given only when a student has a serious medical problem or other extenuating circumstance that legitimately prevents completion of required work by the due date. In any case, the student's work to date, and before the interruption, should be passing, and the student should provide proper written proof (e.g., a doctor's note), in order to get an 'I' grade.

### **Class Schedule**

The preliminary schedule for this class is shown below. It is organized based on weeks/topics. Please note that the class schedule may be slightly adjusted during the semester based on the learning pace of the class without adversely affecting the learning objectives. Please always

refer to the latest class announcements posted on the Canvas class page or shared during the class.

**Table 1: Tentative Course Schedule**

| Dates        | Topics  | Tentative Deliverable Due Dates |
|--------------|---|---------------------------------|
| 8/23 & 25    | Course overview and introduction to business analytics                        |                                 |
| 8/30 & 9/1   | Analytics methodology & fundamental statistical concepts                      |                                 |
| 9/6 & 8      | Fundamental statistical concepts<br>Data Management with SAS Enterprise Guide |                                 |
| 9/13 & 15    | Decision trees  | Homework 1 (9/15)               |
| 9/20 & 22    | Decision Trees with SAS Enterprise Miner                                      | Quiz 1 (9/20)                   |
| 9/27 & 29    | Logistic regression   | Homework 2 (9/29)               |
| 10/4 & 6     | Logistic regression with SAS Enterprise Miner                                 |                                 |
| <b>10/11</b> | <b>Student recess. No class</b>   |                                 |
| <b>10/13</b> | <b>Mid-term exam (No lecture)</b>   |                                 |
| 10/18 & 20   | Cluster analysis  | Homework 3 (10/18)              |
| 10/25 & 27   | Cluster Analysis with SAS Enterprise Miner                                    |                                 |
| 11/1 & 3     | Data warehouse and Association Rule Mining                                    | Homework 4 (11/3)               |
| 11/8 & 10    | Introduction to AI and artificial neural networks                             |                                 |
| 11/15 & 17   | Artificial neural networks  | Quiz 2 (11/15)                  |
| 11/22        | Mobile health systems and recommender systems                                 |                                 |
| <b>11/24</b> | <b>Thanksgiving break – no class</b>  |                                 |
| 11/29        | Final exam review and course project  |                                 |
| 12/1         | Group project presentations   |                                 |
| 12/6         | Group project presentations   | Group project report            |
| 12/8~15      | <b>Final exam</b>   | TBA                             |

**Note: all assignment deliverables will be due at 10am on the due dates**

In order to make class discussion more interesting and closely tied to research and/or real-world practice, each course project group is required to select a refereed journal paper or a real-world case study related to one of the topics listed in the **“in-class student presentations” thread on the discussion board** in the course Canvas, and presents it to the class on the corresponding designated date. Specific requirements of this in-class group topic presentation are as follows:

- Each group, once determining the preferred presentation topic/date, should first go to the discussion forum on the Canvas site and respond to the thread of the selected topic/date by including the names of all group members, indicating that the group has

signed up for presenting a paper or case study on that topic. It will be on a first come, first serve basis.

- Each group should search the related literature and select 4~5 relevant journal papers or case studies on the selected topic to the instructor for approval at least one week prior to the scheduled presentation date. The instructor will provide suggestions on which one seems better for the course, or may ask for more alternatives if none of the candidate papers seems appropriate.
- Each group will present one and only one paper on the topic selected from the above list. The presentation should be prepared in the Microsoft PowerPoint;
- Each presentation will last about 20 minutes, including 3 minutes for possible question-answering. Your presentations should **NOT** repeat the basic concepts that have already been discussed in the prior lectures;
- Each presentation should consist of a good-quality, real-world applications or case studies that involve the use of selected technique. Those paper and case studies should be obtained from peer-reviewed **journal papers** or industry reports, preferably those that were **published after year 2016**.
- Either one or multiple group members can present, up to the group's choice;
- Each group should upload .ppt slides into the discussion forum (under the signed-up date/topic thread) on course Canvas site before the presentation.

### **Academic Integrity/Honesty**

All students are required to read and abide by the Code of Student Academic Integrity. Violations of the Code of Student Academic Integrity, including plagiarism, will result in disciplinary action as provided in the Code. Definitions and examples of plagiarism are set forth in the Code. The Code is available from the Dean of Students Office or online at <https://legal.uncc.edu/policies/up-407>

### **Student Assistance and Support Services**

Student Assistance and Support Services (SASS) (<https://sass.uncc.edu/>) is operating remotely Monday-Friday from 8 AM to 5 PM. SASS is committed to ensuring that students are supported during this challenging time. It can be reached via email at [studentsupport@uncc.edu](mailto:studentsupport@uncc.edu) or via phone at 704-687-0289.

Academic support: <https://ninernationcares.uncc.edu/students/academic-support>.

Health support: <https://ninernationcares.uncc.edu/health-support-services>

### **Disability Accommodations**

UNC Charlotte is committed to access to education. If you have a disability and need academic accommodations, please provide a letter of accommodation from Disability Services early in the semester. For more information on accommodations, contact the Office of Disability Services at 704-687-0040 or visit their office in Fretwell 230.

**Diversity**

The Belk College of Business strives to create an inclusive academic climate in which the dignity of all individuals is respected and maintained. Therefore, we celebrate diversity that includes, but is not limited to ability/disability, age, culture, ethnicity, gender, language, race, religion, sexual orientation, and socio-economic status.

Additional policies, including academic credit hour, inclusion & diversity, disabilities accommodations, religious accommodations, adverse weather policies, and withdrawal deadline are described on the College website.

Wish everyone a successful semester!