Course Syllabus
MIS 7621 – Business Machine Learning II
Spring 2020
3.0 Credit Hours

Instructor Information
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Office Hours: MT 1:00-3:00 PM
Teaching Assistant: Md. Jabir Rahman
TA E-mail: mrhman13@memphis.edu

Course Information
Section meeting times:
W 7:10-10:10 PM
Meeting location: Remote Only
Meeting dates: Aug 17th to November 18th

Course Overview:
This is a general introduction to the methods used in Machine Learning. We focus on learning the theory and intuition behind supervised and unsupervised learning techniques. Students will also learn how to implement these techniques using open source software tools on real world datasets.

Pre-Requisites/Co-Requisites:
This is a graduate level advanced course in Machine Learning. While there are no pre-requisites, a background in basic statistical methods would be of great help.

Course Objectives:
By the end of this course, you should be able to:

- Describe the two types of unsupervised and the three types of supervised machine learning methods.
- Demonstrate the ability to select the appropriate machine learning method for a given problem and apply it using R.
- Execute a machine learning project end-to-end from problem definition to recommendations.
- Apply Text Mining to real-world problems.

Basis for course objectives:
The objectives for this course were formulated by a team of faculty in the BIT department and are based upon a significant amount of input from business executives, industry experts, other FCBE faculty, and business school accreditation guidelines (AACSB). The specific topics covered in this course are based upon the current and projected demand for job skills that employers will need to achieve the strategic goals of their organizations.
Fogelman College: Learning Outcomes for Your Degree

The Fogelman College has established the following learning goals for all students successfully completing the MSIS/MSBA degree:

- Graduates will be effective communicators.
- Graduates will be problem solvers.
- Graduates will be leaders.
- Graduates will be knowledgeable about the global business environment.

Required Texts (and Related Materials):

**COMPUTER & SOFTWARE:**

This course requires the use of a computer and specific software programs. To complete some of the assignments, you will need access to a computer that can access specific software programs. Tutorials for downloading, installing and using these programs will be posted at the appropriate time during the semester.

- **RStudio** is the interface for the opensource statistical software R. Throughout the semester, we will be using code samples from R. You will also need to use R for some of the class assignments. Students can access RStudio using umApps. Instructions on how to download and install the software are provided on eCourseware.

- **Microsoft Excel** (a spreadsheet program) is part of the Microsoft Office software suite – for both the PC or MAC. U of M students may install Microsoft Office on a PC or MAC by following the instructions here: GetOffice

**READING ASSIGNMENTS:**

All the outside reading material for this course is available online. The elearn [Content] page has links to all the weekly reading assignments. **There is no required textbook for this course.** We will use learning material and readings from a variety of sources.

**Course Methodology**

- This course is offered in an online asynchronous format this semester. All the lectures, lab-assignments, readings and relevant course material will be released as per the schedule given below.
- There will be a virtual classroom session on eCourseware on Wednesdays 7:10-10:10 PM. While attendance is optional, the instructor will be available for any questions. Students are suggested to go through the lectures either during or before this time and avail this opportunity for any clarifications.
- **Students are suggested to visit this link for information related to ongoing COVID Situation.**

Fogelman College: Learning Outcomes for Your Degree

This course is designed to help you to meet the overall learning objectives for the BBA degree offered by the Fogelman College. You should take the time to become familiar with the overall learning objectives as a student in the BBA degree program. The learning goals for the BBA degree are:

- Graduates will be effective communicators.
- Graduates will demonstrate critical thinking skills.
- Graduates will be knowledgeable about ethical factors in the business environment.
- Graduates will be knowledgeable about the global business environment.
- Graduates will be proficient users of business presentation and analysis technology.
Suggestions for improving your success in your college studies:

- **Make a PLAN OF STUDY** for yourself. Decide upon a set time of day or week that you can devote to your schoolwork (such as “every Sunday evening” or “Fridays and Saturdays from 4pm to 6pm”)

- The weekly schedule (below) includes the recommended number of hours you should devote to this course each week.

- It may be beneficial to you to post specific appointment times in your personal calendar. Try to schedule your study appointments during the time of day when you are likely to be rested, alert, and not hungry.

- If you get distracted easily, you may need to set up frequent-but-shorter study sessions such as one to two-hour study sessions several times throughout the week as opposed to one long study session on the weekend. Review the previous weeks’ lesson before starting to learn the next lesson; it’s a good way to review and to remind yourself where you left off.

- Ask friends and family members not to disturb you during your study time.

- Have a quiet place where you can go to study, where there won’t be a lot of distractions. You may want to set your phone on “do not disturb” during your study time.

- Sit at a desk in a well-lit area (and grab a cup of coffee!) so that you don’t get too sleepy!

- View reading content on a large screen device such as a desktop or laptop computer, not a cell phone. (Larger screens cause less eye strain)

**Grading and Evaluation Criteria:**

Over the semester, you will have a variety of opportunities to earn points towards your final (overall) letter grade in this course. This section of the syllabus describes the assessed work you will be doing and how overall (final) letter grades will be computed.

**Final Course Grades:**

Your final letter grade is based on your overall average. Your overall average is calculated as the sum of all the points you earned on graded assignments divided by the total number of points possible. The letter grade is based on the following schedule:

```
Above 90% .......................................................... A
Above 80% but below 90% .................................. B
Above 70% but below 80% ................................. C
Above 60% but below 70% ................................. D
Below 60% ............................................................ F
```

Your overall grade for the semester is based on how well you perform on a mixture of formal activities including assignments, quizzes, exams and a project. A detailed description of each of the assessed activities can be found after the scoring summary table below.

**Scoring Methodology Used to Determine Course Grade:**

Points earned on the assessed activities will be distributed as follows:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>5 Homework Project Assignments (5*10 – Best 5 out of 7) pts</td>
<td>50 points</td>
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<tr>
<td>Quizzes (5 * 10) pts</td>
<td>50 points</td>
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<tr>
<td>Mid Term Exam (1*50) pts</td>
<td>50 points</td>
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<tr>
<td>Final Exam (1 * 50) pts</td>
<td>50 points</td>
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<tr>
<td>Project (1*100) pts</td>
<td>100 points</td>
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<tr>
<td><strong>Total Possible for Semester</strong></td>
<td><strong>300 points</strong></td>
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**Final Exam Schedule**

The final exam for this class will be scheduled according to the [Registrar’s academic calendar website (opens in new window)](http://example.com).
## Course Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Reading Material</th>
<th>Key Deliverables</th>
</tr>
</thead>
</table>
| 1    | August 17th | Course Introduction  
Introduction to Machine Learning  
Review of Basic Statistics  
Project Introduction | 12 Steps to Applied AI  
What is Machine Learning?  
Predictive Analytics Terms Business People Need to know | Pretest  
Survey of Learning Habits  
Project – List of Topics (Due Date 08/24/2020 7:10 PM) |
| 2    | August 24th | Review of Probability Concepts  
Introduction to R | HBR – What Every Manager Should know about Machine Learning  
Linear Algebra and Probability Theory Review for ML  
A Tour of Popular Machine Learning Algorithms | Lab Session – Introduction to R  
Project - Team Formation (Due Date 08/31/2020 7:10 PM) |
| 3    | August 31st | Data Preprocessing, Exploration and Data Visualization | Data Visualization Wiki  
HBR – Data Visualizations that really work  
Feature Engineering Techniques | Quiz-I (Probability, Statistics and Readings of the previous two weeks)  
Project – Title and Description (Due Date 09/07/2020 7:10 PM)  
Home Work 1 – Data Preprocessing, Exploration and Visualization (Due Date 09/07/2020 7:10 PM) |
| 4    | September 7th | Clustering – I | Case Study on Cluster Analysis  
Calculate Similarity – The most relevant metrics in a nutshell  
Cluster Analysis for Segmentation | |
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
<th>Assignments</th>
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<tbody>
<tr>
<td>5</td>
<td>September 14th</td>
<td>Clustering – II</td>
<td>How Machines Make Sense of Big Data – An Introduction to Clustering</td>
<td>Project – Data Collection Report (Due Date 09/21/2020 7:10 PM)</td>
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<td>10 Interesting Use Cases of K-Means Cluster Analysis</td>
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<td>6</td>
<td>September 21st</td>
<td>Association Rule Mining</td>
<td>Case Study on Association Analysis</td>
<td>Home Work 2 – Clustering (Due Date 09/28/2020 7:10 PM)</td>
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<td>HBR - What boards need to know about AI</td>
<td>Quiz-II (Data Preprocessing, Visualization, Clustering and Readings)</td>
</tr>
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<td>7</td>
<td>September 28th</td>
<td>Classification Methods -I</td>
<td>Visual Introduction to Machine Learning - I</td>
<td>Home Work 3- Association Rule Mining (Released in class. Due Date 10/04/2020 7:10 PM)</td>
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<td>Confusion Matrix</td>
<td>Team Lab – I</td>
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<td>Understanding Random Forest</td>
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<td>8</td>
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<td><strong>Mid Term Exam 10/05/2020 7:10 – 10:10 PM</strong></td>
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<td>9</td>
<td>October 12th</td>
<td>Classification Methods - II</td>
<td>HBR - Why many model-thinkers make better decisions</td>
<td>Project – Data Preprocessing, Exploration and Visualization (Due Date 10/19/2020 7:10 PM)</td>
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<td></td>
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<td>HBR – Better Ways to Predict who is going to quit</td>
<td>Home Work 4 – Classification (Due Date 10/19/2020 7:10 PM)</td>
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<tr>
<td>Week</td>
<td>Date</td>
<td>Topic</td>
<td>Readings</td>
<td>Homework</td>
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<tr>
<td>10</td>
<td>October 19&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Logistic Regression and Neural Networks</td>
<td><strong>Customer Churn Prediction using Logistic Regression</strong>&lt;br&gt;<strong>A Gentle Introduction to Neural Networks</strong>&lt;br&gt;<strong>Understanding the Math behind Neural Networks</strong></td>
<td>Home Work 5 – Logistic Regression and Neural Networks (<strong>Due Date 10/26/2020 7:10 PM</strong>)</td>
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<td>11</td>
<td>October 26&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Interpretability in Machine Learning</td>
<td><strong>HBR – Make Fairness by Design a part of Machine Learning</strong>&lt;br&gt;<strong>Interpretability in Machine Learning</strong>&lt;br&gt;<strong>Making Sense of Shapley Values</strong></td>
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<td>12</td>
<td>November 2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>Dimension Reduction Techniques</td>
<td><strong>Machine Learning Concepts – Dimensionality Reduction</strong>&lt;br&gt;<strong>The Curse of Dimensionality</strong>&lt;br&gt;<strong>Bias Variance Tradeoff</strong></td>
<td>Quiz – IV (Classification Techniques, Logistic Regression, Neural Networks, Interpretable Machine Learning and Readings&lt;br&gt;Home Work 6 – Dimension Reduction Techniques (<strong>Due Date 11/09/2020 7:10 PM</strong>)</td>
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<tr>
<td>13</td>
<td>November 9&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Text Analytics – I</td>
<td>Tapping the Power of Text Mining&lt;br&gt;HBR – Everything Alibaba does Differently</td>
<td>Home Work 7 – Text Analytics (<strong>Due Date 11/23/2020 7:10 PM</strong>)</td>
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<td>14</td>
<td>November 16th</td>
<td>Text Analytics - II</td>
<td>Which Machine Learning Algorithm should I use?</td>
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<td>15</td>
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<td>Final Exam – Wednesday November 24th 7:10 PM – 10:10 PM</td>
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* All the key deliverables are due before the beginning of class on that day.
* Quizzes are open-book, open notes
Professor’s Expectations of Students:

• All homework assignments are individual assignments and each person is expected to create their own files and do their own work. Collaboration on homework assignments is cheating. If you turn in another student’s work as your own, you will receive a 0 on that assignment.
• You are expected to turn in your assignments on time. The due dates for assignments are provided on the weekly schedule (below). Five points will be deducted for each day that an assignment is late. Late assignments must be turned in to the late assignment drop box on elearn.

Student’s Expectations of the Professor:
In my role as your instructor, there are certain things you can expect from me including: well-organized and engaging learning experience, response to emails within two (2) business days, and feedback on all work submitted within 7-10 calendar days.

Course Policies
E-mail:
All students are required to maintain and access their University of Memphis (@memphis.edu) email account. You will receive all official course correspondence at this email account. It is your responsibility to check your inbox frequently and read all email messages from the course instructor.

Academic Integrity:
The University of Memphis has clear codes regarding cheating and classroom misconduct. If interested, you may refer to the Student Handbook section on academic misconduct for a discussion of these codes. Note that using a “Solutions Manual” is considered cheating. Should your professor have evidence that using a “Solutions Manual” has occurred, he/she may take steps as described on the campus’ Office of Student Conduct website (opens in new window). If you have any questions about academic integrity or plagiarism, you are strongly encouraged to review the Fogelman College’s Website on Academic Integrity (opens in new window).

Classroom or Online Behavior:
All participants in the course should be considerate of the other course participants and treat them (as well as their opinions) with respect. The class will operate under the assumption that any and all feedback offered is positive in nature and that the intentions of the person(s) providing feedback are strictly honorable. Insensitivity in this area will not be tolerated. If you have any questions about online communication, you should review the Fogelman College’s Netiquette website (opens in new window).

Late Assignments:
Quizzes will be deactivated on the date and time they are due. Quizzes will not be re-opened for any student unless (1) the student has a valid reason why they could not submit their quiz on time and (2) the student makes a request in person to the instructor to re-open the quiz. (No requests will be approved via email.)
Assignments that are submitted to the dropbox (activities and homework projects) should be uploaded to the dropbox by the due date. The dropbox will accept late submissions for one week beyond the due date, however, the 5 points may be deducted for each day that the assignment is late.

Syllabus Changes:
The instructor reserves the right to make changes as necessary to this syllabus. If changes are necessitated during the term of the course, the instructor will immediately notify students of such changes both by individual email communication and posting both notification and nature of change(s) on the course bulletin board.
Student Services
Please access the FCBE Student Services (opens in browser window) page for information about:
- Students with Disabilities
- Tutoring and other Academic Assistance
- Advising Services for Fogelman Students
- Technical Assistance