**Course Description:**

Increased monitoring of transportation network via traditional and non-traditional techniques will only be fruitful if a timely analysis can be conducted for accurate assessment of traffic conditions. The rate of collection of such data is poised to increase, with more closed circuit cameras, community based sensing such as Waze, instrumentation of taxis and bus systems, and vehicle to infrastructure communications. Rigorous mining of such data can lead to several insights that might be buried in enormous data logs. Recent advances in big data software (eg. Hadoop 2, SPARK), distributed file system (eg. HDFS, RDD), and databases (HBASE, HIVE) have made it feasible to operate on big quantities of data, coming in real time from heterogeneous data sources. These systems operate on a cluster of commercially available servers instead of high end machines. The advantage of such a system is that high performance capability can be achieved at a very reasonable cost. In recent years, there has been a big push in developing big data analytics in the areas of computer science and business analytics. Despite being the perfect use case for applying big data analytics, the trend has not caught up in the area of transportation.

You will find that this class is a window to the world of big data analytics specifically focused to the the domain of transportation engineering. You will be exposed to lot these technologies through hands on activities over the course of this course!

**What You Will Do**

You will have three primary tasks during this course:

* Build a knowledge base on why do we need big data analytics in transportation.
* Use big data tool for simple performance analytics.
* Use big data tools for advanced machine learning applications.

You will be using an actual big data cluster environment in which you will learn by observing, coding and experimenting.

**Prerequisite:**

**Text:**

In class notes

**Instructor:**

Dr. Anuj Sharma

(anujs@iastate.edu)

**Class Hours & Room:**

Thursday, 6:00 – 9:00 , Town 206

**Office Hours:**

By Appointment

**Grading System:**

*Extra credit:* The instructor reserves the right to determine when, if ever, extra credit work will be given. You should assume that no extra credit will be given.

*Contribution of activities to final grade:* The final grade for the course will be distributed among the various activities as follows:

**Design Projects 20 %**

Assignments 20 %

Midterm Exam 25 %

Final Exam 25 %

Class Activity 10 %

A complete schedule for all exams is given with the Course Topics listing.

*Assignments*

Assignments will be made and collected regularly. You will be expected to turn in these assignments when they are due. Late assignments will not be accepted. All assignments, unless otherwise noted, should be turned in electronically or through github. The program would be run on dummy data sets and evaluated.

*Determination of Course Letter Grades:* The final grade will be determined by a relative method of grading. Following assessment chart would be used to determine the final letter grade:

≥ 97% A+

≥ 94% to <97% A

≥ 90% to <94% A-

≥ 87% to <90% B+

≥ 84% to <87% B

≥ 80% to <84% B-

≥ 77% to <80% C+

≥ 74% to <77% C

≥ 70% to <74% C-

≥ 67% to <70% D+

≥ 64% to <67% D

≥ 60% to <64% D-

< 60% F

**Policies:**

***Academic Integrity***

The academic integrity policy as shown in the current Iowa State Policy will be adhered to. Please review it and make yourself familiar with it.

***Cell Phones***

* **Turn OFF mobile phones & pagers during class.**
* **Use the silent mode and vibrating alert feature** when you must leave on the phone for that vitally important call. The rest of the class will be most appreciative.
* **Sit by the aisle for an easy exit** if you are expecting a call during a class
* **Go to a suitable place to use your phone** which can be anyplace outside of the classroom.

**Main Expectations**

* Attend all classes. Your input and contribution is very important. If you are not in class, we cannot learn from you, and you cannot learn from other students.
* Follow ethical behavior during all class activities and understand the importance of ethical behavior for engineering practice. This includes but is not limited to why plagiarism is wrong, why cheating is wrong, and more importantly why striving for high quality practice based on your own work is critical to the success of an engineer.
* Come to each class prepared, having completed any reading assignments or homework assignments, and ready to discuss the readings and your assignment results.
* Be on-time for each class. If you are late, you not only disrupt others in the class when you enter, but you will miss out on important information.
* Participate fully in all classes and don't work on other class assignments or on computers during our class time.
* Turn in all assignments on time. Late assignments will not be accepted.
* Ask when you have a question. If you do not understand something that is being discussed, it is likely that others in the class do not understand as well. Asking questions is a very important part of the learning process.
* The work that you complete will be your best effort and of the highest quality. Learning to do work of high quality is important now and when you begin your career as a civil engineer.
* Work with others in the class on assignments. Working in teams is important in today’s engineering environment.
* Turn in will be your own work, not copied or unfairly extracted from other students or other sources.
* Be honest in your dealings with me and others in the class. High ethical standards are one of the cornerstones in engineering education and practice.
* Be engaged during class in whatever work that we are doing, and do not use computers or other electronic devices unless specifically instructed to do so. Please turn off cell phones before coming to class; texting or other electronic communications during class is strictly prohibited.
* Learn and have fun!

**CIVE 965 Class Schedule**

The course schedule is subject to change depending on student performance and participation.

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Topic** | **Project** | **HW** |
| 12-Jan | Introduction, Projects - groups | Talk about it, Decide groups |  |
| 19-Jan | Linux Basic Commands, Github |  | Basic Command HW |
| 26-Jan | Python |  | Bring the xml feeds n parse |
| 2-Feb | Numpy and MatplotLib |  | Basic Maths calculating average of one INRIX file |
| 9-Feb | Performance Measures for Roadways | Topic 5 min Presentation |  |
| 16-Feb | Map Reduce; Pig |  | Calculate Performance Measures |
| 23-Feb | Visualization; Tableau |  | Visualization in Tableau |
| 2-Mar | Dynamic Message Sign Performance | Abstract, Introduction, Lit Review and Data Presentation; Presentations |  |
| 9-Mar | Mid-term Exam |  |  |
| 16-Mar | **SPRING Break** |  |  |
| 23-Mar | Data cleaning (Fourier, Wavelet Transform) |  | DMS sign application |
| 30-Mar | Clustering (DBF, K-means) |  | Finding patterns |
| 6-Apr | Classifiers (logistics, SVM) |  | DMS application |
| 13-Apr | Image Processing - basic lane det |  | Lane Identification |
| 20-Apr | **Neural Net, Deep Net - Intro** |  |  |
| 27-Apr | Final Presentations |  |  |
| 4-May | Final exam week |  |  |