CSC 591-055/ECE 592-072 Spring 2025 - IoT Analytics

Instructor
Dr. Wenye Wang
3056 EB2, Centennial Campus
Email: wwang@ncsu.edu
Phone: 919 513 2549
Whatsapp: 919 602 0965 (text)
Office hours: 5:00-6:00pm on Tuesdays, 3056 EBII, and email to schedule other walk-in or zoom meetings.

Course website: Moodle - 'my courses page and then go to CSC 591-055/ECE 592-072
Teaching Assistant: Not Available

Class Meeting Time: Mon/Wed. 10:15 am - 11:30 am, 1228 EB2, January 6 (Monday) to April 21 (Monday).

Overview
This is an introductory and comprehensive course on IoT data analytics, which is uniquely developed for students with preliminary math and programming skills in CSC/ECE departments, but with little or no preparation in optimization and machine learning. We will start from the generation of data source, via simulations and measurements, and then move on to the statistical properties of time series data, data visualization and pre-processing techniques, includes regression modeling, forecasting, clustering and classification algorithms such that a data set can be labeled as a benchmark data set for machine learning. Finally, we will explore basic ideas of support vector machine (SVM) and hidden Markov models (HMM) for data and event prediction. Therefore, this class can be considered as a precedent course for data mining or machine learning, through hands-on experience in IoT applications.

The **prerequisite** of this course is basic programming skill in **one** of the follows: Python, Java, Matlab, C/C++/C Sharp, and R. Also, fundamental probability theory at 100 or 200 levels are critical to understand the concepts and rationale behind data analytics. This is not a class on 'big data' to draw insights with data mining techniques, and neither about IoT platforms, such as SaaS, AWS, etc. that operate remote IoT devices.

Reference Books
"An Introduction to IoT Analytics," 1st Edition by Harry G. Perros (draft available online)

There is a large number of books available through the NCSU library on statistics, machine learning and other analytics-related topics. Also, there are a lot of documents and on-line lectures available through various sites in the Internet. Students are encouraged to consult and share other sources in addition to Chapters of the text book, in order to get a different point of view which will help you understand the material better. Nonetheless, the contents discussed in the classroom provide sufficient knowledge for all course assignments.

Tentative Schedule (Subject to Changes - Update on Moodle Page Weekly)

Contents	Dates	Activity	Notes
Class overview and data simulation (Ch. 1)	01/06, 01/08		Project 1
Review of Probability	01/16, 01/21, 01/23	Quiz 1	
Random numerate and event generation (ch. 3)	01/24, 02/09, 02/16	Quiz 2	Project 2
Preliminaries of Statistics (ch. 3)	02/18, 02/23		
Multivariable linear regression (ch. 5)	02/25, 02/27, 3/03, 03/05	Quiz 3	Project 3
Time series and Forecasting (ch. 6)	03/17, 03/19 03/24, 03/26	Quiz 4	Project 4
Clustering techniques (ch. 8)	03/31, 04/02, 04/07	Quiz 5	
Artificial neural networks (ch. 10) Hidden Markov Models (ch. 12) Support Vector Machine (ch. 11)	4/09, 4/14, 4/16	Quiz 6	Project 5
Review and Presentation	04/21	Presentation	

Assignment, Submission, and Grading
This course will have assignments and tests as follows:

- **Individual Projects (5) – 75%:** These assignments are distributed about every 3 weeks on the Moodle page. All assignments will be submitted via Moodle link, and each project will be graded on a 50-point scale.
- **Quizzes (5-6) – 20%:** there will be 5 or 6 quizzes (45 minutes) with problem-solving questions that are distributed in the class about 3 lectures.
- **Attendance – 5%:** This is required for all on-campus students. Specifically, students who attend more than 75% classes (or equivalent to about 21 out of 28 lectures : 7 in January, 8 in February, 7 in March, 6 in April), will receive the full credit of attendance, less than 50% or equivalent to 10 lectures will receive no credit for attendance. Proofs of excuses for absence is **NOT** required, which includes sickness, family issues, career fair, conferences, conflict of schedules, and so on.
- **Letter grades (100 points):** A (97, 93, 90), B (87, 83, 80), C (77, 73, 70). Any students who receive lower than C-range will be encouraged to quit the course so as not to affect GPA significantly.

No extension will be granted, unless there is a serious medical reason for which you will have to provide a doctor's letter. Start working on your assignment as early as possible. Do not procrastinate!! Learn to plan you work ahead of deadlines and use your time efficiently.

University Policy: We follow the general university policy and resources on academic integrity (https://studentconduct.dasa.ncsu.edu/academic-integrity-overview/), health and well-being guidelines (https://counseling.dasa.ncsu.edu/ and https://healthypack.dasa.ncsu.edu/) , and NC State Protect the Pack (https://healthypack.dasa.ncsu.edu/services-provided/covid-19/).
Students with disabilities: All effort will be made to ensure that no students with disabilities are denied any opportunity to successfully complete this course. If you have specific requirements that need to be addressed, please contact me immediately. Possible changes can include (but are not necessarily limited to) rescheduling classes from inaccessible to accessible buildings, providing access to auxiliary aids such as, recorded videos, readers, note takers, scribes, separate testing rooms, or extension of time limits.