Fall 2023

CS 643: Cloud Computing

Manoop Talasila

CS 643 – Cloud Computing

Syllabus

Faculty Contact Information

Instructor: Manoop Talasila

Email: mt57@njit.edu

Office Hours: WebEx Wednesdays 7-8 P.M. ET

Course Description

The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on parallel programming techniques for cloud computing and large scale distributed systems which form the cloud infrastructure. The topics include: overview of cloud computing, cloud systems, parallel processing in the cloud, distributed storage systems, virtualization, security in the cloud, and multicore operating systems. Students will study state-of-the-art solutions for cloud computing developed by Google, Amazon, Microsoft, Yahoo, VMWare, etc. Students will also apply what they learn in one programming assignment and one project executed over Amazon Web Services.

Textbook and Materials

There is no textbook required for this class. Each module is based on recent conference/journal papers as well as documentation from cloud providers. These papers and documentation are posted on the Schedule and Deadlines page.

Course Outcomes

1. Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure.
2. Compare the advantages and disadvantages of various cloud computing platforms.
3. Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google AppEngine.
4. Program data intensive parallel applications in the cloud.
5. Analyze the performance, scalability, and availability of the underlying cloud technologies and software.
6. Identify security and privacy issues in cloud computing.
7. Explain recent research results in cloud computing and identify their pros and cons.
8. Solve a real-world problem using cloud computing through group collaboration.

Course Structure

Module
Introduction to Cloud Computing
Cloud Computing Platforms
Parallel Programming in the Cloud
Distributed Storage Systems
Virtualization
Cloud Security
Multicore Operating Systems

Grading Scale

Grade	Percentile	Percentage
A	4.0	90.00-100.00%
B+	3.5	80.00-89.99%
B	3.0	65.00-79.99%
C+	2.5	58.00-64.99%
C	2.0	50.00-57.99%
F	N/A	0-49.99%

At the discretion of the instructors, the grading may be done on a curve.

Grading Categories

Categories	Percentage
Midterm Exam	25%
Final Exam	25%
Programming Assignment 1	15%
Programming Assignment 2	15%
Homework Problems	10%
Paper Presentations	10%

Course Policies

Course Correspondence

All correspondence with the instructor will take place through Moodle. Questions of general interest should be posted on Moodle's Ask the Instructor discussion board. Personal/ individual questions should be emailed if the instructor is not responsive to your discussion board posting.

Paper Presentations

Students will present, in groups of two, one research paper during the semester. These papers cover very recent developments in cloud computing. The presentations (using PowerPoint slides) will take place in class, and extra-credit will be assigned for active participation in discussions.

Programming Assignment

There will be two individual programming assignments. The first is to build an image recognition pipeline in Amazon AWS, using two EC2 instances, S3, SQS, and Rekognition. The assignment must be done in Java on Amazon Linux VMs. You will learn how to use the AWS cloud platform and how to develop an AWS application that uses existing cloud services. The second is to build a machine learning prediction model in Spark/MLlib over AWS. The model must be trained in parallel on multiple EC2 instances. The assignment must be implemented in Java, Scala, or Python on Ubuntu Linux. You will learn how to develop parallel machine learning applications in the AWS cloud platform.

Exams

There will be two exams: a midterm, and a final exam. Both are proctored closed book (i.e., papers, notes) exams. The final exam will cover only the material taught after the midterm.

Time Commitment

The students are expected to allocate ten hours per week to study and work on the assignments for this course.

Late Work and Make-Up Exams

In case of missing an exam, a make-up may be taken only after providing written documentation to the Dean of Students. It is left the instructor's discretion whether to accept all other late assignments.

Sharing Information

Students are free to discuss assignments with their colleagues. However, they should not take any written (electronic or otherwise) record away from the discussion. This applies when the assignment is supposed to be an individual effort or whenever two teams discuss common problems they are each encountering (inter-group collaboration). After the discussion, it is advisable to engage in at least half hour of non-course related activity before starting to work on the assignment. This will assure that students are able to reconstruct by themselves what they learned from the discussion.

Student Conduct

The NJIT University code on academic integrity (Links to an external site.) will be followed in all courses.