Developing a Remote Sensing and Cloud Computing Curriculum for the Association of Computer/Information Sciences and Engineering Departments at Minority Institutions (ADMI)

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Abstract

In the past decade, online learning initiatives have become increasingly comprehensive and have allowed students to be unburdened from learning complex subjects in a traditional teach-learn environment. Universities have recognized the need to adapt new teaching-learning approaches for meeting students' diverse inadequacies. Cloud computing, which offers a scalable and flexible approach to storing, processing, and analyzing big data, has benefited from a variety of science applications except for remote sensing. The research explored the potential for a cloud computing and remote sensing curriculum through the use of video resources and hands-on assessments. This research discusses a curriculum for coupling two diverse research areas, cloud computing and remote sensing. The solution acquired information about cloud computing and remote sensing in order to develop five 15-20 minute self-contained modules. Understanding the challenges recognized by minority serving institutions in adapting from a teaching-learning environment to an online environment was also explored.

Introduction

In fall 2006 19.6% of students were learning online and in fall of 2011 that percentage was increased to 32.0%. Online education is slowly increasing. According to previous research, findings show that in 2012 56.4% of students taking online courses had the same learning outcome compared to students taking courses face to face with professors. With the increasing of technology, online education will continue to increase [1]. Online education has the ability to teach subjects that some professors cannot teach at historically black colleges and universities (HBCU). Some HBCU's have limit to no resources to teach cutting edge research options like cloud computing. If the institutions have resources to teach subjects like cloud computing, the downfall is not having the teachers who can communicate the subject effectively. Producing cutting edge online courses for Massive Open Online Courses (MOOC) allows students at ADMI institutions to experience cutting edge education in virtual time and train the next generation of engineers.

Related Work

This project used two highly known online educational services as a reference for the course, MIT OpenCourseWare (OCW) and Stanford Online. Massachusetts Institution of Technology (MIT) has developed online courses on a cloud called MIT OpenCourseWare (OCW). OCW allows materials that are being taught in MIT's classrooms available on the Internet for no charge. MIT OpenCourseWare currently has 2,150 courses and about 125 million people who have visited the site [4]. Stanford Online is an educational tool for people to experience Stanford University's high quality education by unleashing innovation in online learning.

Methodology

Big Data
Module 1: What is Big Data?
Module 2: Three V's of Big Data
Module 3: Volume of Information
Module 4: Variety of Information
Module 5: Velocity of Information
Module 6: Other Factors of Big Data
Module 7: Uses
Module 8: Challenges
Module 9: Solutions
Module 10: Technological Advancements

Distributed &Parallel Computing
Module 1: Distributed Computing
Module 2: Benefits
Module 3: Client/Server Model
Module 4: Parallel Computing
Module 5: Uses
Module 6: Why use parallel?
Module 7: Flynn's Classical Taxonomy
Module 8: Single Instruction Single Data Stream
Module 9: Single Instruction Multiple Data Stream
Module 10: Multiple Instruction Single Data Stream
Module 11: Multiple Instruction Multiple Data Stream
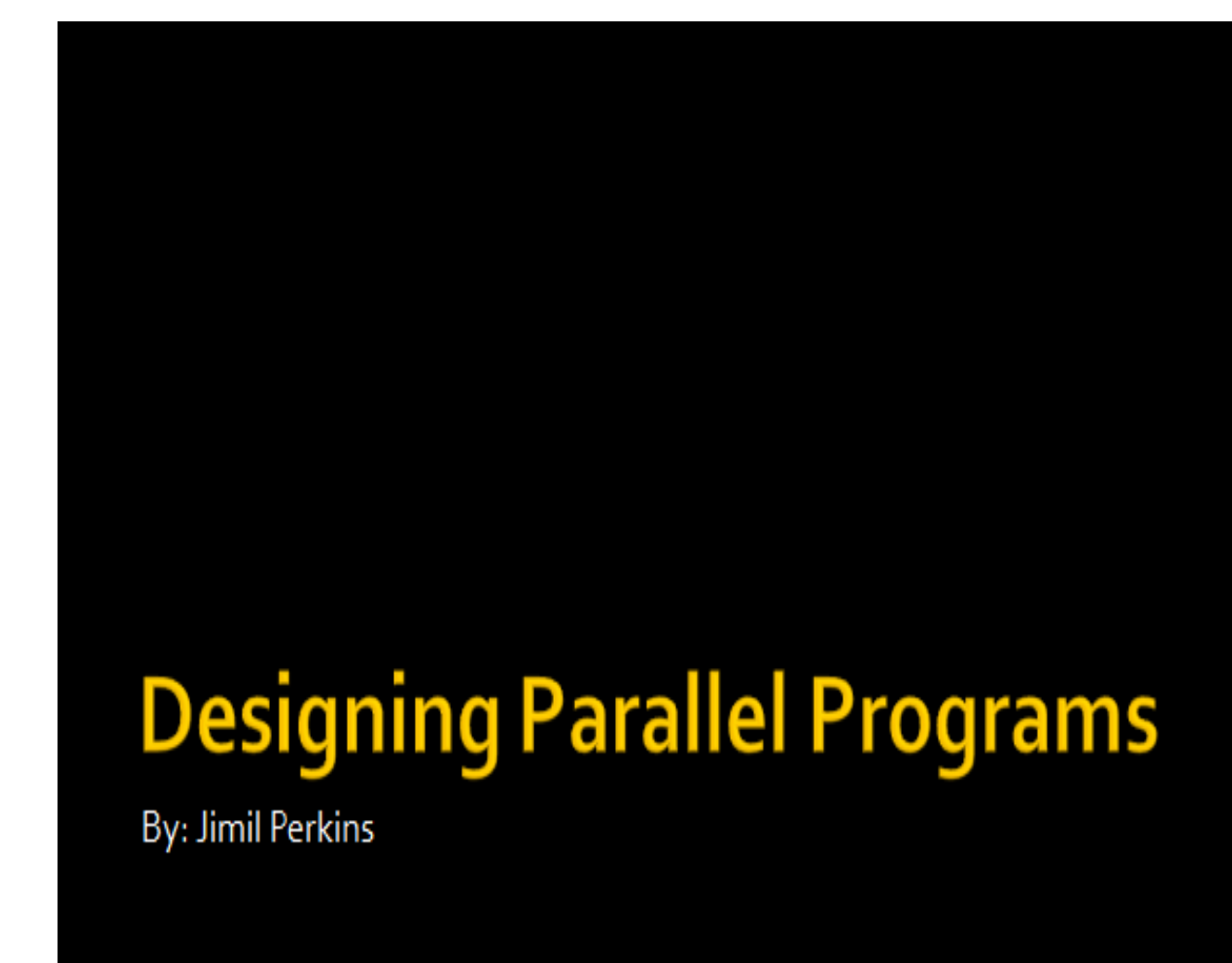
Designing Parallel Programs
Module 1: Auto vs. Manual
Module 2: Understanding the Problem
Module 3: Partitioning
Module 4: Communication
Module 5: Factors of Communication
Module 6: Synchronization
Module 7: Data Dependencies
Module 8: Load Balance
Module 9: Granularity
Module 10: Input / Output Negative Aspects
Module 11: Input / Output Tips
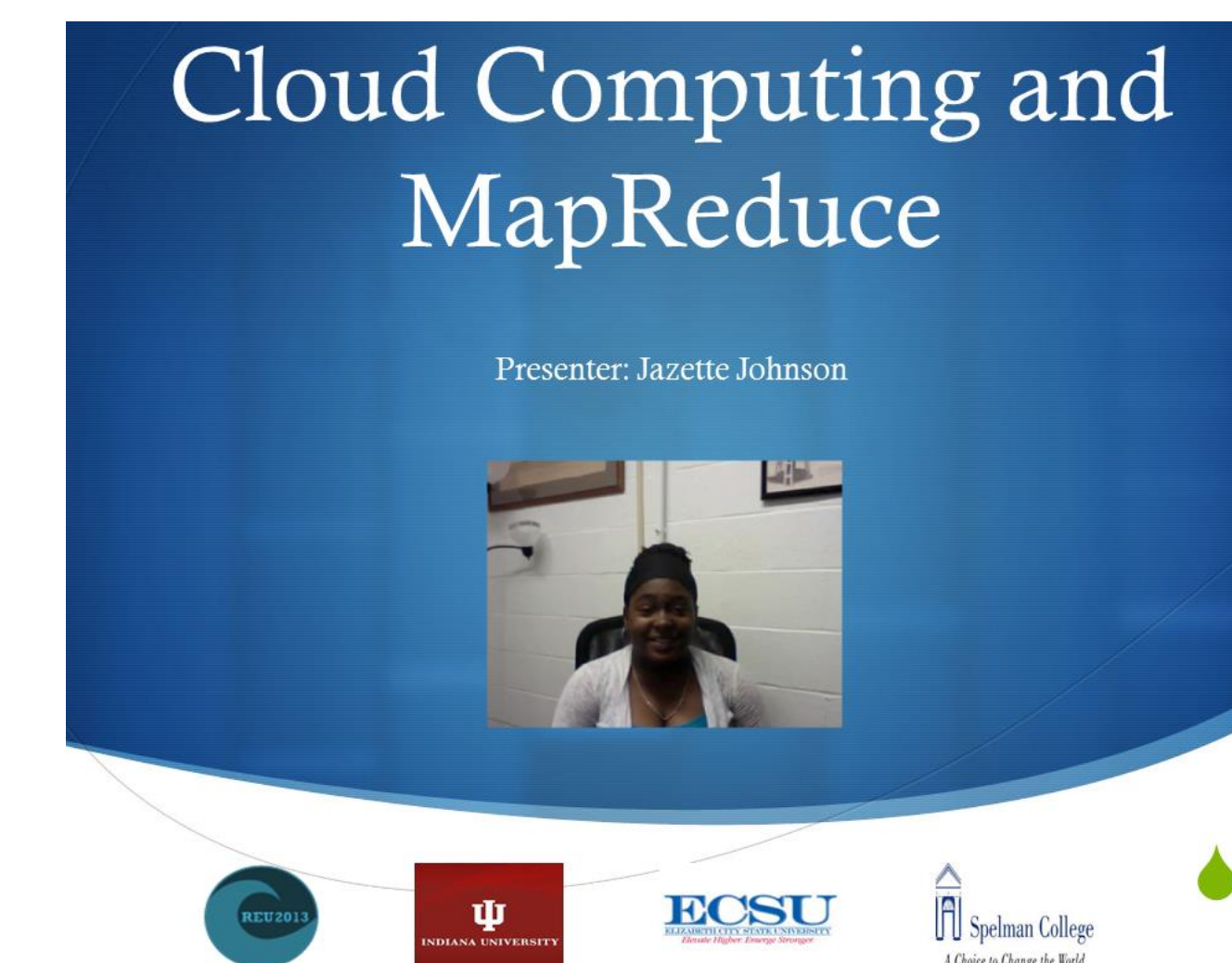
Cloud Computing
Module 1: Why is Cloud Computing Important?
Module 2: What is Cloud Computing?
Module 3: Infrastructure as a Service (IaaS)
Module 4: Platform as a Service (PaaS)
Module 5: Software as a Service (SaaS)

MapReduce
Module 1: What is MapReduce?
Module 2: Who is using MapReduce?
Module 3: MapReduce Structure
Module 4: Map
Module 5: Sort
Module 6: Reduce

Conclusion & Future Work

We have created modules to introduce cloud computing. Some of the topics covered were Big Data, Parallel and Distributed Computing, Cloud Computing and MapReduce. Modules were designed to appeal to multiple learning styles (i.e. auditory). In future research of the remote sensing and cloud-computing curriculum the modules will be expanded and user experience studies will be conducted with students who attend ADMI institutions (i.e Spelman College, Norfolk State University, Elizabeth City State University). The user study will allow the student to take the course online; feedback will be gathered to see how the curriculum is effective. A Message Passing Interface (MPI) and Hadoop virtual appliance will be developed so students can apply theoretical concepts gained from the curriculum.

Acknowledgements

Reference

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[3] Sriram , I., & Khajeh-Hosseini, A. (n.d.). Research agenda in cloud technologies.

[4] Abelson, H. (2007). The creation of opencourseware at mit.Journal of Science Education and Technology