

IT C275: AI INTEGRATION: LOCAL AND CLOUD SOLUTIONS

Item	Value
Curriculum Committee Approval Date	12/06/2024
Top Code	070800 - Computer Infrastructure and Support
Units	3 Total Units
Hours	54 Total Hours (Lecture Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S), • Pass/No Pass (B)

Course Description

This course explores the integration of artificial intelligence across local and cloud-based environments. Students will learn how to implement AI solutions that leverage both on-premises resources and cloud services, ensuring scalability, efficiency, and security. Topics include cloud-based machine learning platforms, local AI deployment, hybrid architecture design, and data synchronization strategies. Practical exercises will focus on deploying AI applications in hybrid settings to address real-world challenges. ADVISORY: IT 128 & IT C198. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Demonstrate the ability to design and implement hybrid AI architectures that integrate local and cloud environments effectively.
2. Utilize cloud platforms such as AWS, Azure, or Google Cloud for AI model training, deployment, and scalability.
3. Implement secure and efficient data synchronization techniques between local and cloud systems.
4. Develop and deploy artificial intelligence (AI) solutions tailored to real-world scenarios, ensuring optimal performance and cost-efficiency.

Course Objectives

- 1. Describe the key concepts and benefits of integrating artificial intelligence (AI) across local and cloud environments.
- 2. Explain how to develop and implement AI solutions that seamlessly operate across both local systems and cloud platforms.
- 3. List cloud-based AI services (such as AWS SageMaker, Azure AI, and Google AI) for model training, deployment, and scaling.
- 4. Demonstrate methods for implementation of AI solutions on local devices and systems, including edge computing and on-premises hardware.
- 5. Share how to apply techniques for secure and efficient data synchronization between local and cloud environments.

- 6. Demonstrate methods used to adjust AI models to ensure optimal performance, cost-efficiency, and scalability when deployed across local and cloud infrastructures.
- 7. Explain how to address security challenges and compliance requirements when integrating AI systems in hybrid environments.
- 8. Provide methodologies used to assess and select appropriate AI tools and platforms for local and cloud integration, considering the needs of the system and organization.
- 9. Share strategies to minimize latency and optimize performance when running AI models in hybrid local and cloud settings.
- 10. Showcase how to use monitoring and management tools to track the performance and health of AI models in both local and cloud environments, ensuring continuous improvement and adaptation.

Lecture Content

Introduction to Local and Cloud AI Integration Overview of local and cloud AI environments Benefits and challenges of hybrid AI integration Case studies of hybrid AI applications Cloud AI Platforms Introduction to cloud services (AWS SageMaker, Azure ML, Google AI) Deploying pre-trained models to the cloud Managing AI workloads in cloud environments Local AI Deployment Setting up local environments for AI (using GPUs, edge devices, etc.) Tools for local model training and inference Challenges of local-only AI deployment Hybrid Architecture Design Designing AI systems with local and cloud integration API usage for communication between environments Balancing performance, cost, and latency Data Synchronization and Storage Secure data transfer between local and cloud environments Managing large datasets efficiently Real-time data synchronization Security and Compliance in Hybrid AI Systems Ensuring data privacy and security in hybrid setups Compliance with legal and ethical standards Preventing vulnerabilities in hybrid AI systems Performance Optimization Tuning AI models for hybrid environments Cost-efficient resource allocation in the cloud Monitoring and troubleshooting hybrid AI systems Capstone Project Preparation Review of tools and techniques Planning and designing a hybrid AI solution for deployment

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)

Instructional Techniques

This course will utilize a combination of lecture, hands-on guided laboratory assignments, classroom/discussion board student interactions, Internet problem solving, quizzes, tests, and troubleshooting assignments to achieve the goals and objectives of this course. All instructional methods are consistent across all modalities.

Reading Assignments

Read about and research local and cloud AI environments. Read about tools for local model training and inference. Read about methods used to balance performance, cost, and latency.

Writing Assignments

Design and implement a real-world hybrid AI application (e.g., image recognition, predictive analytics). Present the solution with a focus on performance, security, and cost-effectiveness.

Out-of-class Assignments

Create and configure a cloud account. Train a pre-built machine learning model on a cloud platform. Develop a system that trains a model in the cloud and deploys it locally for inference. Students will work in a lab environment to complete the following assignments: Lab 1: Setting Up Cloud AI Services Create and configure a cloud account (AWS, Azure, or Google Cloud). Train a pre-built machine learning model on a cloud platform. Lab 2: Deploying a Local AI Model Use a local GPU-enabled environment to train and test an AI model. Perform inference on edge devices such as Raspberry Pi or Jetson Nano. Lab 3: Building a Hybrid AI Pipeline Develop a system that trains a model in the cloud and deploys it locally for inference. Utilize APIs for communication between local and cloud environments. Lab 4: Real-Time Data Synchronization Create a system for real-time data transfer between local and cloud environments. Use cloud storage solutions like Amazon S3 or Google Cloud Storage. Lab 5: Securing Hybrid AI Systems Implement encryption for data transfers between local and cloud systems. Configure security groups and permissions in a cloud environment. Lab 6: Capstone Project: Deploying a Hybrid AI Solution Design and implement a real-world hybrid AI application (e.g., image recognition, predictive analytics). Present the solution with a focus on performance, security, and cost-effectiveness.

Demonstration of Critical Thinking

Given sets of operational data, the student will be able to critically analyze the data and make recommendations on how to improve the operations based on those findings.

Required Writing, Problem Solving, Skills Demonstration

Given a scenario, students will be able to troubleshoot a specific problem, write a detailed outline of the tasks that need to be accomplished to rectify the problem, complete the tasks as outlined, and test to determine if the problem has been solved.

Eligible Disciplines

Computer service technology: Any bachelor's degree and two years of professional experience, or any associate degree and six years of professional experience. Computer service technology: Any bachelor's degree and two years of professional experience, or any associate degree and six years of professional experience.

Other Resources

1. Commonly referenced cybersecurity and information technology whitepapers and Open Educational Resources (OER), will be used along with the latest AI tools case studies, such as: (ISC)²<https://www.isc2.org/> Verizon Data Breach Investigations Report (DBIR)<https://www.verizon.com/business/resources/reports/dbir/> NIST Computer Security Resource Center Publications<https://csrc.nist.gov/publications/cswp> CrowdStrike Whitepapers<https://www.crowdstrike.com/resources/white-papers/> SANS Information Security White Papers<https://www.sans.org/white-papers/> 2. Coastline Library 3. IT white papers and articles are available at no charge to all students at multiple sites as recommended by the instructor.