School of Electrical Eng. and Information Technology

Course name: CE7502 Cloud for AI

Instructor Information:

Name: Ala' Khalifeh
Office Hours: S/T from 11:30 – 12:30 or by appointment
Office: M 217 – Main campus

Grading:

Midterm exam	30
Course work (e.g. assignments, projects)	30
Final Exam	40

Course Content: The course will cover the following topics:

Part 1: Cloud computing

Module 1: Journey to the Cloud
Module 2: Classic Data Center (CDC)

- Application
- DBMS
- Compute and Storage
- Networking
- Business Continuity Overview and Backup

- **Module 3**: **Virtualized Data Center (VDC)**
  - Compute Virtualization Overview
  - Virtual Machines
  - Resource Management Techniques
  - Physical to Virtual Conversion
  - Storage Virtualization Overview
  - Virtual Machine Storage
- **Module 4: Virtualized Data Center (VDC) – Networking**
  - VDC Networking Overview
  - VDC Networking Components
  - VLAN and VSAN Technologies
  - Network Traffic Management
- **Module 5: Virtualized Data Center (VDC) – Desktop and Application**
  - Desktop Virtualization
  - Application Virtualization

Part 2: Cloud and AI integration

Module 1: Introduction to Cloud and AI

- Role of cloud computing in AI/ML development
- Benefits of using cloud-based AI (scalability, cost-efficiency, performance)
- Comparison of major cloud providers (AWS, GCP, Azure, IBM Cloud, etc.)

Module 2: Setting Up Cloud-Based AI Development Environment

- Cloud-based Jupyter Notebooks (e.g. Google Colab, Amazon SageMaker, Azure ML Studio)
- Connecting cloud services with local development environments

Module 3: Cloud Hardware for AI/ML

- Using GPUs, TPUs, and specialized AI hardware (NVIDIA, AMD, Google TPUs)
- Selecting the right cloud instance for AI workloads (AWS EC2, GCP AI Notebooks, Azure VMs)

Module 4: AI Development with Cloud Services

- Installing and managing ML libraries (e.g. TensorFlow, PyTorch, Scikit-Learn)
- Handling large datasets (cloud storage, databases, object storage)
- Using cloud-native AI services (e.g. AWS SageMaker, Azure ML, Google Vertex AI)

Module 5: Handling Data in the Cloud

- Cloud storage options (e.g. AWS S3, Google Cloud Storage, Azure Blob Storage)

Module 6: Training and Fine-Tuning AI Models in the Cloud

- Training models using cloud-based resources
- Distributed training across multiple GPUs/TPUs

Module 7: Deploying AI Models in the Cloud

- Model deployment strategies (serverless, containerized, edge AI)
- Deploying models using cloud-based APIs and microservices
- Monitoring and maintaining AI applications

References:

- Dell- EMC Inc. slides and materials for Cloud computing and Big data.
- Marinescu, Cloud Computing - Theory and Practice, Morgan Kaufmann, 2013.
- Berman, J.: Principles of Big data, preparing, sharing, and analyzing complex information, Morgan Kaufmann, 2013.
- Dell-EMC slides and material.

Online Tutorials and Resources

1. Google Colab Tutorials:

- **Official Google Colab Introduction:** Provides an overview and sample notebooks to get started.

colab.research.google.com

- **Deep Learning Basics with Colab:** A hands-on tutorial introducing deep learning concepts directly in Colab.

colab.research.google.com

- **Neptune.ai's Comprehensive Guide:** Offers insights into using Colab for deep learning, including handling datasets and utilizing GPUs/TPUs.

neptune.ai

2. Online Courses and Specializations:

- **Google Cloud's Machine Learning & AI Courses:** Interactive labs and classes designed by Google experts to enhance your ML skills.

cloud.google.com

- **Coursera's "Introduction to AI and Machine Learning on Google Cloud":** A course focusing on AI and ML offerings on Google Cloud, supporting the data-to-AI lifecycle.

coursera.org

- **DeepLearning.AI's "Deep Learning Specialization":** A series of courses covering deep learning techniques, with practical assignments often utilizing Colab.

3. Additional Learning Platforms:

- **Fast.ai:** Offers a practical deep learning course with a focus on using accessible tools like Colab.
- **Codecademy's AI Courses:** Provides tutorials on AI topics, including leveraging cloud platforms and tools.

codecademy.com