**University of Central Missouri**

**Department of Computer Science & Cybersecurity**

**CS5720 Neural network and Deep learning**

**Spring 2025**

**Home Assignment 2. (Cover Ch 4,5)**

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**Submission Requirements:**

* Total Points: 100
* Once finished your assignment push your source code to your repo (GitHub) and explain the work through the ReadMe file properly. Make sure you add your student info in the ReadMe file.
* Submit your GitHub link and video on the BB.
* Comment your code appropriately ***IMPORTANT.***
* Make a simple video about 2 to 3 minutes which includes demonstration of your home assignment and explanation of code snippets.
* Any submission after provided deadline is considered as a late submission.

**Question 1: Cloud Computing for Deep Learning (20 points)**

Cloud computing offers significant advantages for deep learning applications.

(a) Define **elasticity** and **scalability** in the context of cloud computing for deep learning. (10 points)  
(b) Compare **AWS SageMaker**, **Google Vertex AI**, and **Microsoft Azure Machine Learning Studio** in terms of their deep learning capabilities. (10 points)

**Expected Output**

Write the definition and comparison for (a) and (b). No code needed.

Elasticity: It is the dynamic adjustment of resources based on demand fluctuations. In deep learning, it is the scaling up of GPUs during intensive training and scaling down when there is less demand optimizing cost and performance.

Scalability: It is the ability to handle increased workload by adding resources. In deep learning, scalability ensures that larger models or datasets can be processed efficiently by distributing computations across multiple nodes or instances.

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| **Features** | **AWS SageMaker** | **Google Vertex AI** | **Microsoft Azure Machine Learning Studio** |
| Usage | A fully managed service that simplifies the process of building, training, and deploying deep learning models | AI Platform Managed Jupyter Notebooks for collaborative ML development. | A drag-and-drop environment for building AI models |
| Support | Supports frameworks like TensorFlow, PyTorch | Deep Learning VM – Pre-configured instances with TensorFlow, PyTorch, and JAX | Supports PyTorch, TensorFlow, and Scikit-learn |
| Features | Features like automatic model tuning (Hyperparameter Optimization) and real-time inference | AutoML – Automated model training with minimal coding | Enables automated ML and model monitoring |
| Pricing Model | Pay-as-you-go, spot instances for cost savings | Usage-based pricing with flexible options | Pay-as-you-go, reserved capacity pricing |