University of Central Missouri

Department of Computer Science & Cybersecurity

CS5720 Neural Networks and Deep Learning

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Home Assignment 1.

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4.1 Questions to Answer:

1. What patterns do you observe in the **training and validation accuracy curves**?
2. How can you use **TensorBoard to detect overfitting**?
3. What happens when you increase the number of epochs?

4.1.1) What patterns do you observe in the training and validation accuracy curves?

Typical patterns:

- **Both increasing**: Indicates that the model is learning and generalizing well.
- **Training accuracy > Validation accuracy**: Normal, but a large gap may suggest **overfitting**.
- **Validation accuracy plateaus or drops** while training accuracy keeps increasing: Clear sign of **overfitting**.
- **Both curves fluctuate or stay low**: Model may be **underfitting**, possibly due to insufficient training or a simple model.

4.1. 2) How can you use TensorBoard to detect overfitting?

Use TensorBoard's **Loss** and **Accuracy** plots:

- **Overfitting signs:**
  - **Training loss keeps decreasing** while **validation loss starts increasing**.
  - **Training accuracy increases**, but **validation accuracy plateaus or decreases**.
- TensorBoard lets you **zoom in on epochs**, **compare runs**, and view metrics in real-time, making overfitting easy to spot.

4.13). What happens when you increase the number of epochs?

- **Initially**, both training and validation performance may improve.
- **Eventually**, the model may:
  - Learn the training data too well (memorization),
  - Start **overfitting**, leading to a **gap** between training and validation metrics,
  - Waste computation if early stopping isn't used.