Lab 3 Theory

Advanced Deep Learning - D7047E

Github Repo: https://github.com/juliusatgit/AdvancedDeepLearning

Task 3.1.1 - Explain the pros and cons of utilising Concatenation for combining embeddings

Pros:

- Easy to implement
- Keeps full information from individual embeddings
- Larger embedding captures more complex patterns
- Suitable for multimodal tasks

Cons:

- Expensive, requires high computational and memory resources
- Doesn't model interactions between embeddings
- Large vectors may lead to overfitting or slow convergence

Task 3.1.2 - Explain the pros and cons of utilising Addition for combining embeddings

Pros:

- Easy to implement.
- Faster and less memory-intensive than concatenation
- Combines embeddings element-wise, allowing shared patterns
- Works well with embeddings of the same size

Cons:

- May not preserve all individual details from embedding
- Can't capture complex interactions as effectively as other methods
- Combined features may cancel each other out

Task 3.1.3 - Explain the pros and cons of utilising Multiplication for combining embeddings

Pros:

- Models multiplicative relationships between embeddings
- Useful for feature fusion, can highlight important features between embedding interactions
- Handles complex, non-linear dependencies better than addition

Cons:

- Computationally more expensive than addition or concatenation
- Is very sensitive to embeddings and may be vulnerable to noise or irrelevant features
- Harder to interpret than simpler methods like addition.

Task 3.1.4 - Explain the pros and cons of utilising Attention for combining embeddings

Pros:

- Dynamic weighting, as it assigns different importance to each embedding
- Captures complex interactions and relationships between embeddings
- Can combine embeddings in context-dependent ways
- Suiteable for complex task

Cons:

- Computationally expensive, as it requires huge resources and time
- More difficult to implement and tune

- Can lead to overfitting with too many parameters
- Needs large training data to perform effectively
- Harder to interpret compared to simpler methods

Task 3.1.5 - Explain the pros and cons of utilising Difference for combining embeddings

Pros:

- Used for determining differences between embeddings
- Useful when embeddings represent opposing features
- Easy to implement and computationally efficient
- Can help isolate distinct aspects of the embeddings

Cons:

- May discard important shared features
- Large differences can dominate
- Doesn't capture complex interactions
- Not ideal for similar embeddings
- Subtracting embeddings can be vulnerable to irrelevant features