Embeddings: Test Your Knowledge

Let's do a quick test! You must answer at least 4 questions correctly to pass this quiz.

1. Which of the following would be good candidates for an embedding? (Choose all that apply)

Choose as many answers as you see fit.

- [ ] Daily high temperatures for Tokyo, Japan from 1999–2024.
- [x] Genomic sequences of simple viruses.
  - ✓ One way of approaching this problem would be to consider each genome a document and each nucleotide a token.
- [x] A large dataset of high-definition photos of horses.
  - ✓ Each photograph would have, at minimum, the total number of pixels as the number of dimensions in an encoding vector. There is almost certainly a lower-dimensional way to represent that information, particularly when the subjects have shapes, colors, and patterns in common.
- [x] Lines of code in a large software project.
  - ✓ Code lines are also a good candidate for an embedding, because the data is categorical and sparse.

2. You encode a database of 100px by 100px black-and-white images of handwritten digits as vectors representing the pixels in the image: 0 for white and 1 for black. If you create an embedding from this encoding, roughly how many dimensions will your embedding have?

- ○ 10,000 dimensions
- ○ Greater than 10,000 dimensions
- ◉ Fewer than 10,000 dimensions
  - ✓ In the question, we encode each image of 10,000 pixels as a vector 10,000 elements long, so the encoded data has 10,000 dimensions. Embeddings translate high-dimensional data into a lower-dimensional space, so the embedding will have far fewer dimensions than the sparse vectors.

3. Which of the following are benefits of using embedding vectors for feature data over one-hot vectors of the same data? (Choose all that apply)

Choose as many answers as you see fit.

- [x] A model using embedding vectors will have fewer weights to tune during training.
  - ✓ The embedding vector will have fewer dimensions than the one-hot vectors, which means fewer weights.
- [x] Training the model will be faster and cheaper when using embedding vectors.
  - ✓ Because the model requires fewer weights when using embedding vectors, training will be require less computation.
- [ ] A model trained on the embeddings does not need to be evaluated with a test set.
- [ ] Dimensionality of the data will increase when using embedding vectors, improving model performance.

4. True or False: Weights taken from a hidden layer of a trained neural network can be used as an embedding.

- ◉ True
  - ✓ You can choose any of a neural network's hidden layers, though preferably one with fewer dimensions than the input data, and use the weights from that layer as an embedding vector.
- ○ False

5. In what ways does a contextual embedding differ from a static embedding? (Choose all that apply)

Choose as many answers as you see fit.

- [x] Contextual embeddings encode positional information, while static embeddings do not.
  - ✓ Whether by incorporating a front-to-back and back-to-front reading of the data, or a positional matrix, contextual embeddings generally transform static embeddings by some function that encodes token position.
- [x] One token is represented by one static embedding, but can be represented by multiple contextual embeddings.
  - ✓ Because contextual embeddings incorporate positional information, one token can have multiple contextual embedding vectors. Static embeddings only allow a single representation of each token.
- [ ] Contextual embeddings have a lower computational cost when compared to static embeddings.
- [ ] Static embeddings allow for semantically meaningful mathematical operations between vectors in all use cases, while contextual embeddings do not.

Results

You scored 5 out of 5. Congratulations! You have passed this quiz.

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