Workshop 8

COMP90051 Statistical Machine Learning

Semester 1, 2023

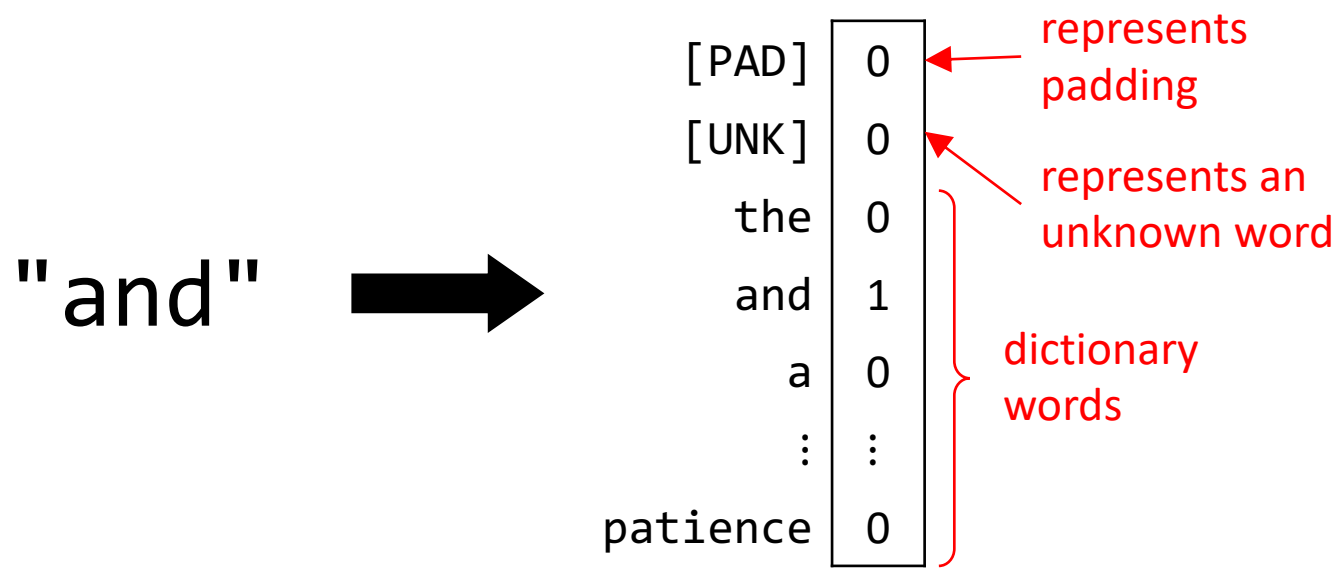
Learning Outcomes

By the end of this workshop you should be able to:

1. explain how to vectorise text data for input into neural nets
2. design neural nets for text classification with recurrent architecture
3. be able to implement attention mechanism

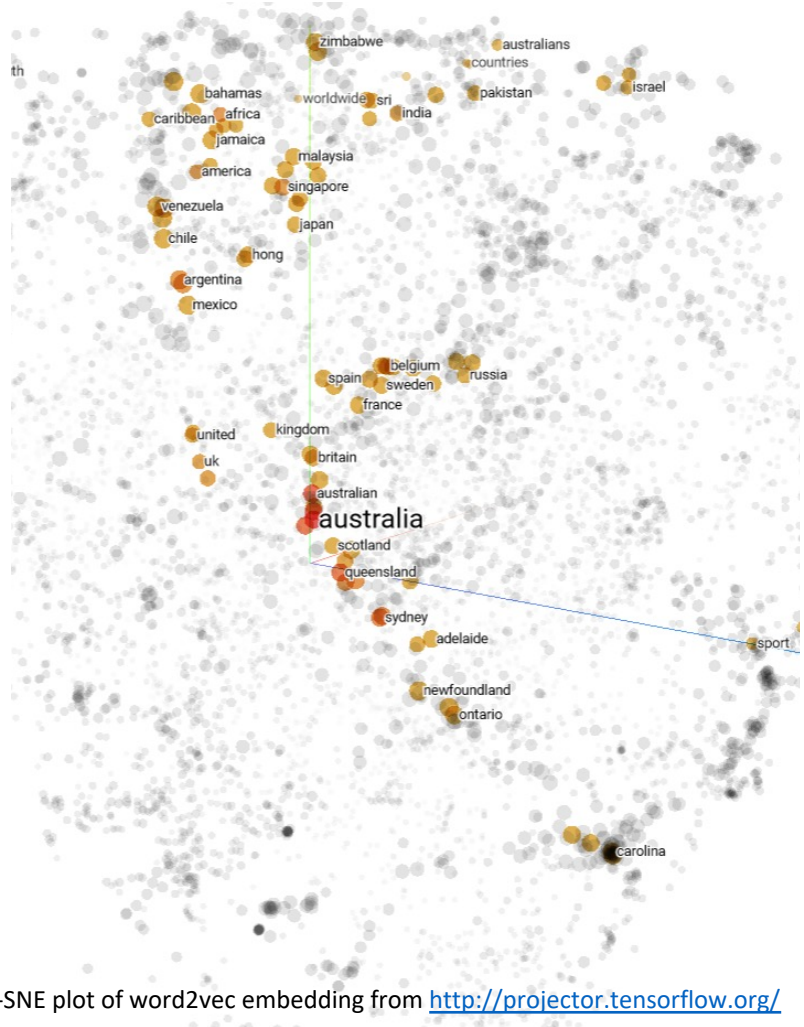
Word embeddings

- Need to represent words as vectors for compatibility with differentiable neural networks
- A familiar solution is one-hot encoding
- However it's inefficient for large dictionaries (very sparse)



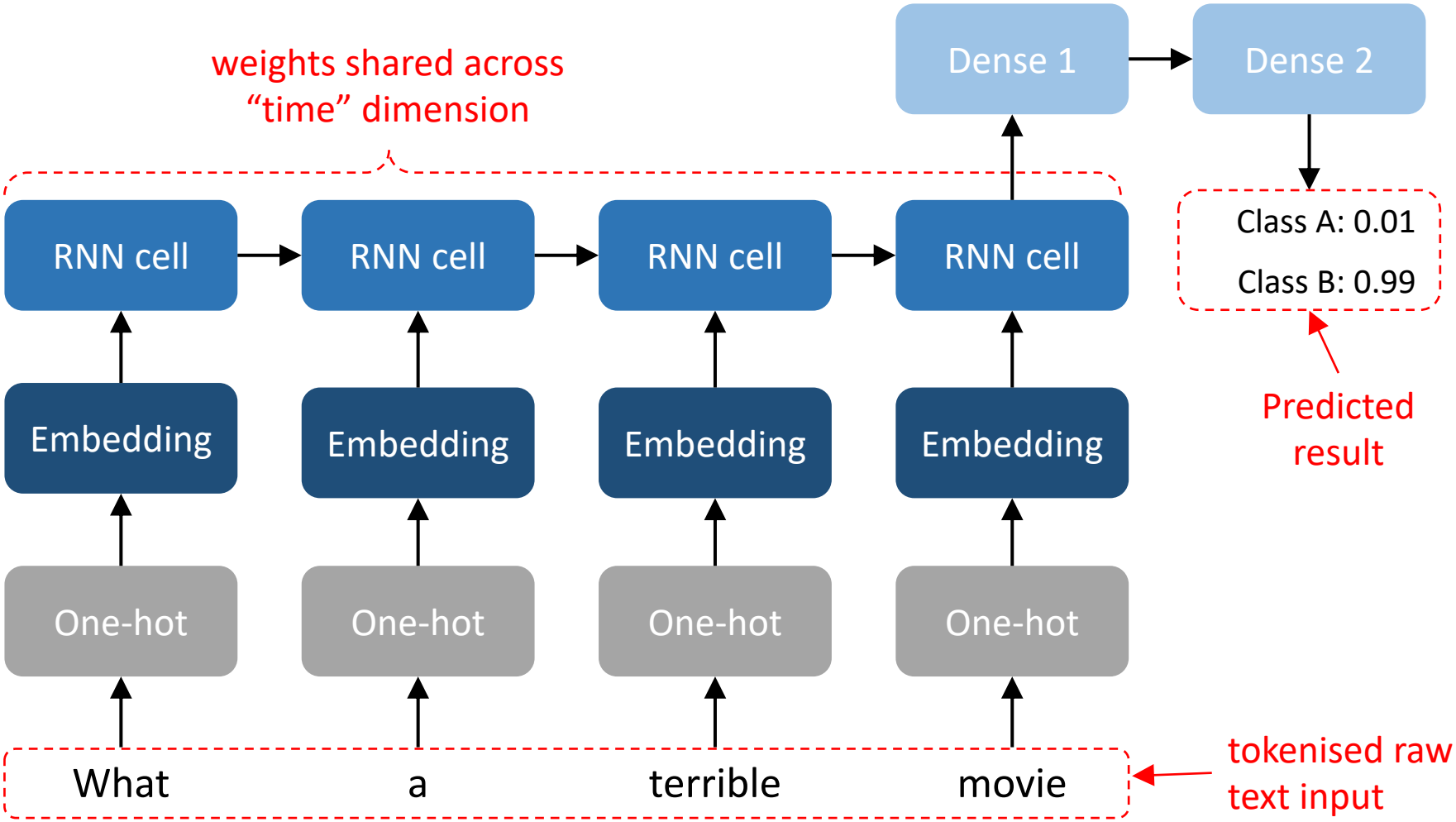
Word embeddings

- To improve efficiency, we can learn an embedding in a lower-dimensional space
- Embedding is a linear map from one-hot encoded word vectors $\mathbf{x}_{\mathrm{o-h}} \in \{0,1\}^k$ to dense word vectors $\mathbf{x}_{\mathrm{dense}} \in \mathbb{R}^d$, parameterised by a weight matrix $\mathbf{W} \in \mathbb{R}^{k \times d}$
- Common to use pre-trained embeddings



t-SNE plot of word2vec embedding from http://projector.tensorflow.org/

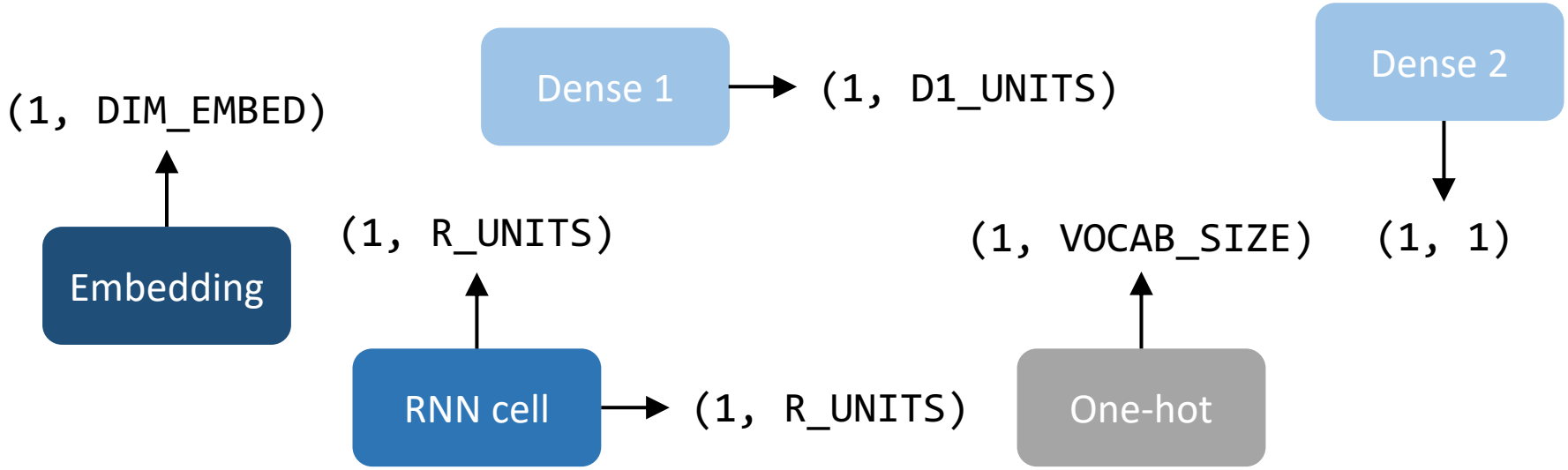
Text classification architecture



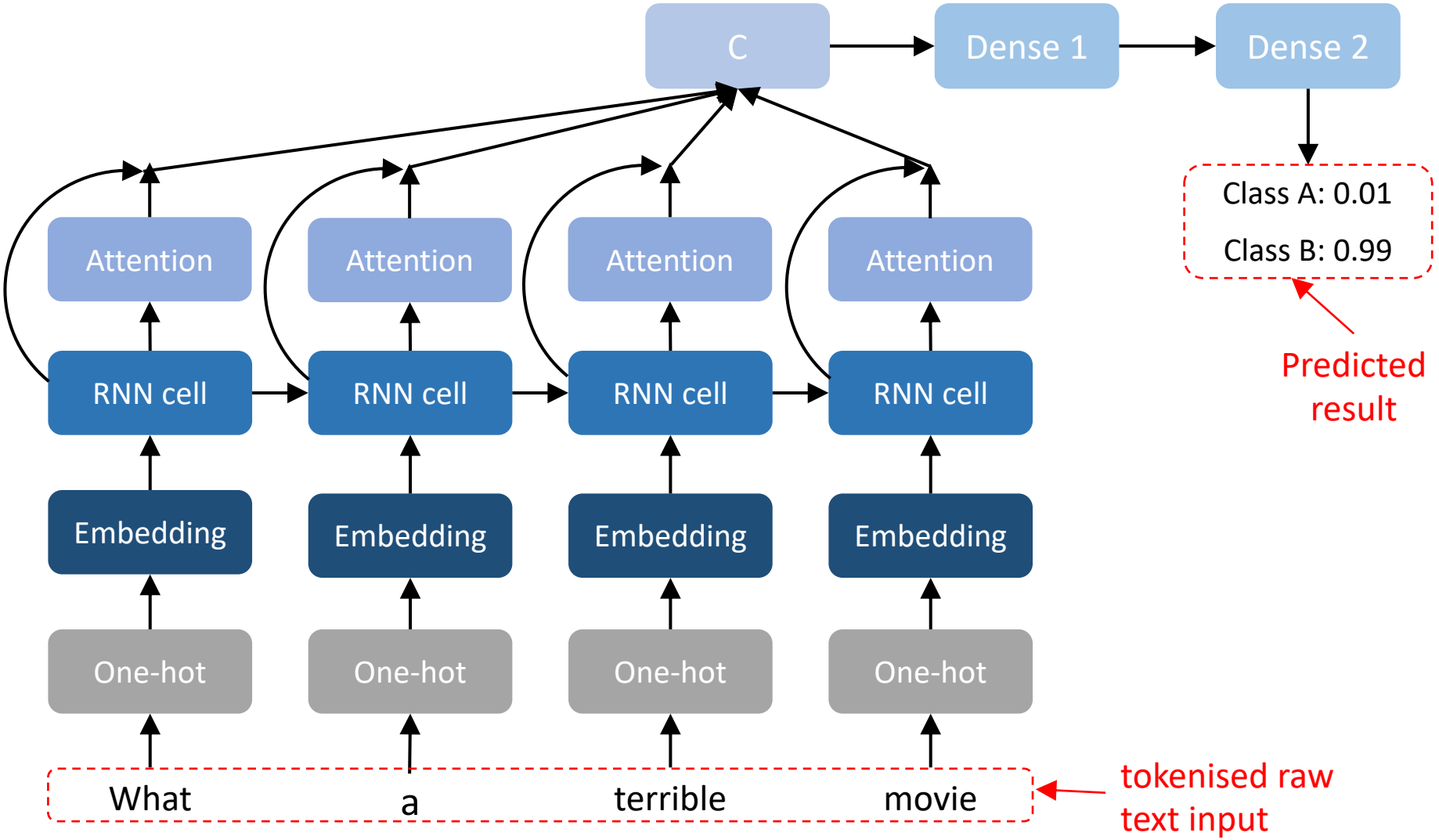
Exercise

Let `VOCAB_SIZE` be the size of the word dictionary, `DIM_EMBED` be the dimension of the embedding space, `R_UNITS` be the number of units in the RNN cell, and `D1_UNITS` be the number of units in dense layer 1.

Write down the shape of the tensor output for each layer when a single sample is fed through the network.



Attention


C
Dense 1
Dense 2
Class A: 0.01
Class B: 0.99
Predicted result
Attention
Attention
Attention
Attention
RNN cell
RNN cell
RNN cell
RNN cell
Embedding
Embedding
Embedding
Embedding
One-hot
One-hot
One-hot
One-hot
What
a
terrible
movie
tokenised raw text input

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