

deep-rnn

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1 Deep Recurrent Neural Networks

Hidden state update

$$\mathbf{H}_t^{(1)} = f_1(\mathbf{x}_t, \mathbf{H}_{t-1}^{(1)})$$
$$\mathbf{H}_t^{(l)} = f_l(\mathbf{H}_t^{(l-1)}, \mathbf{H}_{t-1}^{(l)})$$

Output update

$$\mathbf{O}_t = g(\mathbf{H}_t^{(L)})$$

```
In [1]: import sys
        sys.path.insert(0, '..')

        import d2l
        from mxnet import nd
        from mxnet.gluon import rnn

        (corpus_indices, char_to_idx, idx_to_char, vocab_size) = d2l.load_data_time_machine()
```

Same parameters as before for training.

```
In [2]: num_inputs, num_hiddens, num_layers, num_outputs = vocab_size, 256, 2, vocab_size
        ctx = d2l.try_gpu()
        num_epochs, num_steps, batch_size, lr, clipping_theta = 3000, 35, 32, 100, 1e-2
        pred_period, pred_len, prefixes = 500, 50, ['traveller', 'time traveller']
```

1.0.1 Training

```
In [3]: lstm_layer = rnn.LSTM(hidden_size = num_hiddens, num_layers=num_layers)
        model = d2l.RNNModel(lstm_layer, vocab_size)
        d2l.train_and_predict_rnn_gluon(model, num_hiddens, vocab_size, ctx,
                                       corpus_indices, idx_to_char, char_to_idx,
                                       num_epochs, num_steps, lr, clipping_theta,
                                       batch_size, pred_period, pred_len, prefixes)
```

epoch 500, perplexity 1.028183, time 0.06 sec
- traveller. 'but now you begin to see the object of my inves
- time traveller. 'but now you begin to see the object of my inves
epoch 1000, perplexity 1.020994, time 0.05 sec
- traveller. 'but now you begin to see the object of my inves
- time traveller. 'but now you begin to see the object of my inves
epoch 1500, perplexity 1.015552, time 0.05 sec
- traveller. 'but now you begin to see the object of my inves
- time traveller. 'but now you begin to see the object of my inves
epoch 2000, perplexity 1.014056, time 0.05 sec
- traveller. 'but now you begin to see the object of my inves
- time traveller. 'but now you begin to see the object of my inves
epoch 2500, perplexity 1.014954, time 0.06 sec
- traveller. 'but now you begin to see the object of my inves
- time traveller. 'but now you begin to see the object of my inves
epoch 3000, perplexity 1.017568, time 0.05 sec
- traveller. 'but now you begin to see the object of my inves
- time traveller. 'but now you begin to see the object of my inves