

Homework 4

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1 Fixed-length sequence without prior knowledge

First we consider the SEED data-set as a big one-piece sequence, which means we don't use different individuals and videos as prior knowledge. A training sample is a fixed length sequence cutting from the original big sequence. Denote L as sequence length. We consider the $[0, L - 1]$ th feature and the L th label as a training sample. The test data-set is also generated in the above way. To control the size of dataset, we specify the steps between adjacent samples, denoted as s . The training set and test set are both shuffled before they are fed into the model.

The model is formed by one LSTM unit and a single MLP layer. A ReLU layer is added between these two layers. The hidden dimension of LSTM unit is set as 256. The loss function is CrossEntropyLoss and the optimizer is RMSprop. The learning rate is set as $1e-4$. the model is trained for 1000 epochs, 32 samples per batch. $L = 256, s = 30$.

The plot of loss and accuracy among epoches is shown in Figure 1. As we can see the plot of accuracy fluctuates greatly. The smoothed accuracy went stable at around 60%

2 Variable-length sequence with prior knowledge

We can learn from SEED Dataset that this Dataset is data for each subject arranged in order. Each subject is asked to watch 15 videos segment, the sequence length of each segment are [238, 233, 206, 238, 185, 195, 237, 216, 265, 237, 235, 233, 235, 238, 206], that is 3397 in total. The training data is composed of 11 subjects and the testing data include 4 subjects. We can use this prior knowledge to improve our model accuracy.

By treat each video segment as a single sample. We got 165 samples for training and 60 samples for testing. Since each sample is of different sequence length, we pad 0 at the end of shorter sequence.

We can see from Figure 2 that after using prior knowledge, the accuracy is significantly improved (around 80%).

3 Compared with SVM

For SVM in Homework 2, The accuracy is only 50%. We can see that the extraction of sequential information of LSTM perform better by simply compressing feature dimension. Moreover, by using prior knowledge of dataset also improve the LSTM's performance

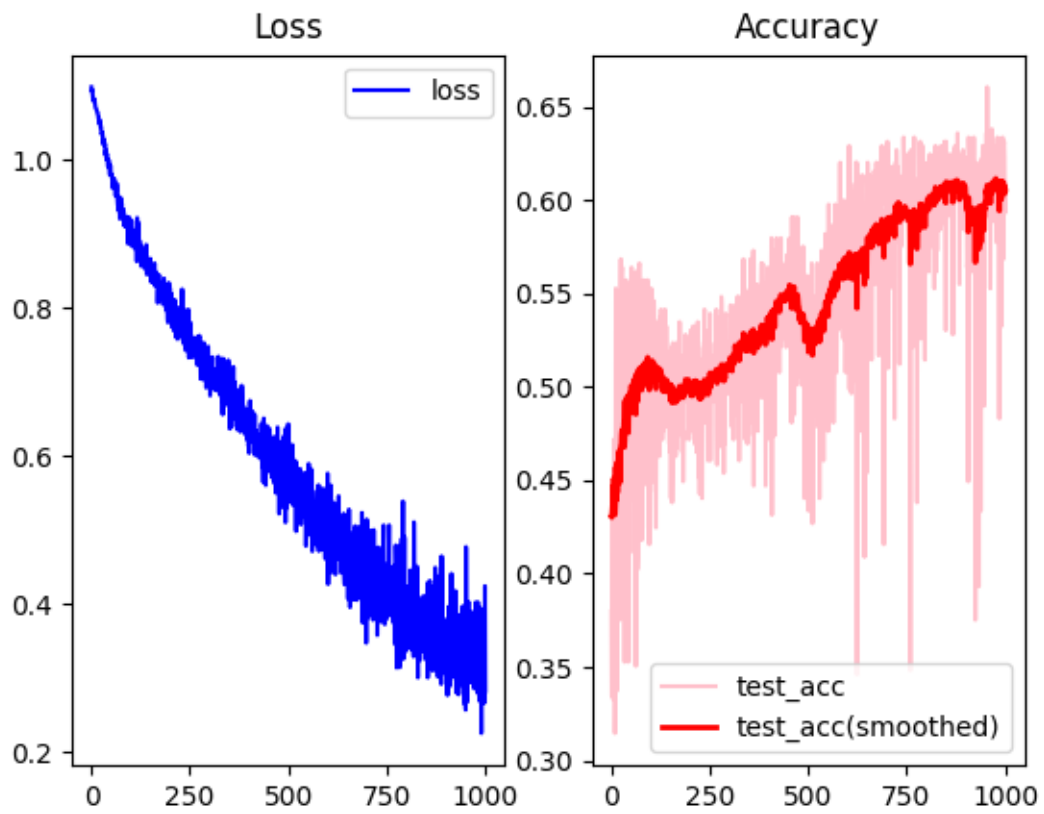


图 1: Fixed-length sequence without prior knowledge. the loss(blue) is shown in the left and the accuracy(red) is shown in the right. The accuracy is smoothed for better view.

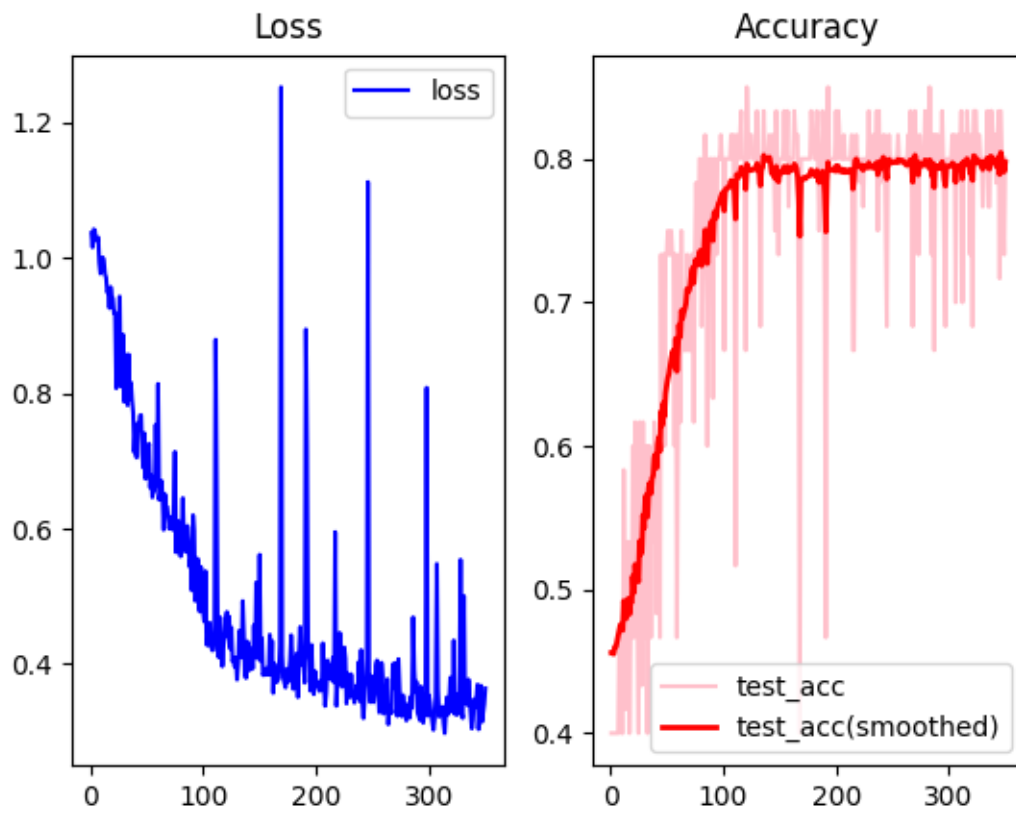


图 2: Fixed-length sequence with prior knowledge. the loss(blue) is shown in the left and the accuracy(red) is shown in the right. The accuracy is smoothed for better view.