인공지능 챕터11 과제

202055518 김병현

LSTM 순환 신경망: 도시 소음 분류 신경망

rnn_lstm_test

```
ad = AutomataDataset()

am_64 = RnnLstmModel('am_64', ad, ['lstm', {'recur_size':64, 'outseq':False}])
am_64.exec_all(epoch_count=10, report=2)
```

lstm 계층으로 수행

```
Model am_64 train ended in 494 secs:
Model am_64 test report: accuracy = 0.895, (0 secs)

Model am_64 Visualization
zk4/b-(uzh+3)/1*n/3)-(66): 잘못된 패턴 => 합격추정(0.91) : X
1803-q1of*6/260+12-(7): 올바른 패턴 => 합격추정(0.89) : O
9/e1i*1*0/0x9-n*fie*xxk: 잘못된 패턴 => 탈락추정(0.00) : O
```

정확도: **89.5%**

도시 소음 분류 실험용 데이터셋 생성

```
usd_10_10 = UrbanSoundDataset(10, 10)
usd_10_100 = UrbanSoundDataset(10, 100)
```

슬라이딩 윈도우 크기가 서로 다른 두 개의 데이터셋 객체 생성

실험용 모델 객체 생성
 - rnn 계층, lstm 계층(순환벡터 출력), lstm 계층(상태벡터 출력)의 세 가지 신경망 구조
 - 두 가지 데이터셋 객체에 세 가지 신경망을 적용해 총 6가지 모델 객체 생성

```
conf_basic = ['rnn', {'recur_size':20, 'outseq':False}]
conf_lstm  = ['lstm', {'recur_size':20, 'outseq':False}]
conf_state = ['lstm', {'recur_size':20, 'outseq':False, 'use_state':True}]

us_basic_10_10 = RnnLstmModel('us_basic_10_10', usd_10_10, conf_basic)
us_lstm_10_10  = RnnLstmModel('us_lstm_10_10',  usd_10_10, conf_lstm)
us_state_10_10 = RnnLstmModel('us_state_10_10', usd_10_10, conf_state)

us_basic_10_100 = RnnLstmModel('us_basic_10_100', usd_10_100, conf_basic)
us_lstm_10_100  = RnnLstmModel('us_lstm_10_100',  usd_10_100, conf_lstm)
us_state_10_100 = RnnLstmModel('us_state_10_100', usd_10_100, conf_state)
```

작은 윈도우 객체에 대한 세 가지 모델 객체 학습 및 비교

```
us_basic_10_10.exec_all(epoch_count=10, report=2)
Model us_basic_10_10 train ended in 62 secs:
Model us_basic_10_10 test report: accuracy = 0.348, (0 secs)

us_lstm_10_10.exec_all(epoch_count=10, report=2, show_cnt=0)
Model us_lstm_10_10 train ended in 186 secs:
Model us lstm 10 10 test report: accuracy = 0.301, (1 secs)


us_state_10_10.exec_all(epoch_count=10, report=2, show_cnt=0)

Model us_state_10_10 train ended in 184 secs:
Model us_state_10_10 test report: accuracy = 0.338, (1 secs)
```

10 에포크 학습 결과 34.8%(rnn) > 33.8%(lstm+상태벡터) > 30.1%(lstm+순환벡터)

세 가지 신경망에 대한 추가 학습

```
Model us_basic_10_10 train ended in 492 secs:
Model us_basic_10_10 test report: accuracy = 0.382, (0 secs)

Model us_lstm_10_10 train ended in 1720 secs:
Model us_lstm_10_10 test report: accuracy = 0.457, (1 secs)

Model us_state_10_10 train ended in 1253 secs:
Model us_state_10_10 test report: accuracy = 0.553, (1 secs)
```

학습 결과 55.3%(lstm+상태벡터) > 45.7%(lstm+순환벡터) > 38.2%(rnn)
추가 학습을 진행하면서 lstm 계층들의 정확도가 많이 상승

넓은 윈도우 객체에 대한 세 가지 모델 객체 학습 및 비교

```
us_basic_10_100.exec_all(epoch_count=100, report=20, show_cnt=0)
us_lstm_10_100.exec_all(epoch_count=100, report=20, show_cnt=0)
us_state_10_100.exec_all(epoch_count=100, report=20, show_cnt=0)
```

```
 Model us_basic_10_100 train ended in 305 secs:
 Model us_basic_10_100 test report: accuracy = 0.587, (1 secs)


 Model us_lstm_10_100 train ended in 1116 secs:
 Model us_lstm_10_100 test report: accuracy = 0.712, (1 secs)


 Model us_state_10_100 train ended in 1105 secs:
 Model us_state_10_100 test report: accuracy = 0.751, (1 secs)
```

총 100 에포크 학습 결과 75.1%(lstm+상태벡터) > 71.2%(lstm+순환벡터) > 58.7%(rnn)