Convolution for MIMIC-III

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Introduction

- Convolution neural network for MIMIC-III database ICU patients
- Compared the result with Logistic Regression

Characteristics of Data

- MIMIC-III database
- Total of 4500 ICU Patients
- cTakes was used for feature extraction
- The data contained doctors note, including medical result of different diagnosis

Goal

- Predict if the Patient Dies or Survives
- Learn about Convolution neural network
- Comparison Analysis with Logistic Regression Classification & CNN

Model Summary

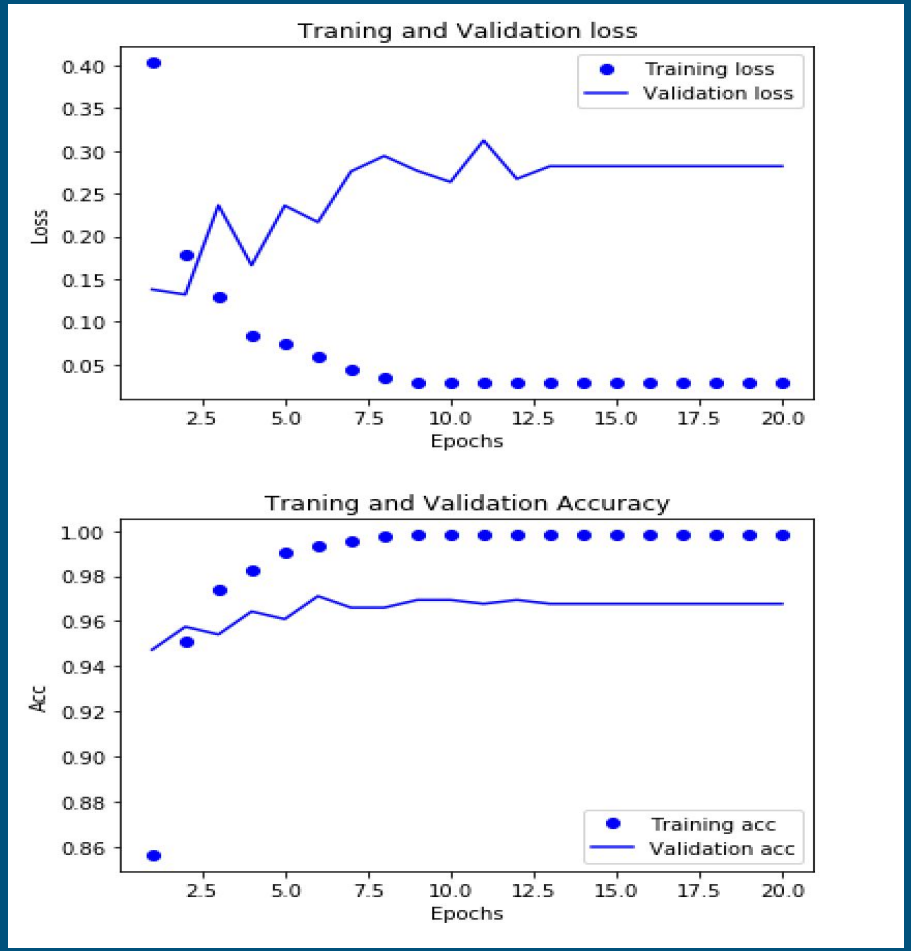
- Embedded Layer, CUI into vectors
- Convolution 1D layer
- Max Pooling
- Convolution 1D layer
- Global Max Pooling
- Dense with sigmoid function, along with l2 regularization and optimizer

Result

Convolution Network : Accuracy 96%

TABLE I
EPOCHS ANALYSIS FOR TRAIN AND VALIDATION DATA'S LOSS AND ACCURACY

EPOCHS	LOSS	ACCURACY	ValLoss	ValAcc.
1	0.4033	0.8563	0.1377	0.9473
2	0.1786	0.9507	0.1317	0.9575
3	0.1284	0.9739	0.2362	0.9541
4	0.0842	0.9826	0.1660	0.9643
5	0.0746	0.9904	0.2359	0.9609
6	0.0592	0.9937	0.2165	0.9711
7	0.0434	0.9952	0.2760	0.9660
8	0.0337	0.9973	0.2940	0.9660
9	0.0288	0.9982	0.2766	0.9694
10	0.0288	0.9982	0.2636	0.9694
11	0.0288	0.9982	0.3122	0.9677
12	0.0288	0.9982	0.2672	0.9694
13	0.0288	0.9982	0.2820	0.9677
14	0.0288	0.9982	0.2820	0.9677
15	0.0288	0.9982	0.2820	0.9677
16	0.0288	0.9982	0.2820	0.9677
17	0.0288	0.9982	0.2820	0.9677
18	0.0288	0.9982	0.2820	0.9677
19	0.0288	0.9982	0.2820	0.9677
20	0.0288	0.9982	0.2820	0.9677



Evaluation

Logistic Regression:

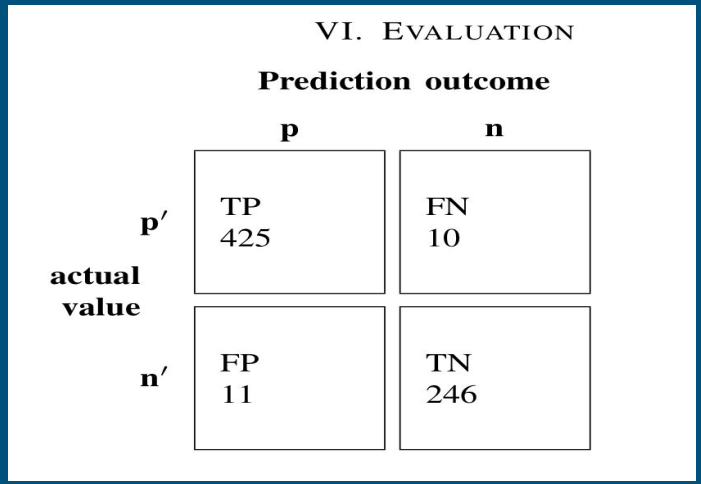
```
0.8610472541507024
{'clf__C': 10.0}
Accuracy: 0.850
             precision    recall  f1-score   support

          0       0.86      0.92      0.89       452
          1       0.82      0.72      0.77       240

avg / total       0.85      0.85      0.85       692

[[414  38]
 [ 66 174]]
```

CNN :



Conclusion

- Learned how we can improve the Efficiency & Accuracy of model using hidden layers of Neural Network
- 10% accuracy increased from Logistic Regression to CNN
- For small number of data Convolution Neural Network quickly overfits

Questions

- References
  - http://climin.readthedocs.io/en/latest/rmsprop.html
  - https://keras.io
  - Deep Learning with Python by Francois Chollet