DRAWING AND RECOGNIZING CHINESE CHARACTERS WITH RNN

陳謙慶

4105053118

Content

- Data Preprocessing
- Model Construction
- Experiment Result

Data Preprocessing

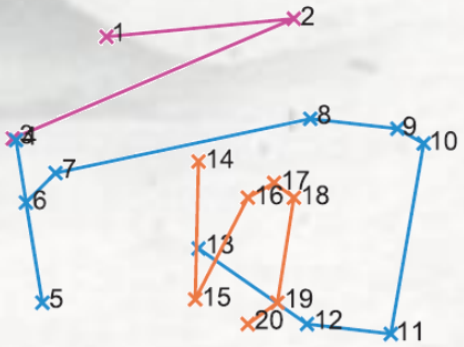
- Dataset: Total 50 kinds of character

Training set	Testing set
16970	4199

- Chinese character picture :

Data Preprocessing

- Representation: $[x_i \quad y_i \quad \Delta x_i \quad \Delta y_i \quad I(s_i{=}s_{i+1}) \quad I(s_i{\neq}s_{i+1})]$



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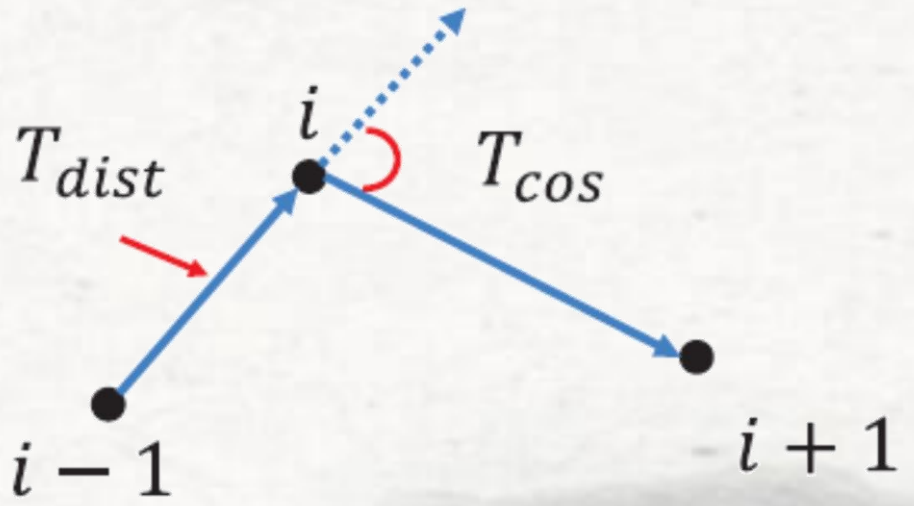
[[2, 83, 2, 1, 1, 0],
 [5, 84, 7, 0, 0, 0],
 [13, 85, 22, 8, 0, 0],
 [35, 93, 13, 5, 0, 0],
 [48, 99, -18, 4, 0, 0],
 [29, 104, -4, -1, 0, 0],
 [25, 102, 4, -74, 0, 0],
 [29, 28, 0, -20, 0, 0],
 [29, 7, -13, -2, 0, 0],
 [16, 4, -16, 16, 0, 0],
```

Data Preprocessing

- Removing redundant points:

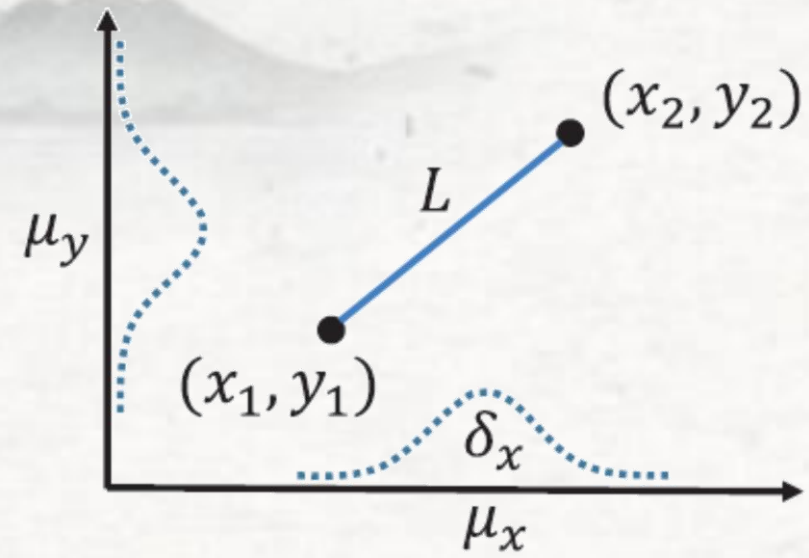
$$\sqrt{(x_i - x_{i-1})^2 + (y_i - y_{i-1})^2} < T_{disc}$$

$$\frac{\Delta x_{i-1}\Delta x_i + \Delta y_{i-1}\Delta y_i}{\left(\Delta x_{i-1}^2 + \Delta y_{i-1}^2\right)^{0.5}\left(\Delta x_i^2 + \Delta y_i^2\right)^{0.5}} > T_{cos}$$



Data Preprocessing

- Normalization:

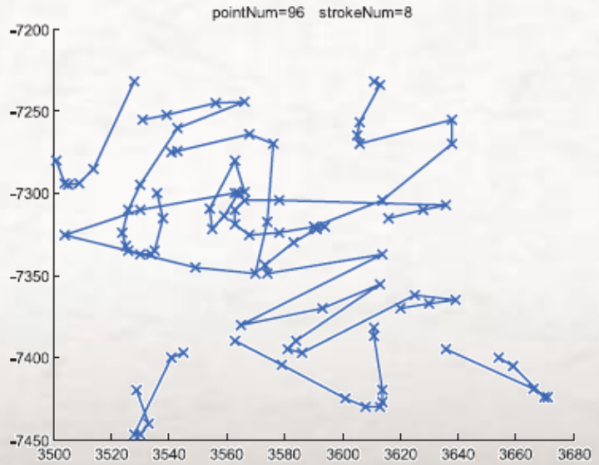


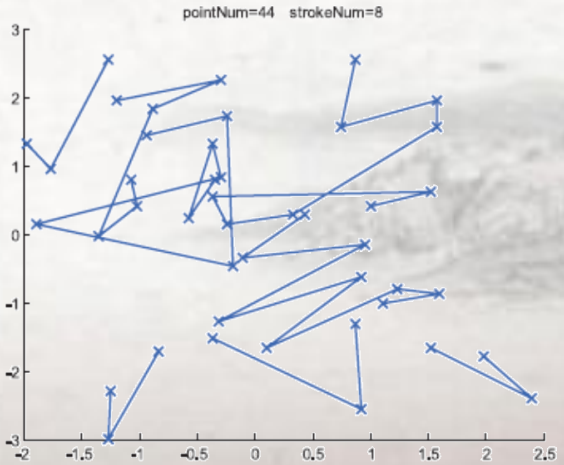
$$p_x(L) = \int_L x\, dL = \frac{1}{2} len(L)(x_1 + x_2) \;\rightarrow\; \mu_x = \frac{\sum_{L\epsilon\Omega} p_x(L)}{\sum_{L\epsilon\Omega} len(L)}$$

$$p_y(L) = \int_L y\, dL = \frac{1}{2} len(L)(y_1 + y_2) \;\rightarrow\; \mu_y = \frac{\sum_{L\epsilon\Omega} p_y(L)}{\sum_{L\epsilon\Omega} len(L)}$$

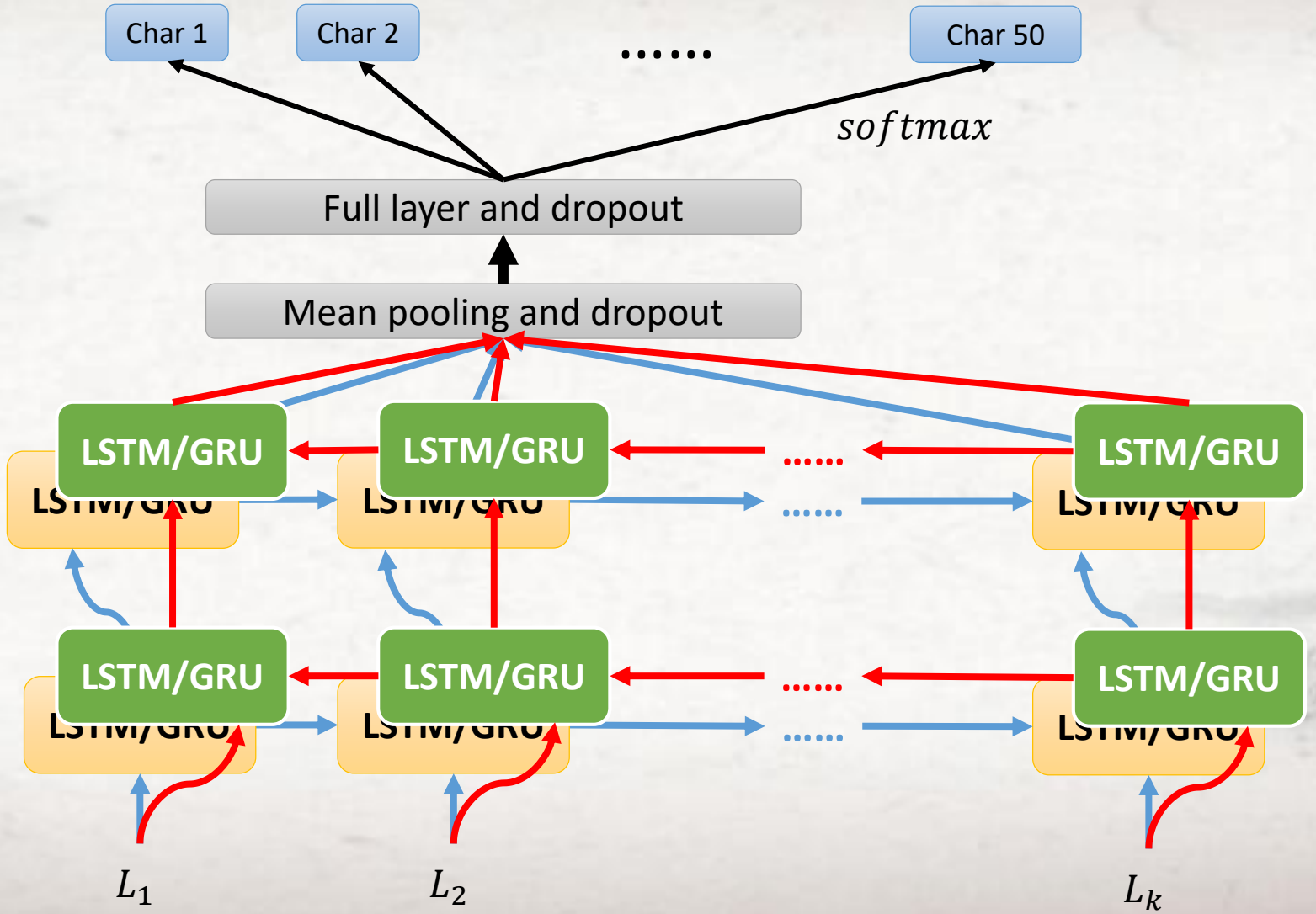
$$d_x(L) = \int_L (x - \mu_x)^2 dL \;\rightarrow \delta_x = \sqrt{\frac{\sum_{L\epsilon\Omega} d_x(L)}{\sum_{L\epsilon\Omega} len(L)}}$$

$$x_{new} = \frac{x - \mu_x}{\delta_x}, \qquad y_{new} = \frac{y - \mu_y}{\delta_x}$$





Discriminative model



Experiment Result

- Validation = 0.3
- Batch size = 200
- Epochs=10

Recurrent type	Train Time	Train Acc.	Val acc.
GRU [100]	840s	84.42%	82.24%
GRU [500]	1489s	91.76%	88.31%

Next…

1. Compare LSTM with GRU
2. Testing 2 and 3 layers RNN
3. Test Accuracy from sub-sequence by Random Dropout
4. Try to build a generative model to generating the Chinese character