

The background is a faded, traditional Chinese landscape painting. It depicts a vast, misty body of water with distant, hazy mountains on the horizon. In the lower-left corner, there are some dark, silhouetted pine trees. The overall tone is light and atmospheric, typical of classical Chinese ink wash art.

# 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

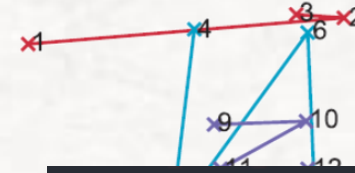
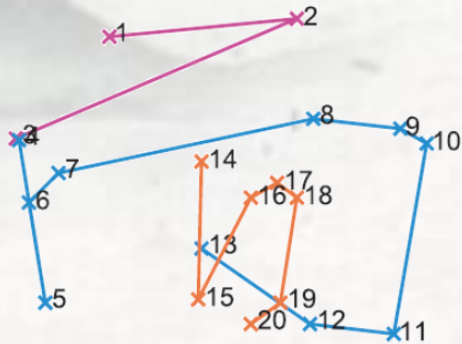
Training set	Testing set
16970	4199

- Chinese character picture :

崩 绷 甬 泵 蹦 迸 逼 鼻 比 鄙  
币 庇 痹 闭 敝 弊 必 辟 壁 臂  
变 卞 辨 辩 辨 遍 标 彪 膘 表

# Data Preprocessing

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



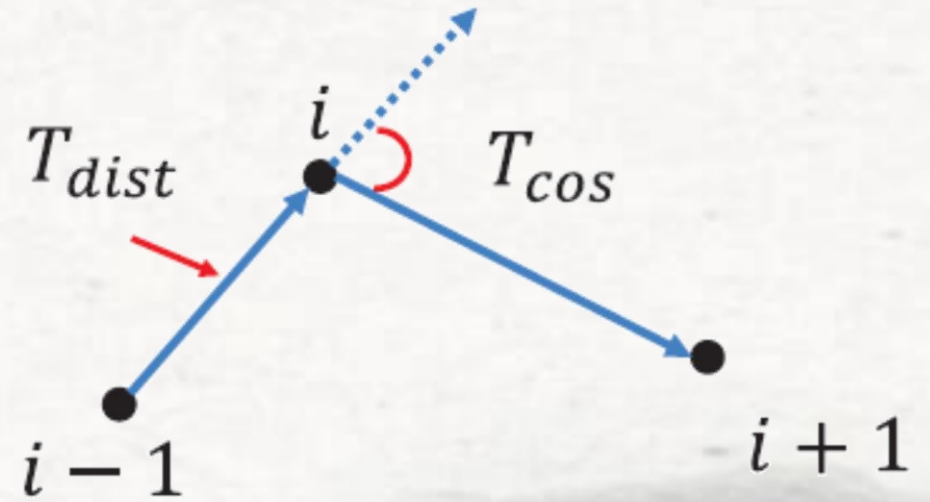
```
[[2, 83, 2, 1, 1, 0],  
 [5, 84, 7, 0, 0, 0],  
 [13, 85, 22, 8, 0, 0],  
 [35, 93, 13, 5, 0, 0],  
 [48, 99, -18, 4, 0, 0],  
 [29, 104, -4, -1, 0, 0],  
 [25, 102, 4, -74, 0, 0],  
 [29, 28, 0, -20, 0, 0],  
 [29, 7, -13, -2, 0, 0],  
 [16, 4, -16, 16, 0, 0]]
```

# Data Preprocessing

- Removing redundant points:

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

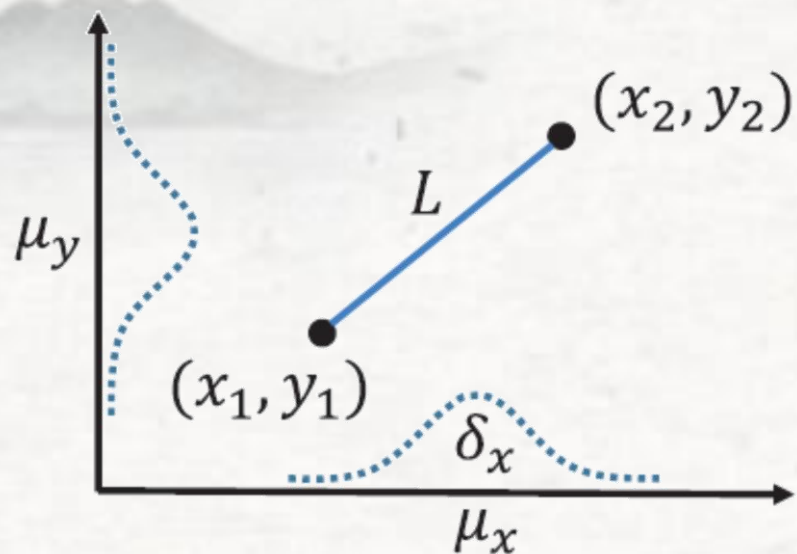
$$\frac{\Delta x_{i-1} \Delta x_i + \Delta y_{i-1} \Delta y_i}{(\Delta x_{i-1}^2 + \Delta y_{i-1}^2)^{0.5} (\Delta x_i^2 + \Delta y_i^2)^{0.5}} > T_{cos}$$





# Data Preprocessing

- Normalization:

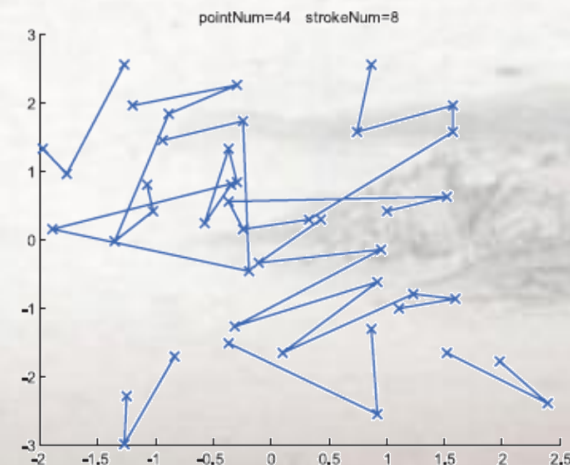
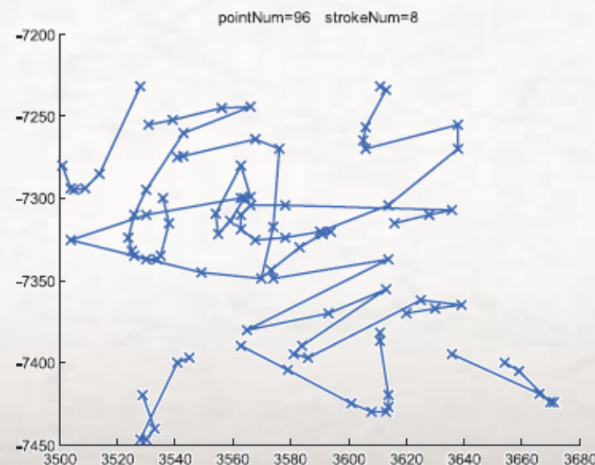


$$p_x(L) = \int_L x dL = \frac{1}{2} \text{len}(L)(x_1 + x_2) \rightarrow \mu_x = \frac{\sum_{L \in \Omega} p_x(L)}{\sum_{L \in \Omega} \text{len}(L)}$$

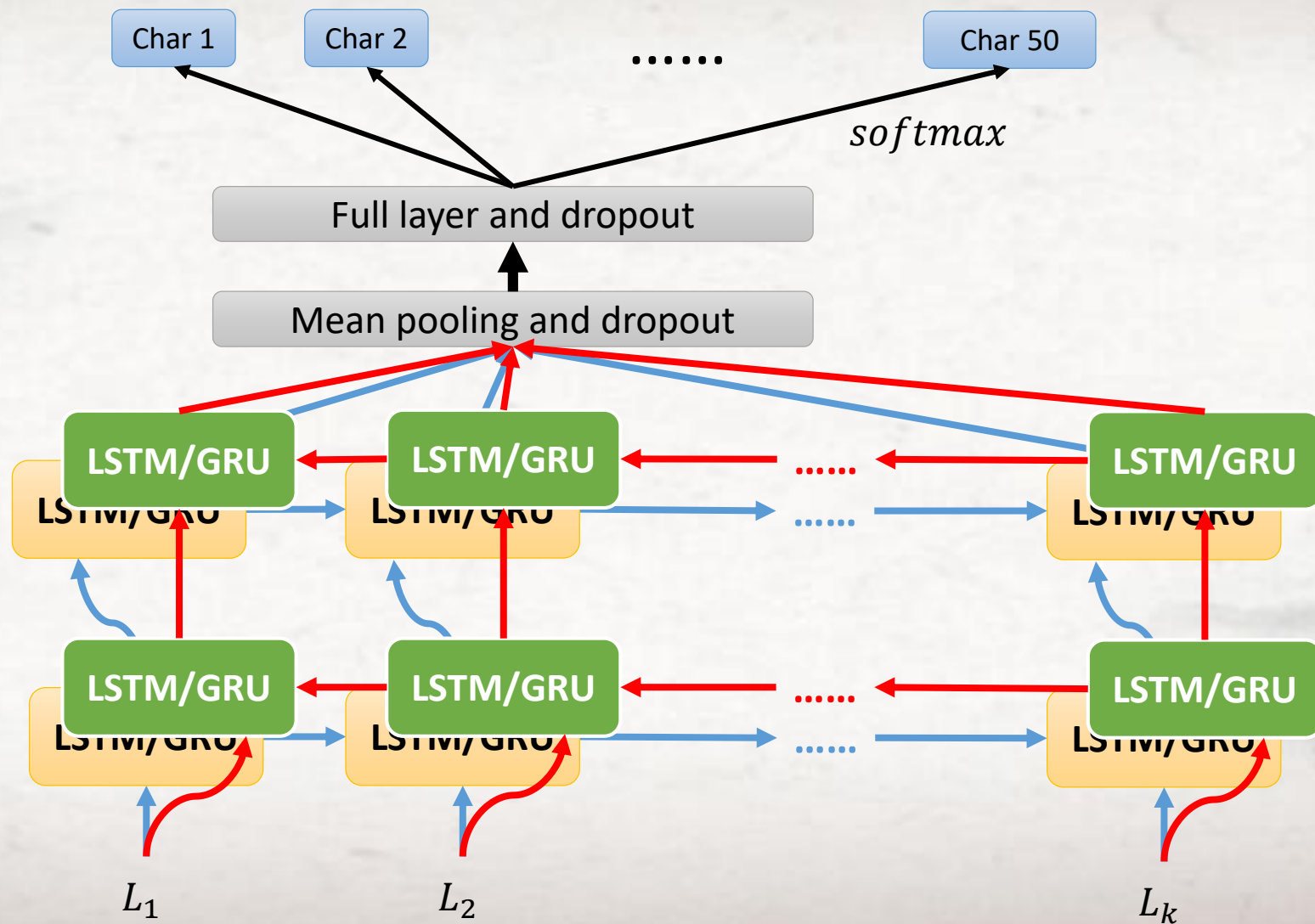
$$p_y(L) = \int_L y dL = \frac{1}{2} \text{len}(L)(y_1 + y_2) \rightarrow \mu_y = \frac{\sum_{L \in \Omega} p_y(L)}{\sum_{L \in \Omega} \text{len}(L)}$$

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

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



# 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