

Comparison Long Short-Term Memory Network and Convolution Neural Network

LSTM 네트워크, CNN 네트워크 구현 및
비교 실험

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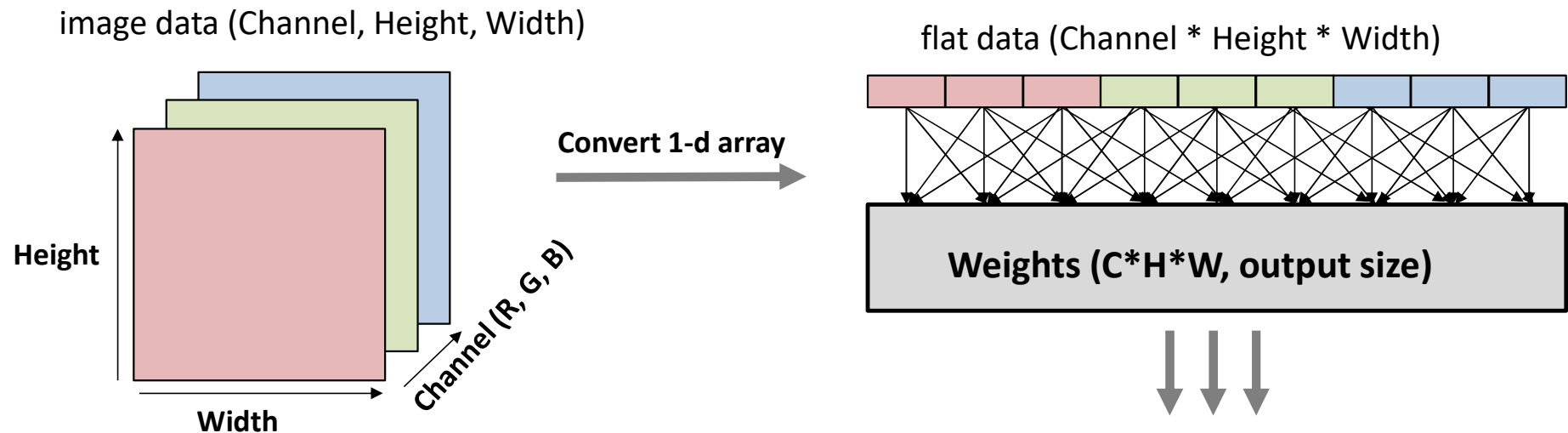
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Fully Connected Layer

- FC problem

- Ignore data shape(structure)



- Difficult to reflect image data features(over 2-d data)
- Patterns may be hidden in three-dimension
- Proposed Convolutional Neural Network(CNN)

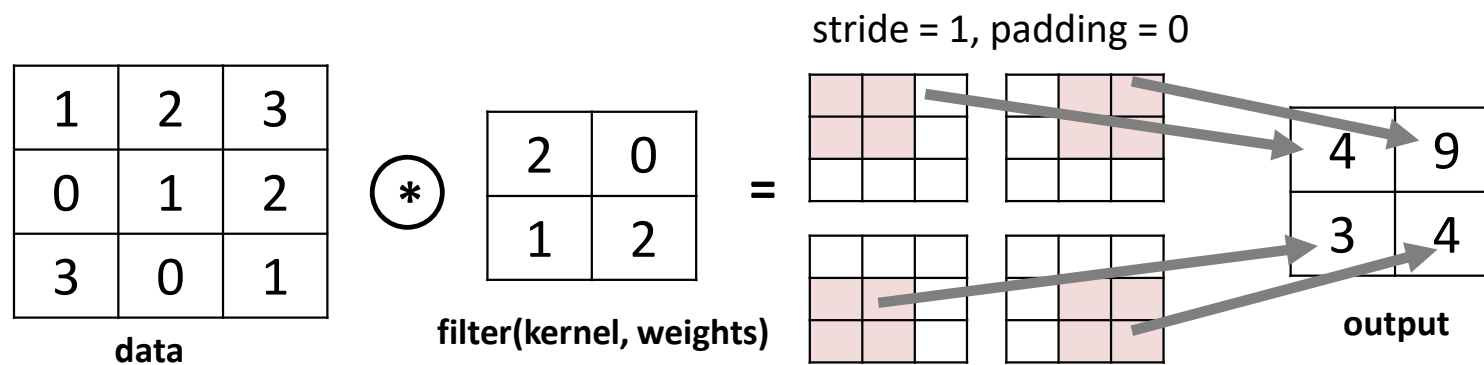
CNN Concept

CNN Concept

Convolution Layer : three dimensions data can be input

Pooling Layer : reduce height, weight length (max pooling, average pooling)

Convolution layer

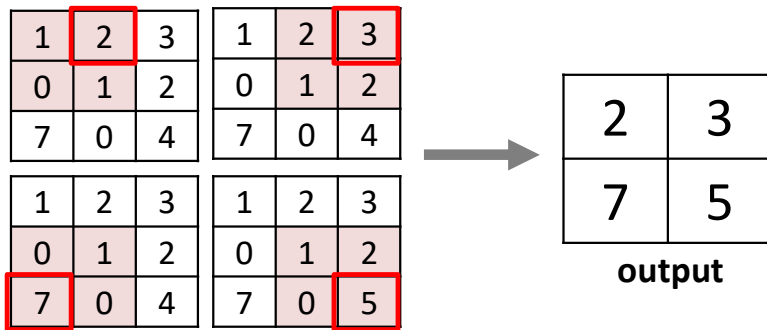


- stride : interval window position (1)
- padding : for adjust output shape
- image channel = filter channel

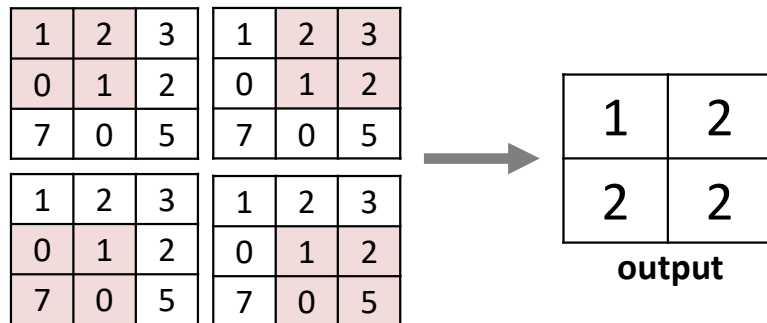
CNN Concept

Pooling layer

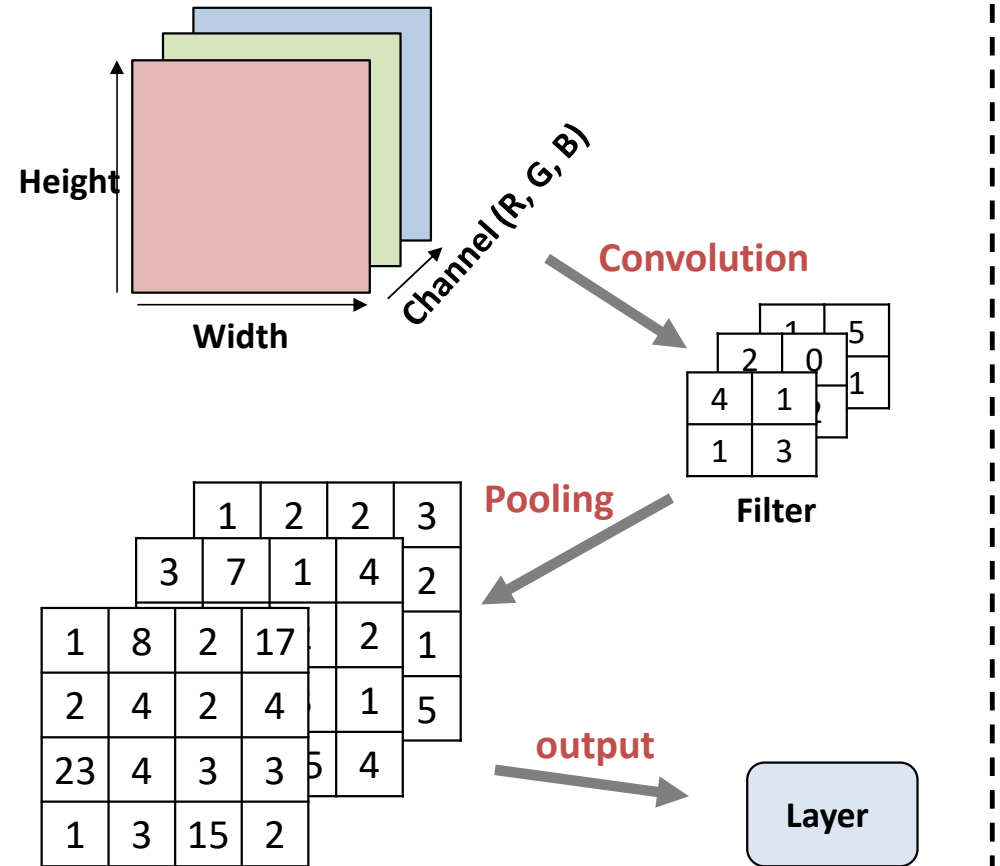
① max pooling



① average pooling



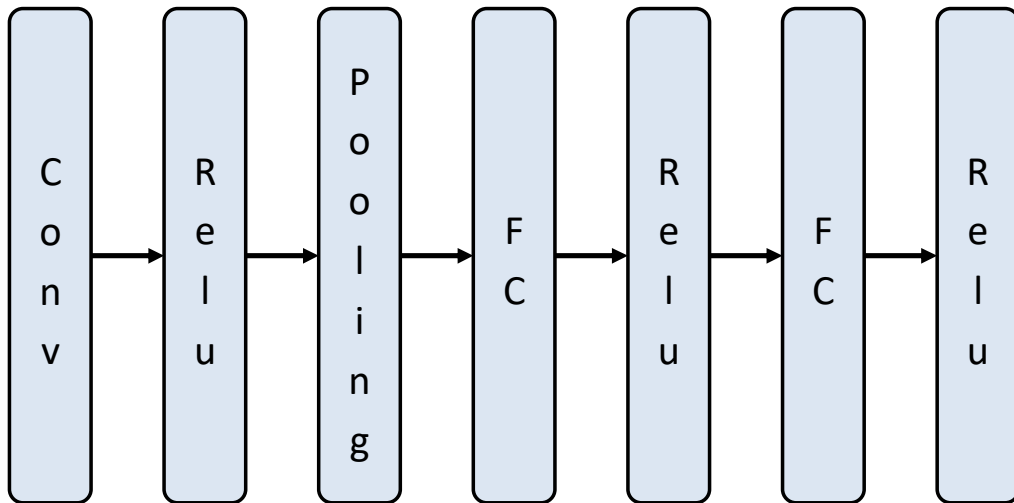
3d data to CNN



CNN (Model Structure)

Structure

$$\text{MSE for Loss} = \frac{1}{2} \sum (y - t)^2$$



- input data shape : (batch, 1, 24, 8)

- Weights (initialize)
 - He for FC(Fully-Connected layer), Conv
- Activation function
 - ReLU for FC, Conv
- Loss function
 - MSE(Mean Squared Error)
- convolution parameter
 - filter : (30, 1, 5, 5)
 - stride : 1, padding : 0
- pooling parameter
 - pool width, height : 2
 - stride : 2

Experimental setting

Dataset

Beijing Air pollution (uci-dataset/00381)

N	train	test
37,596	8,760	28,836

times	pm 2.5	Dew Point	temperature	pressure	wind direction	wind speed	snow	rain
Y-m-d H	129.0	-16	-4.0	1020.0	SE	1.79	0	0

Specific

- Data normalization
 - min max normalization
- Optimizer
 - Adam optimizer

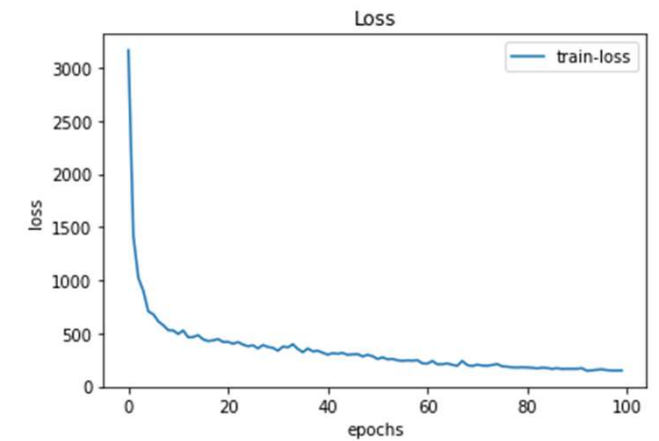
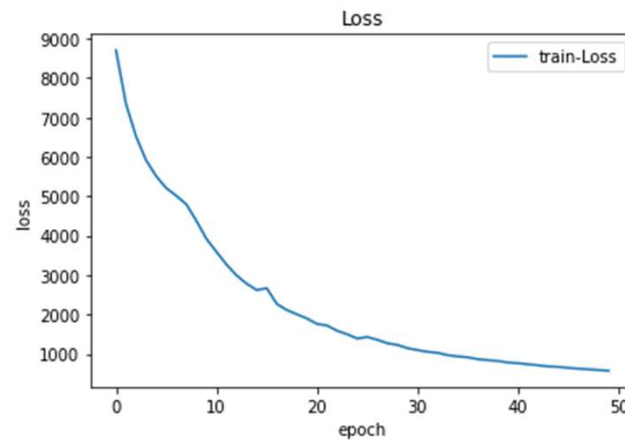
- Hyper parameter

parameter	CNN	LSTM
hidden state, hidden size	100	
input sequence length	24	
output sequence length	1	
epoch	100	50
batch size	64	

Comparison results

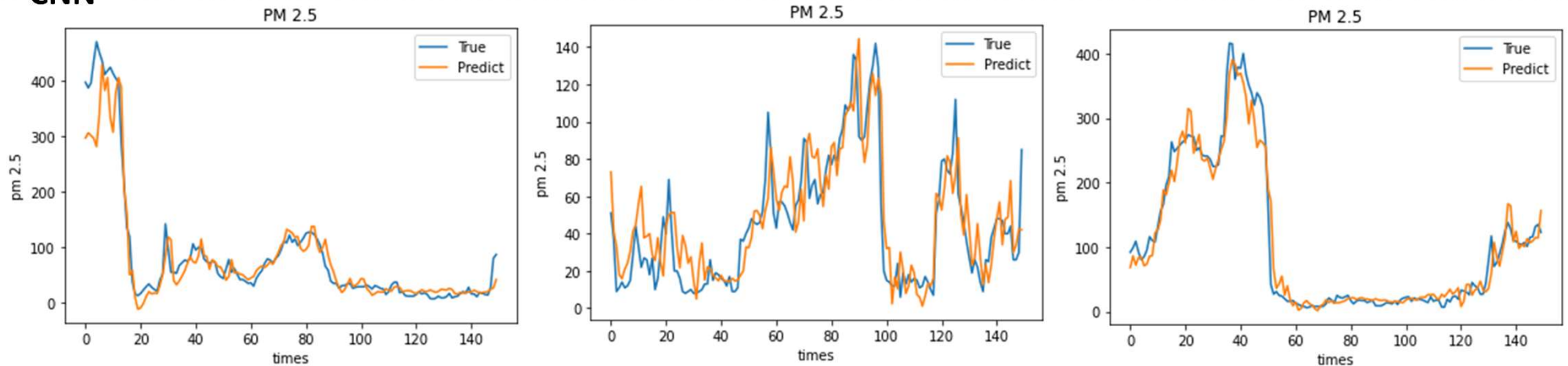
Metrics	LSTM	CNN
Mean Squared Error(MSE)	844.23	865.06
Root MSE(RMSE)	29.05	29.41
Mean Absolute Error(MAE)	17.11	18.79

Train loss graph

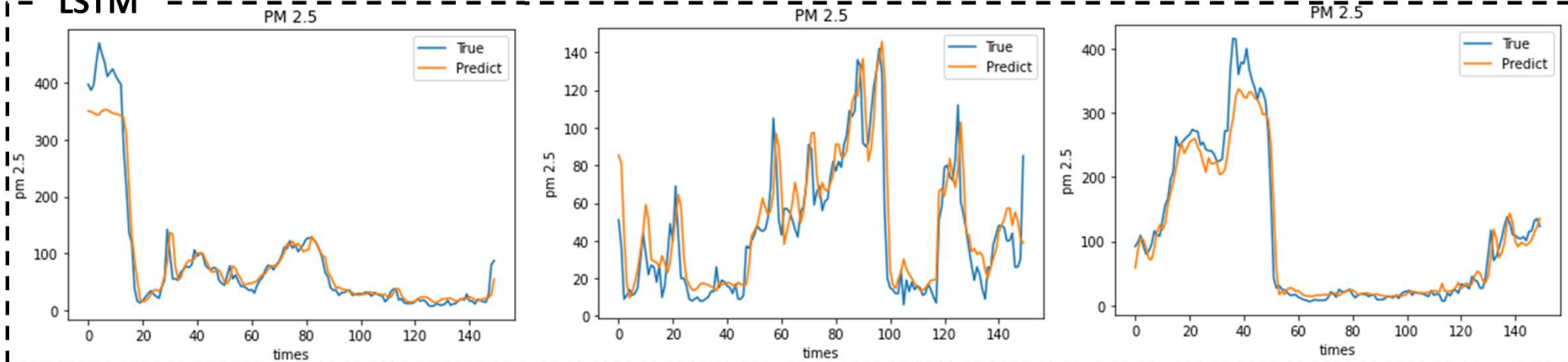


Comparison results

CNN



LSTM



Code

Model	view with code
LSTM	https://colab.research.google.com/drive/1oNW4HzBzmrjyWcWZbjFMtksP1vTV9lO2?usp=sharing
CNN	https://colab.research.google.com/drive/1Ccd7l65bJwiD2HW8XmOKTHO1PEUMuQl3?usp=sharing

Thank you