

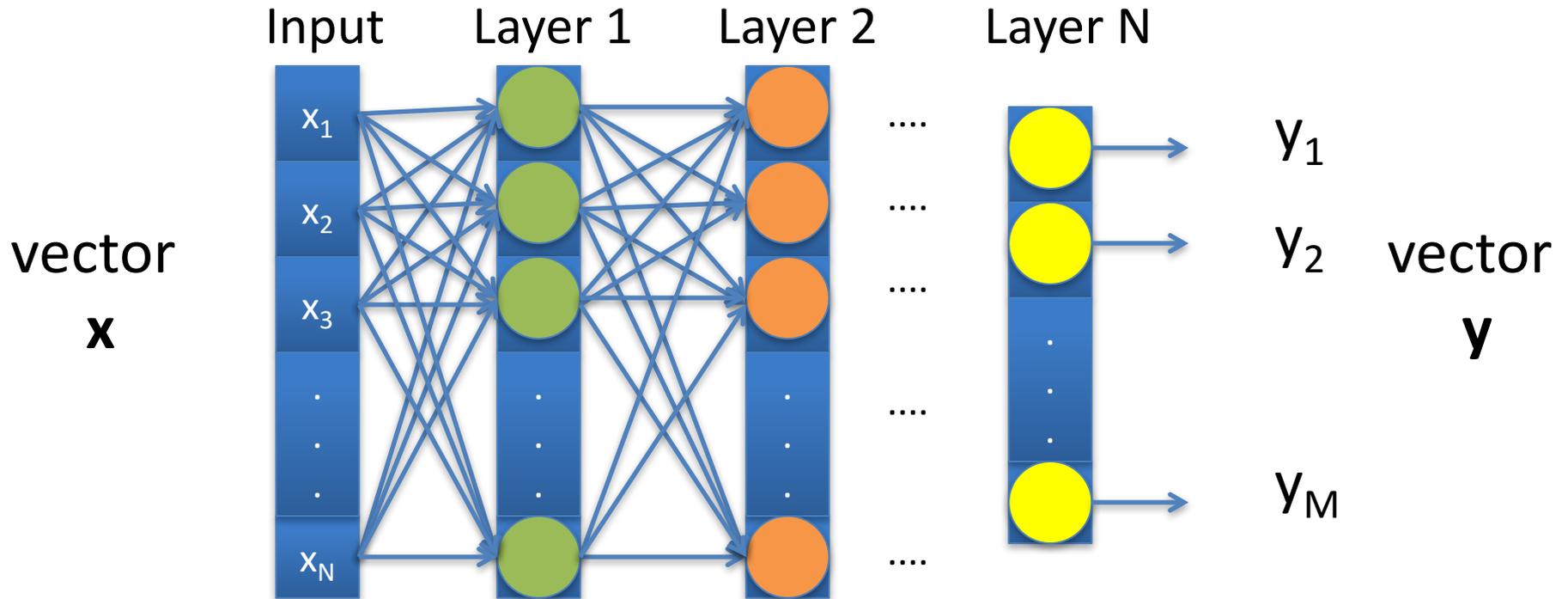
---

# Recurrent Neural Nets

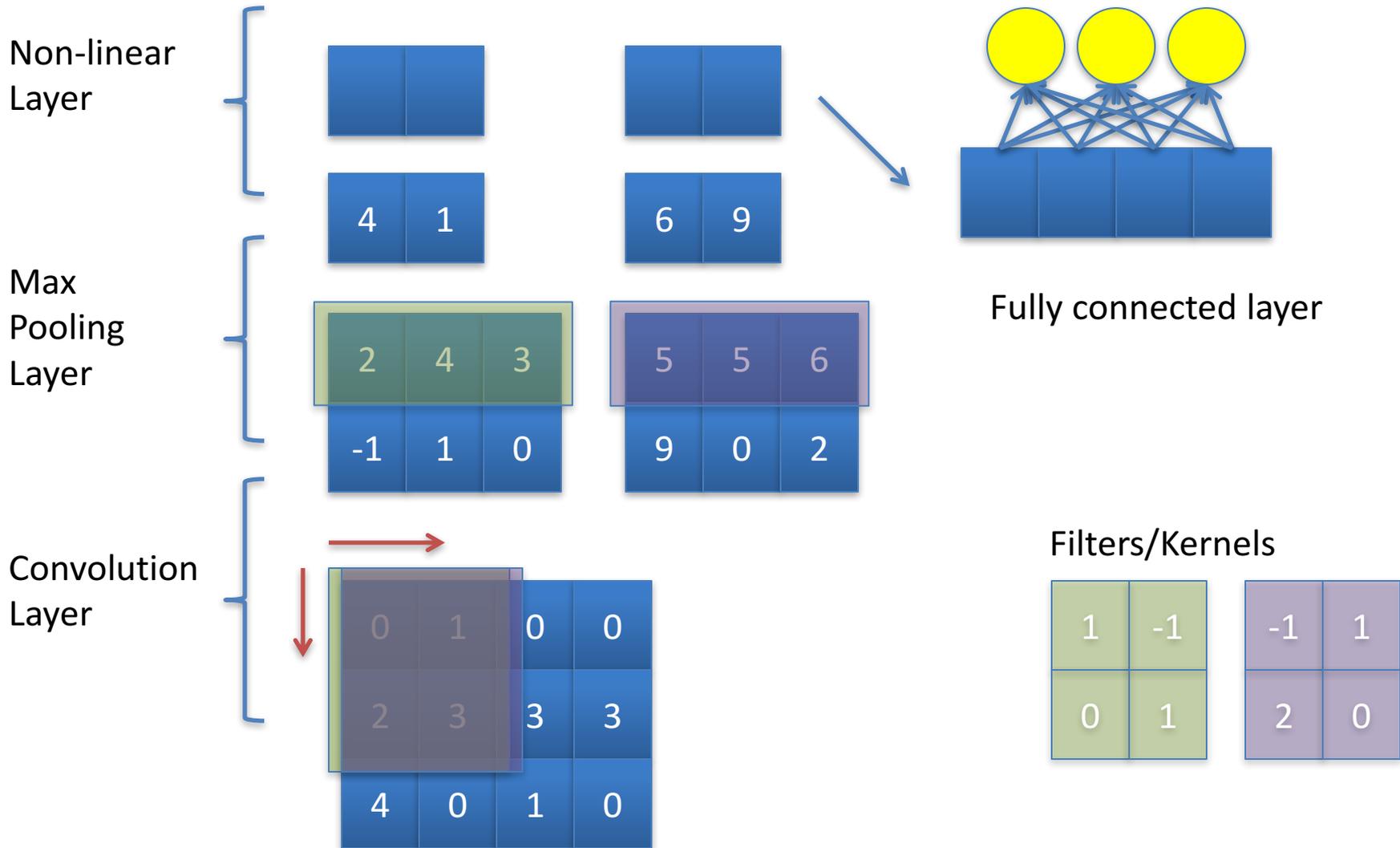
## Motivation

**Thang Vu**

# Feed-forward Neural Nets



# Convolutional Neural Nets



# Recurrent neural nets (RNNs)

- Input data:  $[x_1, x_2, x_3, \dots, x_n]$ 
  - Sequence of data points
  - Prediction at each time step is influenced by previous time steps

# Recurrent neural nets (RNNs)

- Input data:  $[x_1, x_2, x_3, \dots, x_n]$ 
  - e.g. language modeling task, i.e. predict the next word given the history
  - e.g. I apologize for being late, I am very \_\_\_\_\_

# Recurrent neural nets (RNNs)

- Input data:  $[x_1, x_2, x_3, \dots, x_n]$ 
  - Information which is observed from  $[x_1, x_2, \dots, x_{t-1}]$  should be stored in memory
  - Then used for the prediction at the time step  $t$

# Recurrent neural nets (RNNs)

- Recurrent structure seems to be very important which allows us to store information over time for current prediction
- The basic architecture developed in 1980s
  - Hopfield network (1982)
  - Jordan network (1986)
  - Elman network (1990)
  - Etc.

# RNN for Speech Recognition

