Deep Learning

- Stack many layers with different structures to get a deep network
- Able to do many more tasks than classification and regression
- Issues to consider
  - Reducing the number of parameters
  - Control overfitting
  - Fast training/optimization
  - Theoretical understanding
  - ...

Convolutional Neural Network

- Convolution operations
  - Convolution with stride 1
  - Convolution with stride 2

From: http://cs231n.github.io/convolutional-networks/

- Stack convolutional layers

Convolutional Neural Network

- Pooling layer
  - Same as feed-forward network

- Fully connected layer
  - Same as feed-forward network
Convolutional Neural Network

- Full structure

From: Forensic Sketches Recognition Using Deep Convolutional Neural Network

Image classification

Image examples from ImageNet, in 1000 classes

Recurrent Neural Network

- Design of single unit

From: "Understanding LSTM Networks" by Colah

Image Captioning

Poetry Generation

sunset home
the bird of windows
white the hand
at the turn??
the shadow of summer
marks and path
rain pond
the light of shadow
of the song
not the star
the scare of the crooks
of the frost

From: Generating Poetry with PoetRNN
Deep Learning

- Exciting area to explore
- Many things to understand
- Does not mean it can solve all problems