Before and After Deeplearning

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These are my observations

Traditional Methods

Classification (Discrete classes)

- Naive Bayes
- Logistic Regression
- Support Vector Machines
  - Binary SVM
  - Multiclass SVM
- Applications: text classification, image classification, etc

Traditional Methods

Classification (structured classes)

- Support Vector Machines
  - Structured SVM (like SVM-HMM)
- Conditional Random Fields
- Applications: NER and POS (NLP), Video frames tagging

Traditional Methods

Regression

- Linear Regression
- Support Vector Regression
- Applications: stock-price prediction etc

Traditional Methods

Clustering

- K-means
- Gaussian Mixture Models
- Applications: Topic modeling, Image segmentation, bag-of-words in computer vision

Image Classification

Car(1) or no car(0)?

Image Classification

Feature Engineering

- SIFT
- DSIFT
- HOG
- Filters
- etc

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Classifier
- SVM
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Image Classification

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Classifier
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Final Classifier

Text Classification

Spam email(1) or Normal email(0)?

Text Classification

Feature Engineering

- N-Grams
- Bag-of-words
- Linguistic knowledge

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Text Classification

Feature Engineering

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- SVM
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Final Classifier

Deeplearning Methods

- Classification (Discrete classes)
  - Multilayer Perceptron or Simple Feed-Forward Network
  - Convolution Neural Net
  - Example: Text classification, Image Classification

Deeplearning Methods

- Classification (Structured classes)
  - Recurrent Neural Nets
    - LSTM cells
    - GRU cells
  - Example: NER, POS and technically video sequence classification

Deeplearning Methods

Regression

- Multilayer perceptron (remove sigmoid and change loss function to regression loss)
- Applications: stock-price prediction etc

Deeplearning Methods

Clustering

- Autoencoders
- Applications: dimensionality reduction or latent represenation

Image Classification

Pass raw pixels

DEEP CNN

Final Classifier

The model will learn rich representation in deeper layers (guided by loss function)

Text Classification

Pass
BOW

Deep CNN or
Deep MLP

Classifier

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Deeplearning Methods (Fascinating Stuff)

- Multimodality
  - Possible with Traditional Methods?

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  - Possible with Traditional Methods?
  - Multimodal Example: Caption generation

Encoder (Deep architecture of your choice) Decoder **Your caption**

Deeplearning Methods (Fascinating Stuff)

- Generation using Seq-to-Seq models
  - Example: Translation, NER, and I hope segmentation while converting speech to text

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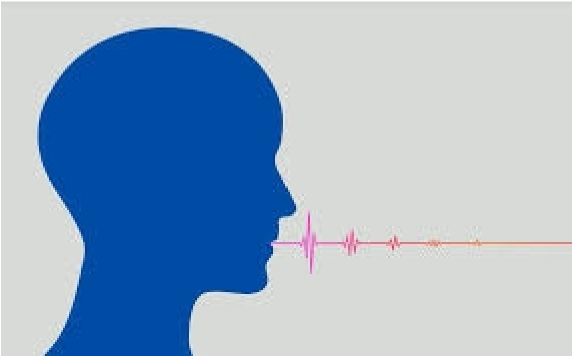

Encoder (Deep architecture of your choice) — Decoder — **Text**

Deeplearning Methods (Fascinating Stuff)

- Getting rid of feature engineering
  - Example: Pass the raw input (Image pixels) and beef-up the network

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- Merger with different fields
  - Example: Bayesian methods in Deep learning (Variational Autoencoders)

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Deeplearning Methods

Summary

- DL methods dominate the application areas where big amount of data is easily available (for instance NLP and CV)
- Problem formulation is simple for majority of applications
- Challenge lies in the training of such deeper and deeper models