

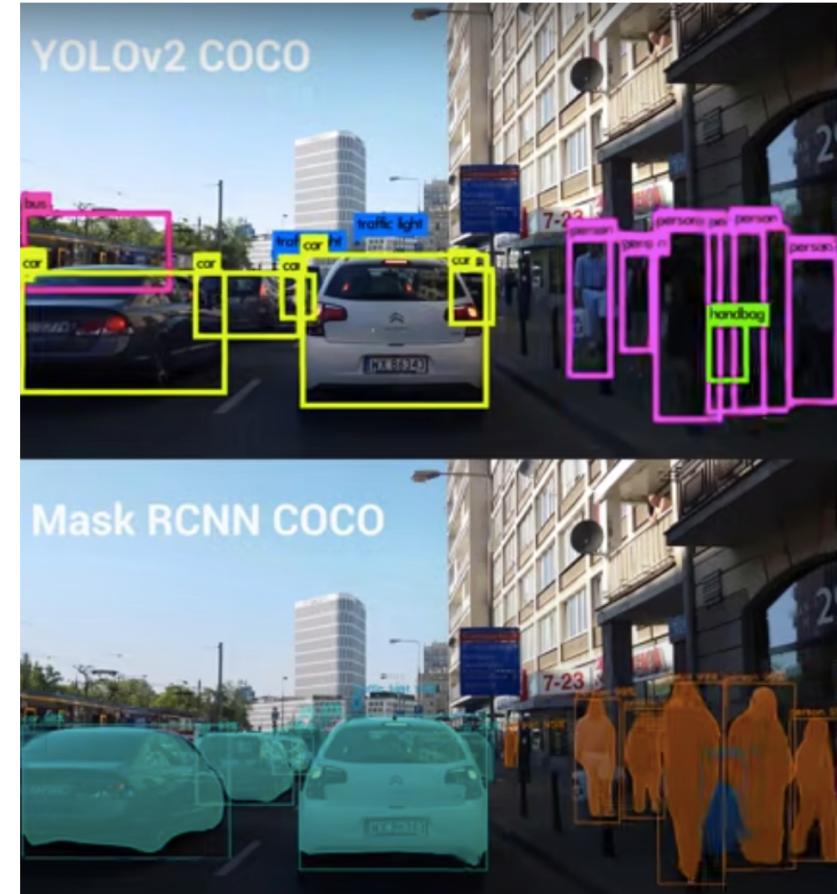
List of Additional Topics on ML/AI for future learning

อ. ปรัชญ์ ปิยะวงศ์วิศาล

Pratch Piyawongwisal

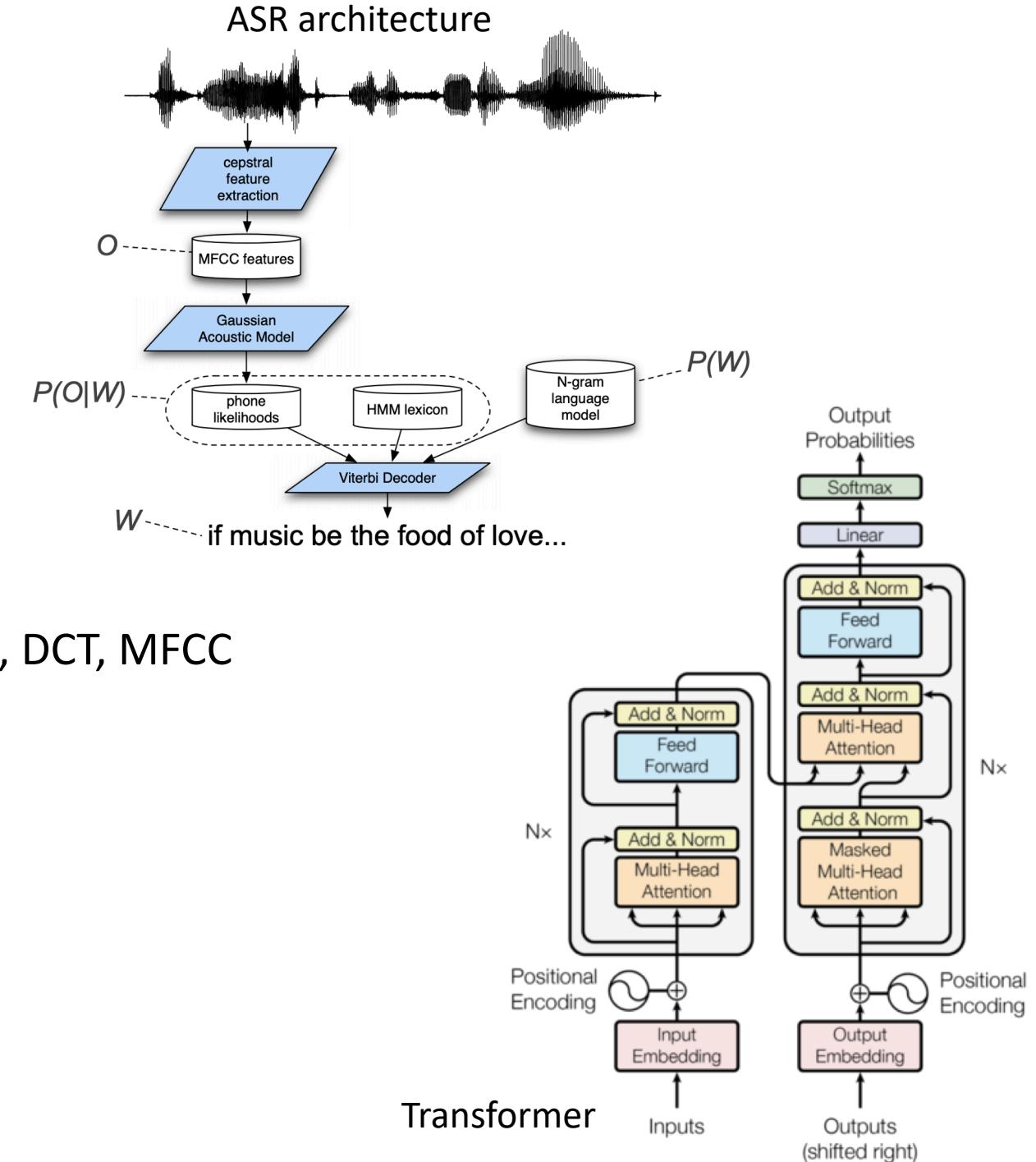
DL models for Computer Vision

- CNN
 - 2014: VGG, Inception
 - 2015: ResNet
 - 2016: DenseNet
 - 2017: NASNet, MobileNet
 - 2019: EfficientNet
- Object Detectors
 - One-stage: YOLO, SSD, RetinaNet
 - Two-stage: Faster R-CNN, R-FCN
 - Swin Transformer
- Segmentation
 - Mask R-CNN, U-Net, Swin Transformer
- Face Recognition
 - MTCNN, FaceNet, Siamese Network



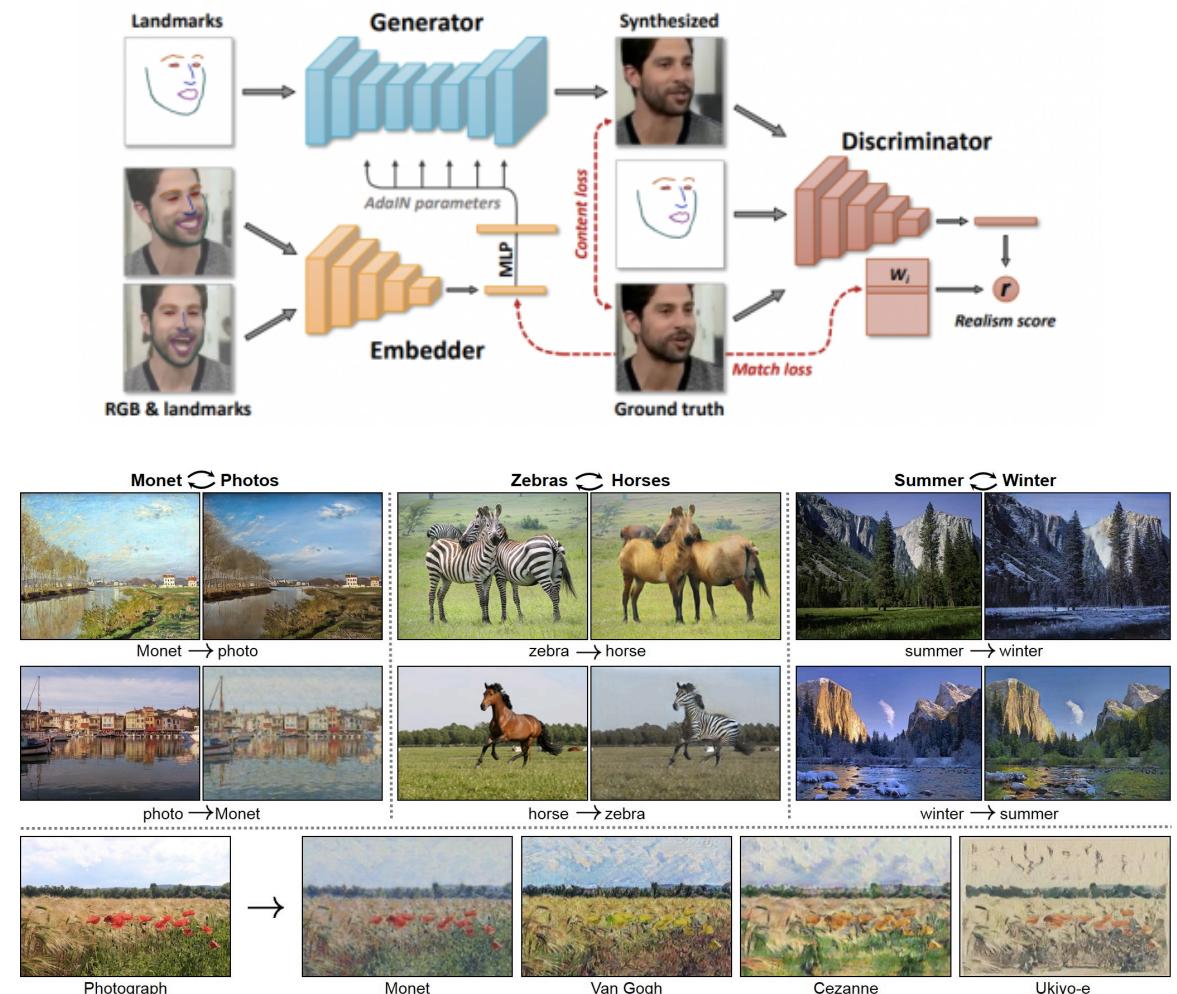
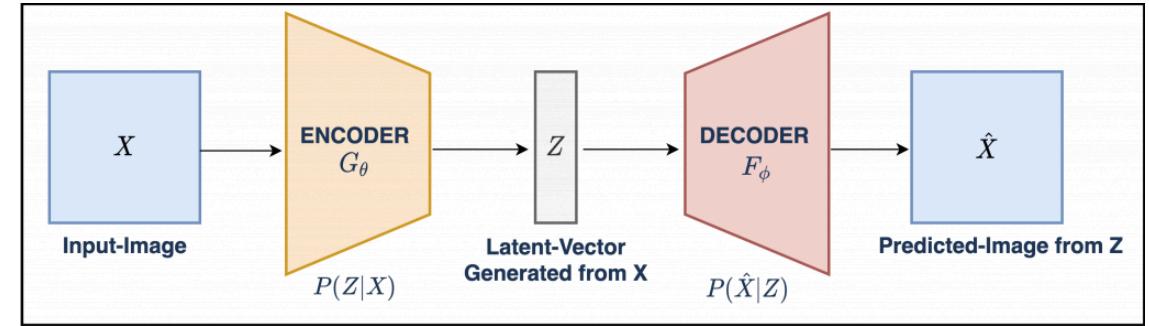
NLP

- Language Model
- Attention, Transformer (replaces LSTM)
- Word Embedding: BERT, ELMo, GloVe
- Sequence Tagging: BiLSTM-CRF
- Topic Modeling: LDA
- Automatic Speech Recognition (ASR): HMM, DCT, MFCC
- Metrics
 - Perplexity
 - Cohen's Kappa
 - BLEU (seq2seq)
- Learning Resource:
 - <https://attapol.github.io/compling/>



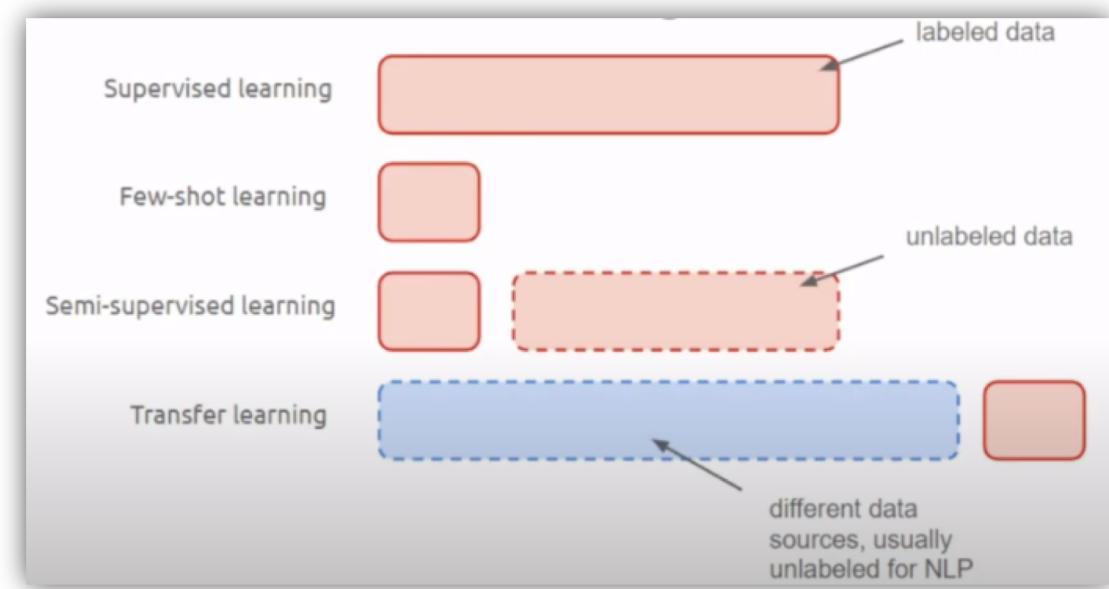
Other DL models

- Autoencoders
 - Denoising Autoencoder
 - Variational Autoencoder
- Generative Adversarial Network
 - DCGAN
 - CycleGAN
 - StyleGAN



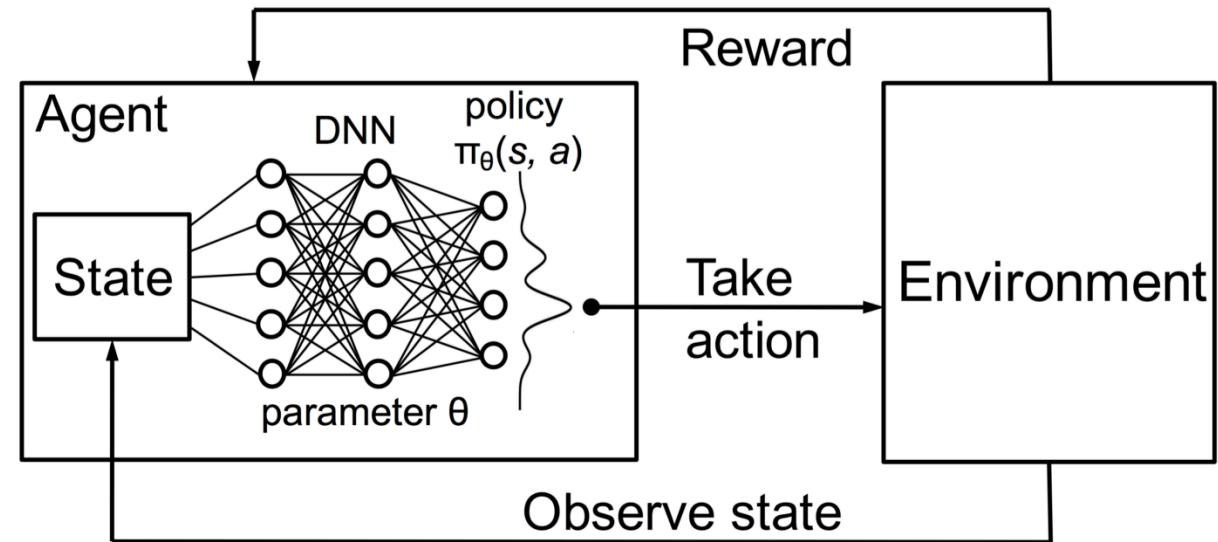
Other branches of ML

- Unsupervised Learning (learn structure of data without labels)
 - Clustering (k-mean, hierarchical, GMM & EM)
 - Dimensionality Reduction (PCA, LDA)
 - Visualization (t-SNE, UMAP)
- Semi-supervised Learning (few labels + lots of unlabeled data)
- Self-supervised Learning (no manual labels, auto-generated labels from input data)
 - e.g., BERT, Autoencoders
- Few-shot Learning (few training data)
- Kernel Methods



Other branches of ML

- Reinforcement Learning
 - Reward, Action, Policy
 - MDP
 - Bellman Equation
 - Temporal Difference
 - Q Learning
 - Policy Gradient

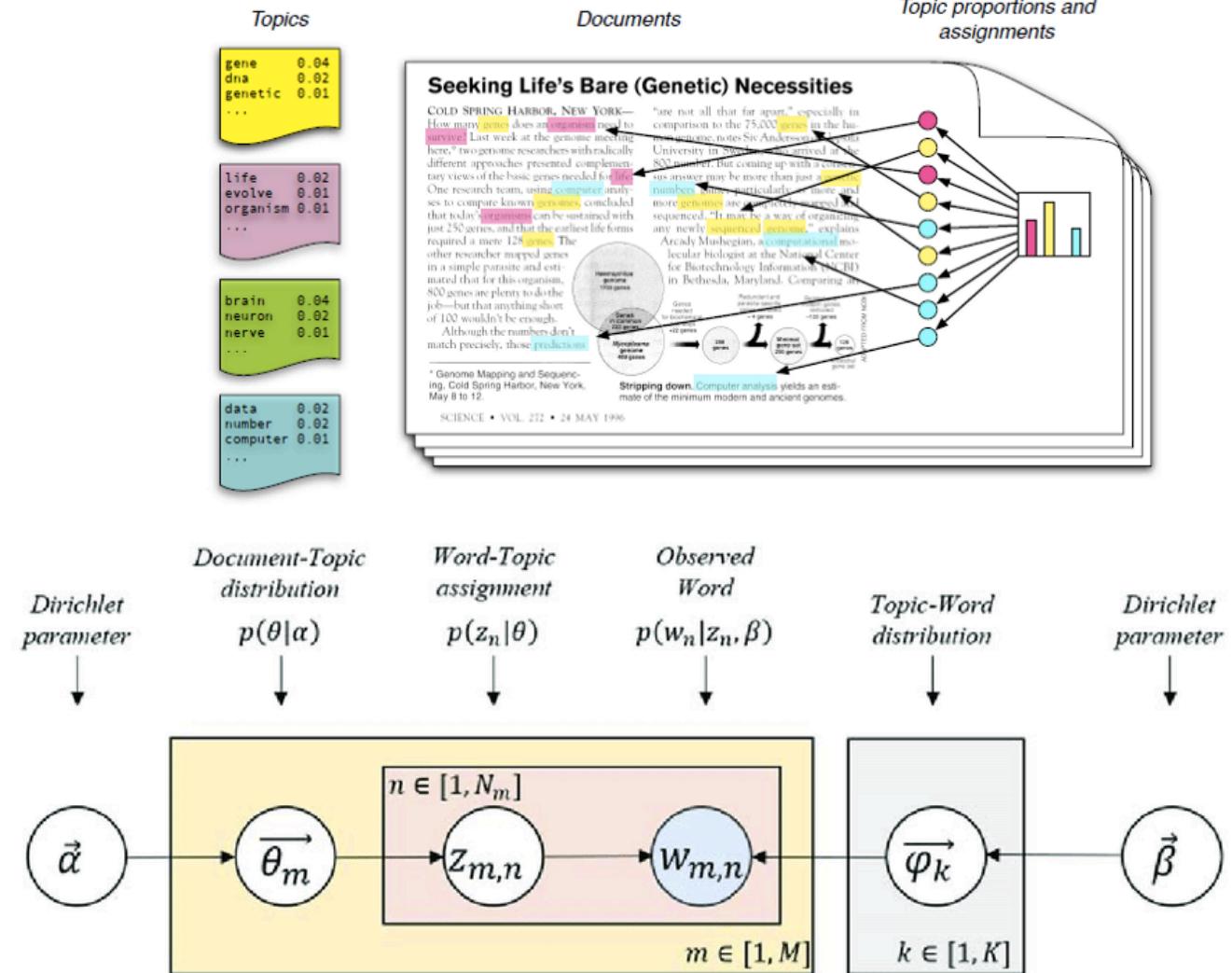


- Learning Resource:
 - https://github.com/ekapolc/RL_course_2019

Other branches of ML

- Bayesian Methods
 - Graphical models
 - D-Separation
 - Inference
 - Causal Calculus
- Algorithms
 - Naïve Bayes
 - CRF
 - LDA (Latent Dirichlet Allocation)
 - HMM
 - Restricted Boltzmann Machine

Latent Dirichlet Allocation



Learning Theory

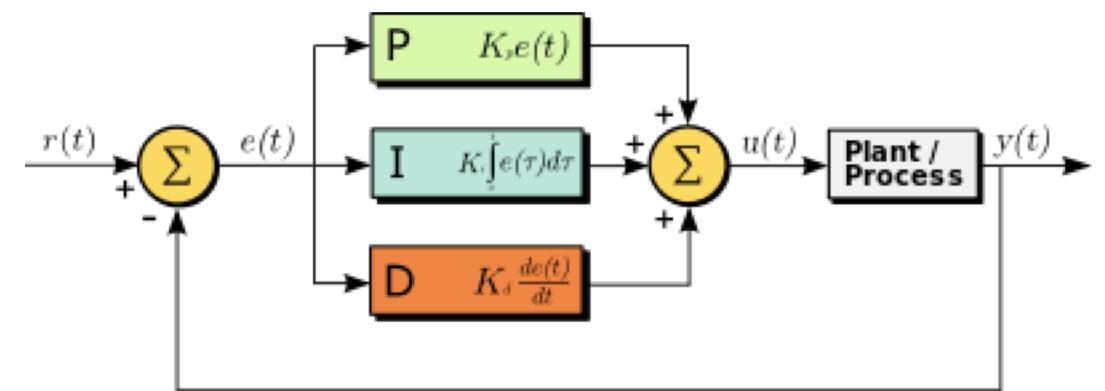
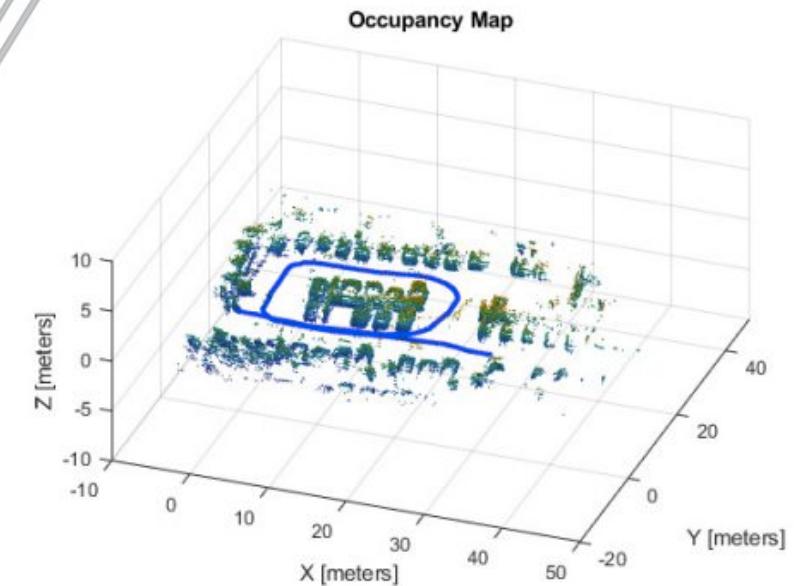
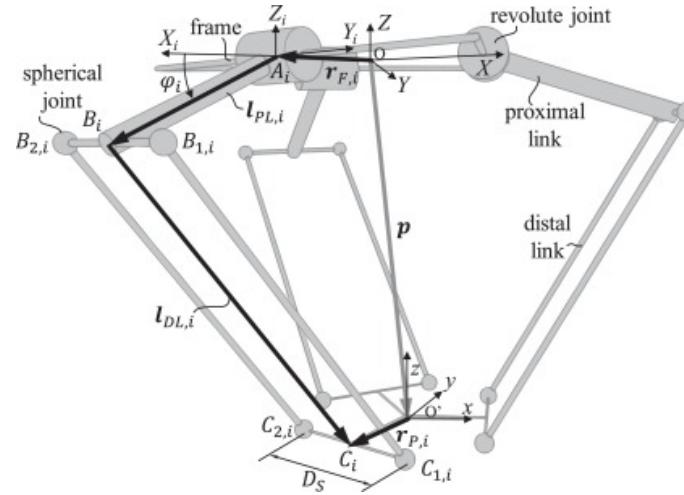
- Hypothesis Space
- PAC Learning Model
- Empirical Risk Minimization
- VC Dimension
- No Free Lunch Theorem
- Inductive Bias
- Learning Resource:
 - http://cs229.stanford.edu/notes_archive/cs229-notes4.pdf
 - https://www.mit.edu/~9.520/scribe-notes/class02_srb_sara.pdf
 - <https://www.cs.princeton.edu/~rlivni/cos511/cos511.html>

Classical AI Methods

- Local search/optimization
 - Hill-climbing
 - Simulated Annealing
 - Beam Search
 - Genetic Algorithms
- Constraint Satisfaction Problem
 - CSP Search
- First-Order Logic
 - Inference
 - Prolog Programming
- Knowledge Representation
 - Ontology

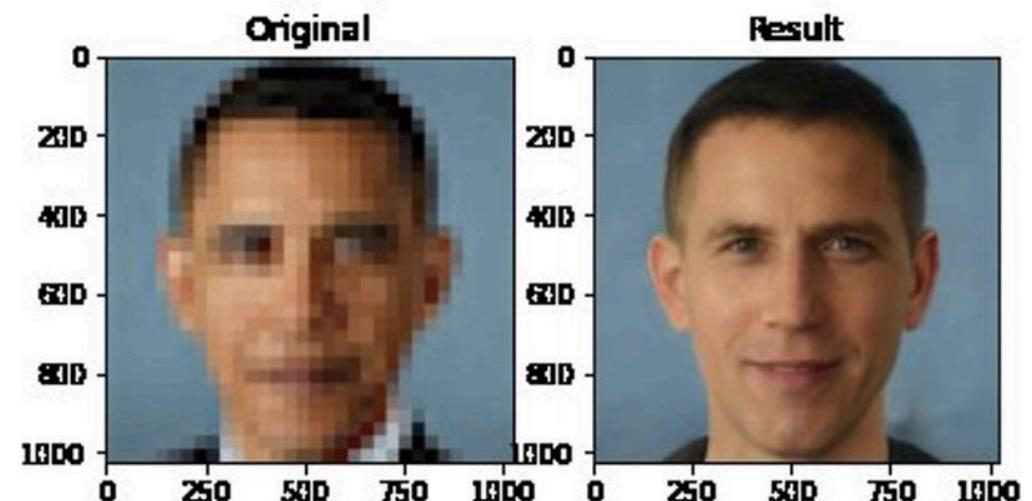
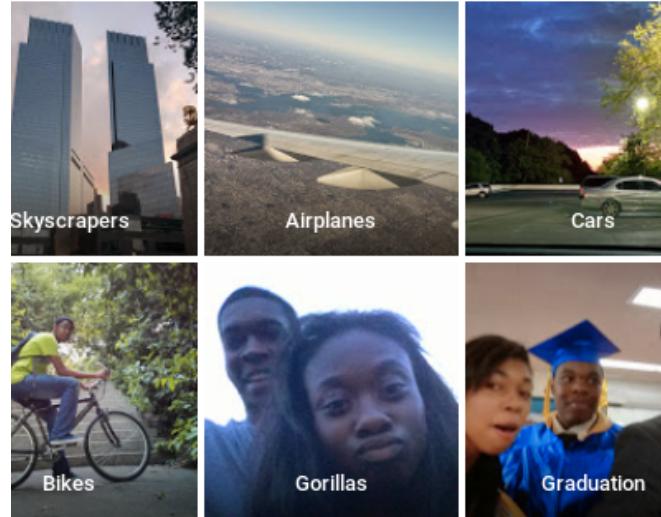
Robotics

- Kinematics
 - Forward/inverse
- Localization and Mapping
 - SLAM
- Path Planning
- Control
 - PID



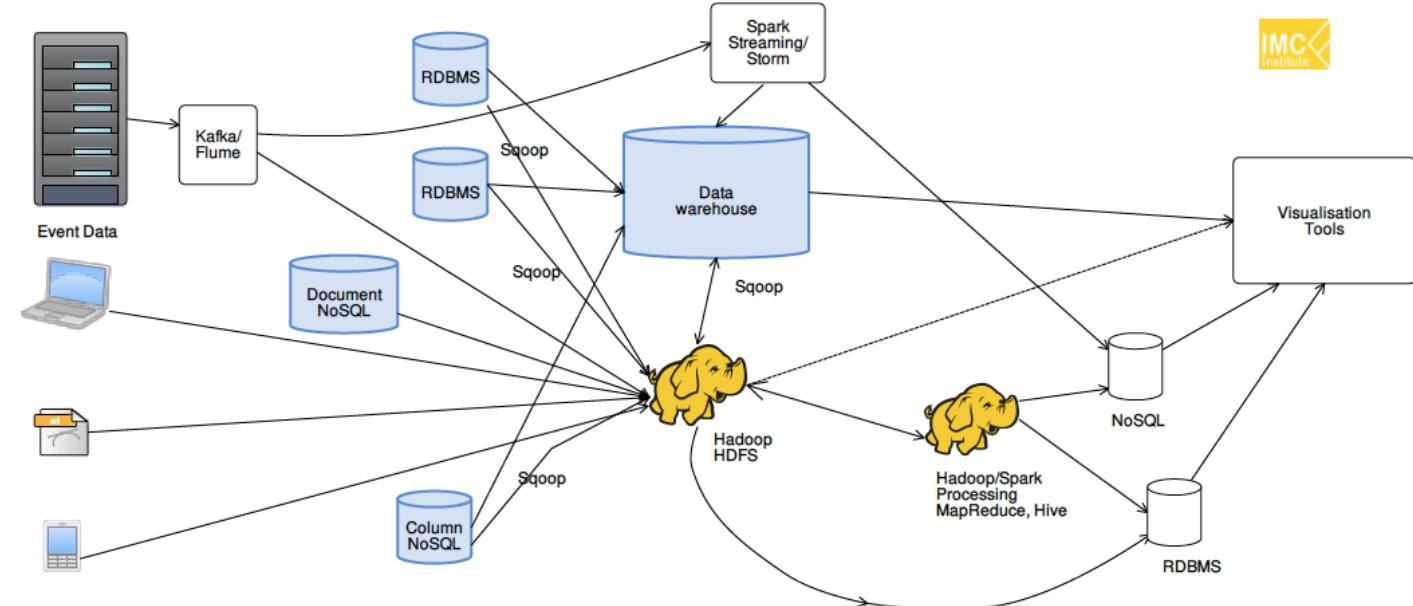
Governance Issues

- Privacy-Preserving AI
 - Differential Privacy
 - Homomorphic Encryption
 - Federated Learning
- AI Fairness
 - Algorithmic Bias
- Explanability
 - Grad-CAM



Mlops (ML + Software Engineering)

- Dev Tools to learn:
 - <https://github.com/kelvins/awesome-mlops>
- Cloud computing
 - AWS, Google Cloud, Azure
 - Hadoop, MapReduce
 - Spark, MLlib



Cloud Architecture (credit: IMC Institute)