1c Perceptrons: Linear Separability, Types of Learning, Ockham’s Razor, Multi-Layer Neural Networks, Activation Functions, Gradient Descent, Chain Rule, Forward Pass, Backpropagation, Training Tips

2a Probability: Gaussian distribution, Bayes’ Rule, Entropy and KL-Divergence, Huffmann Coding,Variations on Backprop (Cross Entropy, Weight Decay, Momentum), Maximum Likelihood
Map Estimation

3a Dynamics: Weight Space Symmetry, Controlled Nonlinearity, Limitations of Two-Layer Neural Networks, Twin Spirals , Vanishing / Exploding Gradients, Activation Functions, Overfitting, Dropout, Ensembling, Bagging

3b Convolutional Networks: Convolutional Network Components, MNIST, CIFAR , Softmax, LeNet
AlexNet, Stride, Zero Padding, Max Pooling

4a Image : Texture Synthesis, Neural Texture Synthesis, Residual Networks, Dense Networks, Batch Normalization, weight initialization, Data Augumentation, AlexNet, VGG, GoogleNet, ResNets, LeNet, MNIST, CIFAR Image Dataset, ImageNet LSVRC Dataset

5a Recurrent Networks: Processing Temporal Sequences, Sliding Window, NetTalk, Simple Recurrent Network (Elman, 1990) , Back Propagation Through Time, Jordan Networks,
Dynamical Recognizers, LSTM, Reber Grammar, Embedded Reber Grammar, Simple Recurrent Network , Gated Recurrent Unit (GRU)

5b WordVectors: Synonyms and Taxonomy, N-Gram Model, Co-occurrence Matrix,
Word Embeddings, Singular Value Decomposition, word2vec and GloVe, Eigenvalue, Cost Function , word2vec Issues , Continuous Bag Of Words (CBOW), Skip-Gram, Hierarchical Softmax, Negative Sampling , Subsampling of Frequent Words , Linguistic Regularities

7a Language: Neural Translation, Bidirectional Recurrent Encoder, Attention Mechanism, Google Neural Machine Translation,

7b Reinforcement Learning: Models of optimality, Value Function Learning, Exploration / Exploitation, Temporal Difference Learning, Q-Learning, TD-Gammon.

8a Deep Reinforcement: Hill Climbing, Policy Gradients, REINFORCE Algorithm, Actor-Critic, Deep Q-Network, Experience Replay, Prioritised Replay,Double Q-Learning, advantage Function.

8b Hopfield: Energy Function, Hebbian learning, Generative Models, Boltzmann Machine, Gibbs Sampling, Restricted Boltzmann Machine, Contrastive Divergence, Greedy Layerwise Pretraining

9a Autoencoders: Greedy Layerwise Pretraining, Avoiding Trivial Identity, Sparse Autoencoder, Contractive Autoencoder, Denoising Autoencoder, Generative Models, Variational Autoencoder

9b GAN: zero-sum, Oscillation and Mode Collapse