TODO: Check if update versions are online

1. Connectionist neurons
   1. Math primer
2. Multi-layer Perceptrons (MLP)
   1. Terminology
   2. Apples vs oranges (Single con. neu 🡪 Hyperplane)
   3. 1L-MLP 🡪 Exploring the parameters
3. Stochastic approx., Online learning, Conjugate Gradient Method, Regularization, Multi-Class, Cross Entropy
   1. Error measures
   2. Binary classification
   3. MLP Regression
4. RBF-networks, nested crossvalidation
   1. Linear neuron 🡪 Hesse Matrix, “weight decay”, conjugate gradient,
5. Radial basis functions (RBF) (“curse of dimensionality”), Gaussian Filters
   1. Regularization, Non-linear basis functions, (un)biased estimators, Cross validation,
6. Empirical Risk Minimization (ERM), Statistical Learning theory (SLT), Linear separability, binomial distribution, generalization performance, Vapnik-Chervonenkis (VC) dimensions, Inductive Learning Problem, Growth function, Regression problems,
   1. Multi-class, kNN, Parzen window classifier, RFB networks
7. Structural Risk Minimization, Margins of Hyperplanes vs VC-dimension, primal optimization problem, Lagrange multipliers, dual problem, Support vectors (SVM) 🡪 Non-linear, Mercers theorem, C-SVM, Sequential Minimal Optimization (SMO), KKT conditions
   1. ERM, Linear Discriminant Analysis, Binomial/Normal/Poisson distribution
8. –
   1. C-SVM, parameter optimization
9. Inference, Conditional Independence, Bayes Theorem,
   1. Support vector regression (SVR), e-SVR, v-SVR
10. DAG, Bayesian Inference, Markov blanket, Bipartite trees, Message passing,
    1. Bayesian Inference, DAG, Moral Graph, conditional independence
11. –
    1. Message Passing, Classification challenge
12. Generative models, Minkowski noise, Bayesian Model Selection, Likelihood, Bayesian Prediction, “maximum a posteriori” (MAP) Method
    1. Junction trees, Message passing,
13. Markov Decision Processes, Markov Chains, Transition model, reward function, Policy evaluation, Value function, Monte Carlo estimation (value iteration), Model-Based
    1. Reinforcement Learning (RL): Markov Decision Problem/Process, Bellman operator, Mazes: Value function, Policy
14. Model-Free, Temporal difference (TD) learning, Batch value estimation, Q-Learning, SARSA, Optimal policy, On-/Off-policy, Exploration-Exploitation, e-greedy policy, softmax policy,
    1. Q-value estimation
15. –
    1. –
16. ERM: MLP, backprop, gradient descent, cost functions, trans functions, RBF, cross validation (grid search), regularization, conjugate gradient, kNN, k-means, feature-expansion
17. SRM: SLT, SVM, VC-Dim, Lagrange multiplyers, kernel trick, SVR, SMO
18. Bayesian inference: Bayes Nets, Message passing, Markov blanket, junction trees, MAP
19. RL: Q learning, MDP, End-to-end RL, Bellman equation, Exploration-Exploitation, on/off policy, model based RL (analytical vs. approx), TD (lambda), greedy policy (policy improvement)