1. Image classification problem in terms of machine learning (supervised problem)
2. How image could be described? Types of image/object features
3. Receptor space. The main idea of method of potential functions.
4. Potentials in the receptor space. Modifications of method of potential functions.
5. Scene recognition. Image understanding system. Visual model. Bottom-up structural analysis.
6. Scene recognition. Image understanding system. Visual model. Top-down structural analysis
7. Structural approach. Feature decomposition. Syntactic methods. Example of image grammar.
8. Image descriptors. Properties of descriptors. Types of descriptors. HOG
9. Image descriptors. Properties of descriptors. Types of descriptors. SIFT
10. Image descriptors. Properties of descriptors. Types of descriptors. GIST
11. Image descriptors. Properties of descriptors. Types of descriptors. SURF
12. Neural networks. Generalized McCulloch-Pits neuron. Rosenblatt rule and Hebbs rule. Perceptron Convergence Theorem. Delta-rule
13. Gradient descent. Linear decision boundary. Linear Separability and the XOR Problem
14. Multilayer perceptron. The modeling of XOR. Back propogation. Flexibility MLP. Problems with MLP
15. Deep architecture. Goal of deep learning. Motivations for using deep nets. Levels of abstraction. Discrete convolution. Convolutional Neural Network core concepts. Layers attributes. Pros and cons of deep learning
16. Deep architecture. Goal of deep learning. Levels of abstraction. Discrete convolution. Convolutional Neural Network core concepts. Data augmentation, dropout, activations, loss functions.
17. Deep architecture. Goal of deep learning. Autoencoders. Convolutional autoencoders.
18. Deep architecture. Goal of deep learning. Recurrent Neural Network. LSTM.
19. Hopfield neural network. Hamming neural network
20. What is object detection? Quality assessment and metrics. Common issues with computer vision detection algorithms
21. What is object detection? Deep learning methods. R-CNN family.
22. What is object segmentation? Quality assessment and metrics. Types of computer vision segmentation (thresholding, clustering, edge based, region based). Examples of different types.
23. What is object segmentation? Deep learning methods. Example of network architecture.