

Программа экзамена по машинному обучению

Продвинутый, весна 2019

Natural Language Processing

1. Embeddings
2. word2vec: linearity, skip-gram, negative sampling
3. Unsupervised translation approach
4. Ways to work with text data (RNN, CNN, classical approaches)
5. Attention, Self-attention approaches
6. Transformer structure
7. Machine translation metrics, quality functions
8. BERT structure, main ideas

Reinforcement Learning

9. RL problem statement. State, Action, Reward, Environment, Action
10. Crossentropy method
11. Value function, Q-function
12. Q-learning, approximate Q-learning. DQN, bells and whistles (Experience replay, Double DQN, autocorrelation problem)
13. Policy gradient and REINFORCE algorithm. Baseline idea, A2C
14. Policy gradient applications in other domains (outside RL)

Computer Vision

15. Computer Vision problem statements: classification, detection, segmentation
16. Metrics in CV: IoU, mAP
17. Main datasets: PASCAL VOC, ImageNet, COCO, OpenImages
18. R-CNN -> Fast -> Faster structure, main ideas, metrics and performance
19. Focal Loss
20. Non Maximum Suppression algorithm
21. YOLO v1 -> v3 main ideas
22. Separable convolutions
23. MobileNet v1, v2 blocks
24. Upsampling methods: poolings, transposed convolutions
25. FCN, DeconvNet, SegNet
26. U-Net
27. Mask R-CNN
28. Neural style transfer technique
29. Model compression methods (distillation and quantization concepts)
30. KL divergence. Relations to crossentropy
31. Variational Autoencoders: structure, loss function, training process
32. Generative Adversarial Networks: structure, loss function, training process

Теоретический минимум

1. KL-divergence
2. Log derivative trick
3. Metrics in CV: IoU, mAP
4. Value function, Q-function
5. Focal Loss
6. Attention mechanism (motivation, main idea, Bahdanau & Luong attention scores)