Computer Vision (INFOMCV) - Test Exam

2017-2018, Utrecht University

April 4, 2018

Instructions:

1. *Put your name and student number on all of the papers you hand in (if you take out the staple).*

2. *There are always potentially multiple correct answers in the multiple-choice questions. Missing one correct answer or providing an incorrect answer will cost you half of the points.*

3. *Ensure that your handwriting is readable. You can answer in English or Dutch.*

4. *You are **not** allowed to use any other materials but a pen. So no reader, slides, phone, etc.*

5. *This test exam is **not** representative of an actual exam and only serves to demonstrate potential types of questions. You might expect more open questions than in this test exam. Also, there will be more questions in an actual exam.*

6. ***Good luck!***

1. **Image formation** When should you recalibrate the camera intrinsics matrix?

    (a) When zooming in
    (b) When rotating the camera around its local origin
    (c) When rotating the camera around the world's origin
    (d) When changing the resolution of the image
    (e) When the background of the scene changes

2. **Clustering** Which of these statements about K-means are true?

    (a) K-means can get stuck in local minima
    (b) The (new) cluster centers are determined in the update step
    (c) With the same initialization, the algorithm will always converge to the same solution
    (d) K-means is a specific type of the expectation-minimization (EM) algorithm

3. **Training and testing** Which of the following statements are true?

    (a) Perfect accuracy on the training set is always optimal
    (b) Outliers increase the intra-class variance
    (c) Negative examples can be obtained by mirroring and inverting positive images
    (d) Cross-validation is used to train a better model without the need for more data

4. **Performance measures** Which of the following performance measures are not affected by the number of true negatives?

    (a) Accuracy
    (b) Precision
    (c) F-score
    (d) ROC-curve

5. **CNNs** In a CNN, we have an input matrix to which we apply a number of filters. D is the depth of the input matrix, F is the size of the filter in one dimension, N the size of the input matrix, P is the number of pixels for padding in each direction and S is the stride length. What is the type used for finding the number of parameters per filter?

    (a) $(F * D + 2 * P) / S$
    (b) $N * N * D - F * F * D$
    (c) $(N - F + 2 * P) / S + 1$
    (d) $F * F * D + 1$

6. **CNNs** Give the output of a max pooling operation with a 2x2 kernel and stride 2 on input matrix:

5	9	2	1	4	6
4	5	2	8	6	9
7	6	0	4	2	4
9	4	7	0	7	9
3	5	1	6	5	1
8	4	2	6	2	7

7. **CNNs** You are given eleven 5x5 filters for an input of 27x27x30. What is the total number of parameters in this convolutional layer?

    (a) 8019
    (b) 276
    (c) 750
    (d) 8261

That's it! :)

Answers:
1. a, d
2. a, b, c, d
3. b
4. b, c
5. d

6.

9	8	9
9	7	9
8	6	7

7. d