

Comprehensive Exam Question Pool for Computer Vision

The following list forms a pool of study questions for MS or PhD students. Please note that such a list of questions is unusual in comprehensive exams: it is provided as a courtesy. However, the Department reserves the right to adjust the questions administered at any time without notice. Because students have fore-knowledge of the questions being asked, please be aware that the explanations are expected to be (a) *very* well organized and well written, (b) fully discussed, and (c) highly focused. It is strongly recommended that you DO: study for the comprehensive exam by studying each topic with outlines and examples.

Format of exam: You will be provided with a list of questions selected at random among the list below on the morning of the exam. For Masters or PhD students, five or three questions will be asked, respectively. The test is closed book. Explain each topic in detail up to 10 lines excluding illustrations or drawings if necessary.

1. Classifier:
 - A. Support Vector Machine,
 - B. Adaboost,
 - C. Neural Networks,
 - D. Bayes classifier,
 - E. K-nearest neighbors,
 - F. Decision tree,
 - G. Random forest
2. Camera model and Image warping
 - A. Pinhole camera model,
 - B. Camera calibration,
 - C. Stereo calibration
 - D. Homography,
 - E. Affine warping
3. Feature detection and description,
 - A. SIFT,
 - B. SURF
 - C. HOG
 - D. Hough transform,
 - E. RANSAC,
 - F. Corner detection
 - G. Sliding Window
 - H. Template Matching
 - I. Scale invariant recognition
 - J. Integral Image
4. Color models
5. Depth sensors
 - A. TOF camera,
 - B. Kinect
6. Edge detectors
 - A. Canny edge detector
 - B. Laplace edge detector
7. Tracking,
 - A. Kalman filter,
 - B. Camshift,
 - C. Meanshift
 - D. EM algorithm
8. Face
 - A. Face detection,

- B. Face recognition
 - PCA,
 - LDA,
 - Fisherface,
 - Eigenface
- C. Active appearance model
- 9. Morphology operation
 - A. Dilation
 - B. Erosion
 - C. Opening
 - D. Closing
- 10. Motion estimation and Structure from Motion
 - A. Epipolar geometry
 - B. Fundamental matrix and Essential matrix
 - C. 8-point algorithm
 - D. 3-point algorithm (P3P)
 - E. Bundle adjustment
- 11. 3D reconstruction
 - A. Dense stereo matching
 - B. Global optimization in stereo matching
- 12. Image stitching
- 13. Background modeling for video