3D Computer Vision

Review of linear algebra, calculus of variations, signals and systems; Camera and image formation – optics; Feature detectors – edge and corner detection; Feature descriptors – SIFT, SURF, feature matching; Shape from X – Reflectance map, BRDF, Shape from shading, Photometric stereo, depth from defocus, depth from focus, RGB-D images; Single view geometry – finite projective cameras, camera parameters, point correspondences, estimation of camera matrix, direct linear transformation (DLT); Two view geometry – homography, epipolar geometry, estimation of fundamental matrix, image rectification, stereo correspondence, shape from stereo; Three view geometry – trifocal tensors; Motion – optical flow field, Estimation of dense and accurate optical flow field; Multi view geometry – structure from motion, triangulation, factorization, bundle adjustment; Internet vision – mining community photo collections (Flickr, Facebook, etc.).