

3 Computer Vision (JGD)

- (a) Briefly define each of the following concepts as it relates to vision:
- (i) active contours and energy-minimising snakes [2 marks]
 - (ii) Hadamard's criteria for well-posed problems [2 marks]
 - (iii) the hermeneutical cycle [2 marks]
 - (iv) reflectance map [2 marks]
 - (v) Bayesian prior and its role in visual inference [2 marks]
- (b) Detecting, classifying, and recognising human faces is a longstanding goal in computer vision. Yet because the face is an expressive social organ, as well as an object whose image depends on identity, age, pose and viewing angle, and illumination geometry, many forms of variability are all confounded together, and the performance of algorithms on these problems remains very poor. Discuss how the different kinds and states of variability (*e.g.* same face, different expressions; or same identity and expression but different lighting geometry) might best be handled in a statistical framework for generating categories, making classification decisions, and recognising identity. In such a framework, what are some of the advantages and disadvantages of wavelet codes (Haar or Gabor) for facial structure and its variability? [10 marks]