COMP3005/Computer Vision
Revision Lecture

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Exam Format

- 2 hours duration
- Choose 3 questions from 6
- Each question worth 33 marks
- Mark wrote 3; I wrote 3
  - Expect that Mark's will *typically* cover lower level vision & mine will cover higher level vision
  - but, there will probably be some overlap!

Typical mark scheme

- 80% from lectures and notes; 20% from independent reading
  - Most questions will be broken down into sub-parts
    - Mark has a tendency to write a single question with 33 marks!
- The marks for each question are **there to help you**
  - Use them to judge how much to write and how much time to spend

COMP3005: Computer Vision (2013-2014)

- COMP3005W1_COMP3005_201213_02.pdf
- COMP3005W1_COMP3005_201112_02.pdf
- COMP3005W1_COMP3005_201011_02.pdf
- COMP3005W1_COMP3005_200910_02.pdf
- COMP3005W1_COMP3005_200809_02.pdf
- COMP3005-2008W1-02.pdf
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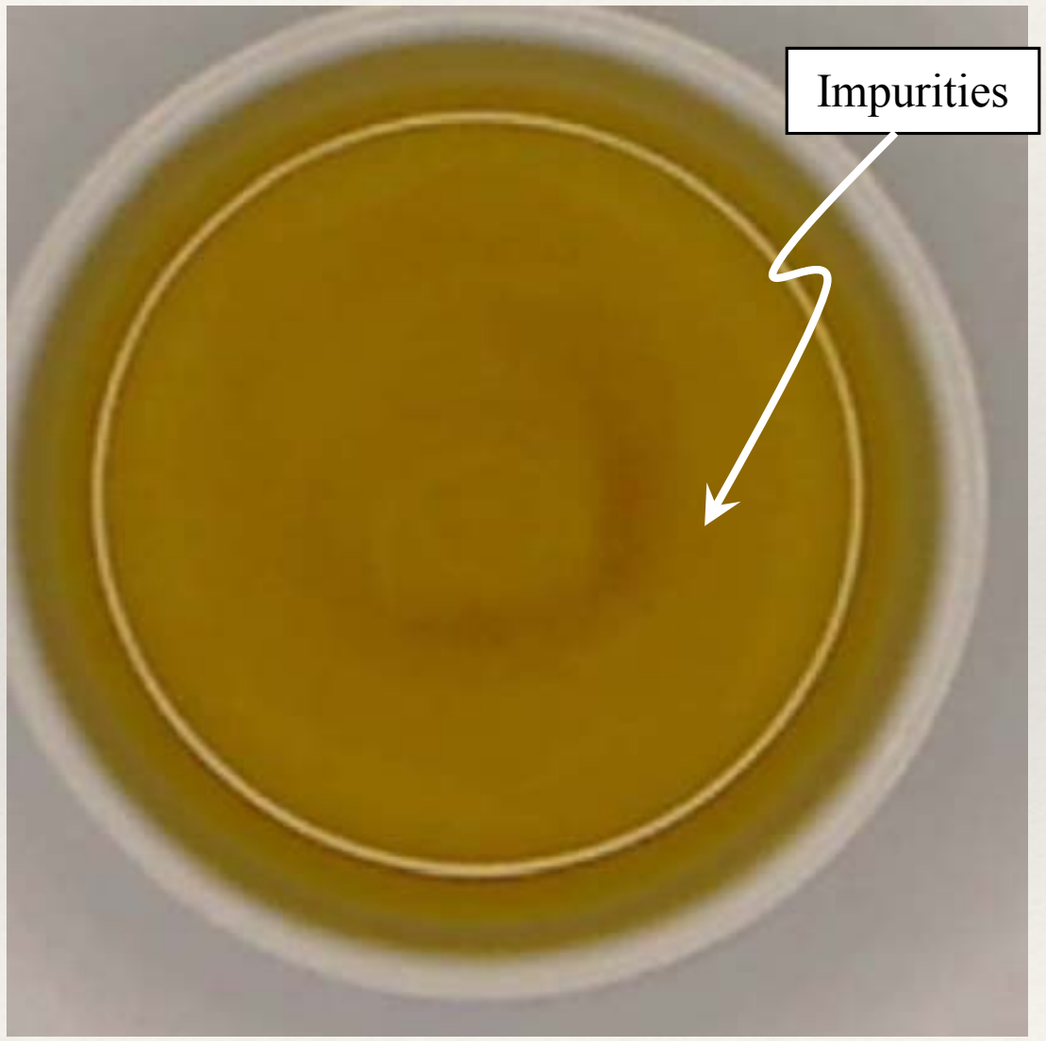
Long Example 1 (Q3 12/13 paper)

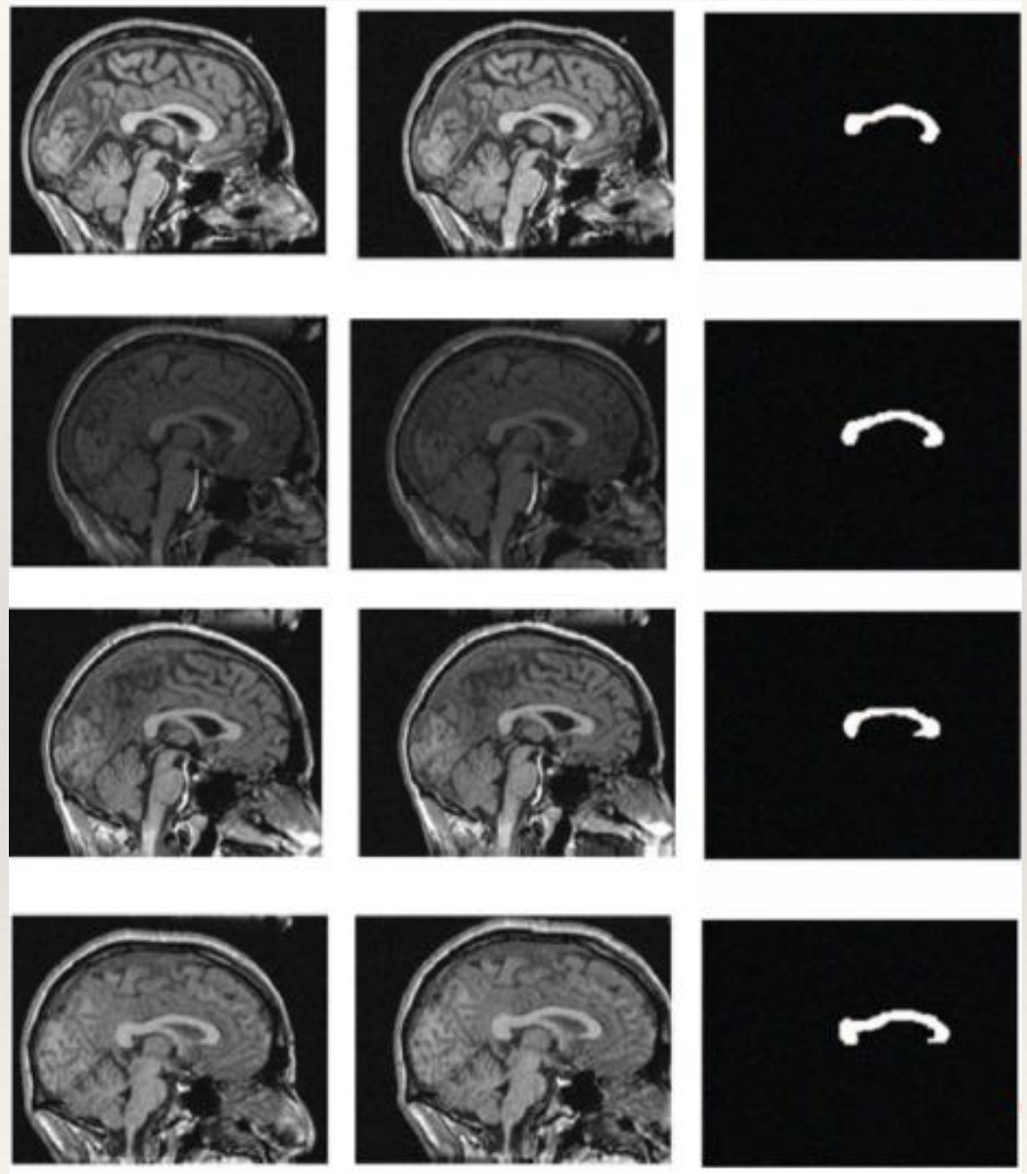
In the manufacture of Olive Oil, the process requires determination of the levels of impurities in the oil. The official EU method CE 2568/91 requires the olive oil to be dissolved in hexane and then filtered through paper. As this is cumbersome, it has been proposed to replace this by using computer vision. This is illustrated in Fig. 1 which shows the impurities in a sample of oil within a container, viewed using an overhead camera.



Describe a computer vision-based approach which could be used to address this inspection task, illustrating how your code would be expected to operate, and showing how it could be implemented (by using any maths/ code as necessary).

Long Example 2 (Q2 11/12 paper)

The Corpus Callosum is a region of the human brain established to be of clinical interest. Images of a human head acquired by Magnetic Resonance Imaging are shown in Figure 1(a) and registered images in Figure 1(b) and the identified Corpus Callosum in Figure 1(c).



Describe how the Corpus Callosum can be detected within these image and how the Corpus Callosum can be described for analysis of its shape.

Example Question

(i) Define what is meant by the following terms with respect to computer vision:

- Constraint
- Robustness
- Invariance

[6 marks]

(ii) For the two following computer vision applications, describe ways in which the vision system can be engineered to achieve robustness by considering invariance and constraints:

- An application for detecting bar codes on a mobile phone
- An industrial machine for sorting beans by their colour

[6 marks]

(iii) Research has suggested that bruises on apples can be detected using infrared imaging before they become visible to the naked eye. Detection of such bruises would allow apples to be rejected before they hit the supermarket shelf. Assuming that a bruise appears as a dark blob (compared to the un-bruised parts) on the surface of the apple under IR light, describe in detail with pseudo-code how you might detect and extract any such blobs.

[10 marks]

(iv) Apples only need to be rejected if they have bruises bigger than 1cm2 in size that are approximately circular (the ratio of the longest axis to smallest must be less than 2). Develop a feature that could be used for determining whether an apple should be rejected, and give details of the bounds on the numeric values of the feature that would cause an apple to be rejected. Assume the imaging system has a resolution of 1pixel/mm in both x and y directions.

[11 marks]

Another example (Q4 11/12 paper)

(i) Define what image segmentation is.

(ii) Describe two alternative strategies to segment an image.

(iii) Compare the two strategies from the previous answer, highlighting advantages and disadvantages of one with respect to the other.

(iv) Identify parameters which will need to be set, either manually or automatically for the segmentation methods you described and strategies to choose them.

Questions