

Engineering Tripos Part IIA Project, SF2: Image Processing, 2023-24

Leader

[Prof J Lasenby](#) [1]

Timing and Structure

Thursdays 9-11am plus afternoons and Mondays 11-1pm

Prerequisites

3F1, 3F3, 3F6 useful, none presumed

Aims

The aims of the course are to:

- To gain understanding of the main processes in an image compression system, and the typical trade-offs in designing such a system;
- An input filtering (or transformation) process, which compacts most of the energy of the image data into a relatively small number of filter output samples;
- A quantisation process, which represents these samples to some desired accuracy;
- A lossless entropy coding process, which codes the quantised samples into the minimum number of bits that still allows the samples to be recovered to their quantised accuracy in the decompressor.

Content

This project introduces you to some of the essential design tradeoffs which must be made during the design of image data compression systems. The main purpose of such systems is to compress as far as possible the size of data file required to store an image (typically a real-world scene) while still preserving the quality of the decompressed image at an acceptable level.

The project covers techniques which to some extent reflect the compression inherent in the JPEG, JPEG2000 and JPEG-XR standards. JPEG (Joint Photographic Experts Group) is the image compression standard from 1992 still commonly used today. JPEG2000 and JPEG-XR are more modern versions which are gradually becoming more widespread. The images above are examples of the same data compressed to the same size but using three different schemes.

FORMAT

Students will work in pairs. Each student will write interim reports by the end of weeks 1 and 2 and a final report by the end of week 4.

ACTIVITIES

The project introduces you to each of these processes in turn and allows you to make a number of inter-related design decisions. New concepts are introduced as the project progresses, rather than by trying to introduce too much theoretical material at the beginning.

At the end of the project all groups will use their final design solutions to compress a small set of images to given

file sizes, and the quality of the reconstructed images will be assessed both subjectively and objectively in a competition (complete with a prize!) to select the best design.

Coursework

Coursework	Due date	Marks
Interim report 1 (2 pages + appendices)	TBA	12
Interim report 2 (3 pages + appendices)	TBA	18
Final report (9 pages + appendices)	TBA	50

Dates TBC

Examination Guidelines

Please refer to [Form & conduct of the examinations](#) [2].

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Links

[1] <mailto:jl221@cam.ac.uk>

[2] <https://teaching.eng.cam.ac.uk/content/form-conduct-examinations>