Detecting and Recognising Faces in Images

Introduction

For this assignment, you should read the provided research papers and write a report to discuss them according to the task described below.

Intended Learning Outcomes

By the end of this assignment, you should be able to:

- demonstrate an appreciation and understanding of key research issues and methodologies in the area of face recognition;
- select what is important about a scientific paper and explain the key points;
- identify the commonalities and di erences between di erent methods of solving the same problem; and
- present di erent approaches within a standard framework so as to highlight the commonalities and di erences.

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1 Task

You will be given six papers that describe di erent approaches to the problem of detecting and recognising faces in images. You can find these papers listed at the end of this document; the papers can be downloaded from the course web page. You should write an report of 1500-2000 words, which is entirely your own work, covering the following points (it would be a good idea to structure your report to reflect these).

detection and recognition

1.1 Summary of the topic area

Summarise the problem and explain why it is important.

Marks	1: Problem summary: Poor or inaccurate.	2: Problem summary: Well described.	3: Problem summary: Well described with applications for context.

1.2 A short overview of each paper

Give an overview of each paper including

1. key ideas
2. an explanation of the technical approach taken in the paper – you do not need to go into intricate details but you should try to identify the key points
3. results

Marks	2: Overview: Did not sufficiently cover key ideas, technical details and results for each paper.	4: Overview: Provided a good description of the key ideas, technical details and results for each paper.	6: Overview: Provided a very good description of the key ideas, technical details and results for each paper. Demonstrated an understanding of the basic ideas.

1.3 Comparison of the papers

Provide a comparison of the papers including

1. a discussion of the strengths and weaknesses of the di erent approaches – try to give examples of situations where each would succeed and other(s) would fail.
2. how these methods compare to the Active Appearance model approach (see lecture notes).
3. how you would rank each paper relative to the others. Justify by also taking into account
   (a) the generality/applicability of results
   (b) the extent of validation/testing presented within the paper, and
   (c) whether the description of work is clear and complete.

Marks	2: Comparison: Did not sufficiently cover the required criteria of strengths/weaknesses, comparison to AAM, and ranking.	4: Comparison: Covered the required criteria of strengths/weaknesses, comparison to AAM, and ranking.	6: Comparison: Gave an excellent comparison to the required criteria of strengths/weaknesses, comparison to AAM, and ranking.

1.4 Your conclusions

A summary of the conclusions you think can be drawn.

Marks	1: Conclusions: Poor or non-existent.	2: Conclusions: Gave a good summing up.	3: Conclusions: Gave a good summing as well as stating own opinions.

1.5 Presentation

Your report should not be a chore to read. It should be nicely laid out and formatted, sentences should not be overly long, and the writing should flow.

Marks	0: Presentation: Made little attempt to format the document.	1: Presentation: Well-formatted document.	2: Presentation: Well-formatted document, split into sections, and enjoyable to read.

[marks: 20 in total]

2 Tips on how to read a research paper

Most papers assume a familiarity with the research area on the part of the reader making them rather challenging reading when you first get started. You may find the following suggestions useful:

- **Expect to read the paper multiple times** The first time you read the paper, don't worry if you don't understand everything. Initially, try to pick up as much information from the paper as you can. Pay particular attention to the abstract, introduction, conclusion, and any useful pictures as these parts of the paper are most likely to give you a general impression of what the authors are trying to achieve and why. Then, read the paper one or two more times and try to formulate your own summary of the paper's goals and how these are achieved.
- **Details you still don't understand** These may fall into the following categories:
  - **Important implementation details** These are details that you need to understand in order to truly understand how the actual algorithm (or system) works. In this case, you may need to read some related work from the paper's referenced bibliography and/or refer to the recommended text books and your lecture notes.
  - **Unimportant implementation details** These are details that you only need to understand if you are implementing the system and can be ignored.

  - **Important extensions to the basic idea** Maybe part of what makes this paper such a great one is that the basic idea applies to lots of di erent problem domains. In that case, you need to understand how this same idea applies to other problems and reading up on those other problems may be necessary.
  - **Unimportant extensions to the basic idea** Sometimes authors will include trivial (or unimportant) extensions to their work to make it sound as if there are lots of potentially important applications/extensions of it. You are probably safe to ignore these comments; do not let them distract you.

- **Still totally lost?** If you've honestly tried to read the paper three or more times and are still feeling really confused, ask for help.

3 List of Papers

1. V. Belhumeur, J. Hespanha, and D. Kriegman. Eigenfaces vs. Fisherfaces: Recognition using class specific linear projection. IEEE Transactions on Pattern Analysis and Machine Intelligence, 19(7):711-720, July 1997.
2. B. Moghaddam and A. Pentland. Probabilistic visual learning for object representation. IEEE Transactions on Pattern Analysis and Machine Intelligence, 19(7):696 - 710, July 1997.
3. B. Schölkopf, A. Smola, and K.-R. Muller. Nonlinear component analysis as a kernel eigenvalue problem. Neural Computation, 10(5):1299 - 1319, 1998.
4. M. Turk and A. Pentland. Eigenfaces for recognition. Journal of Cognitive Neuroscience, 3(1):71- 86, 1991.
5. P. Viola and M.Jones, Rapid Object Detection using a Boosted Cascade of Simple Features, Proceedings of Computer Vision and Pattern recognition, 2001.
6. M. A. O. Vasilescu and D. Terzopoulos. Multilinear analysis of image ensembles: TensorFaces. In Proceedings of European Conference on Computer Vision, pages 447 - 460, Copenhagen, Denmark, May 2002.