

COMP3204 & COMP6223

Computer Vision

Welcome!

Mark Nixon and Jonathon Hare

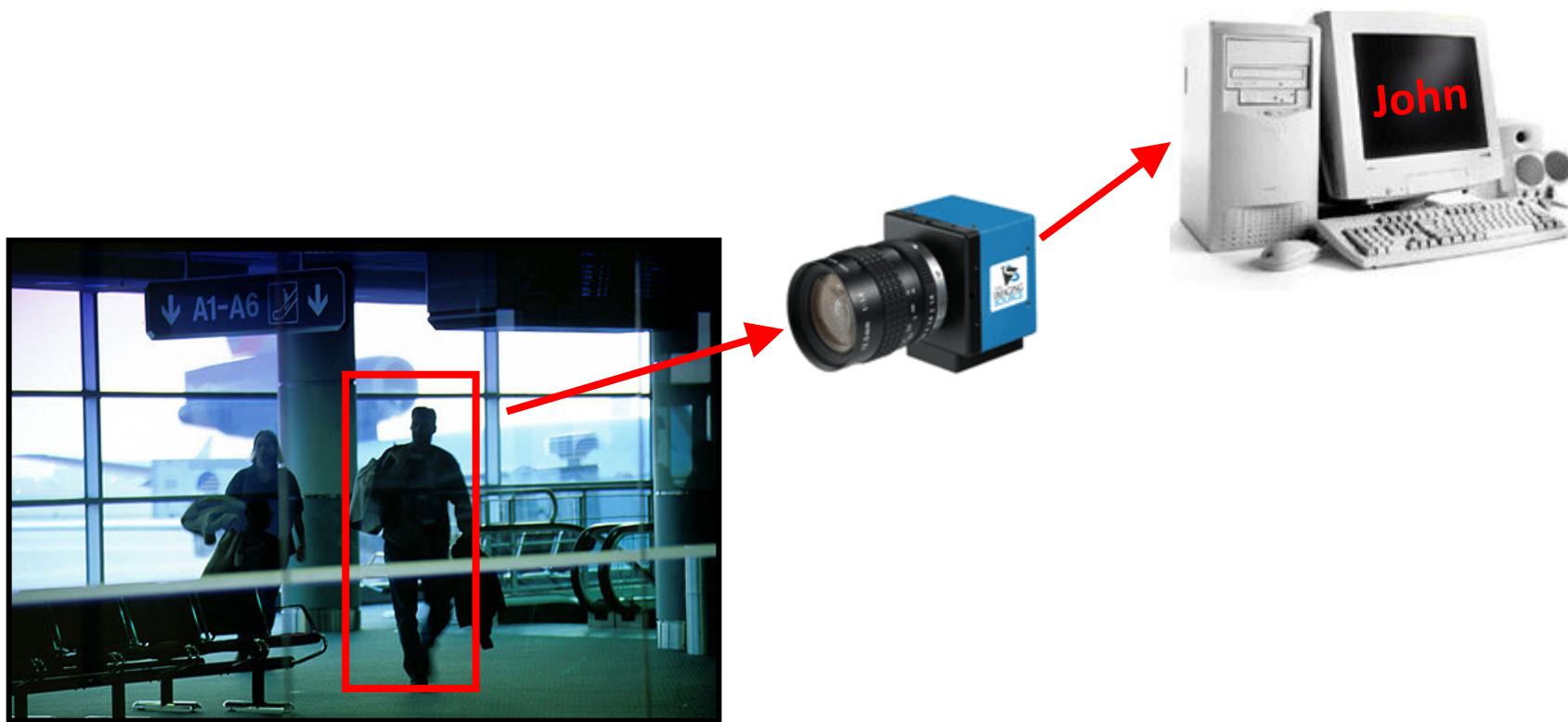


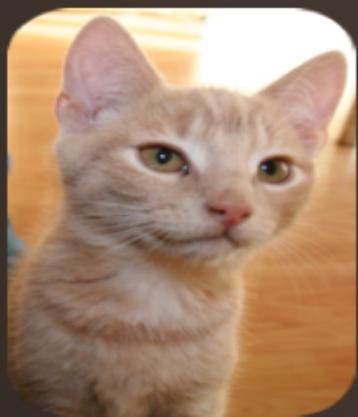
**Book
Intro**

**Department of
Electronics and
Computer Science**

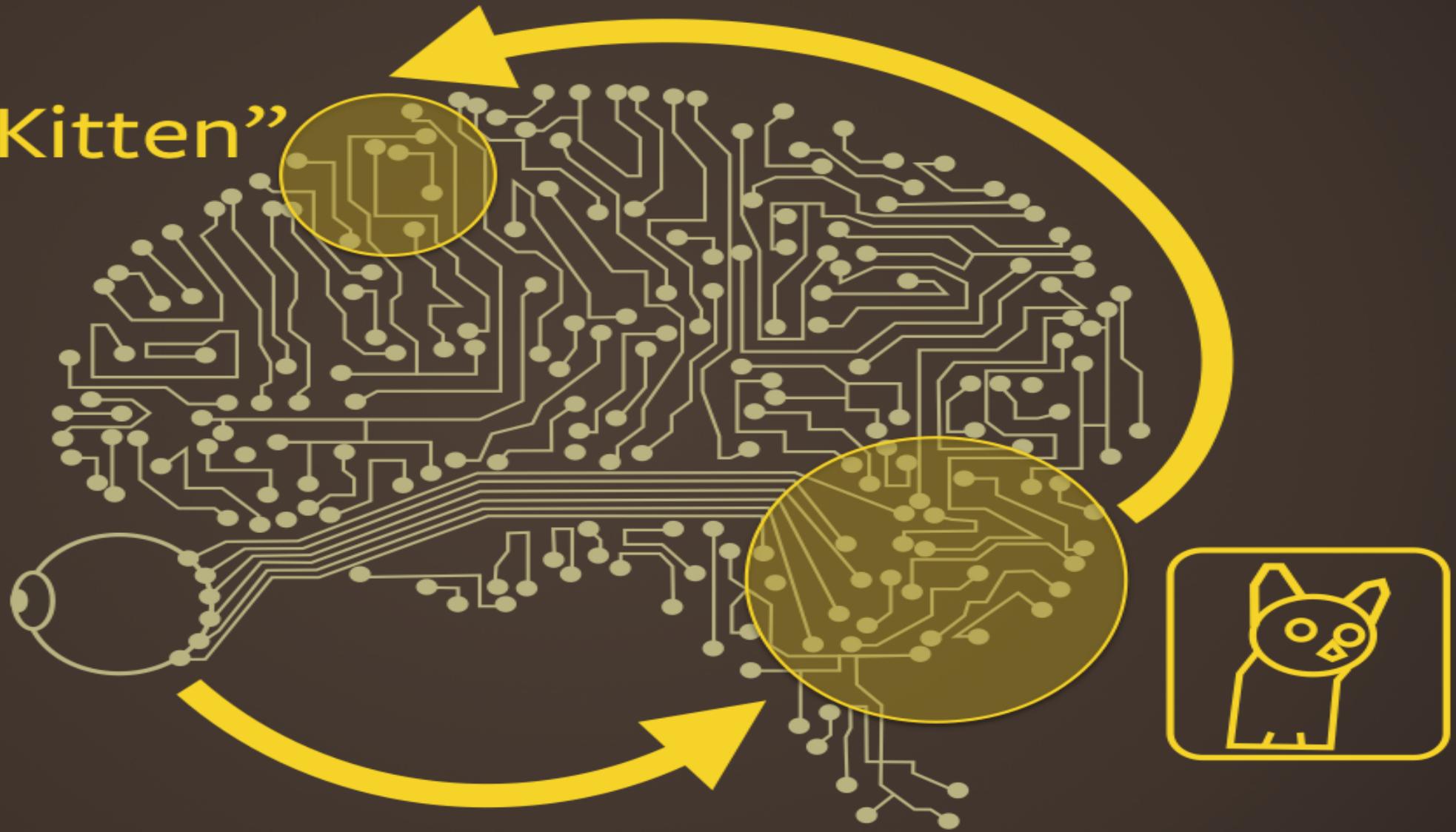
UNIVERSITY OF
Southampton
School of Electronics
and Computer Science

Vision based biometrics





“Kitten”



What can image analysis achieve?



Key to our slides

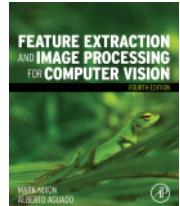
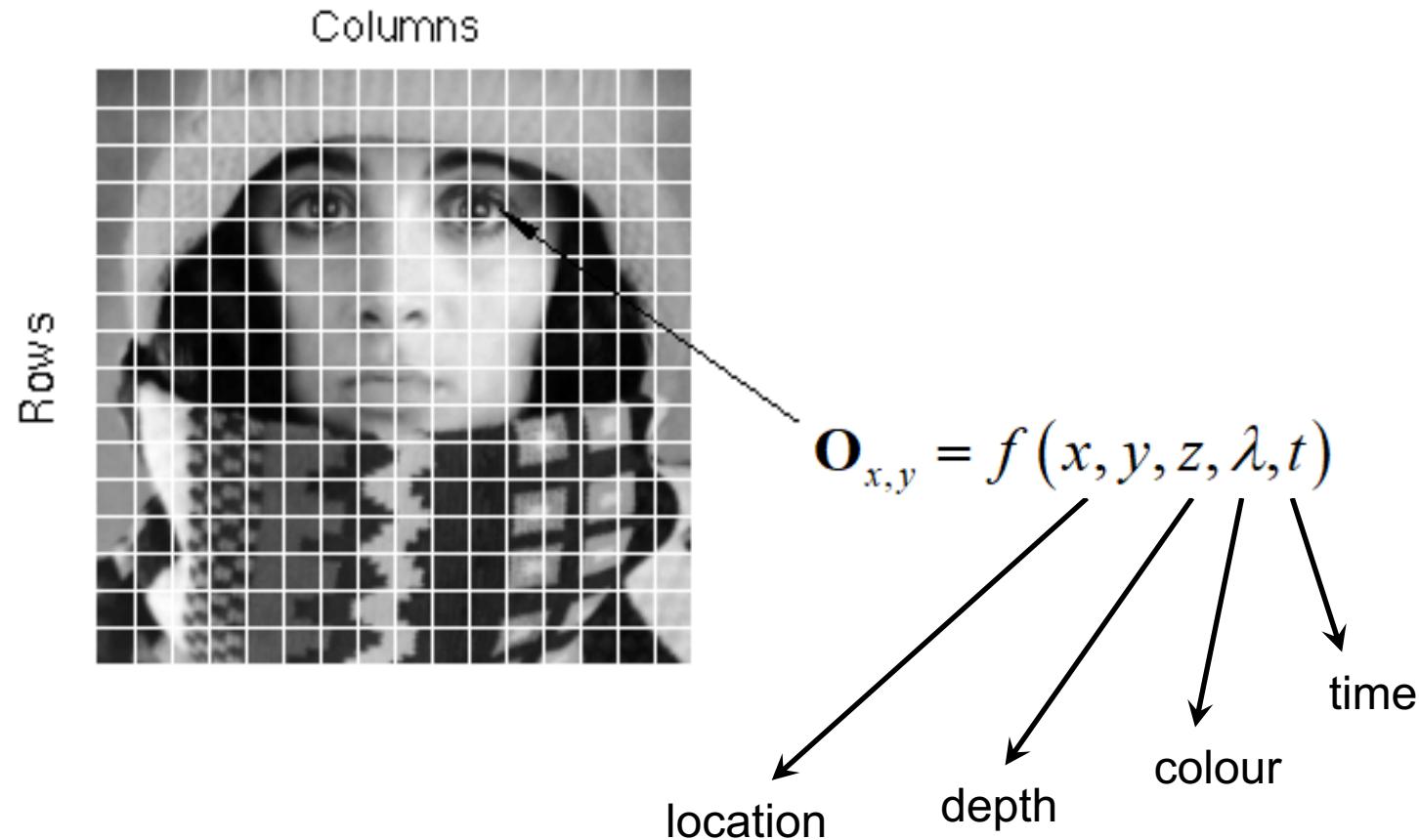
This bit is to be found in [Mark's book](#)

We expect you to [remember](#) this stuff

If [neither](#) of these are there, this is stuff to illuminate the course material



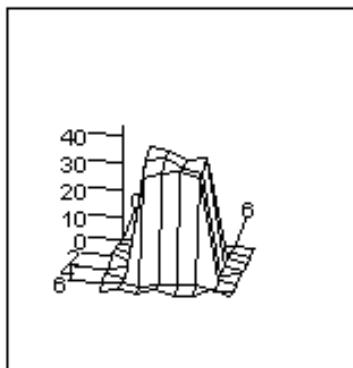
Images consist of picture elements known as “pixels”



2D Images are matrices of numbers



Grey level
image



3D view

pic =

| | | | | | | | |
|---|---|----|----|----|----|---|---|
| 1 | 2 | 3 | 4 | 1 | 1 | 2 | 1 |
| 2 | 2 | 3 | 2 | 1 | 2 | 2 | 1 |
| 3 | 1 | 38 | 39 | 37 | 36 | 3 | 1 |
| 4 | 1 | 45 | 44 | 41 | 42 | 2 | 1 |
| 1 | 2 | 43 | 44 | 40 | 39 | 1 | 3 |
| 2 | 1 | 39 | 41 | 42 | 40 | 2 | 1 |
| 1 | 2 | 1 | 2 | 2 | 3 | 1 | 1 |
| 1 | 2 | 1 | 3 | 1 | 1 | 4 | 2 |

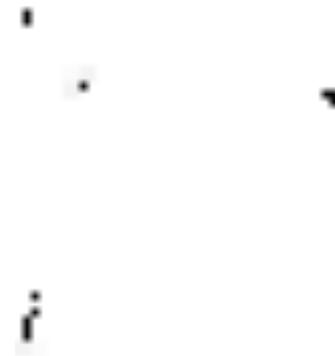
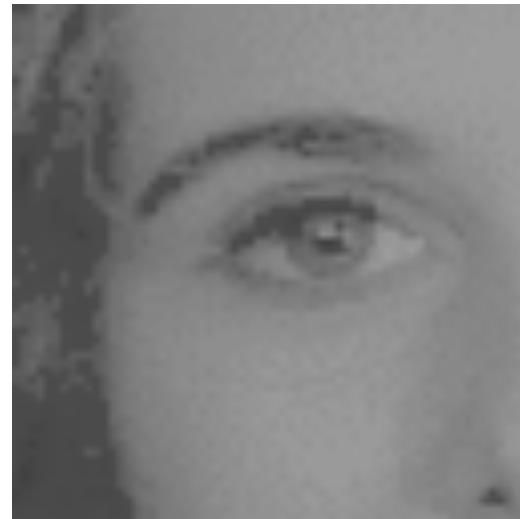
Corresponding
Matrix

Pixel



Point Operations

Recalculate point values



Modify brightness

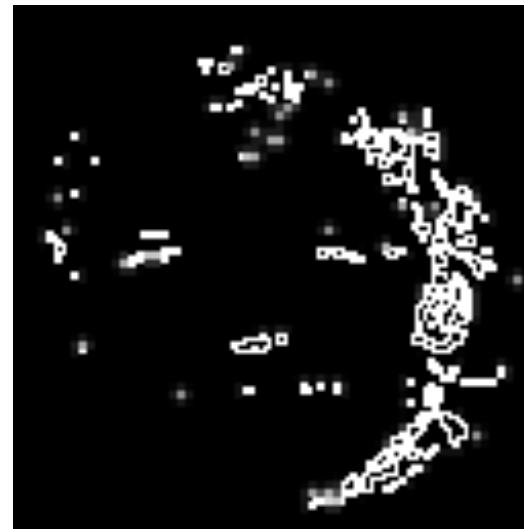
Find Intensity

Group Operations

Process neighborhoods



Image filtering



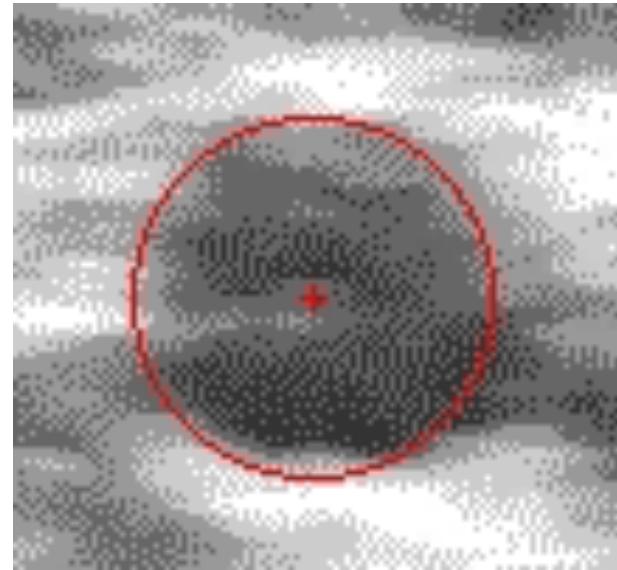
Edge detection

Feature Extraction

Finds shapes



Roads in remotely-sensed image



Artery in ultrasound image

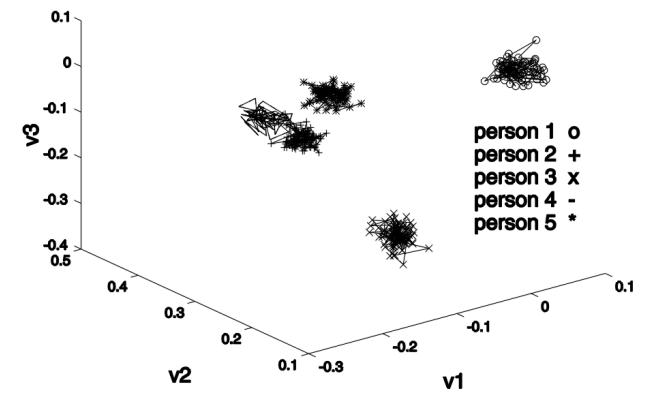
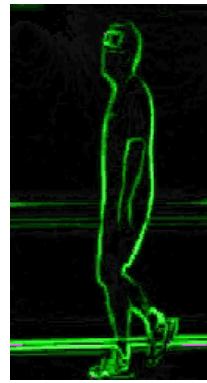
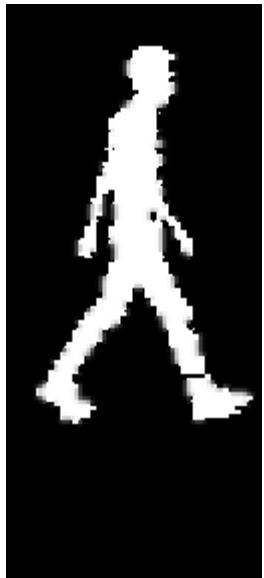
Applications of Computer Vision

- Image **coding** (MPEG/JPEG)
- Product **inspection**
- **Robotics**
- **Modern cameras/ phones**
- **Medical imaging**
- **Demography** (applied politics?)
- **Biometrics** (recognising people)



Gait Recognition

Recognising people from the motion of the **whole** body



silhouette

flow

edges

symmetry

acceleration

feature space



Gait Recognition

natural walking (well....)



Ear biometrics

- Person identification from ear image
- Uniqueness: used in forensics
- Unique advantage: age invariant
- Unique disadvantage: hair!
- Much smaller field than gait recognition

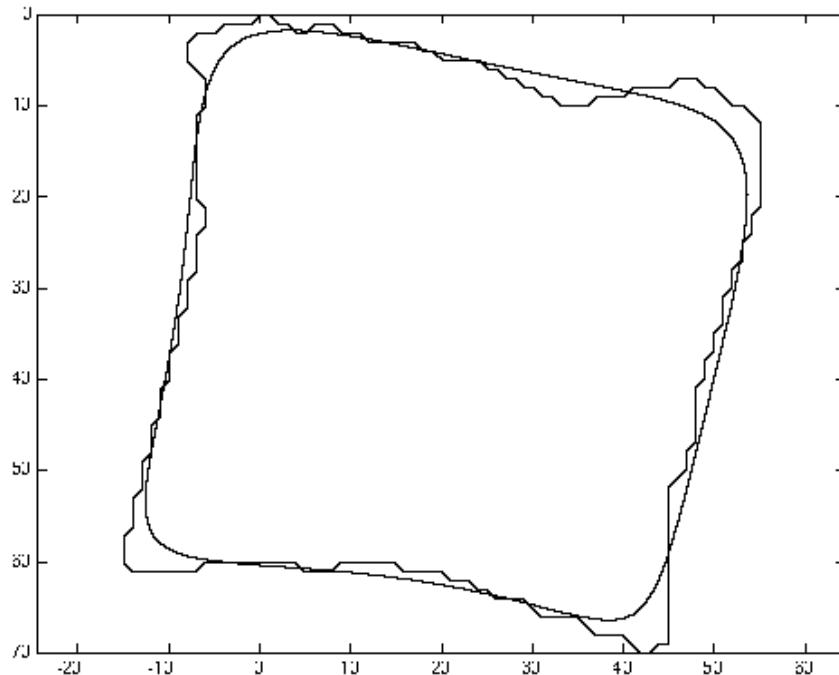


Thanks, BBC1

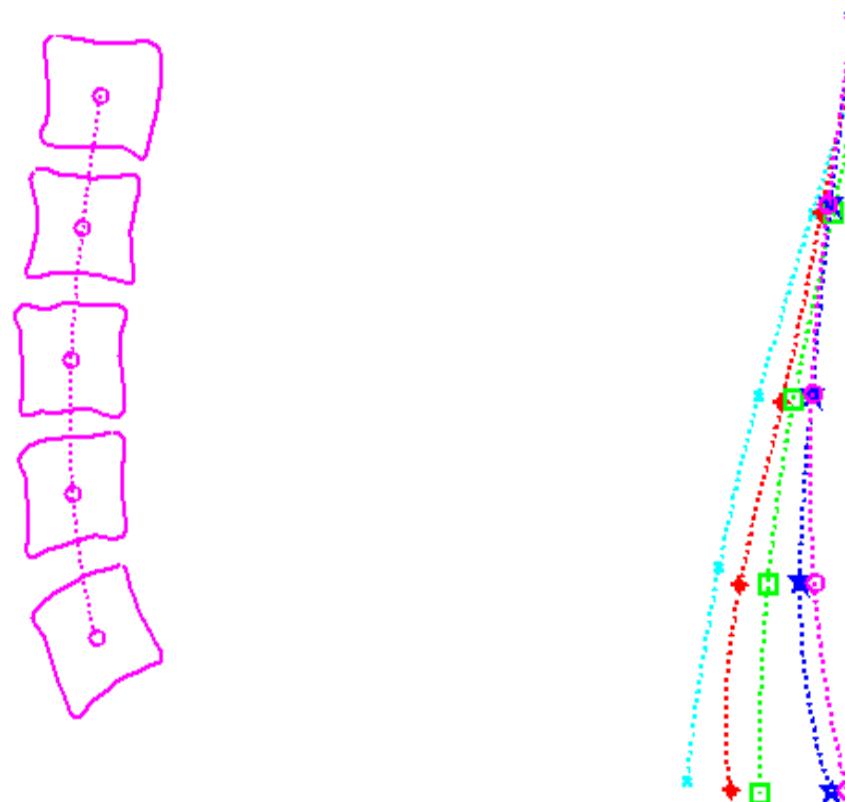
Digital videofluoroscopic Imaging



High level feature extraction



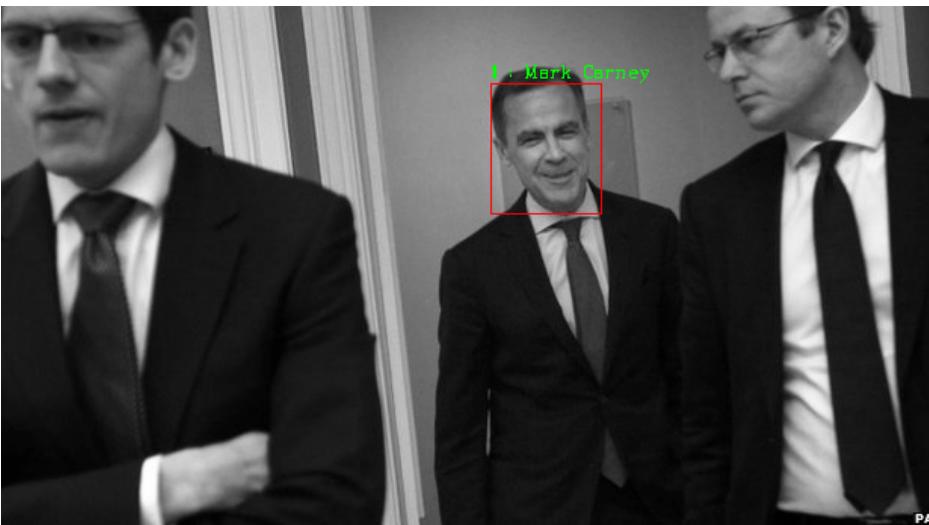
Animated extraction



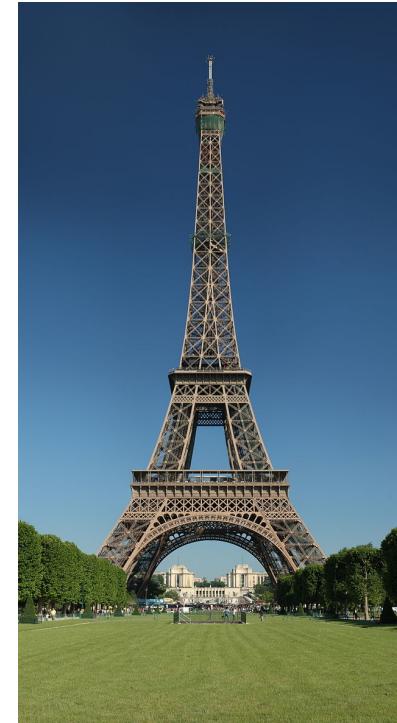
Content-based retrieval and image matching



Higher level visual cognition



Who?



Where?



Why?

Computer vision support

- WWW homepages
<http://comp3204.ecs.soton.ac.uk> (for 3204 and 6223)
- Lecture **support** materials
- **Links**
- **Notes**
- **Tutorials** (on demand)
- **Book**

Computer vision support

<https://www.southampton.ac.uk/~msn/book/>



CONTENTS

1. Introduction
2. Images, sampling and frequency domain processing
3. Basic image processing operations
4. Low-level feature extraction (including edge detection)
5. Feature extraction by shape matching
6. Flexible shape extraction (snakes and other techniques)
7. Object description
8. Region Based Analysis
9. Moving Object Extraction and Description
10. Camera Geometry Fundamentals
11. Colour Images
12. Distance, Classification and Learning

1st Edition 2002; 2nd Edition 2008, 3rd Edition 2012 in Library (and electronic)

4th Edition 2019 (Current price ~ £69 Amazon) It must drop. Is this the Brexit price?

Direct from the Library!!

In webcat <https://www-lib.soton.ac.uk/> I have searched for your book

Quick Search

Keyword Browse Exact

nixon feature

keywords ▾

Search Catalogue

library: ALL ▾

Search only Electronic Books

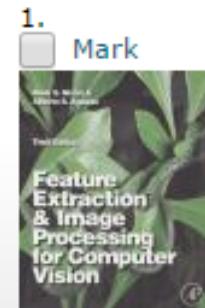
medium:

ANY ▾

material type:

ANY ▾

If off campus the students need to use the VPN or Southampton virtual environment - then click on the highlighted link to access the full text of the book. This is not available on kindles etc



1.  **Feature extraction & image processing for computer vision [electronic resource] 3rd ed.**

Nixon, Mark S.

Internet

2012

1 copy available in Our Online Collection

Online link to document

Lecture Support (Mark)

- Slides (pdf) available online
- The 4th Edition is out now so
 - Matlab and Python from Book
 - Used in lectures
 - Bonus is for you only!!!

Lecture Support (Jon)

- Interactive slides with many demos
(often using a webcam to capture images)
 - Available for you to download and run
 - Source code on github
 - (more info when you get to Jon's lectures)
- Handouts*

Assessment

- Mixture of coursework and final exam
- COMP3204: 60% exam; 40% coursework
- COMP6223: 55% exam; 45% coursework
- (exam questions are the same! The exams are concurrent)

Coursework

- Three courseworks
 - 2 individual
 - 1 in groups of 4 (competition format)
- Much requested feature!
- Designed to support learning
 - Has worked really well since introduced
- **Different coursework assignments for COMP3204 and COMP6223 students**

- COMP3204:
 - **No 1: Set today! handin wk 8; fb by wk 11**
 - No 2: Set wk 3; handin wk 6; fb by wk 10
 - No 3: Set wk 8; handin wk 11; fb by wk 12 (In groups)
- COMP6223:
 - No 1: Set wk 2; handin wk 6; fb by wk 9
 - No 2: Set wk 3; handin wk 8; fb by wk 11
 - No 3: Set wk 8; handin wk 11; fb by wk 12 (In groups)

Note the overlap in deadlines; you are responsible for planning appropriately!

Lecture Timetable

This course has 24 lectures of stuff

- Mark will start next tomorrow for 3 and a bit weeks [10 lectures]
- Jon will then take over for 4/5 weeks starting week 5
- Mark will reappear later
- We'll run revision lectures after Xmas

Finally

✓ Enjoy!

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