
VC 12/13

Course Projects

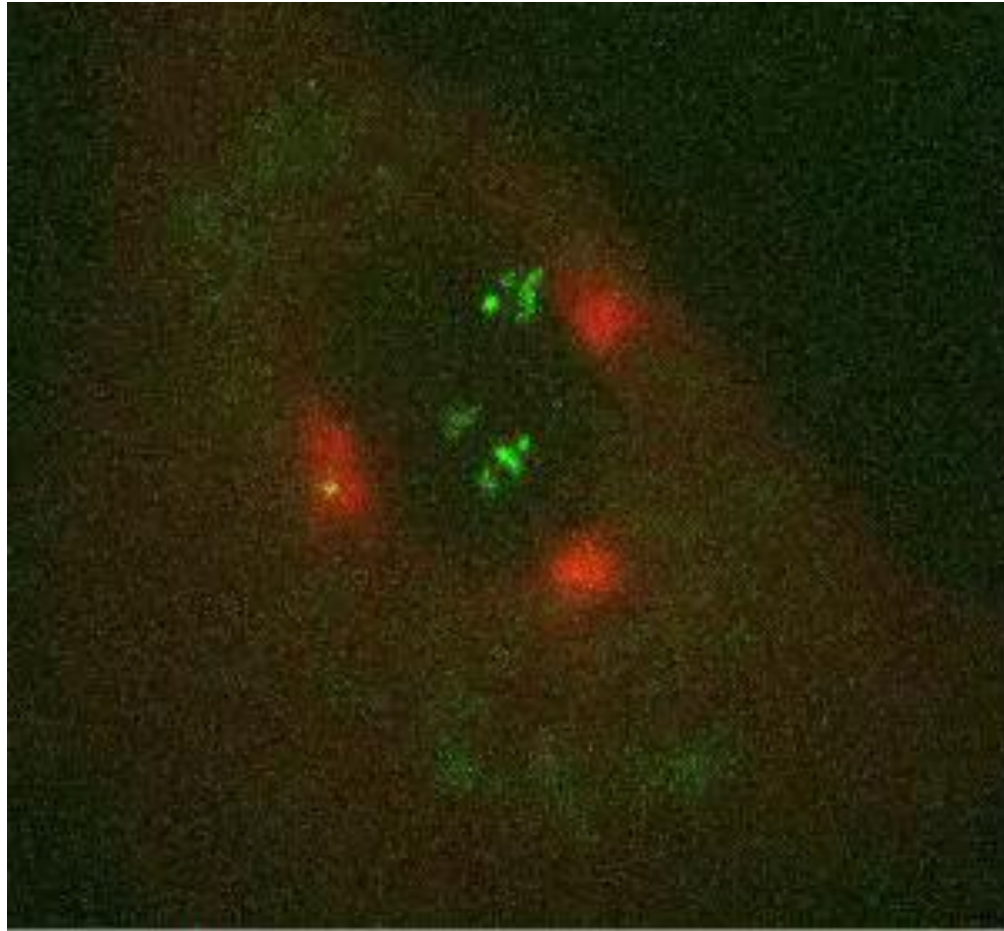
Mestrado em Ciência de Computadores
Mestrado Integrado em Engenharia de Redes e
Sistemas Informáticos

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Projects

- **Proposed projects**
 - Kinethocore dynamics analysis
 - Particle counting in cellular imaging
 - Android projects using real-time video or photos
- **Popular projects**
 - Face detection
 - Pedestrian / Vehicle detection

Project 1: Kinethocore dynamics analysis



Kinethocore dynamic analysis

- **Motivation**

- Cells divided via a complex process named mitosis
- Two sister chromatids need to separate and align correctly during this process
- Chromatids have a structure (kinethocore) that supports this process
- **We need dynamic data to better understand this process!**

- **Objective**

- Track pairs of kinethocores
- Gather tracking information

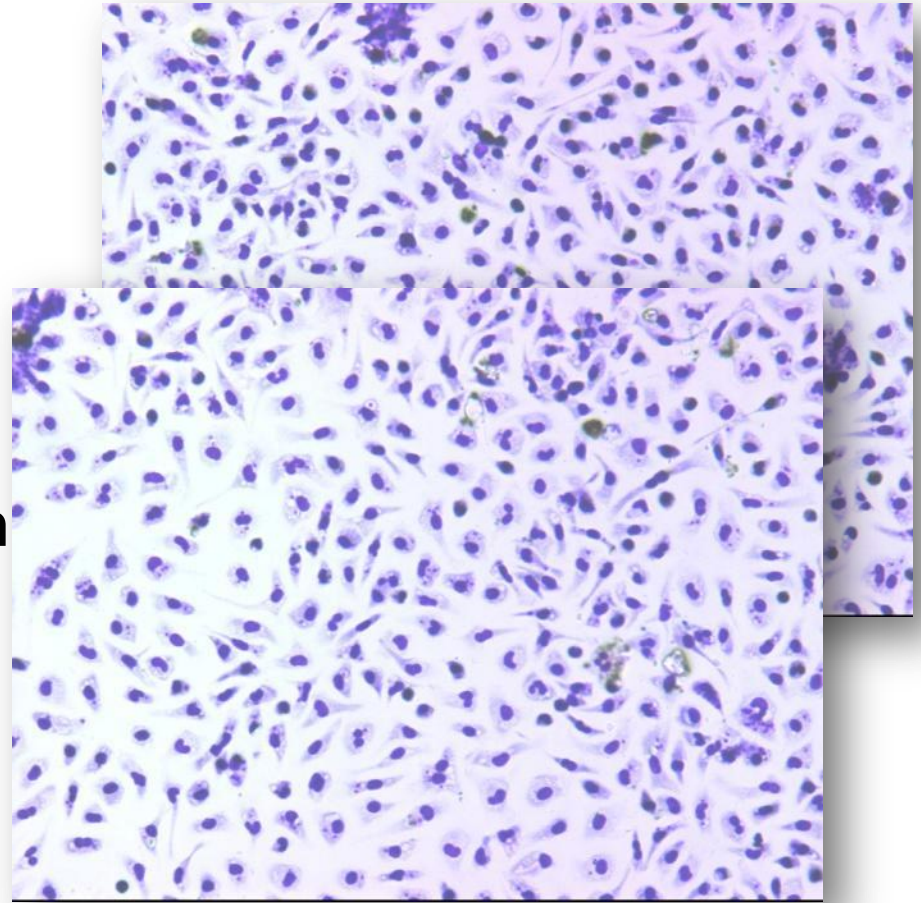
Challenges

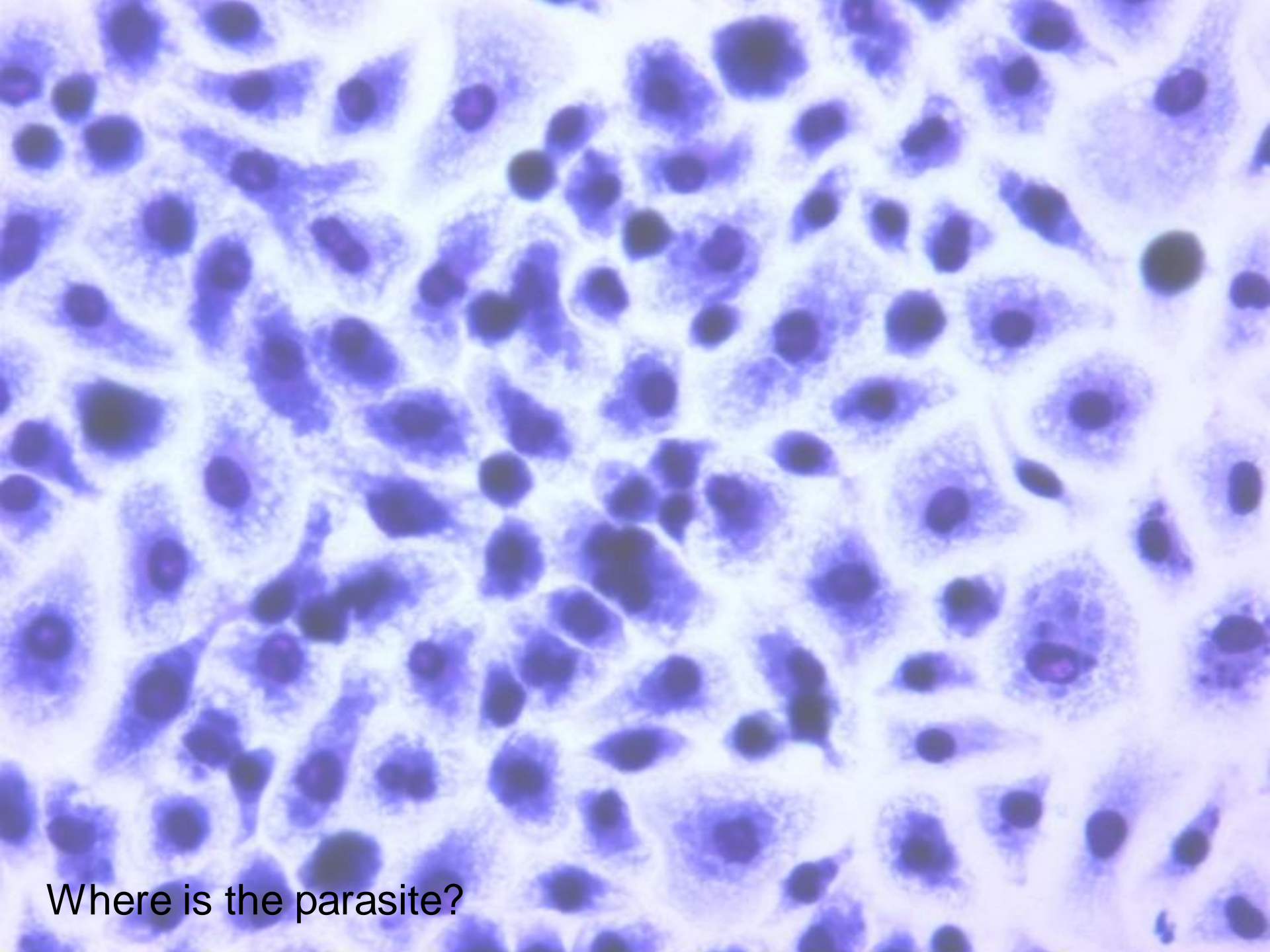
- Segmenting kinethocores in an image
- Track kinethocores over various images
- Gather motion information

Cooperation with Dra. Paula Sampaio,
IBMC, Porto.

Project 2: Automatic analysis of microscopy images

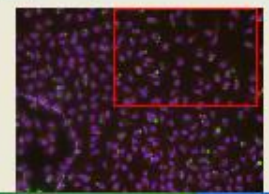
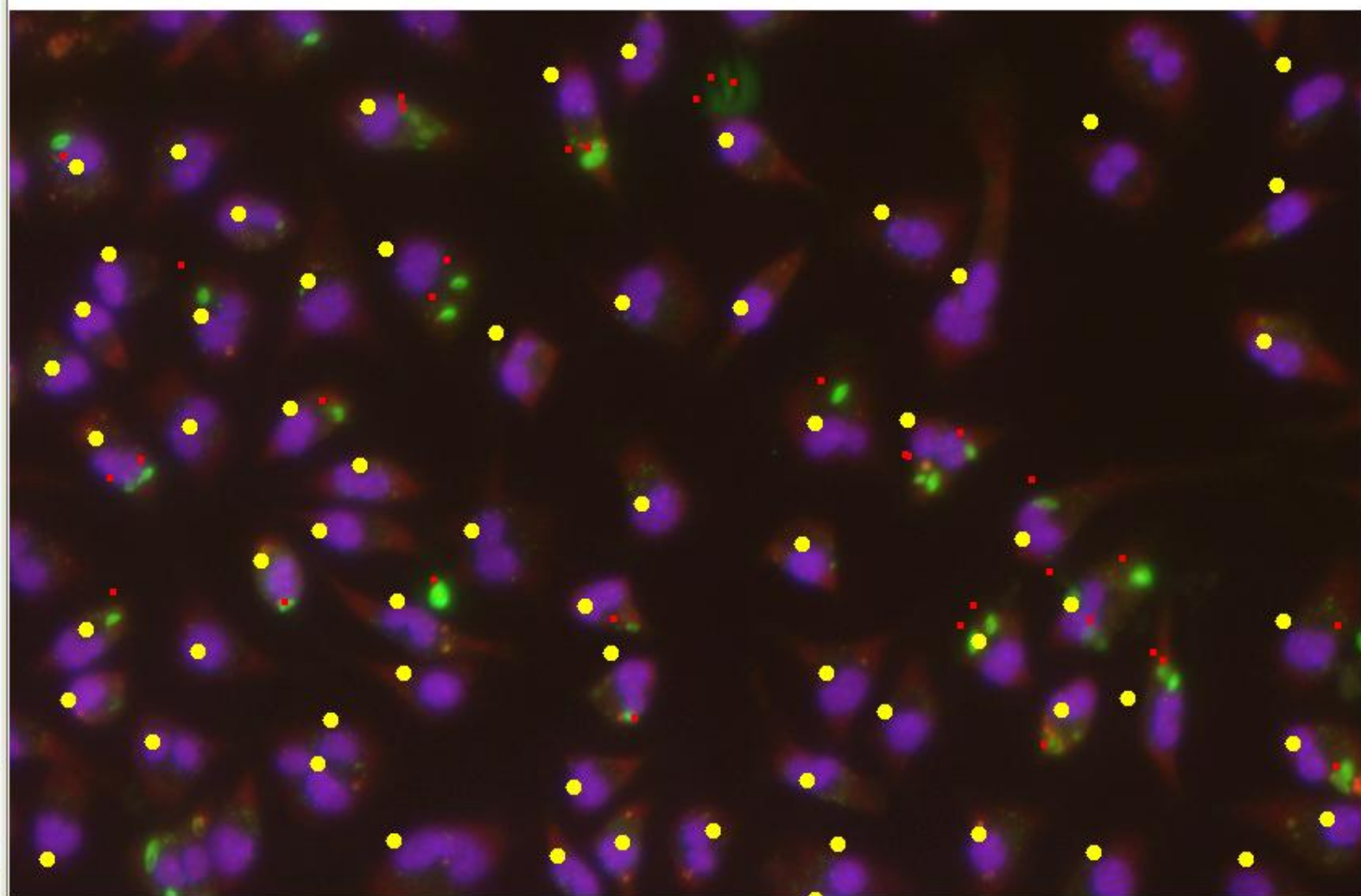
- **Objective**
 - Detect and count cells and parasites in Giemsa images
- **Motivation**
 - Faster research
 - Reproducible research





Where is the parasite?

- Y:\Pastas individuais\Tânia\IF
 - 24h mo + leish(4015)
 - cv1 (1290)
 - 1... (260)
 - 2.zvi(274)
 - 3.zvi(278)
 - 4.zvi(255)
 - 5.zvi(223)
 - cv2 (1525)
 - 1.zvi(376)
 - 2.zvi(303)
 - 3.zvi(405)
 - 4.zvi(239)
 - 5.zvi(202)
 - cv3 (1200)
 - 1.zvi(230)
 - 2.zvi(274)
 - 3.zvi(231)
 - 4.zvi(210)
 - 5.zvi(255)
 - 24h mo+leish+rbc(3356)
 - cv1 (1703)
 - 1.zvi(300)
 - 2.zvi(358)
 - 3.zvi(405)
 - 4.zvi(314)
 - 5.zvi(326)
 - cv2 (634)
 - cv3 (1019)
 - 72h mo + leish(3057)
 - 72h mo+leish+rbc(3297)
 - 96h mo+leish(3412)
 - 96h mo+leish+rbc(3297)
 - cv1 (921)



My Count
Comp

Cells: 260 ■ Parasites: 153 ■
 Channels: Red Green Blue B&W
 File: 1.zvi Size: 1388 x 1040

✗ Not Finish

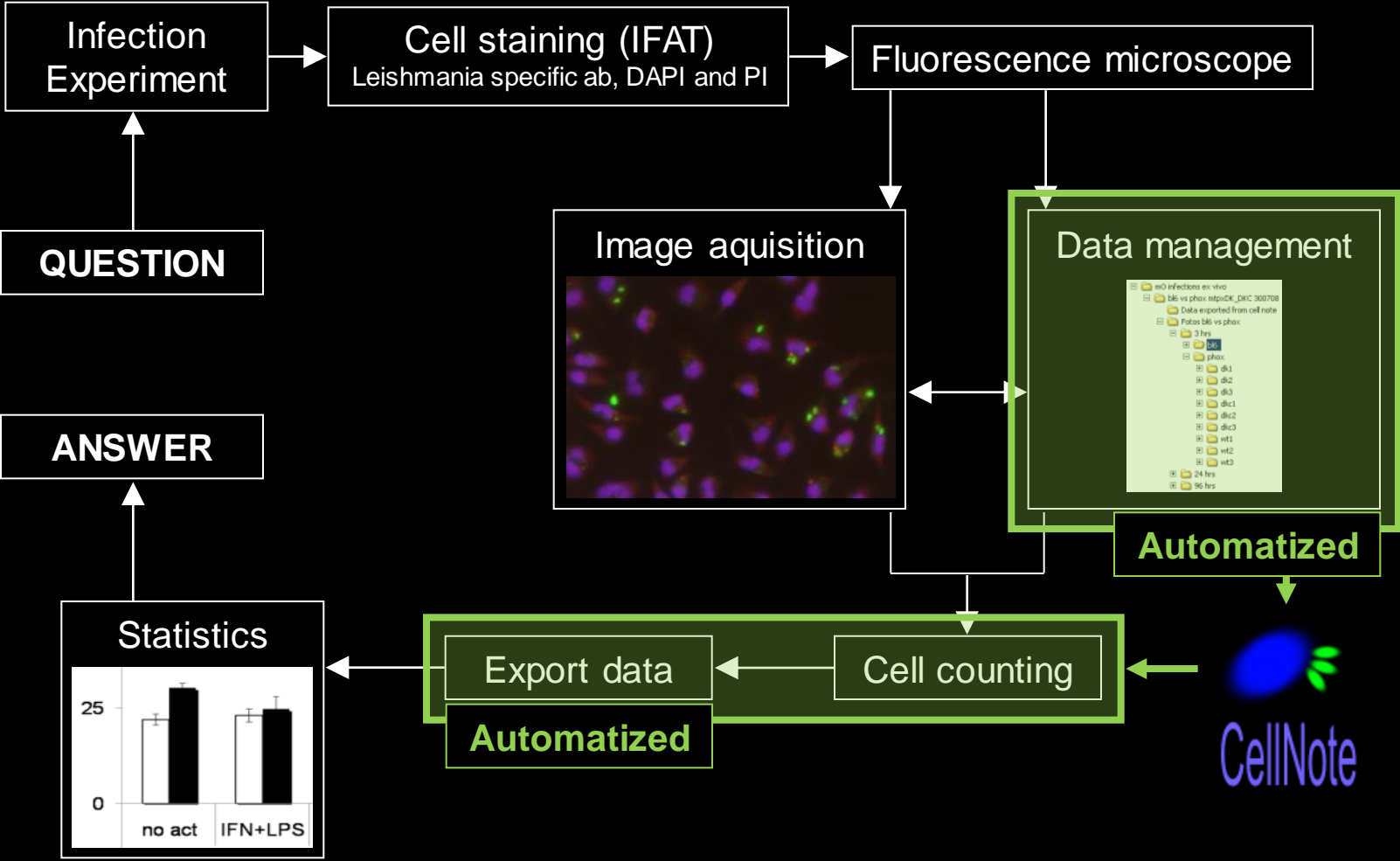
Next Image ➡

Visible Area:

➡ Previous

Next ➡

CellNote: an approach to overcome a problem



Challenges

- Create computer vision modules for automatic annotation
 - Segment particles
 - De-cluster particles
 - Associate particles

Project 3: Android

- Camera is a powerful data gathering system in a smartphone
- Can we manipulate images and video to produce interesting results?
 - Entertainment
 - Business
 - Medicine
 - Etc?
- Use your creativity!

⊗ Electric Travolta (TM)



Electric Travolta (tm) free for use.

The second main exhibit was the **Electric Travolta (TM)**. It is an analog-digital installation interacting with the following components: **visitor - dancer, stage - electronic display, dj.**



Real Tracking and Shooting Portal Turret

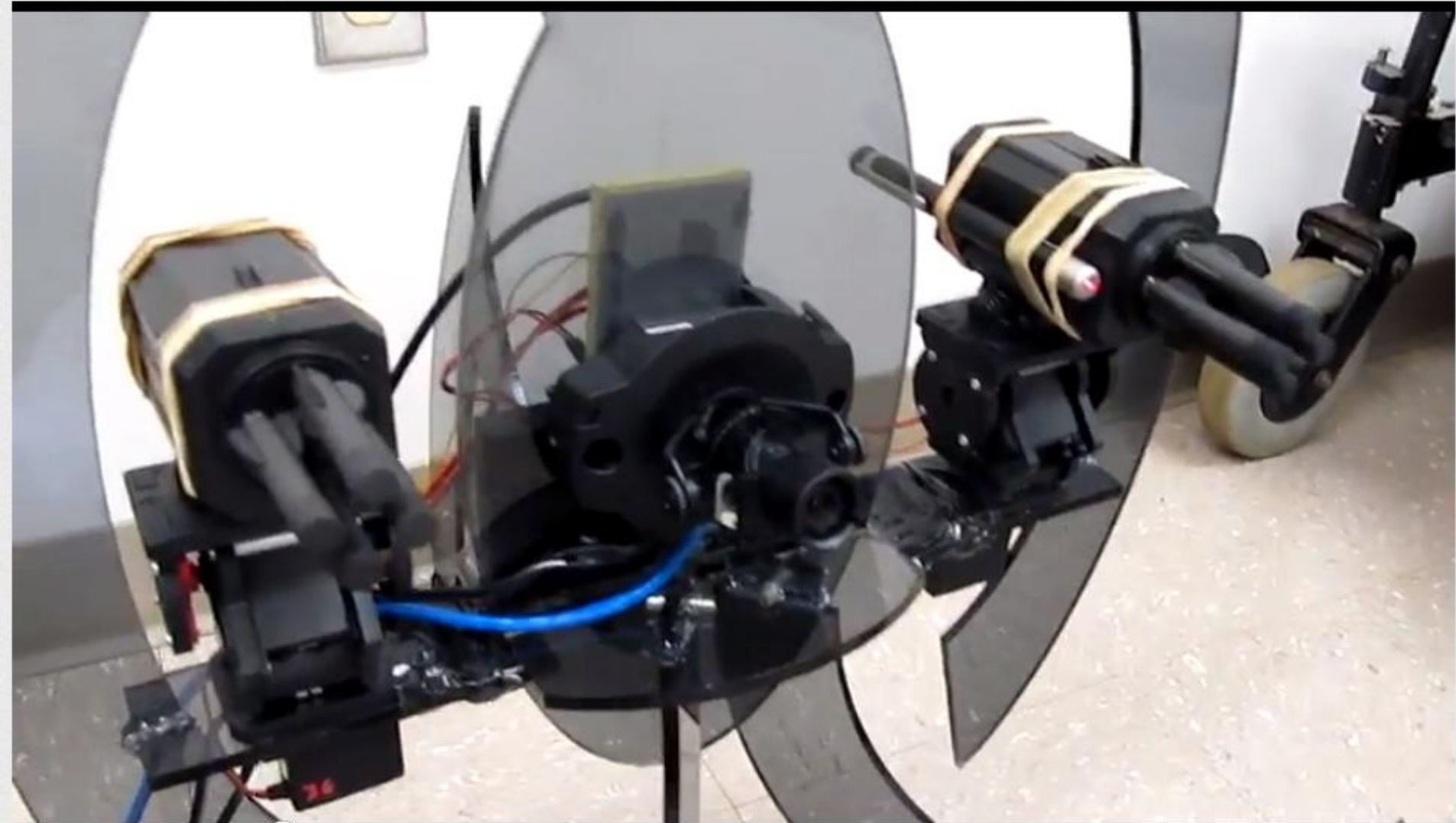
kss5095



Subscribe

1 video ▾

<http://youtu.be/MTSWjkXBHOs>



0:31 / 2:51



Challenges

- Smartphones have the ability to film anywhere, anytime
 - Very uncontrolled environments!
 - Tough to obtain robust results
 - Must depend on previous knowledge:
 - Use specific colors (gloves, shirt)
 - Use known shapes and patterns
 - Use ... your creativity!

Kinect

Lego Mindstorm

Project 4: Face Detection

- **Objetivo**

- Identify that there is a human face in a picture

- **Motivation**

- Facial recognition
- Biometrics
- Improved Auto-focus



Popular research topic

- PCA
- ICA
- LDA
- EP
- EBGM
- Kernel Methods
- Trace Transform
- AAM
- 3-D Morphable Model
- 3-D Face Recognition
- Bayesian Framework
- SVM
- HMM
- Boosting & Ensemble

• <http://www.face-rec.org/algorithms/>

M. Turk, A. Pentland,
Eigenfaces for Recognition,
Journal of Cognitive
Neuroscience, Vol. 3, No. 1,
1991, pp. 71-86

Popular topic but this
is **The Paper**

<http://www.cs.ucsb.edu/~mturk/Papers/jcn.pdf>

Support material

- http://en.wikipedia.org/wiki/Facial_recognition_system
- <http://www.myheritage.com/FP/Company/tryFaceRecognition.php>

Project 5: Pedestrian / Vehicle Detection

- **Objective**
 - Detect and track object motion on images captured by static cameras
- **Motivation**
 - Video surveillance
 - Intrusion alarms
 - Crowd monitoring





Eric Harris and
Dylan Klebold, in
the Columbine High
School Massacre
via CCTV cameras

L 11:57:20-63 AM 04/20/99



AFP

The men alleged to be responsible for the 7 July attacks on London, captured on CCTV.

Typical approach

- Assume camera does not move
 - Static background. I can “learn” it
- Background modeling
 - Picture with an empty scene
 - Statistical methods
- Background subtraction
 - Everything different from the background must be a person / vehicle
 - Process shapes of resulting objects



<http://www.merl.com/projects/pedestrian/>

Support material

- Background subtraction for the detection of moving objects:
 - <http://www.llnl.gov/casc/sapphire/background/background.html>
- Review on popular algorithms:
 - <http://www.mcs.csu Hayward.edu/~tebo/Classes/6825/ivcnz00.pdf>
 - <http://www-staff.it.uts.edu.au/~massimo/BackgroundSubtractionReview-Piccardi.pdf>

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- **Your proposals!**