

# Indexing big colored image bank : Texture 3.0

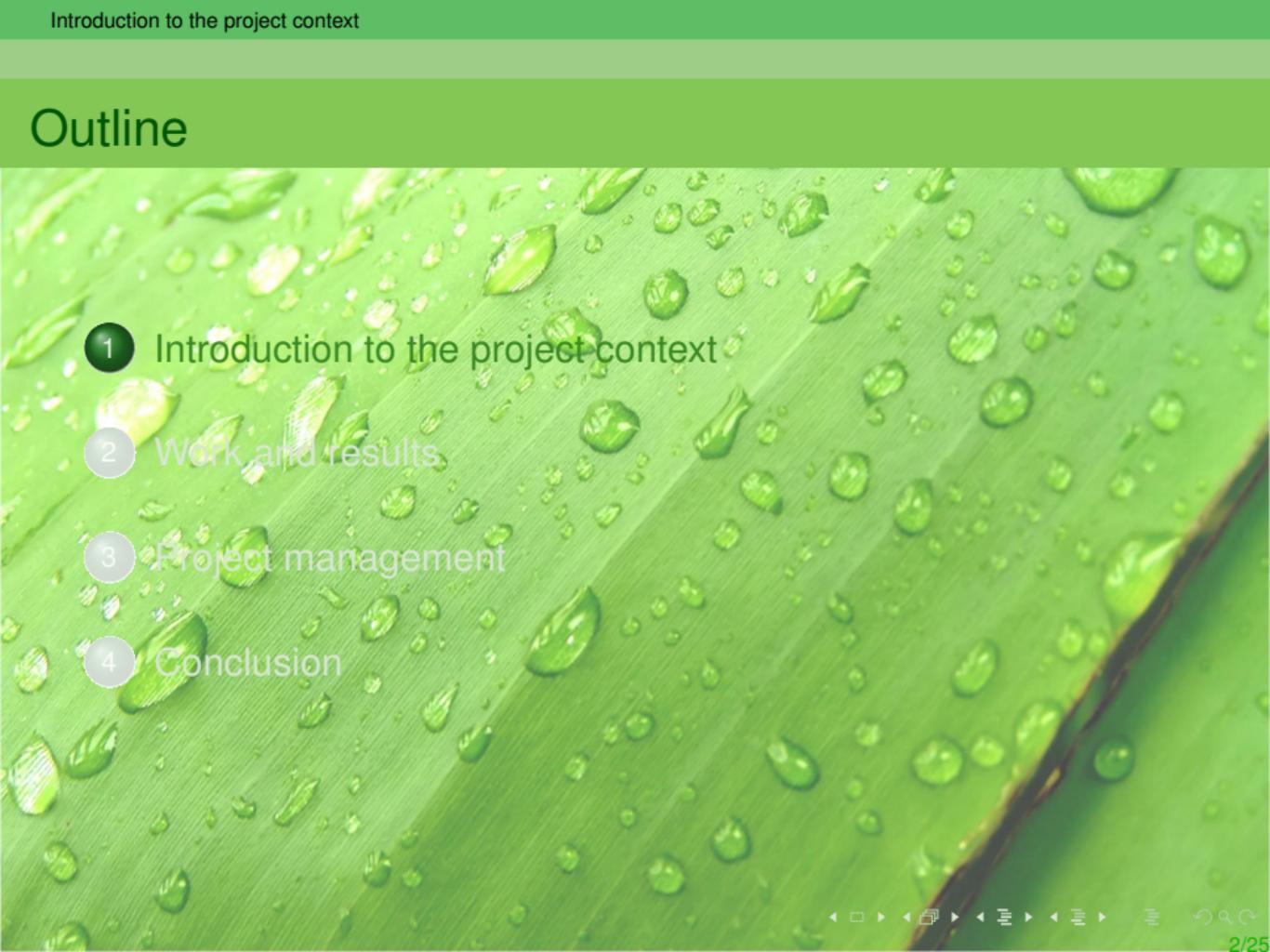
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Gaetan ADIER**



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# Outline

- 
- 1 Introduction to the project context
  - 2 Work and results
  - 3 Project management
  - 4 Conclusion

# Project context (1/2)

What is a imageCLEF ?

International contest which purpose is to benchmark plant identification from images.



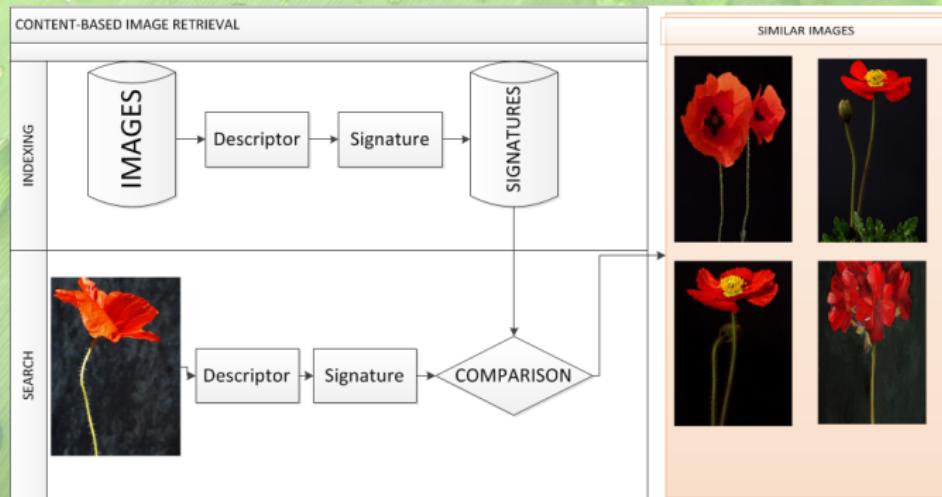
# Project context 2/2

## Objectives

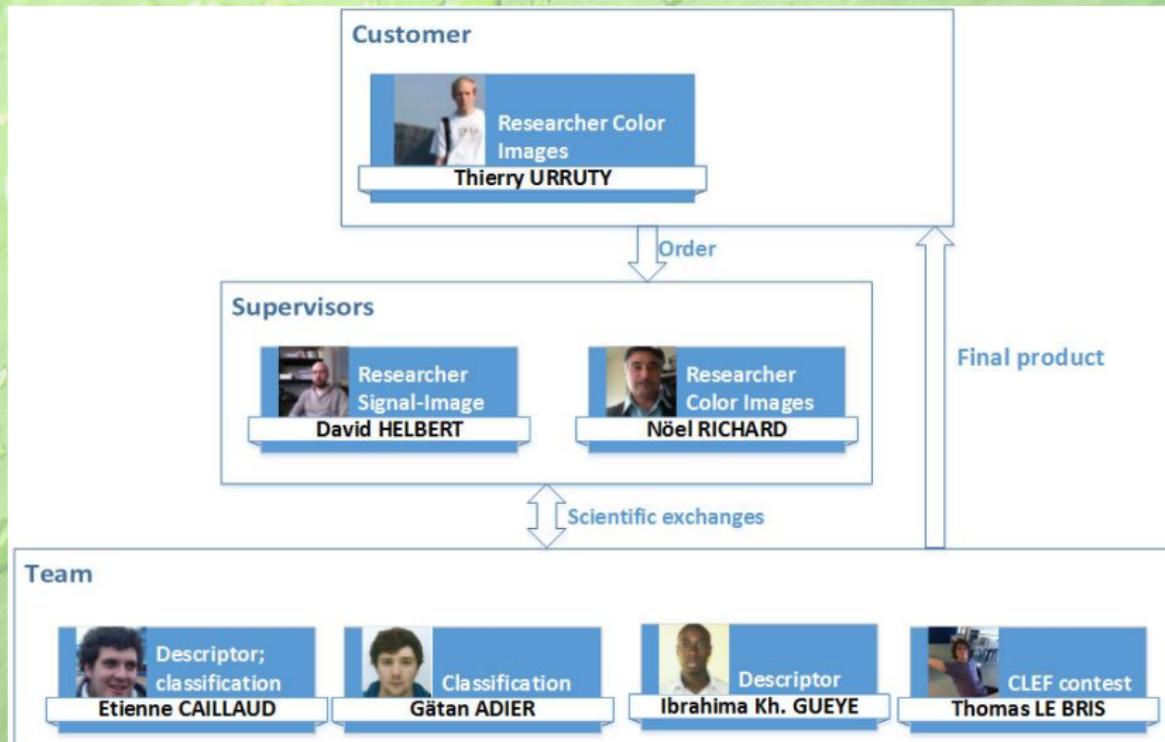
- Adapt XLIM's descriptor to image classification
- Benchmark results

## Constraints

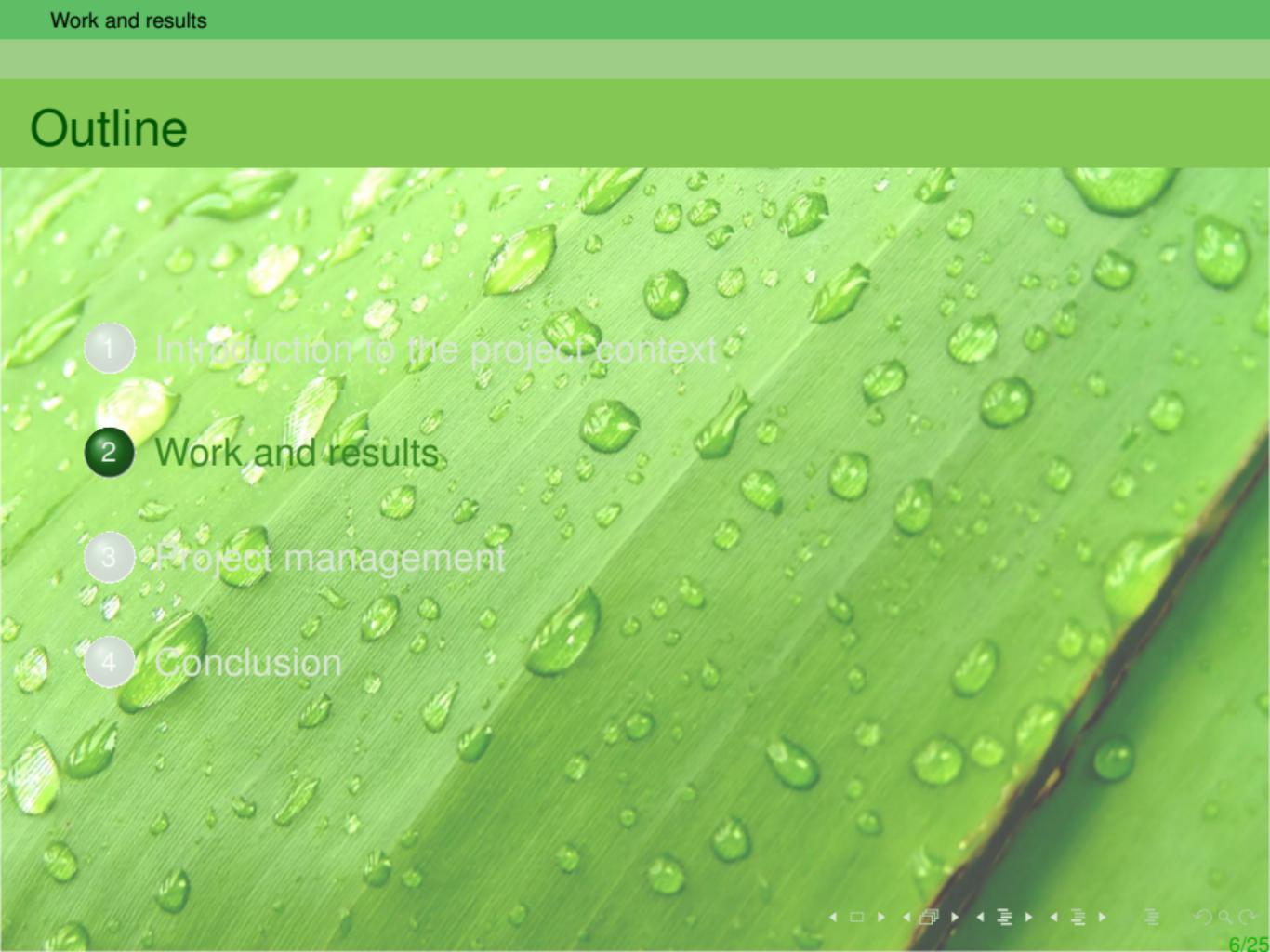
- Use of Python language
- Parallel programming



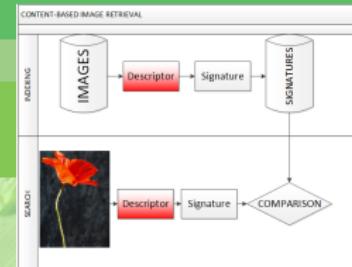
# Team presentation



# Outline

- 
- A close-up photograph of a bright green leaf with numerous small, clear water droplets scattered across its surface. The leaf has prominent veins running diagonally.
- 1 Introduction to the project context
  - 2 Work and results
  - 3 Project management
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# SIFT descriptor(1/2)



Key-points detection ( $x,y,\sigma$ )

- Scale-space extrema detection
- Key-point location
- Orientation assignment
- Key-point descriptor

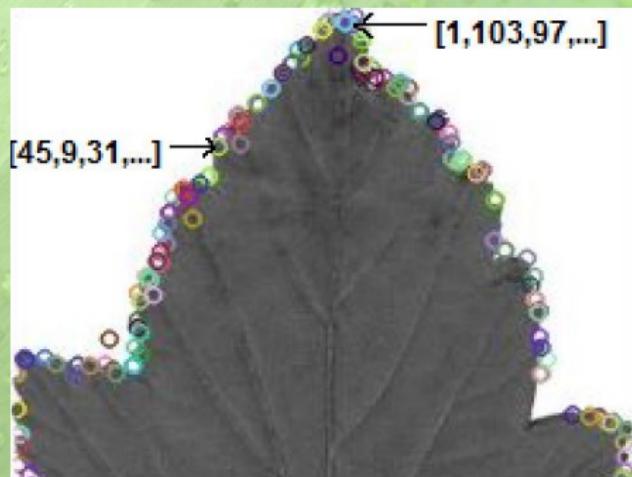


FIGURE: SIFT Keypoints

## SIFT descriptor(2/2)

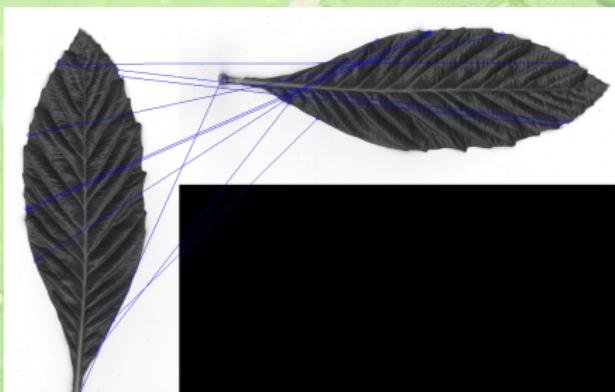
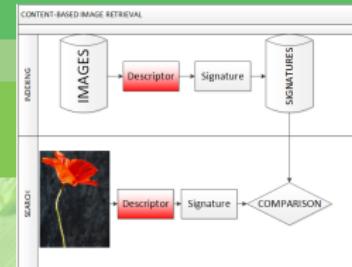


FIGURE: SIFT Matching for rotation

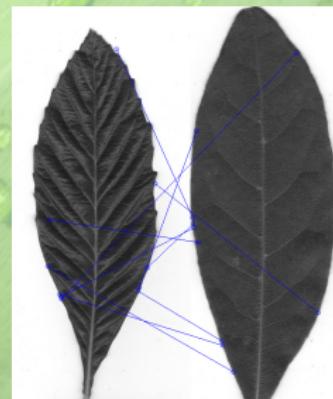
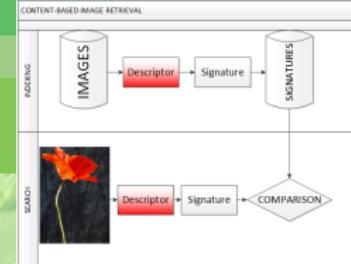


FIGURE: SIFT matching for scale changes

# What about nature images ?



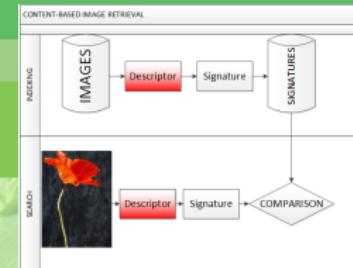
## SIFT descriptor

- Description using orientation of shapes
- Natively used on grayscale images
- Only marginal methods for color images
- Unable to get the texture information from image

## C<sub>2</sub>O descriptor

- Description based on color difference
- Natively conceived for color images
- Take account of the texture information

# C<sub>2</sub>O descriptor (1/2)



- The C<sub>2</sub>O matrix for a poorly textured image :



FIGURE: Image to characterize

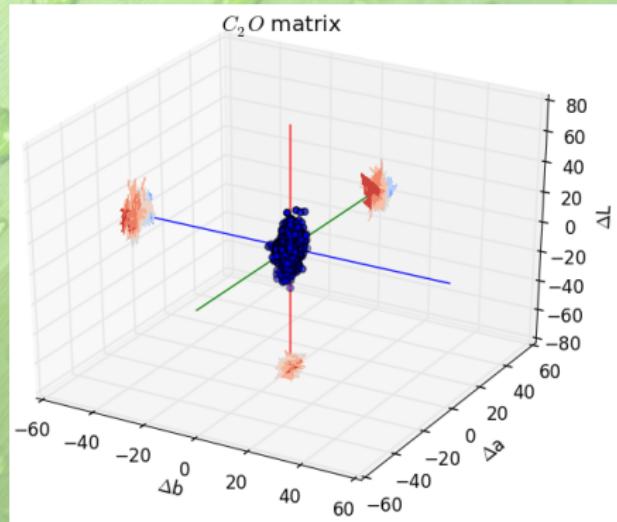


FIGURE: Signature

# C<sub>2</sub>O descriptor (1/2)

- The C<sub>2</sub>O matrix for a poorly textured image :
- The C<sub>2</sub>O matrix for a more textured and colored image :



FIGURE: Image to characterize

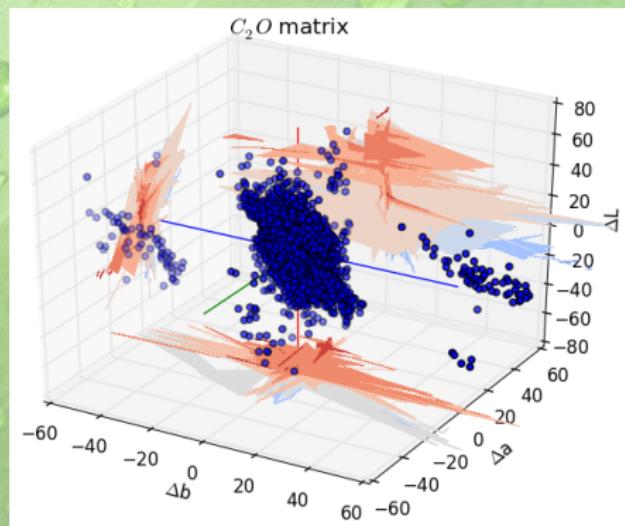
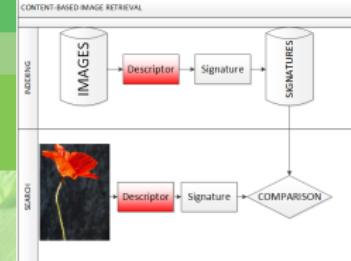
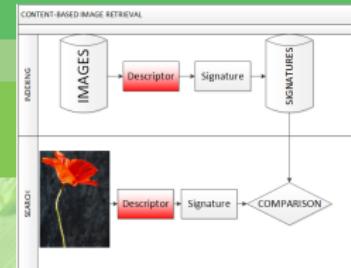
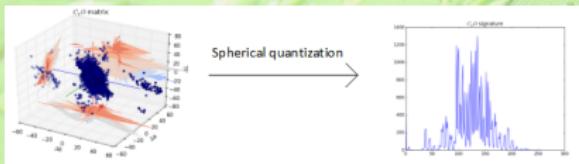


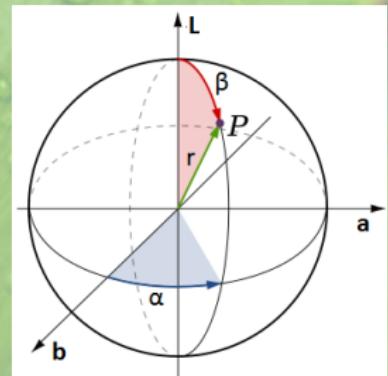
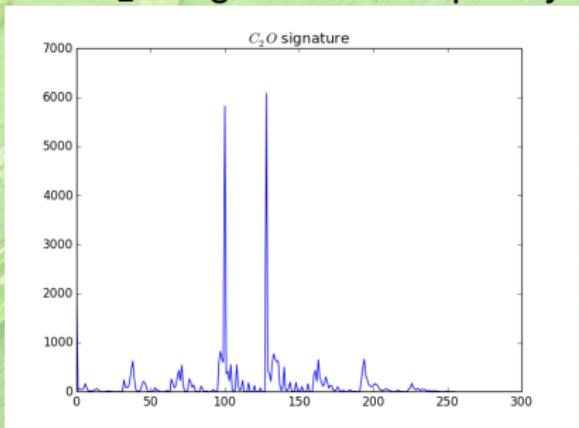
FIGURE: Signature



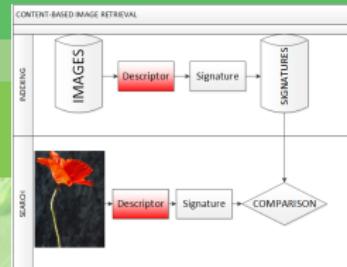
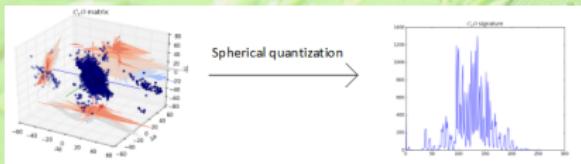
# $C_2O$ descriptor (2/2)



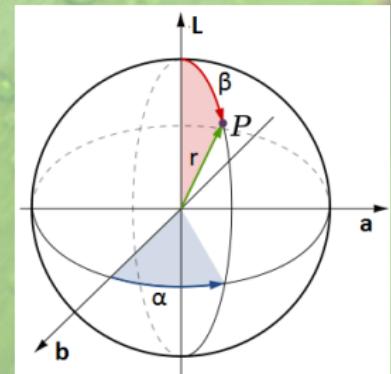
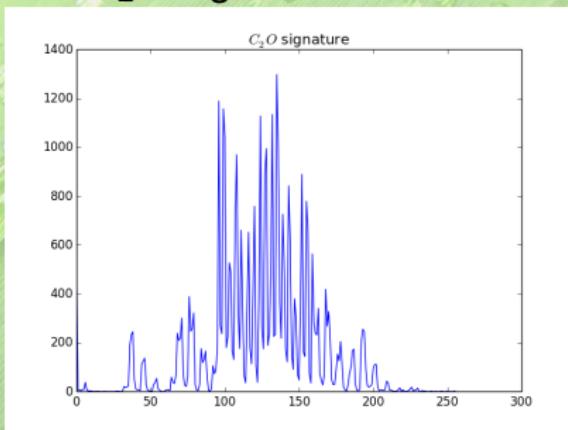
- The  $C_2O$  signature for a poorly textured image :



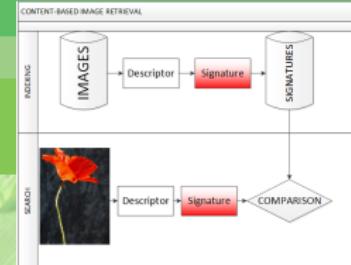
# $C_2O$ descriptor (2/2)



- The  $C_2O$  signature for a poorly textured image :
- The  $C_2O$  signature for a more textured and colored image :

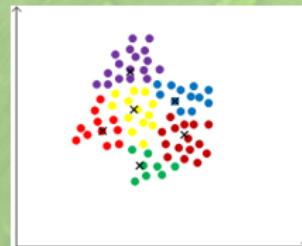
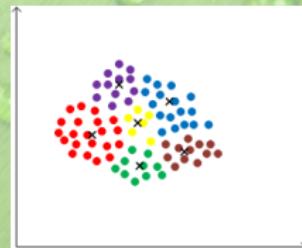


# Bag of word (1/2)

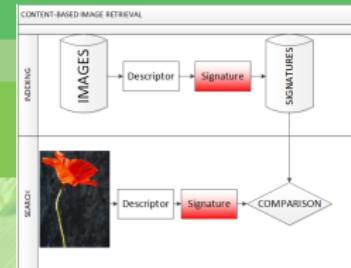


Reducing the number of points (100 in our case).

- K-means
  - Attribute the vectors to centroid vectors.



# Bag of word (2/2)



- Signature
  - Design histogram in function of assignment of the vectors.

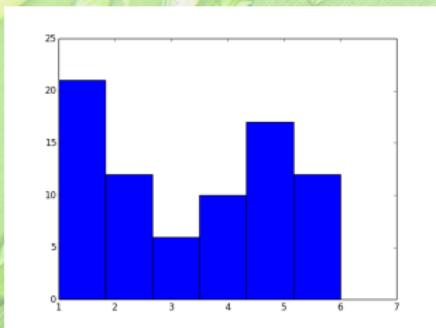


FIGURE: image 1

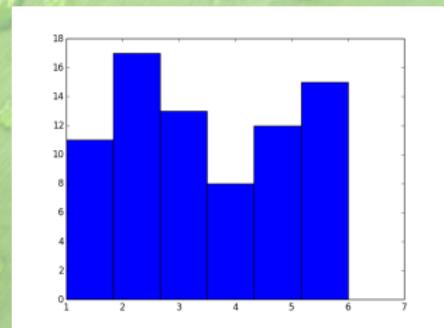
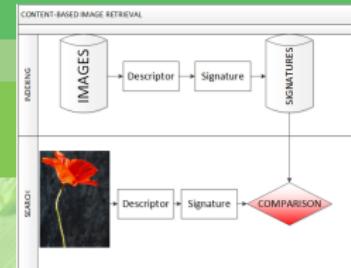
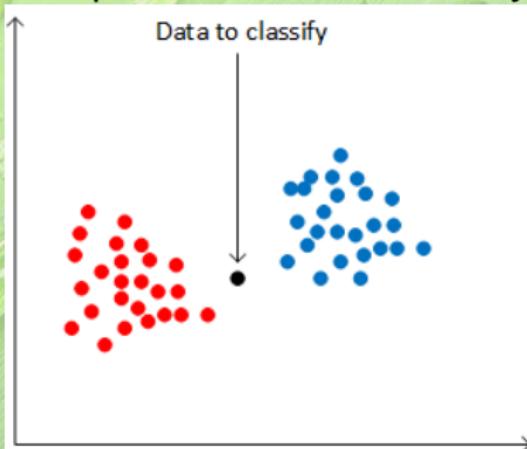


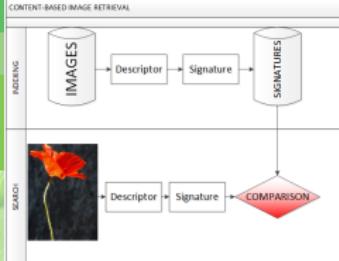
FIGURE: image 2

# K-nn(1/2)



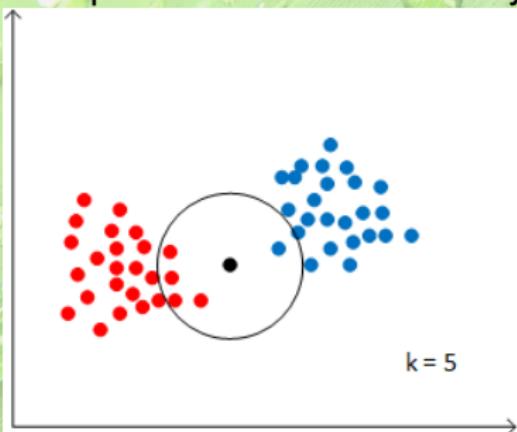
- The k nearest neighbor method
  - Comparison to the dictionary .





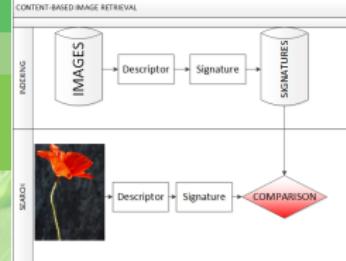
# K-nn(1/2)

- The k nearest neighbor method
  - Comparison to the dictionary .



- 4 occurrences of the **red** class
- 1 occurrence of the **blue** class
- The new point is attributed to the **red** class

# K-nn(2/2)



- Application for image classification
  - More complex data.
  - Distances on signature vectors extracted from the K-mean method.
  - One most adapted distance type for each descriptor .

# Results and Discussion (1/3)

- Reduce data-base of 100 images composed of 4 species.



FIGURE: Specie Id : 173

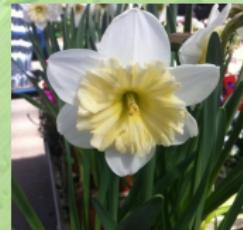


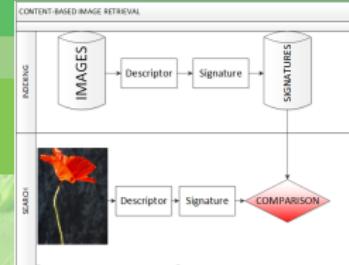
FIGURE: Specie Id : 1102

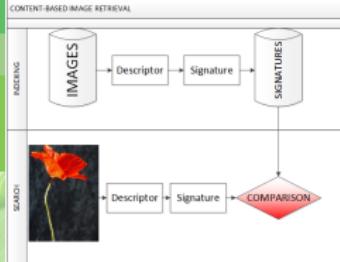


FIGURE: Specie Id : 1889



FIGURE: Specie Id : 2717





## Results and Discussion (2/3)

- Compare the two descriptors SIFT and C<sub>2</sub>O.

TABLE: SIFT and C<sub>2</sub>O results

ID	Training Base	Test Base	Correct (SIFT)	Correct (C <sub>2</sub> O)	Accuracy (SIFT)	Accuracy (C <sub>2</sub> O)
173	17	8	4	1	50%	12.5%
1102	22	3	1	1	33%	33%
1889	16	9	1	0	11%	0%
2717	15	10	7	7	70%	70%
Total	70	30	13	9	/	/

- Classification

- To much reducing on the K-means (100 words).
- Euclidean distance not the most efficient or adapt.

# Results and Discussion (3/3)

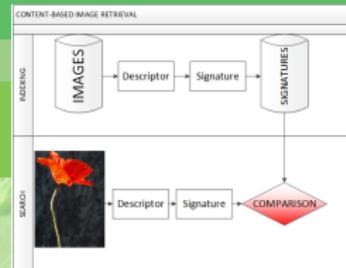


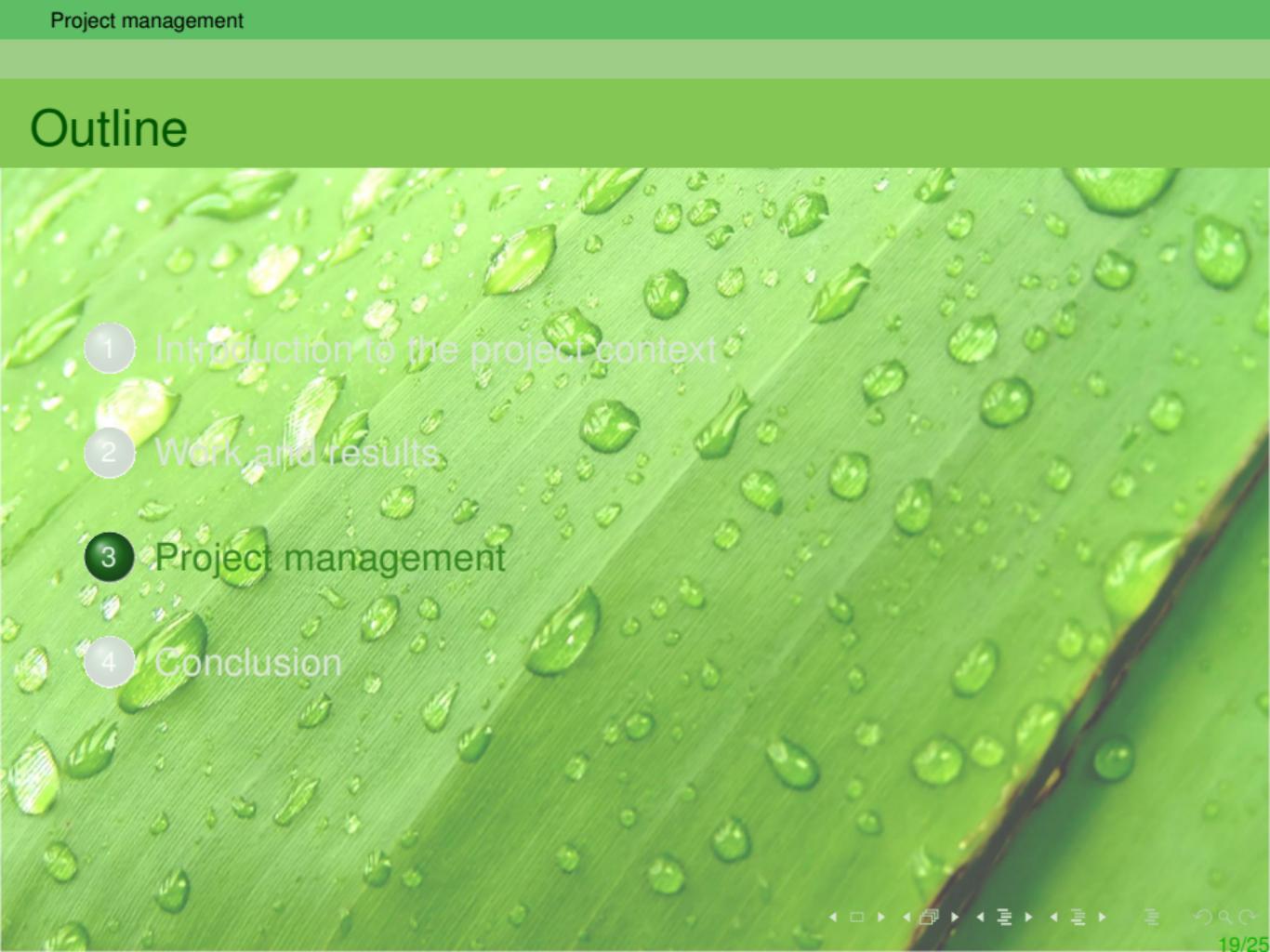
TABLE: SIFT and C<sub>2</sub>O results

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Total	70	30	13	9	/	/

## • C<sub>2</sub>O

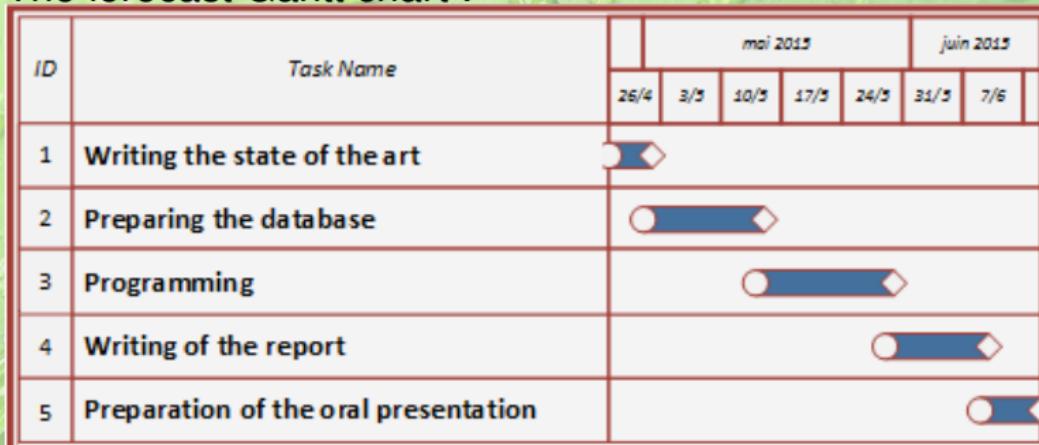
- The concatenation way is not optimal.
- Parameters D, alpha, and beta has to be discussed regarding to the images.

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# Scheduling (1/2)

- The forecast Gantt chart :



- All time affectation done before the beginning of the project
- Rarely respected in important project

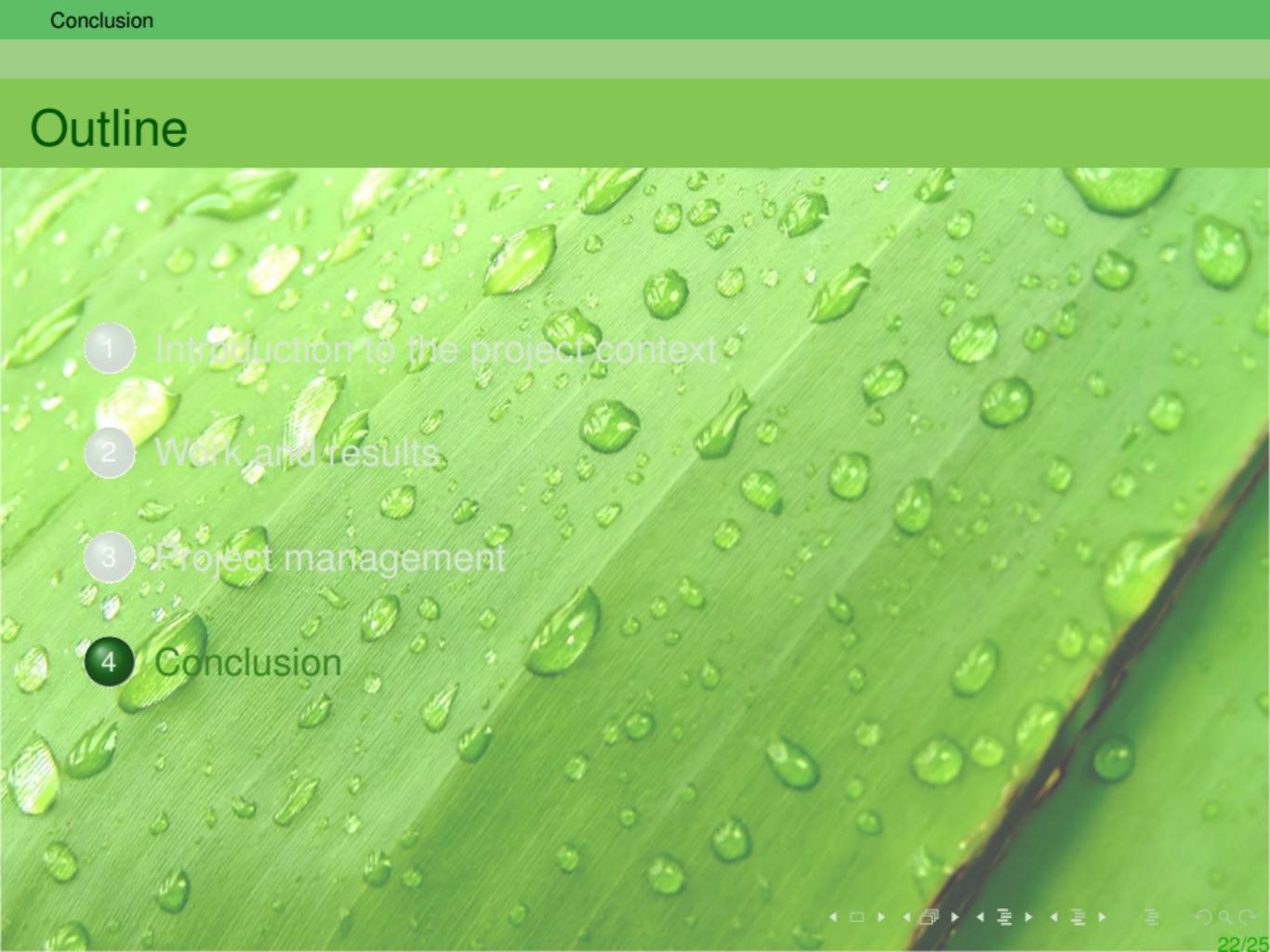
## Scheduling (2/2)

- The project backlog :

Spring	Catégorie	Sous catégorie	Nom / Description	Importance	Estimation
5	Dev Logiciel	Redaction documentation	CLEF metrics - doc	65	0,5
5	Dev Logiciel	Redaction documentation	documentation sur le processus "complet"	60	1

- What is the backlog ?
- Advantages of the backlog
- Drawbacks of the backlog

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# Sum-up of the situation

## Starting objectives

- SIFT tests
- C<sub>2</sub>O programming
- classification  
programming
- Code optimizing for  
speed
- parallelization

## Ending situation

- SIFT tests
- C<sub>2</sub>O programming
- Classification  
programming

## Issues

- C<sub>2</sub>O concatenation order
- Distance calculation

# Personal conclusion

## Personal gains

- New way to organize teamwork
- Technical knowledge
- Contest participation context
- Code management on a project scale

## Perspectives

- Fixing technical issues
- Test on the whole database



Thank you for attention