LIEN
DE LA VIGNE

VINELINK INTERNATIONAL
www.liendelavigne.org

ASSEMBLEE GENERALE 2017
2017 General Assembly

NOUVEAUX OUTILS POUR LE SUIVI DE LA QUALITE DES RAISINS :

Capteurs, analyse des données, outils d'aide à la décision

New tools for monitoring grapes quality : sensors, data analysis, decision

Smartgrappe

A smartphone in a vineyard

Story by Christophe Guizard

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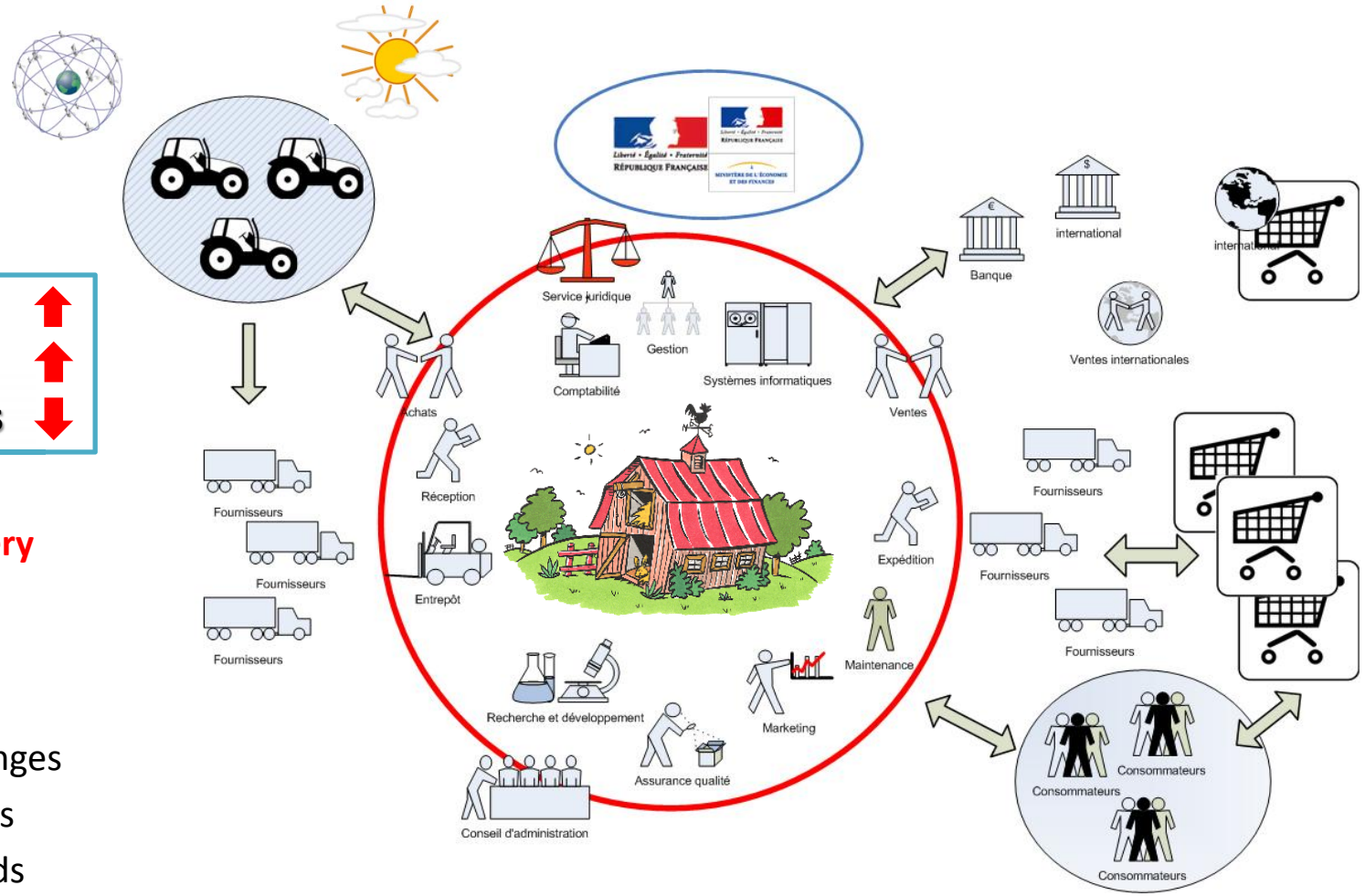
Farm ecosystem

Farm size ↑
World market ↑
Human resources ↓



An ecosystem very complex

- Lot of actors
- Lot of rules
- Lot of exchanges
- New business
- New demands

What farmers need

New tools? YES, but do do what?

- **Simplify the farmer life**
  - By providing a **good information** for a **good decision** in a **simply** way

How to do?

- Use new technologies to give an objective information for better decision
  - **Technologies must be**
    - *Easy to use, to install, to maintain*
    - *Efficient*
    - *Cost effective, with a fast return of investment*

- **THE IDEA : why not using a smartphone as a new sensor to help the farmer to decide?**

First approach : pedestrian sensors

SPECTRON
Irstea-Pellenc

GREENSEEKER
Trimble

QUALIRIS GRAPPE
IFV-Irstea-Sodimel
(Prototype)

SMARTGRAPPE
(prototype Irstea)

DUALEX
Force-A

vitisFlower®

MULTIPLEX
Force-A

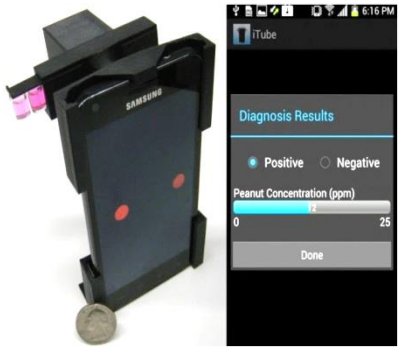
Why using a smartphone ?

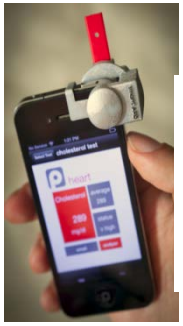
- Advantages :
  - Very common, low cost and performant product :
    - Embedded computer with Network communication (WIFI, Bluetooth, GSM), GPS, environment sensors, **Camera on board**
  - **Need only software to run**
  - A mass market product

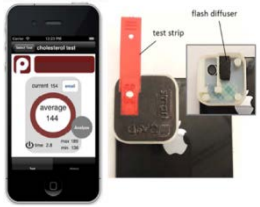
- Disadvantages :
  - Smartphone is a mass market product with an unsecure sustainability
  - Not designed to be a sensor for vineyard
  - Development not so easy, you take the product as is it!
  - Ecosystem and market need to be developed

Lab on the chip

- Allergy Test with a smartphone
- Test counterfeit (ie pills)
- Cholesterol test
- Colorimetric test



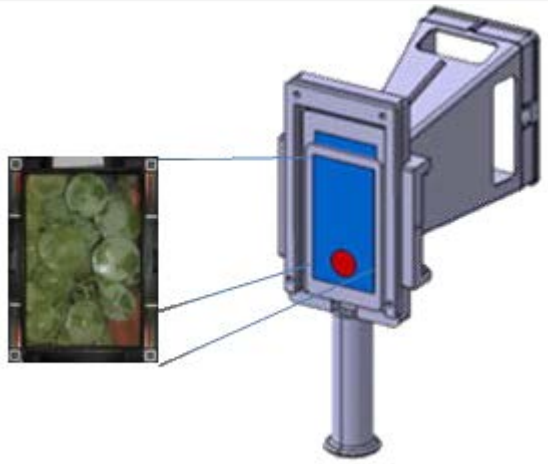




Source :UCLA Henry Samueli School of Engineering and Applied Science
MIT Techology Review (Photo courtesy of Stratio)
Cornell University

Smartgrappe concept

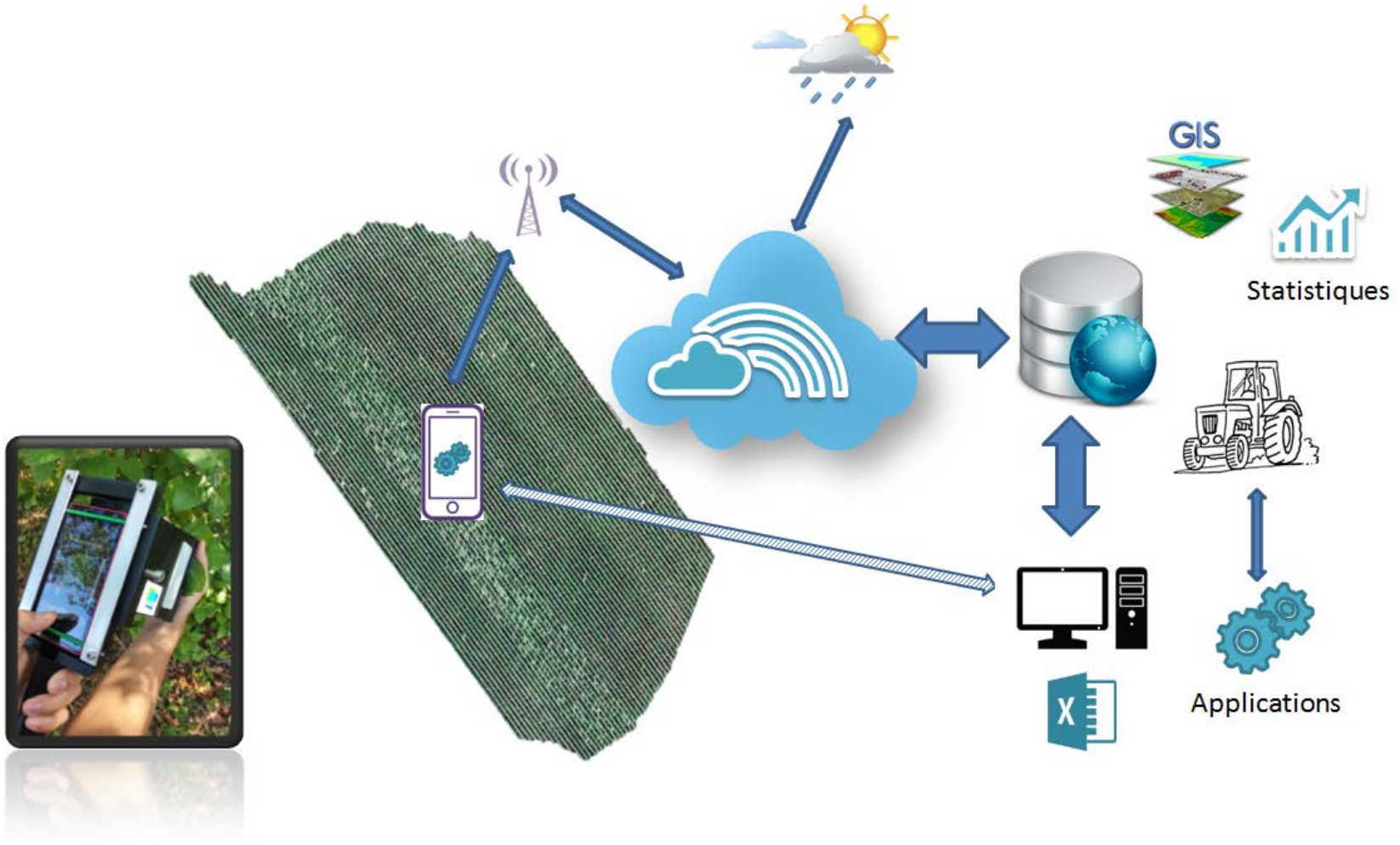
Support + Mobile + Software = SMARTGRAPPE



Patented apparatus

- ✓ **Low cost support**
  - ✓ Controlled lighting conditions
  - ✓ Constant distance to the scene
  - ✓ Reference targets inside
  - ✓ Work on any smartphone (IOS, Android, Win10…)
  - ✓ Contactless = non destructive
- ✓ **Data provided**
  - ✓ Berries size, color and surface defect
  - ✓ Number of berries / surface unit

Actually running into the Cloud



Robust detection

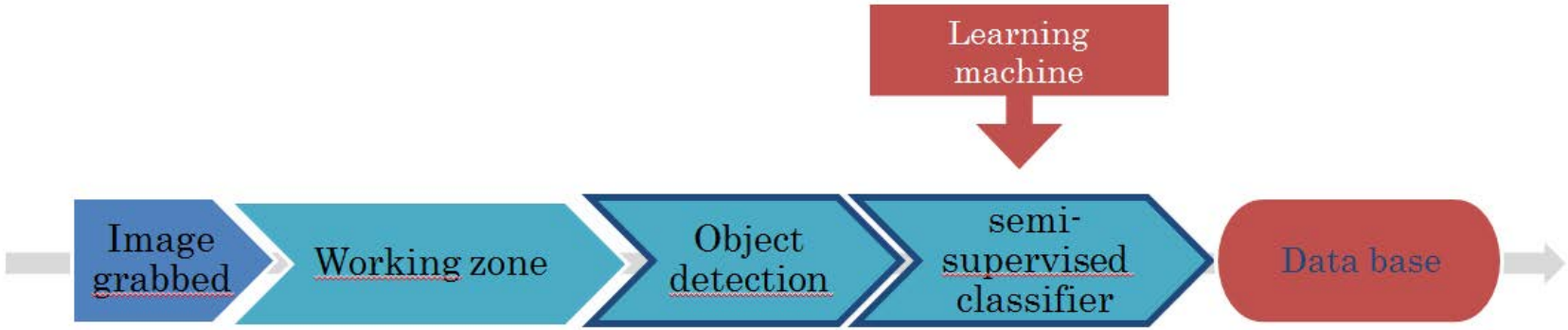
IMAGES DIVERSITY

Blooming

Grappe variety

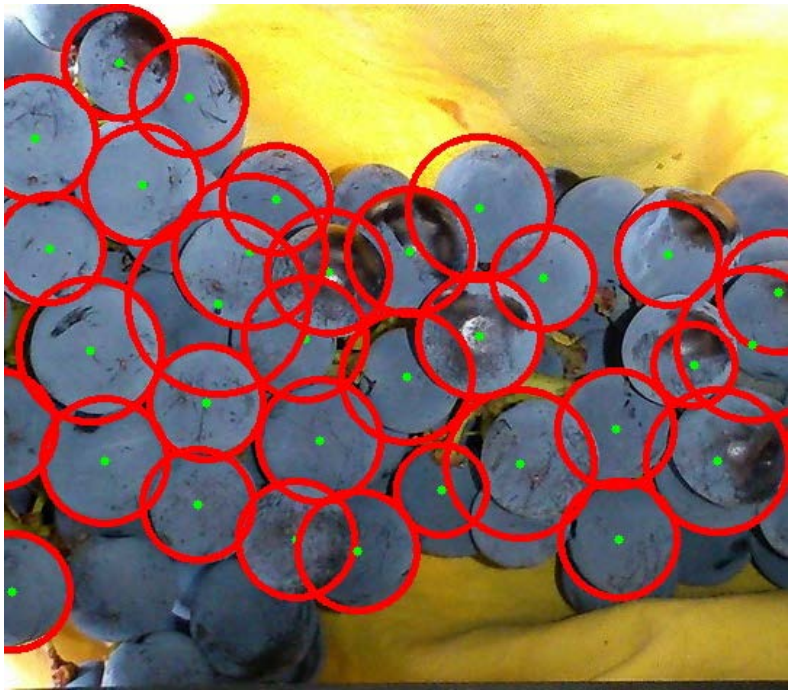
Berries Size

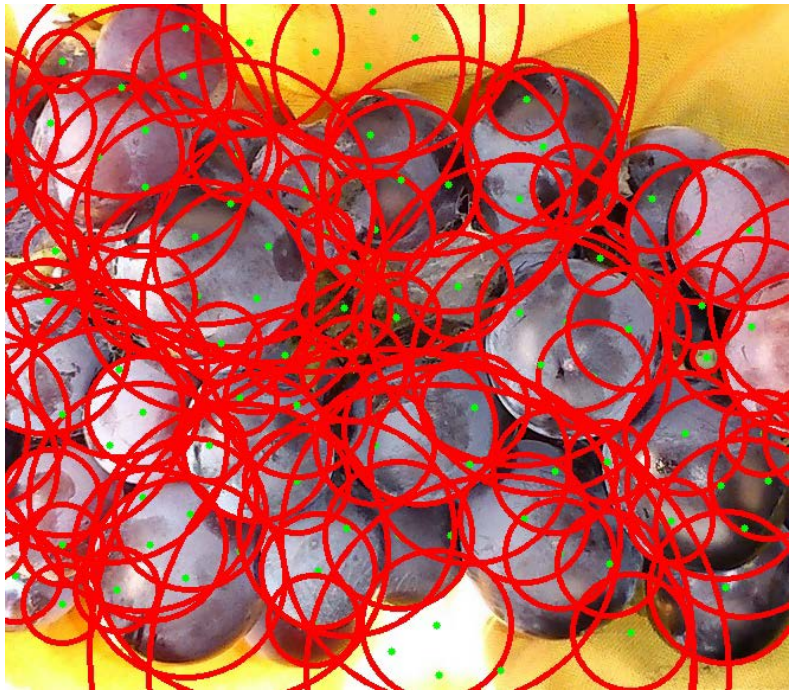
Program principle



Objects detection

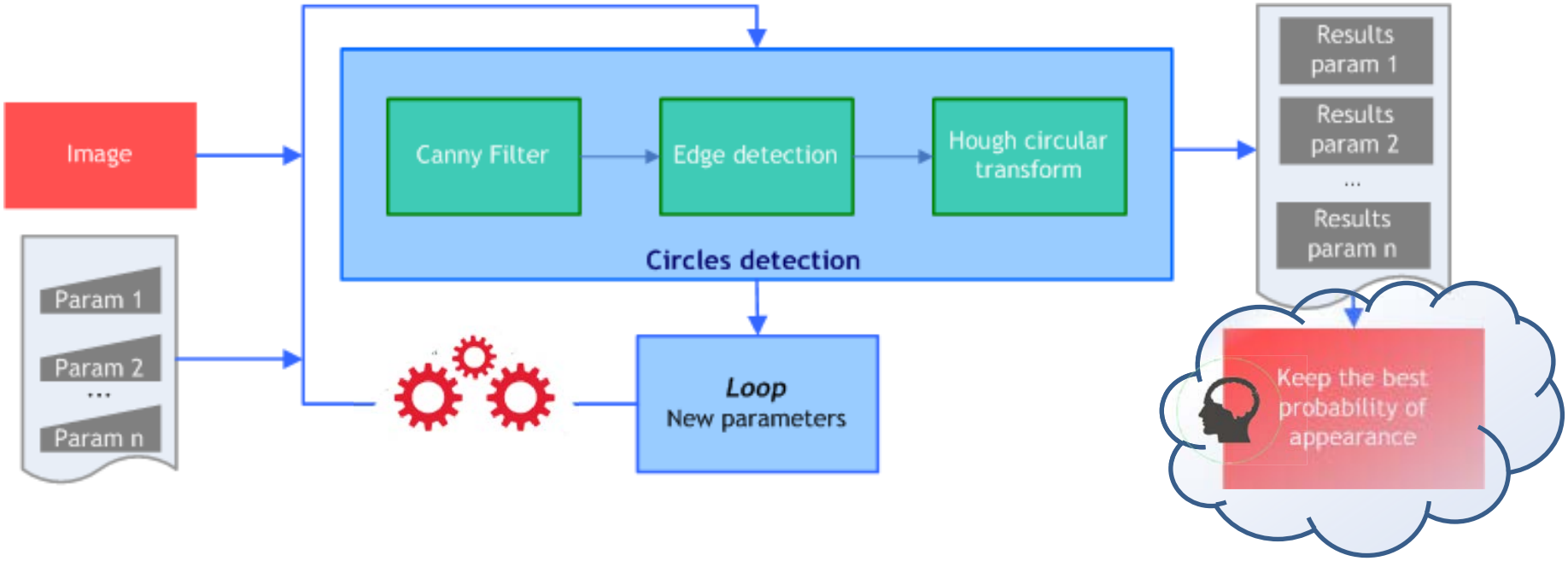
Effect of the choice of parameters





Same parameters for detection operator give two different performances

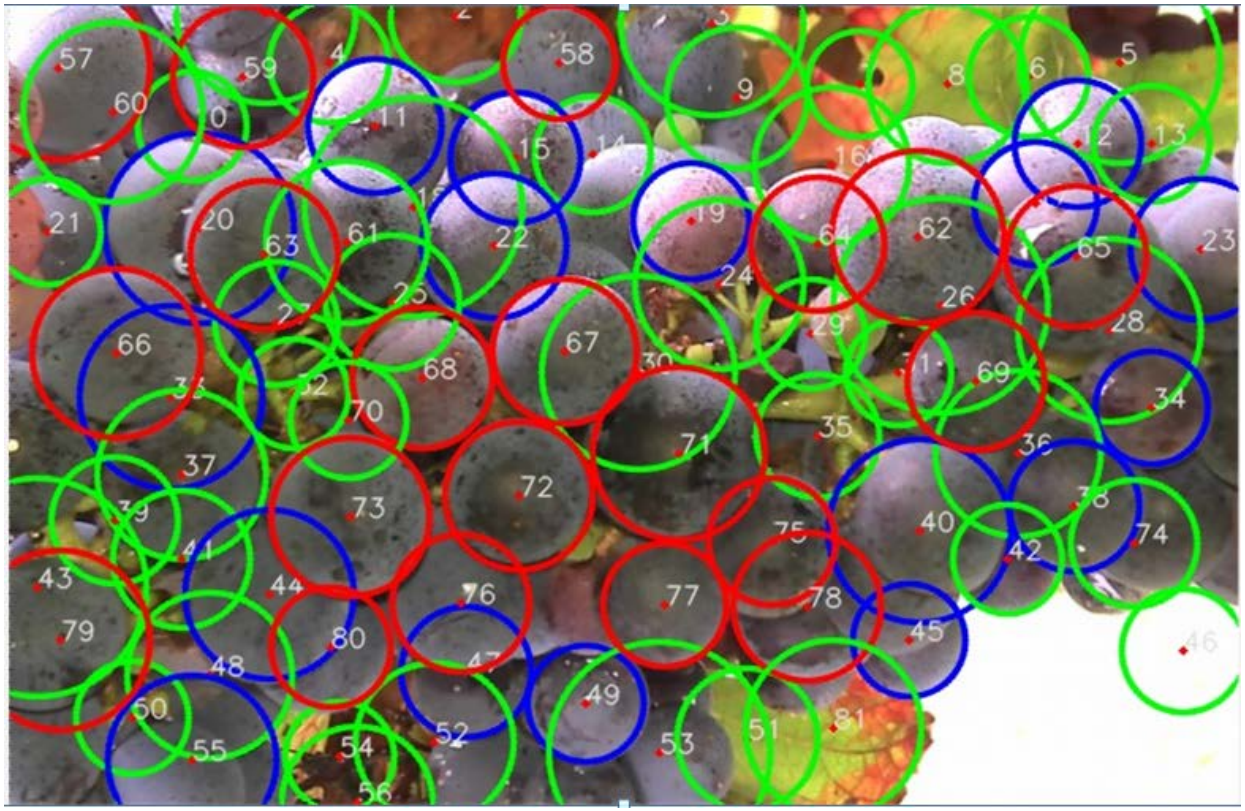
Objects detection



Intelligent detector based on Hough Transform

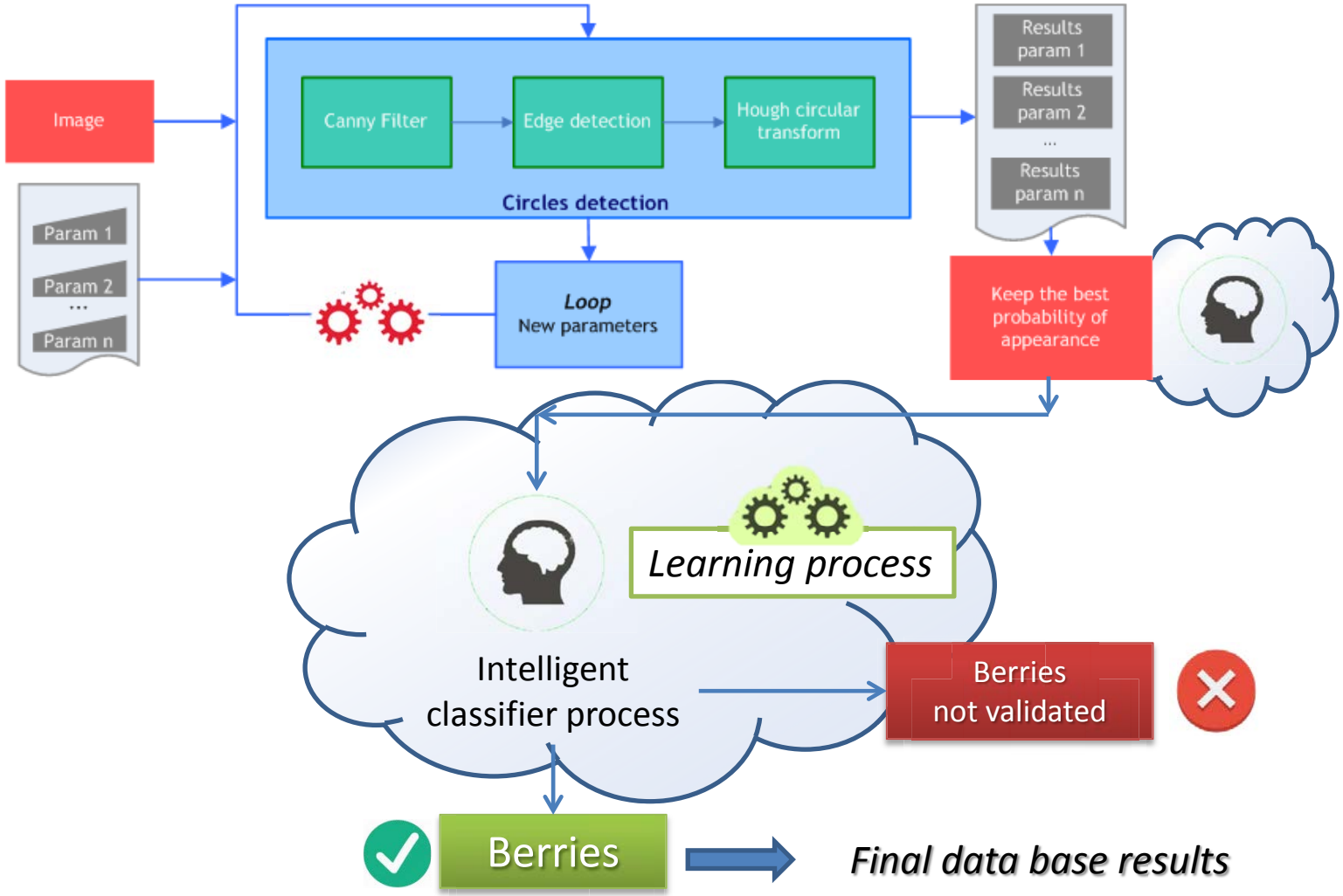
Objects classification

Previous detection must be corrected !



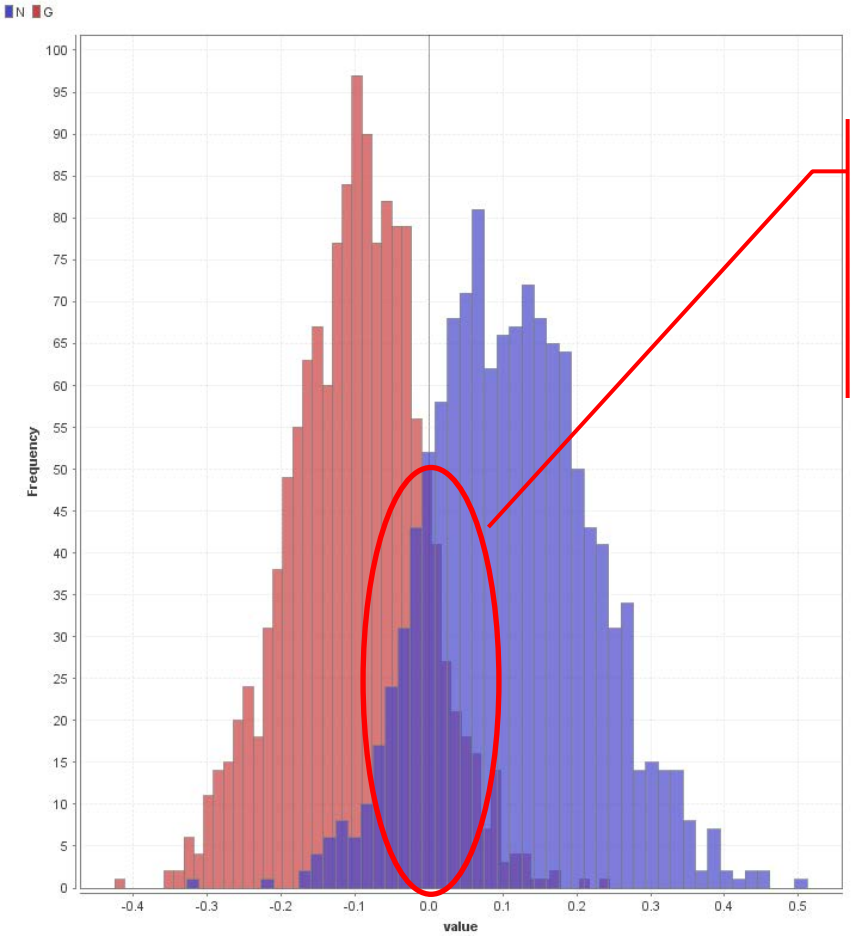
Green circle = non-berry = to be removed

Objects classification



BERRIES Classification

DISCRIMINANT ANALYSIS



Confusion area

BERRIES Classification = result sample

CLASSIFICATION **RESULT on 2025 berries samples**

	N real	G real	Precision
N estimated	1075	231	82,31%
G estimated	224	1247	84,77%
%	82,76%	84,37%	

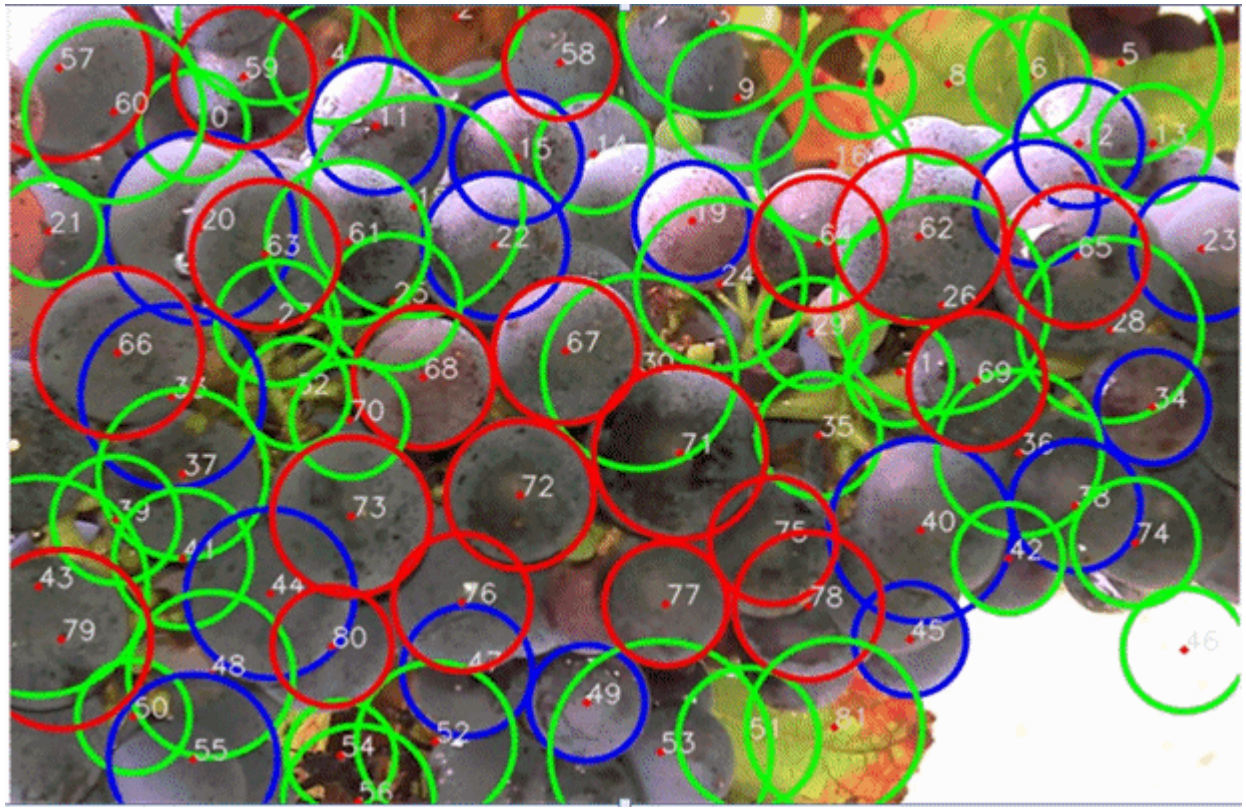
Confusion Matrix with Rule Induction model

```
if % detect > 45.989 and CON [1] ≤ 966.066 and Variance_V > 1152.826 then G
if CON [3] > 1309.777 and ColorMoy_H ≤ 120.268 and % detect ≤ 36.418 then N
if % detect > 27.865 and CON [0] ≤ 606.366 and CON [1] ≤ 396.419 and R (pixel) ≤
          46.417 and ColorMoy_R ≤ 72.916 then G
(…)
```

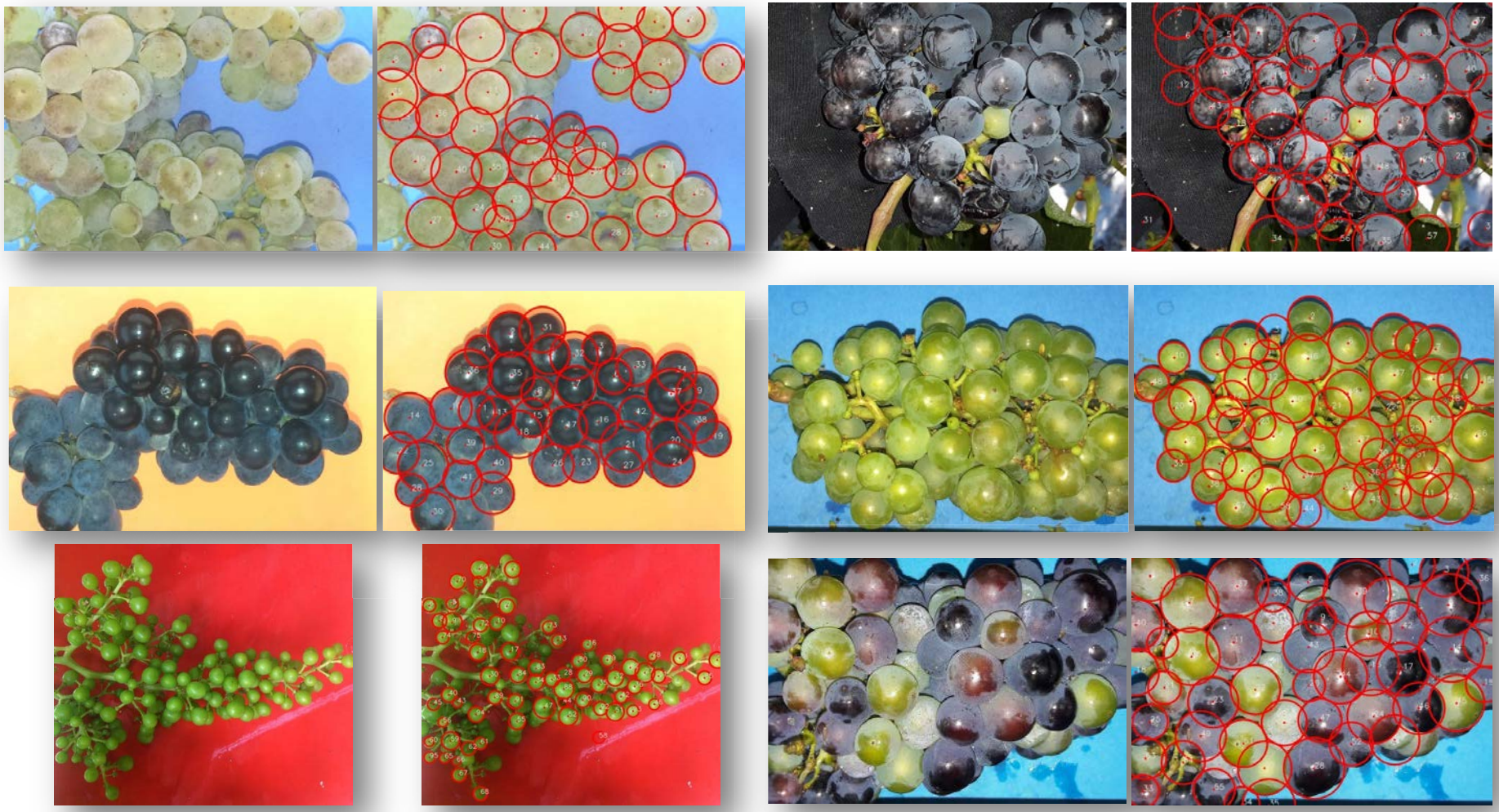
Example of Rule Induction model
Learning database : 100 samples

Objects classification performance

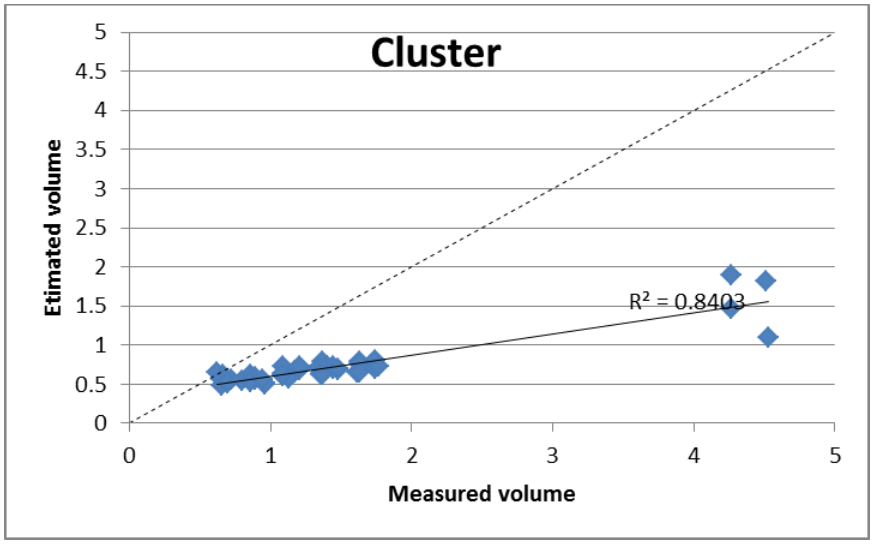
CLASSIFICATION **RULE INDUCTION**

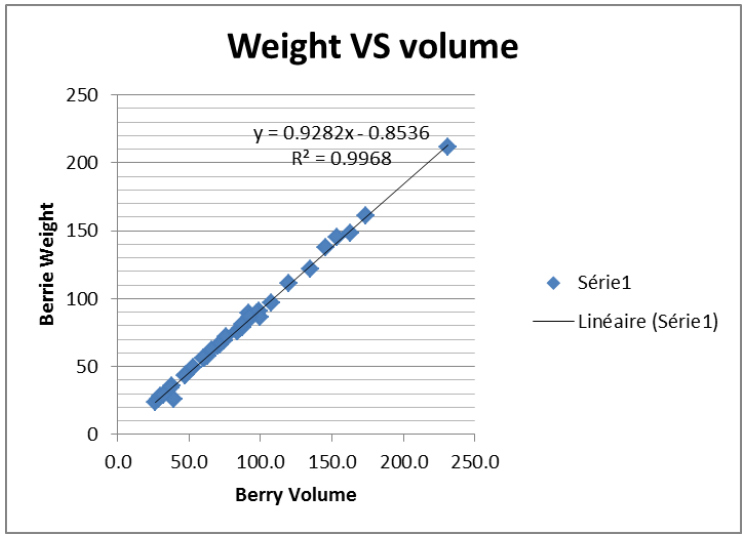


Results Images Samples



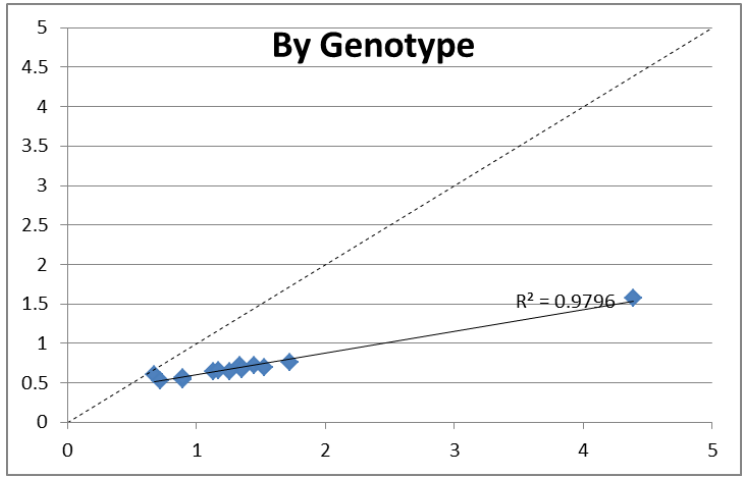
First Results





Work done by INRA - Agnes Doligez

- Berries mean volume (mL), Mean by genotype = Mean of clusters.
- This first analys show s an under estimation of berries volume, the bias increase with the berry size.
- No notable difference between a clean cluster (rotten berries removed) and untouched cluster



Correlation Cluster volume observed and measured by genotype

Conclusion

- **New device** for **new services**
  - **Non destructive tool** providing
    - Berries size, color, surface defect
      - *By using a **robust algorithm** to detect berries*
  - Light and low cost solution, very useful

- Presently we provide
  - useful information **for specialist** NOT for farmers
  - **Can change the practices** and methods

Conclusion

Smartgrappe

A simple and low cost solution
to help you to manage your vineyard
with your smartphone

Now you can imagine the future

Thanks for your attention.

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