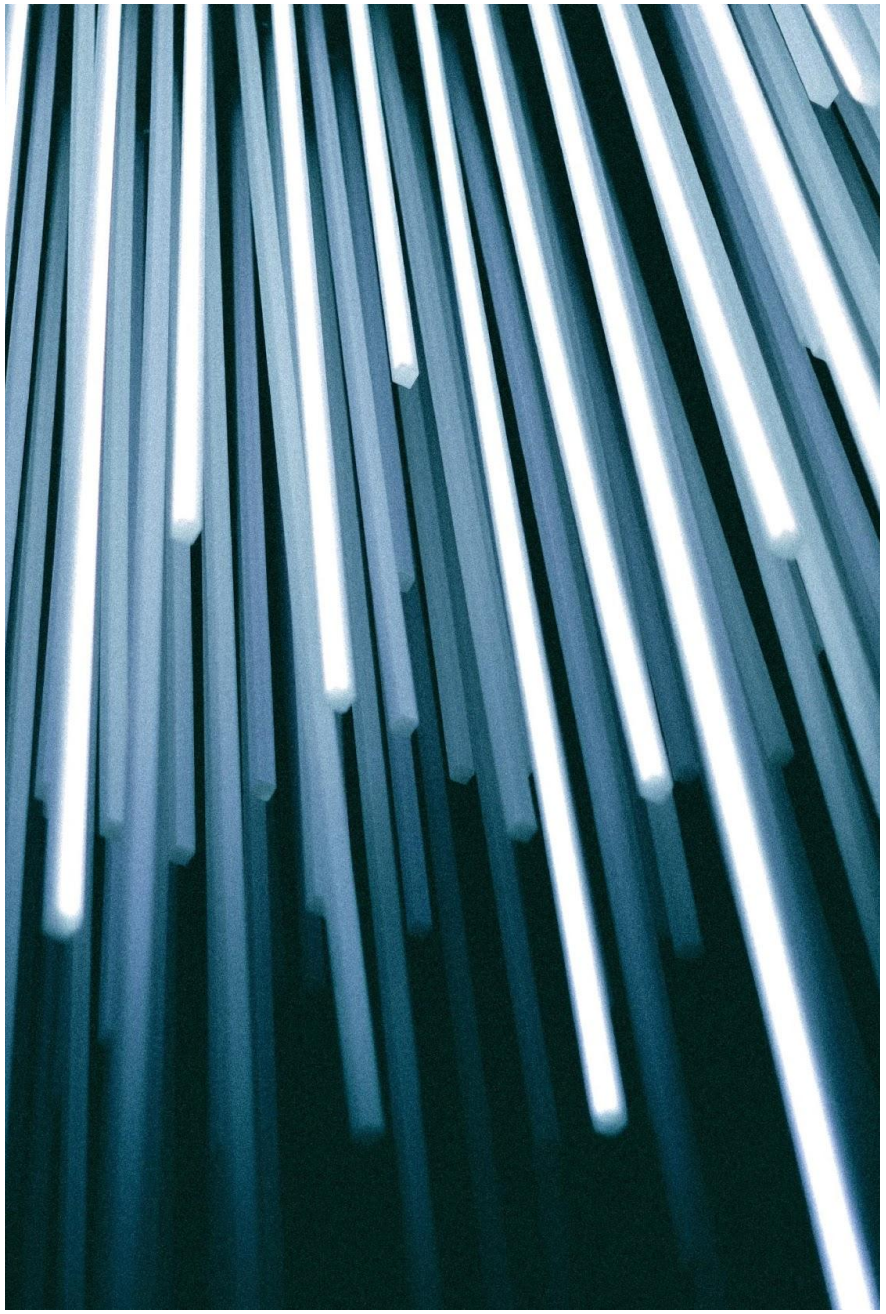


Qualipap-IA
March 2021

Fotonower

Intelligence artificielle et reconnaissance d'images

Automatisez vos processus métier

Qualipap-IA 03-21

- **I) Automatic And Light Entrance Quality Inspection**
  - A) Methodology with pictures for Qualipapia
  - B) Some Results and quick analysis
  - C) Statistics behind: representativity of sampling
  - D) IA/Maths behind: CNN in a nutshell

- **II) Fotonower - Achievement and Roadmap**
  - A) Accomplishment and service
  - B) Announcement

- **III) Annexes**
  - A) Team
  - B) Setup and technical roadmap
  - C) Others

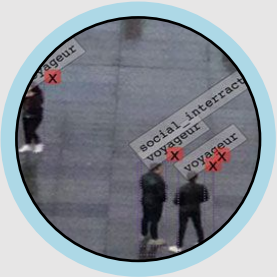
Fotonower

I. Qualipap-IA

Fotonower

Car damage estimation

Characterisation for recycling



Risk assessment

They rely on us

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perlen papier ag

VEOLIA

ATIP

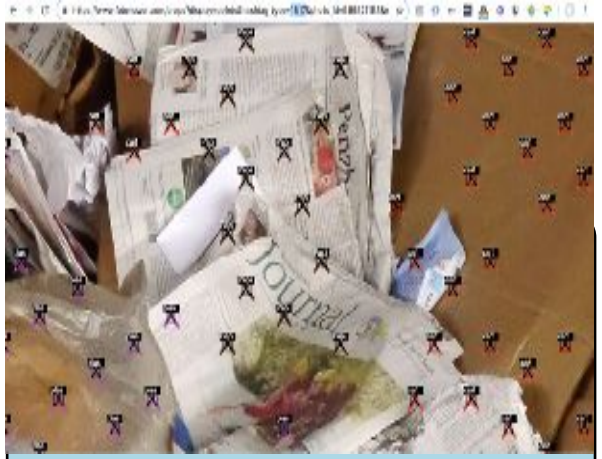
UPM

Characterisation and calibration

Details on Qualipapia: Automatic Algo or Manual Labelling

Unload

Photo



Algo

Photo rejected : dark, blurry, not white

PfR Characterisation and Calibration

A Comparison of the different methodologies used on same load: step by step

Two references and methodologies

- Manual gravi : INGEDE Method 14 – provided by Perlen
- Visual Manual : INGEDE Method 7 – provided by Perlen

AI Analysis on photos (provided by Perlen) :

- Qualipapia Manual – Manual labelling by individuals on photos + weight ponderation
- Qualipapia Automatic – Automatic analysis thanks to algorithm on photos + weight ponderation

Some explanations

- Enable a step by step fine-tuning and consolidation
- Each methodology provides a rate of unwanted material that we can compare due to different error metrics, emphasizing on correlation

Automatic Labelling

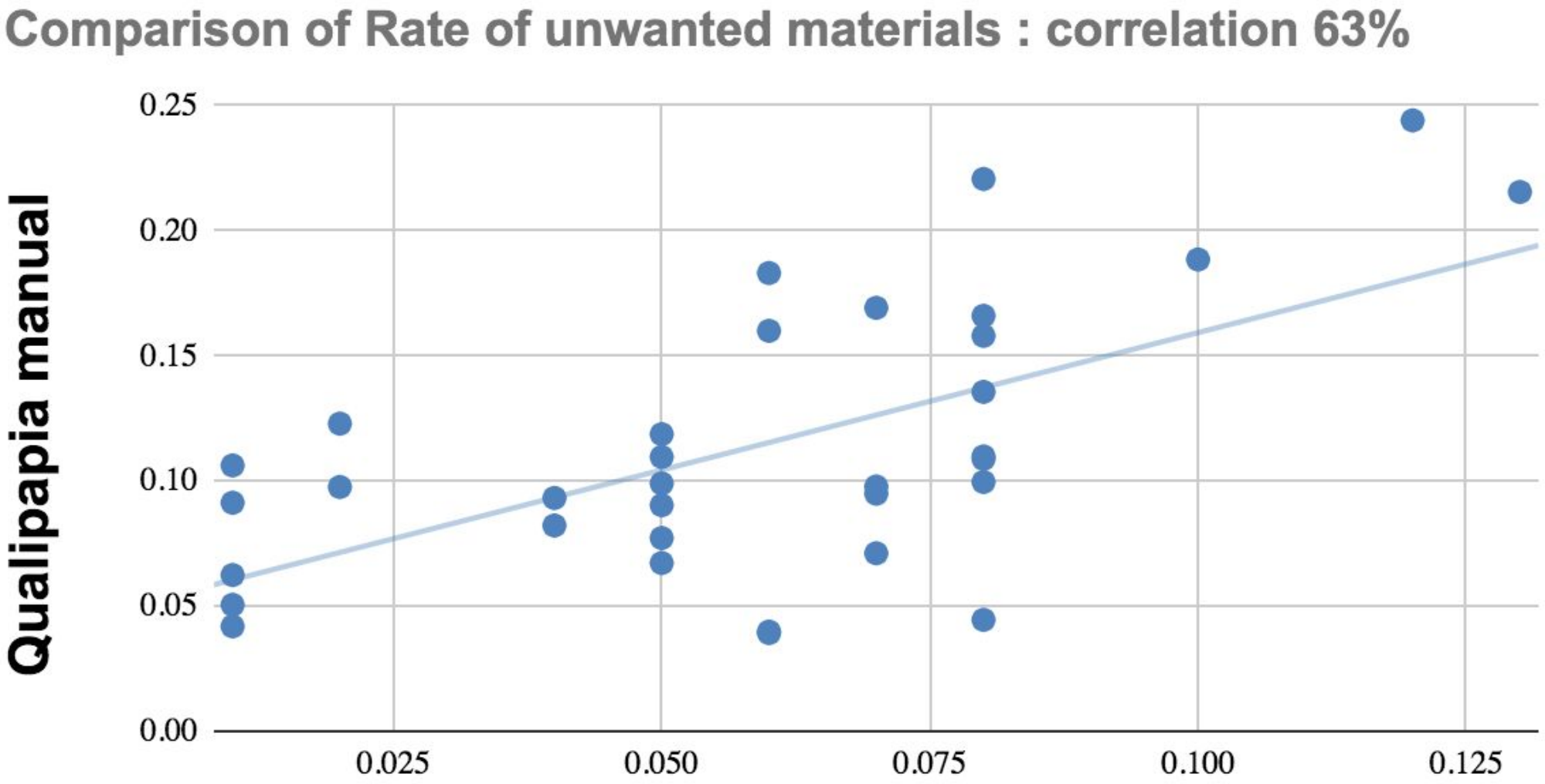
Manual Labelling

Results

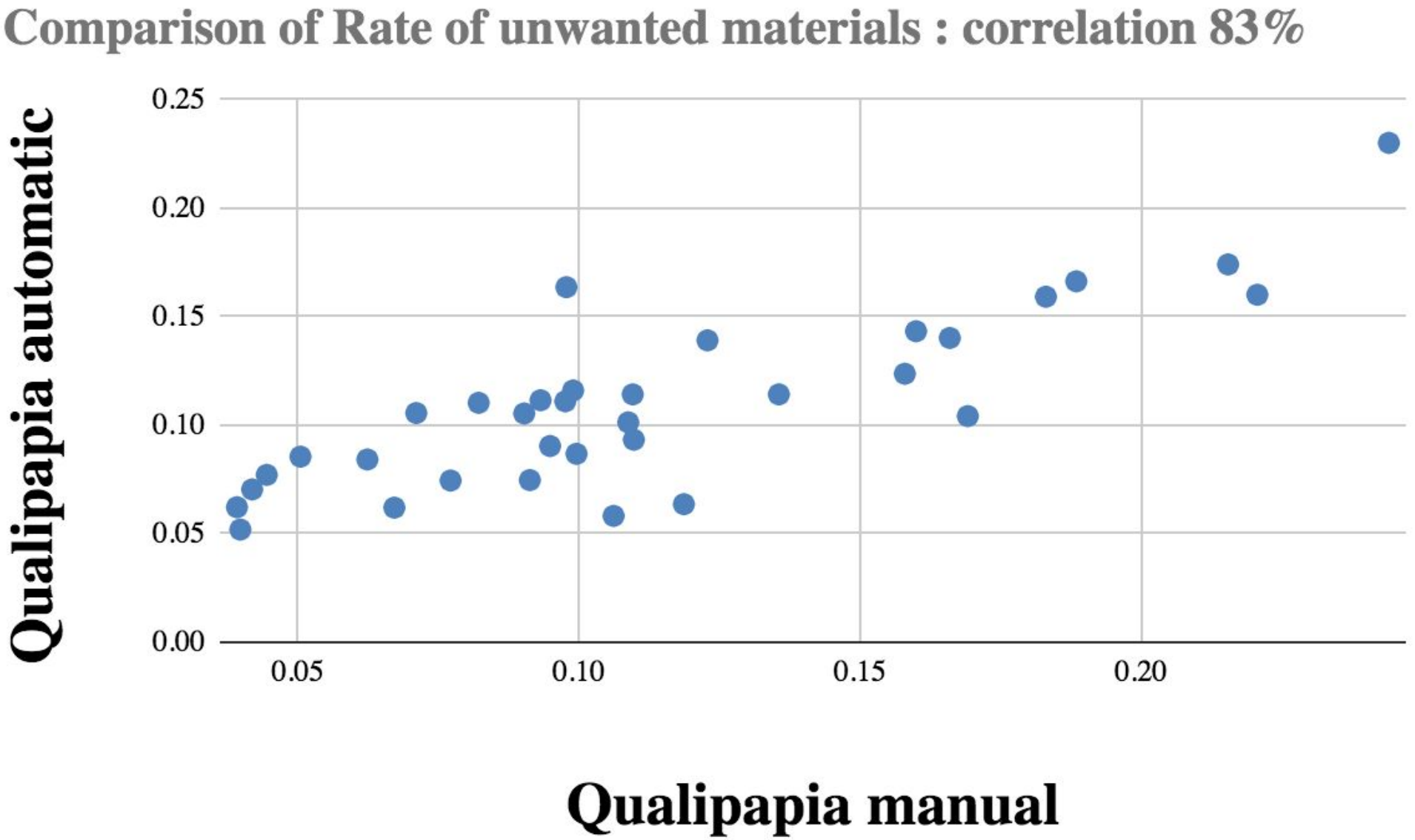
- 4X4 Correlations : 3 + 2 + 1 : data points
- Correlation between rates of two different methods

Only Accepted Photos 38 data points	Gravimetry INGEDE 14	Visual INGEDE 7	Qualipapia Manual	Qualipapia Automatic
Gravimetry INGEDE 14	100%			
Visual INGEDE 7	91%	100%		
Qualipapia Manual	63%	62%	100%	
Qualipapia Automatic	53%	53%	83%	100%

Results



Results



Error analysis and enhancement

Analysis of outliers and understanding of error detection

1. Tinted mass detected as brown cardboard

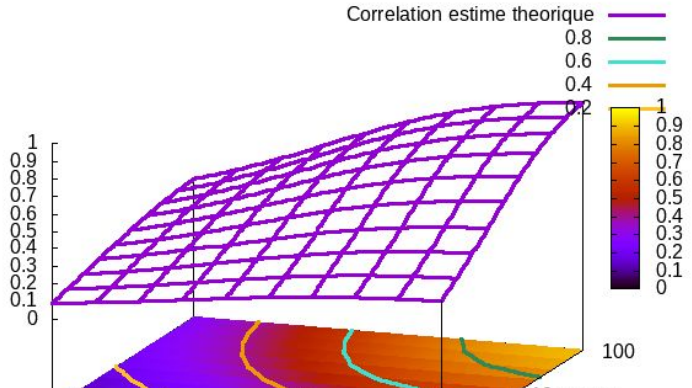
2. Kraft detected as brown cardboard

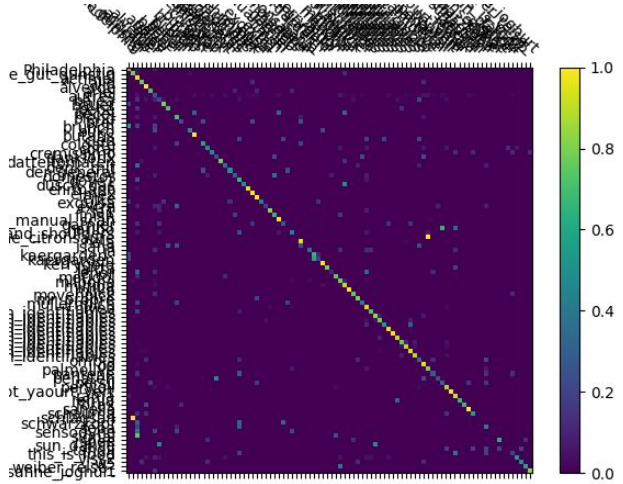
3. Missed brown cardboard from a pizza packaging

4. Deinkable taken as grey cardboard

Statistics

- Modelling of the representativity of a load by a sampling thanks to binomial law
- Variability of the quality of loads can explain more correlation between measurement methods than the previous modeling
- From confusion matrix and precision-recall to correlation of two different measures
- Markov chain modelling of set of sample to explain the variability of quality over time
- Modelling of binomial variable (two measure per load) to explain the confidence in the accuracy of the methods
- Three different ways of considering the accuracy of a characterisation method :
  - Confusion matrix
  - Mean square error
  - Correlation with a reference method

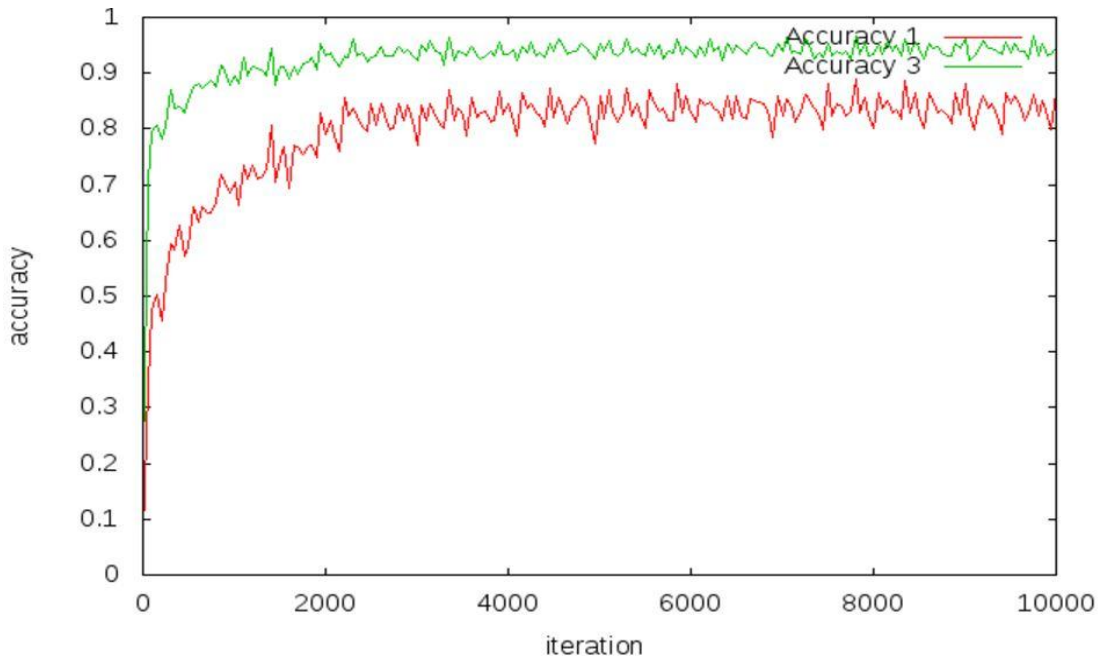


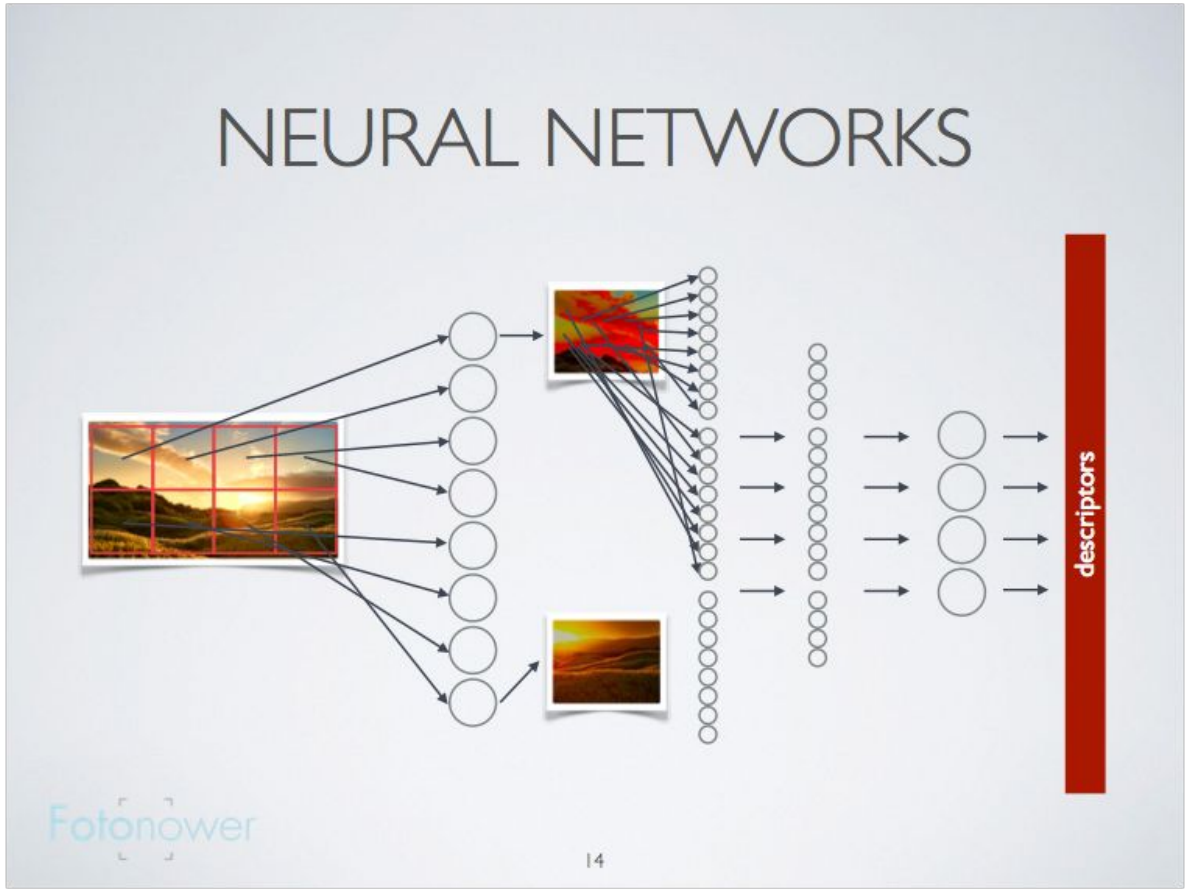


IA/Maths

- Neural Network
- Calibration
- Training data: UPM and Semardel: 2000 photos manually labelled

Graphique d'apprentissage pour 22 modèles de voiture



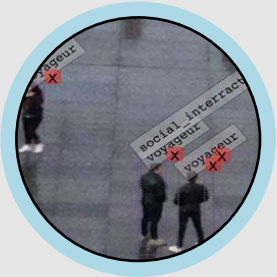


II. Fotonower

Fotonower

Car damage estimation

Characterisation for recycling



Risk assessment

Ils nous font confiance

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perlen papier ag

VEOLIA ATIP

UPM

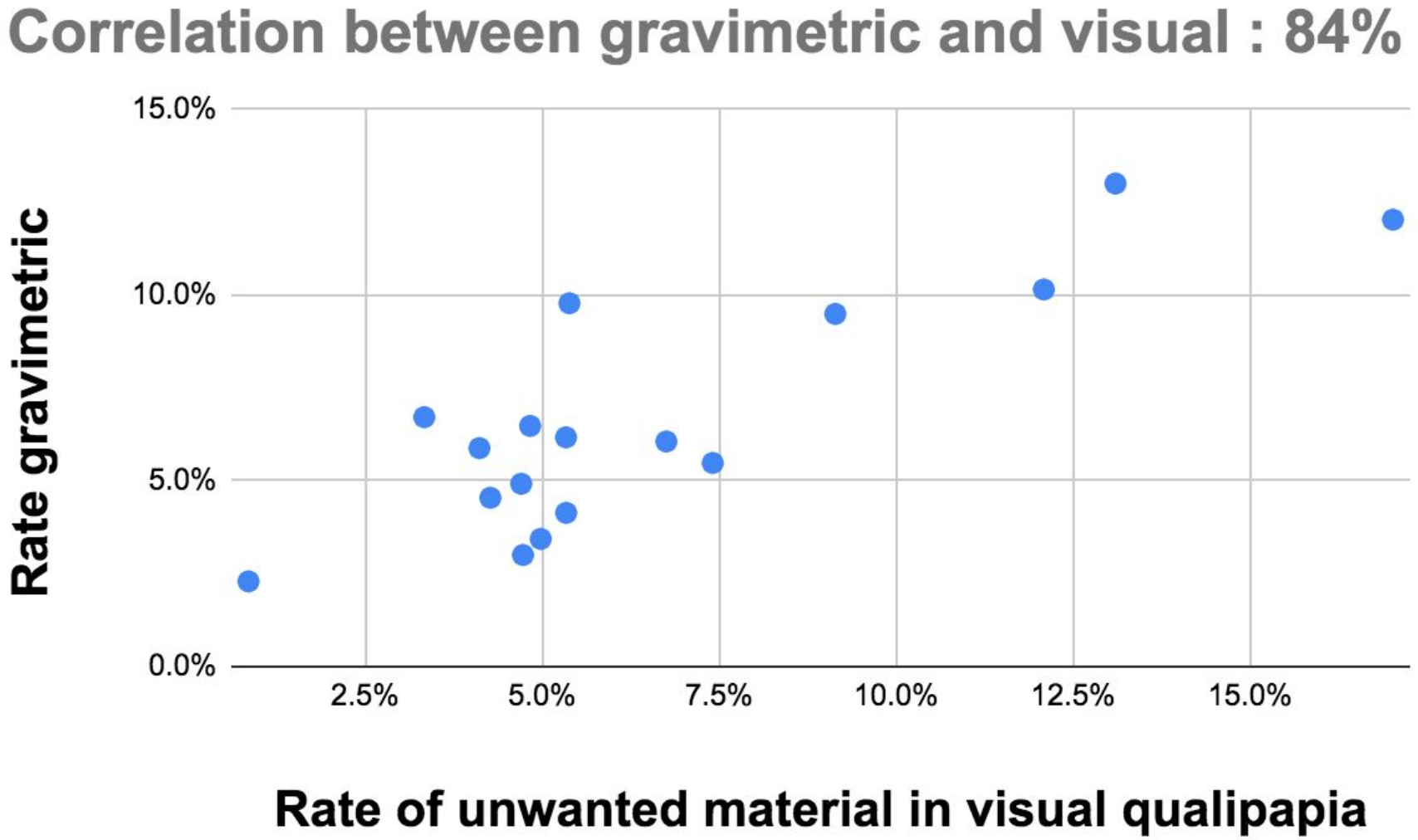
II 2021 and beyond

New Cam in 2021: 4

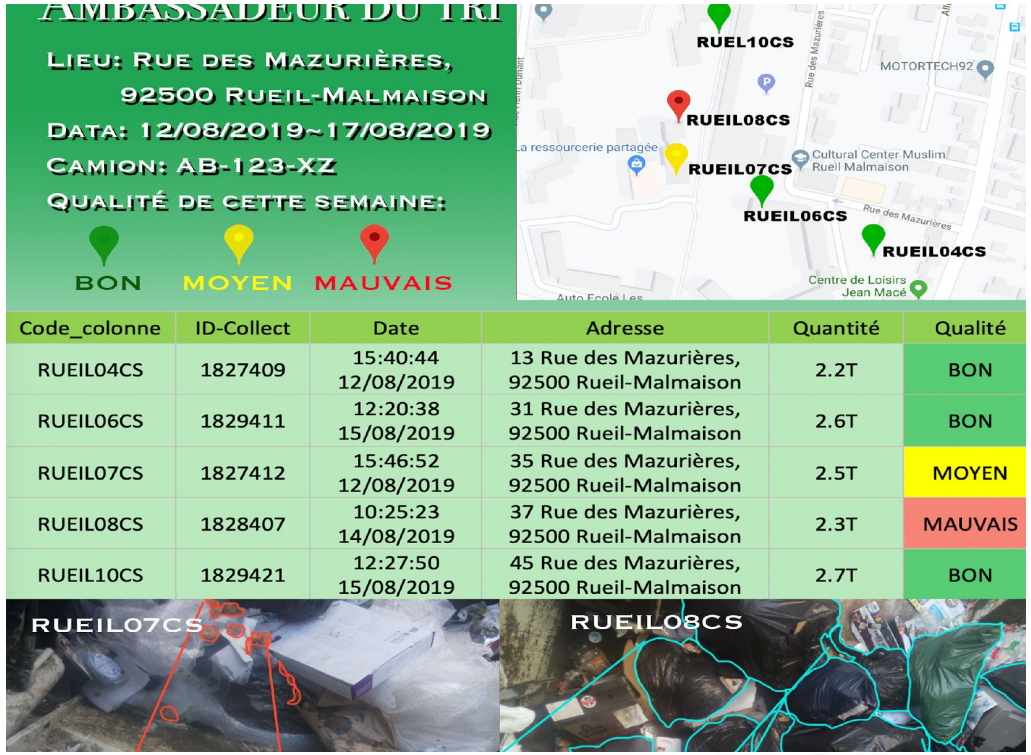
Veolia
Syctom
Derichebourg

Fundraising

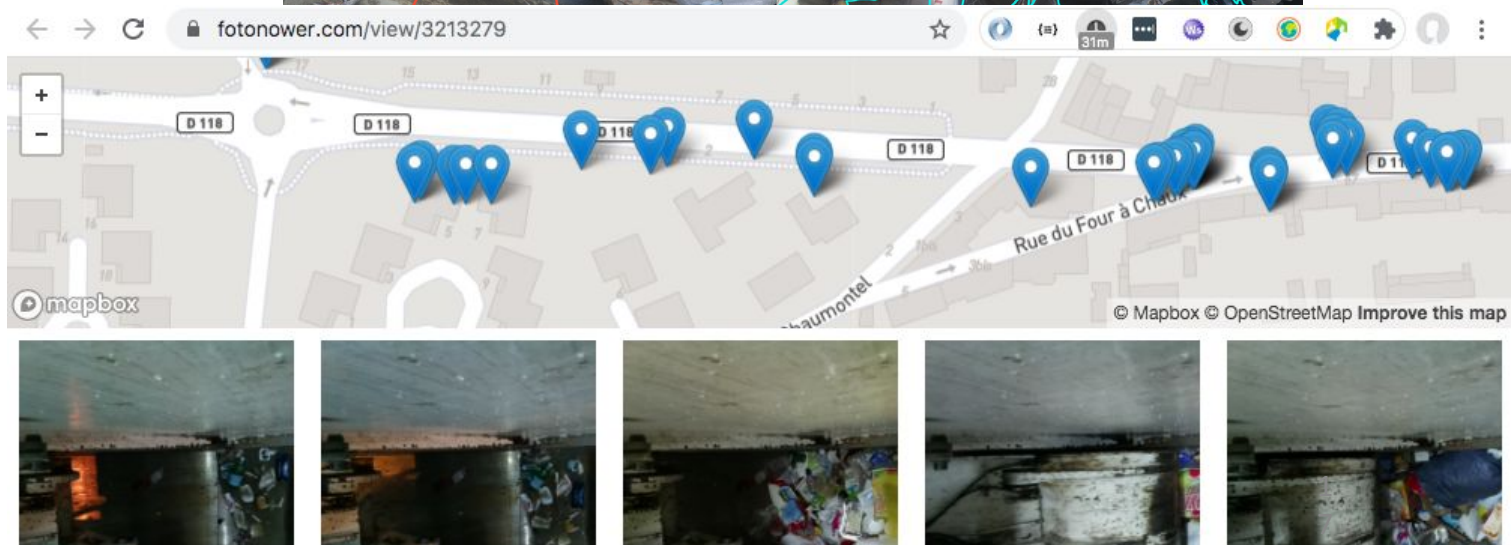
II 2021 and beyond



Other services



Code_colonne	ID-Collect	Date	Adresse	Quantité	Qualité
RUEIL04CS	1827409	15:40:44 12/08/2019	13 Rue des Mazurières, 92500 Rueil-Malmaison	2.2T	BON
RUEIL06CS	1829411	12:20:38 15/08/2019	31 Rue des Mazurières, 92500 Rueil-Malmaison	2.6T	BON
RUEIL07CS	1827412	15:46:52 12/08/2019	35 Rue des Mazurières, 92500 Rueil-Malmaison	2.5T	MOYEN
RUEIL08CS	1828407	10:25:23 14/08/2019	37 Rue des Mazurières, 92500 Rueil-Malmaison	2.3T	MAUVAIS
RUEIL10CS	1829421	12:27:50 15/08/2019	45 Rue des Mazurières, 92500 Rueil-Malmaison	2.7T	BON



THANK YOU!

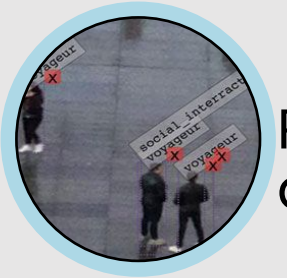
QUESTIONS AT THE END OF THE JOINT SESSION

III. Annexes

Fotonower

Car damage estimation

Characterization for recycling



Risk assessment

They rely on us

APS ALTPAPIER SERVICE SCHWEIZ AG

perlen papier ag

VEOLIA

ATIP

UPM

Fotonower's team

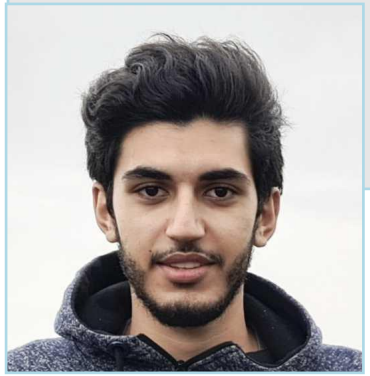
Victor Reutenauer
CEO - Phd

Stéphane Poirier
Chief Science Officer - PhD

M'hand Rahani
CTO

Wei Gao
Data Scientist

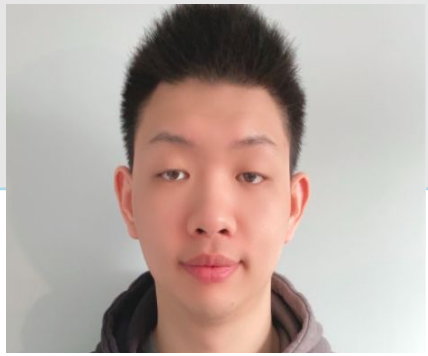
Marine Colin
Data Scientist



Ali Golmakani
Data Scientist PhD Student

Guillaume Boutoille
Data Scientist PhD Student

Shu Wah Mui
Data Analyst & Partnership

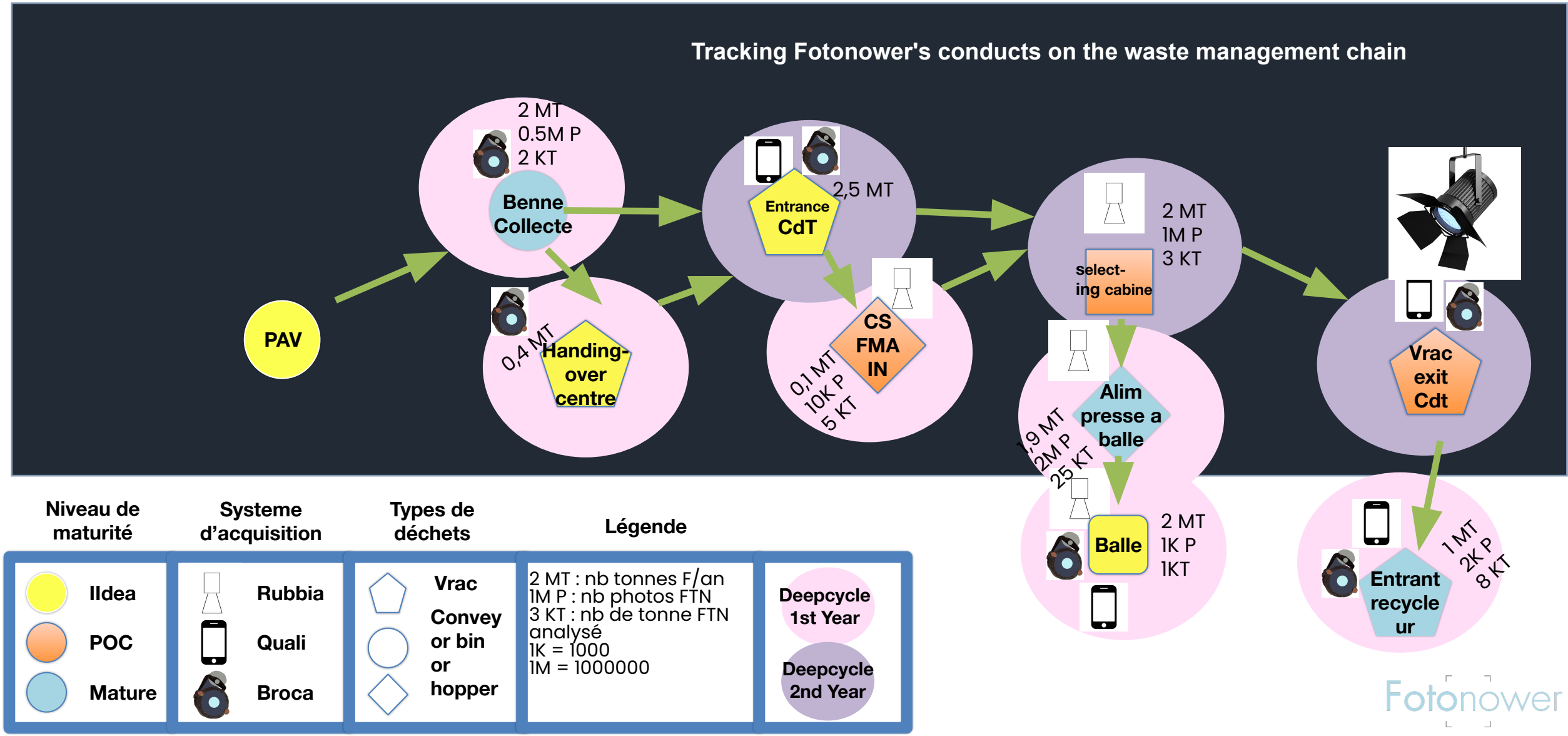


Chengcheng Xu
Data Scientist & Partnership

Marc Thebault
Po Web-App characterisation

Fotonower

The Diagram of Fotonower's waste services



Fotonower

II.B Accomplishment and service

Balia

Caractérisation en centres de transfert

Optimisation des process en centres de tri

Centres pneumatiques

Rubia

Marketing et prediction économique

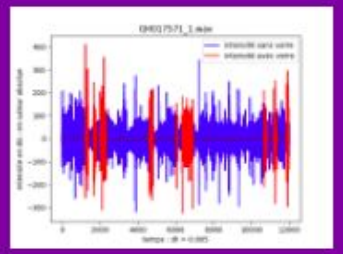
Disposition de caméras dans les Locaux à poubelles

Caméras fixes

Caratérisation du Bois A/B et des DIB

Caractérisation dynamique PAV

Caractérisation du verre via la fréquence du son



Revalorisation des bouteilles en pet

Application mobile pour la caractérisation et la revalorisation des types de déchets

Caméras mobiles

Détection automatique des dépôts sauvages

PARIS

Broca

Sécurité reaper

Qualipapia (blancheur du papier)

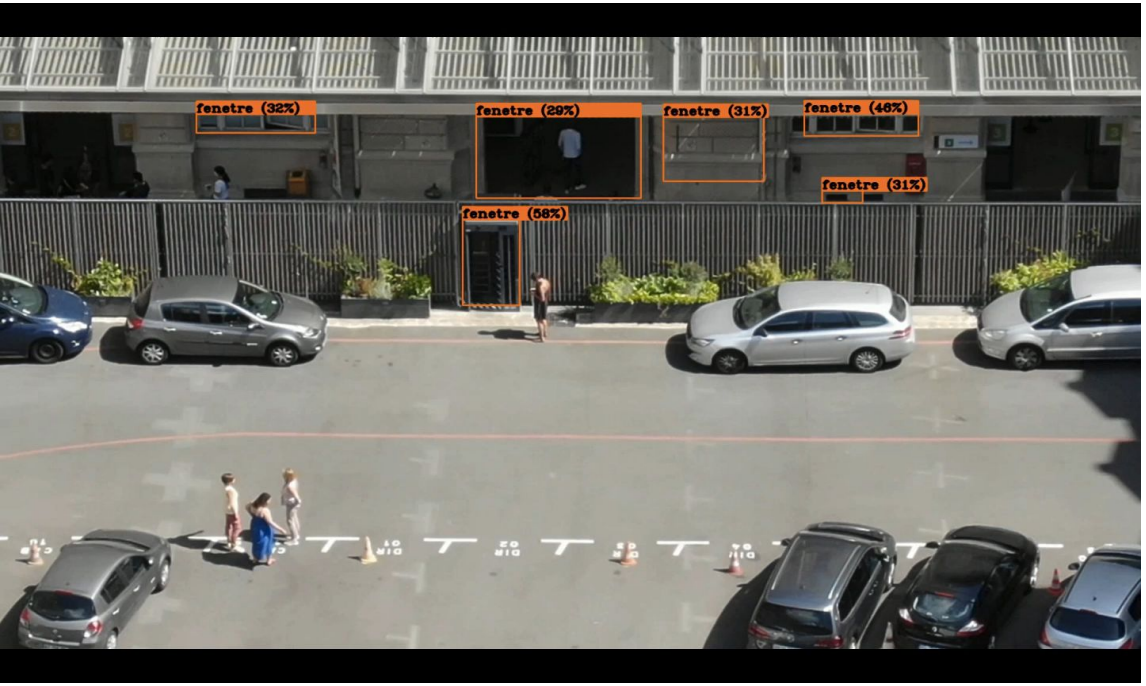
Qualicollectia

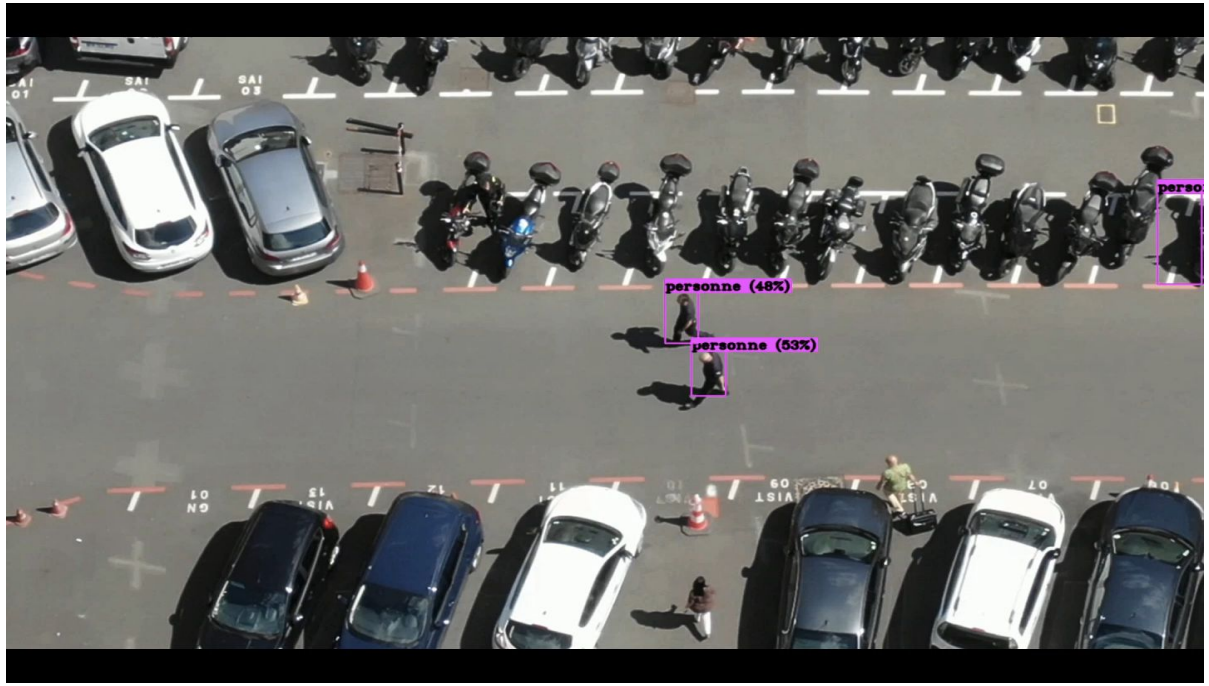
caractérisation entrante de la Collecte Sélective sur convoyeur

Pinpoint, forestall and quantify the endangerments

- As shown in the videos below, we can automatically identify people, windows, cars or even boats, etc.

- Accordingly, the urban world can be surveyed in order to identify what risks affect it.





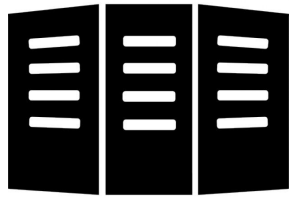
III Rubbia Installation scheme

RUBBIA : SYNOPTIC DIAGRAM

Fotonower's cloud : En UE
The computing power used is in the university of La Sorbonne (Jussieu)

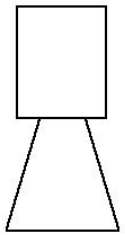
On-board computer
Electricity-Consumption: 12W
Connection : RJ45
Micro USB voltage : 5V
Low current supply potentiality (ethernet)
Voltage transformer 220V/5V standard
weight: 500g

Ethernet connectivity: 20 MBbps Port 80, 8080 et 22



HDMI Cable 3m to 5m

Waterproof HD Camera
Weight : 300g
Magnet: 30Kg provided or a screw to be provide



700 lumen needed by m2 or 15W of LED to 1m of the conveyor

220V is favoured, yet it is possible to work in 12V or 5V

Time-period: 30 minutes to one hour

Dashboard

Report by mail

Bale conveyor: Flat, closest to the bale hopper

Some key-dates

- 2015 : Plateforme recherche contenu Reseau sociaux, outils de classification d'images : Une du Parisien, Francofolies et Hellfest avec L'Obs, Sélection ETI 9 à Pau
- 2016 : WCL, Oui.sncf, CCE Bazar.photo
- 2017 : BCA, Club Algo, Détection d'image segmentation, Système modulaire de reconnaissance d'image, Phd partenariat Sorbonne-université, CNIL Ethique IA Algo
- 2018 : FAT, Hub FFA, Veolia, Apiculture : Prix d'innovation, Velourm : 1M photos
- 2019 : Citeo UPM P&Co : Economie circulaire, Circular Challenge Citeo, CNRS Lov, INGEDE, AFNOR, ATIP
- 2020 : PP, Camera RGPD Compliant, Partenariat école 42, EuvsVirus
- 2021 : Adenes, MRH and expansion in rubbish

- Intervention : Institut des actuaires, Formation Data Actuaires , 100% Data-science 2017-18-19-20

Presse

- Tourmag
- Le parisien
- 20minutes_jesuismemoire
- Challenges
- La Revue du Digital
- Quand les assureurs aspirent les données
- Manifeste pour un bilan environemental

Video

- Optimisons la filière du recyclage
- Assurances : cinq start-ups sélectionnées pour rejoindre la Niort Tech
- Ruche Digitale soutenue par Fotonower
- Démonstration détection parties de véhicule
- Demo Dégats Devis

Fotonower

Internal product roadmap

System-condition

- Labelling/ Data-mining
- Learning process
- Execution / Datou
- Edge Computing
- Acquisition data
- Reporting

➢ Datou/DeepLearning/Edge Computing => SP
➢ FVS/Learning Set => MC, GB
➢ AIOT/Systeme => MR