



Présentation de l'observatoire

Alexis Joly & Pierre Bonnet



Un observatoire citoyen de la biodiversité végétale qui utilise l'apprentissage automatique pour aider les gens à identifier les plantes à l'aide de leur téléphone mobile



Historique



2010-2014



Pl@ntNet projet étendard d'agropolis *fondation*

Recherche Transdisciplinaire
CIRAD, Inra, Inria, IRD, Tela

2015-2018



Floris'Tic: PIA financé par l'ANRU

Maturation des technologies
Sciences citoyennes & éducation à l'environnement
Telabotanica, Inria, CIRAD, Inra, IRD, Agropolis

2019-2099



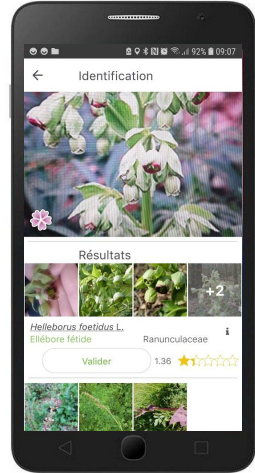
Pl@ntNet consortium (via InriaSOFT)

Foundateurs = Inria, CIRAD, Inra, IRD
Open to new members (cotisation: 5 to 20 K€/year)

Principe de base



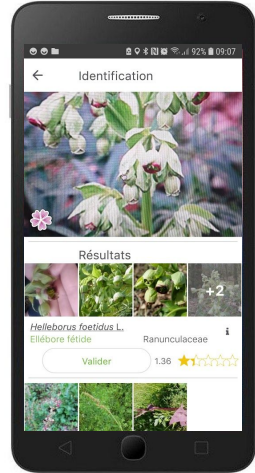
“Intelligence Artificielle”
“Apprentissage profond”
(Réseau de neurones convolutionnel)



Principe de base



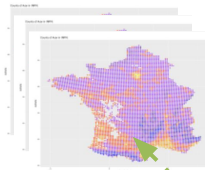
“Intelligence Artificielle”
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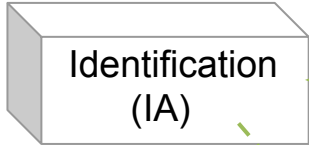
Base d'images d'apprentissage
(Millions d'images, 25K espèces)



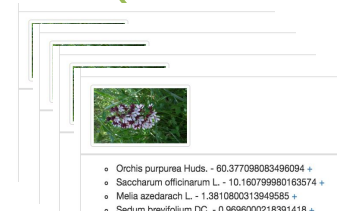
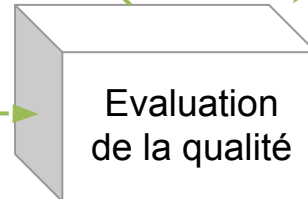
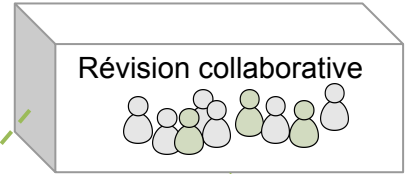
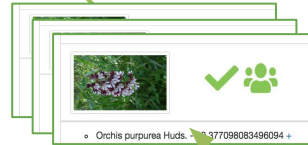
Pl@ntNet Workflow



Cartes de répartition, indices de biodiversité, modélisation de la phénologie, des écosystèmes, etc.



Données validées



Données à réviser



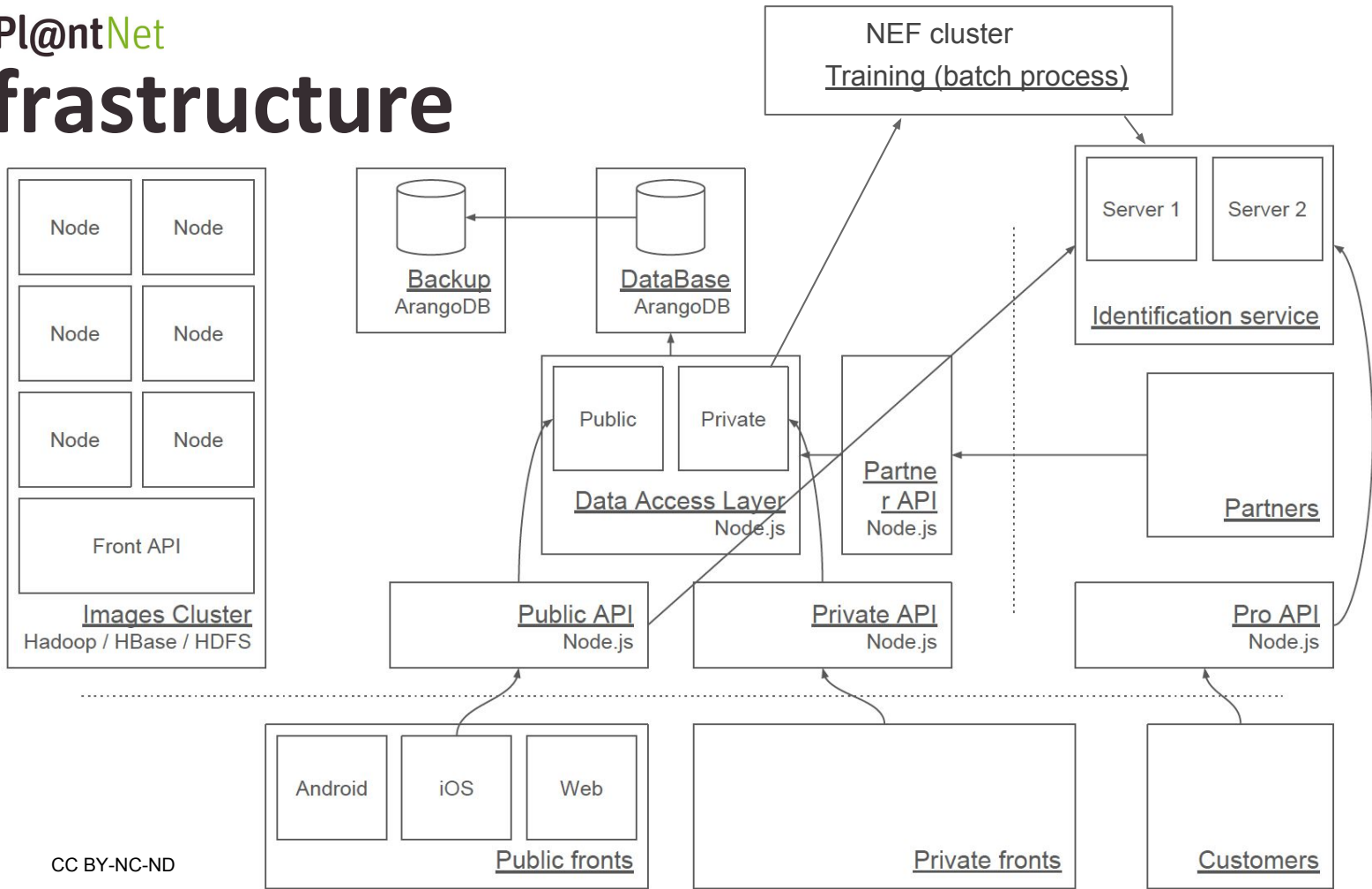
Données identifiées automatiquement

CC BY-NC-ND

- *Orchis purpurea* Huds. - 60.377098083496094 +
- *Saccharum officinarum* L. - 10.160799980163574 +
- *Melia azedarach* L. - 1.3810800313949585 +
- *Sedum brevifolium* DC. - 0.9696000218391418 +
- *Pinus pinaster* Aiton - 0.8718839883804321 +
- *Stachys palustris* L. - 0.7257400155067444 +

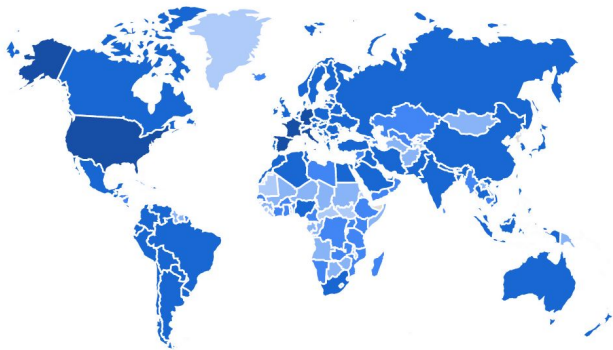
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- *Melia azedarach* L. - 1.3810800313949585 +
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- *Pinus pinaster* Aiton - 0.8718839883804321 +
- *Stachys palustris* L. - 0.7257400155067444 +

Infrastructure



Quelques chiffres

Last 3 months



| COUNTRY | USERS |
|---------------|-------|
| France | 880K |
| Germany | 500K |
| United States | 399K |
| Italy | 279K |
| Spain | 181K |
| Brazil | 162K |
| Netherlands | 142K |



13 million downloads
1.5 million accounts
100K users per day
13 languages
200+ countries



25K plant species
70M plant observations
25 taxonomic checklists



150 million images
25 Tb of data
10 servers
50 API user accounts

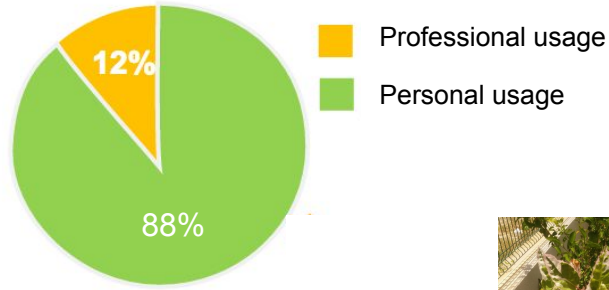


4 researchers
3 engineers
3 PhD students
2 post-docs
100K+ validators





Pl@ntNet Mobile App Usage



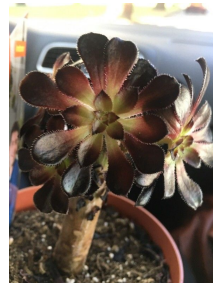
Personal usage (88%)



Nature, Walk, Trekking



Gardening



Houseplants



Phytotherapy, eatable



Pl@ntNet Mobile App Usage

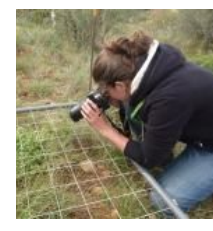
Professional usage (12%)



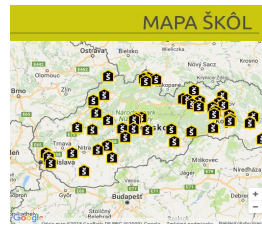
Agriculture



Natural Areas Management



Consulting, expertise, botanists



CC BY-NC-ND Education, formation, animation

Tourism

Merchants



PlantNet Les usages atypiques





Pl@ntNet Les usages inappropriés



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Les outils de l'observatoire

→ **s'informer**

Site internet PI@ntNet



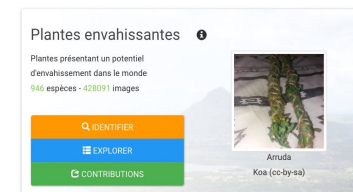
→ **sur le terrain**

PI@ntNet mobile app



→ **contribuer, apprendre**

PI@ntNet web app
<https://identify.plantnet.org/>



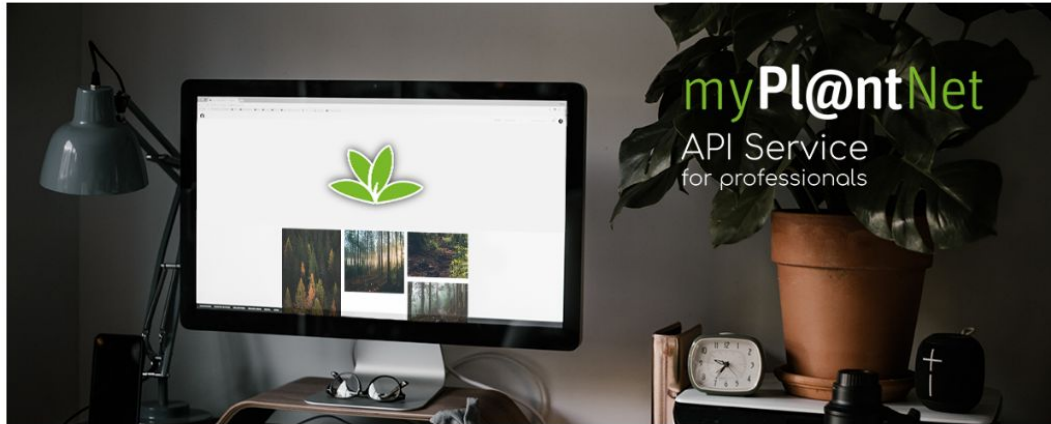
ThePlantGame
<http://theplantgame.com/>



Les outils de l'observatoire

API Pl@ntNet pour les développeurs

- Le service d'identification Pl@ntNet peut être utilisé par d'autres applications informatiques ou pour des travaux de recherche spécifiques
- Environ une centaine d'utilisateurs/développeurs inscrits (start-up, universités, associations, étudiants, etc.)



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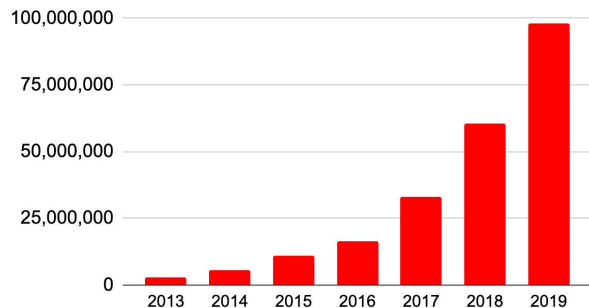
Create an account

Forgot your password?

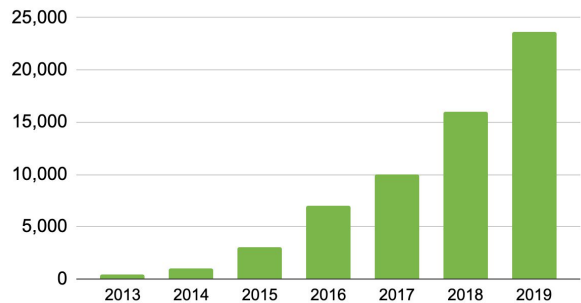


Les données produites par l'observatoire

observations



species



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Carpobrotus edulis (L.) N.E.Br.

Aizoaceae

Ficoïde doux , Griffes de sorcière , Figue marine

Détails

| Famille | Genre | Espèce |
|---------------------------|-----------------------------|--|
| Aizoaceae | Carpobrotus | <i>Carpobrotus edulis</i> (L.) N.E.Br. |

[Wikipedia](#)

Nom(s) commun(s)

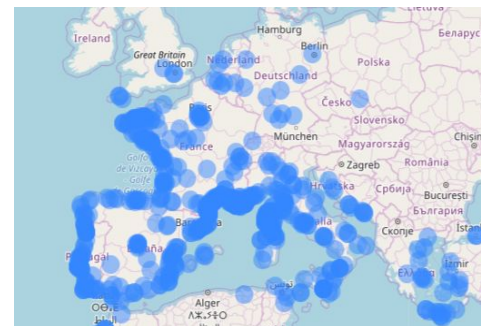
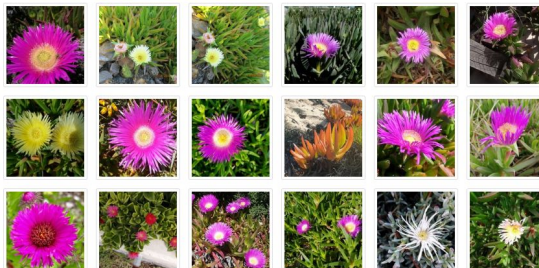
[+ Voir Tout / Modifier](#)

| | | |
|--------------------|------------------------|------------------|
| Ficoïde doux | Griffes de sorcière | Figue marine |
| Ficoïde comestible | Figuier des Hottentots | Croc de sorcière |
| Ficoïde doux | | |

Informations complémentaires

<https://sites.cabi.org/ISC/datasheet/10648>

<https://www.gbif.org/species/3084842>



Les travaux de recherche



Application Article | [Open Access](#) |

Species distribution modeling based on the automated identification of citizen observations

Christophe Botella, Alexis Joly, Pierre Bonnet , Pascal Monestiez, François Munoz

Crowdsourcing Biodiversity Monitoring: How Sharing your Photo Stream can Sustain our Planet

Full Text: [Get this Article](#)

Authors: [Alexis Joly](#) [INRIA, Montpellier, France](#)
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[Julien Champ](#) [INRIA, Montpellier, France](#)
[Samuel Dufour-Kowalski](#) [INRIA, Montpellier, France](#)
[Henning Müller](#) [HES-SO, Sierre, Switzerland](#)
[Pierre Bonnet](#) [CIRAD, Montpellier, France](#)



2016 Article

Bibliometrics

Citation Count: 1
Downloads (cumulative): 147
Downloads (12 Months): 21
Downloads (6 Weeks): 7

Deep-plant: Plant identification with convolutional neural networks

Publisher: IEEE

4 Author(s) Sue Han Lee ; Chee Seng Chan ; Paul Wilkin ; Paolo Remagnino [View All Authors](#)

67
Paper
Citations

1424
Full
Text Views



Plant identification using score-based fusion of multi-organ images

Publisher: IEEE

6 Author(s) Thanh-Binh Do ; Huy-Hoang Nguyen ; Thi-Thanh-Nhan Nguyen ; Hai Vu ; Thi-Thanh-Hai Tran ; Thi-Lan Le

1
Paper
Citation

157
Full
Text Views



Fine-grained classification via mixture of deep convolutional neural networks

Publisher: IEEE

6 Author(s) ZongYuan Ge ; Alex Bewley ; Christopher McCool ; Peter Corke ; Ben Uproft ; Conrad Sanderson [View All Authors](#)

8
Paper
Citations

368
Full
Text Views



Hidden Biases in Automated Image-Based Plant Identification

Publisher: IEEE

3 Author(s) Jose Carranza-Rojas ; Erick Mata-Montero ; Herve Goëau [View All Authors](#)

91
Full
Text Views



[Multimedia Tools and Applications for Environmental & Biodiversity Informatics](#) pp 131-149 | [Cite as](#)

Plant Identification: Experts vs. Machines in the Era of Deep Learning

Deep Learning Techniques Challenge Flora Experts

Authors [Authors and affiliations](#)

Pierre Bonnet , Hervé Goëau, Siang Thee Hang, Mario Lasseck, Milan Šulc, Valéry Malécot, Philippe Jauzenin, Jean-Claude Melet, Christian You, Alexis Joly

Plant identification based on noisy web data: the amazing performance of deep learning (LifeCLEF 2017)

Hervé Goëau¹, Pierre Bonnet¹, Alexis Joly² [Details](#)





¹ UMR AMAP - Botanique et Modélisation de l'Architecture des Plantes et des Végétations

² ZENITH - Scientific Data Management

LIRMM - Laboratoire d'Informatique de Robotique et de Microélectronique de Montpellier, CRISAM - Inria Sophia Antipolis - Méditerranée

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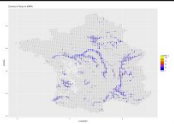
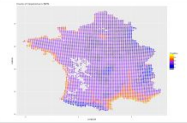


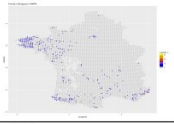




Les travaux de recherche

Application Article |  Open Access |   

Species distribution modeling based on the automated identification of citizen observations

Christophe Botella, Alexis Joly, Pierre Bonnet , Pascal Monestiez, François Munoz

Study of invasive species distribution

| Species names | Species distribution computed from PI@ntNet data | Maps from expert count data of INPN |
|--|--|--|
| <i>Acer negundo</i> L. Sensibility : 0,66 Specificity : 0,72 |  |  |
| <i>Carpobrotus edulis</i> (L.) N.E.Br. Sensibility : 0,94 Specificity : 0,89 |  |  |
| <i>Erigeron karvinskianus</i> DC. Sensibility : 0,64 Specificity : 0,72 |  |  |
| <i>Opuntia ficus-indica</i> (L.) Mill. Sensibility : 0,82 Specificity : 0,95 |  |  |
| <i>Reynoutria japonica</i> Houtt. Sensibility : 0,90 Specificity : 0,77 |  |  |

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Plant living in natural conditions



Reynoutria japonica Houtt.



Opuntia ficus-indica (L.) Mill.



Carpobrotus edulis (L.) N.E.Br.

Ornamental plants



Opuntia ficus-indica (L.) Mill.



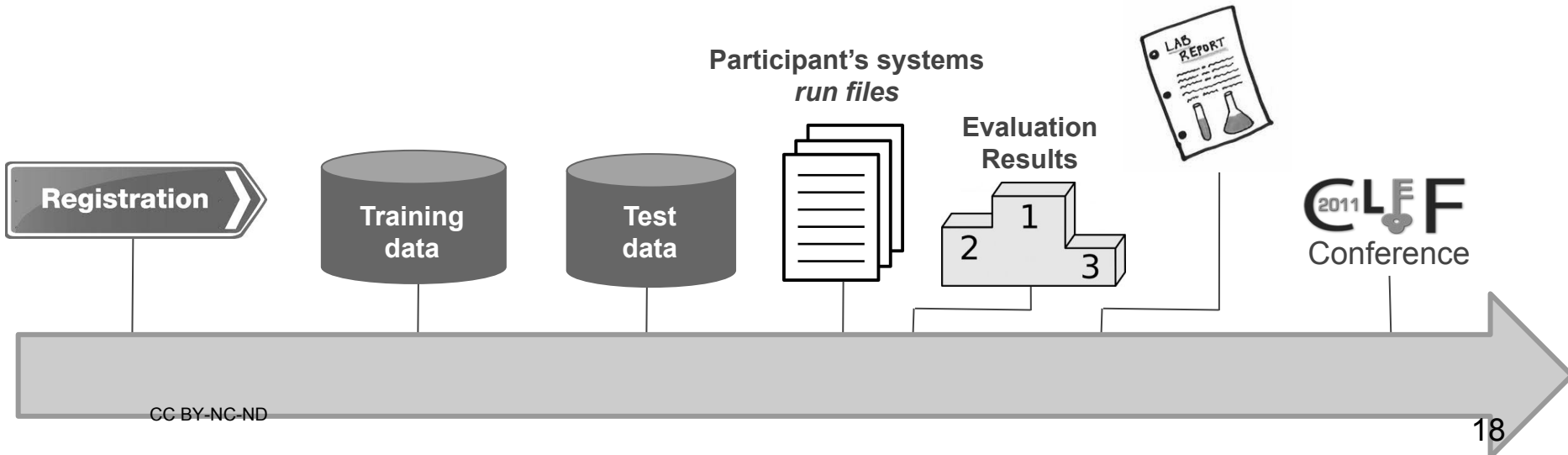
Carpobrotus edulis (L.) N.E.Br.



Les challenges LifeCLEF



- Pl@ntNet organize un challenge international annuel depuis 2011
- Des dizaines de chercheurs travaillent sur les données Pl@ntNet
- **System-oriented** benchmarks/competitions



LifeCLEF: Trois tâches



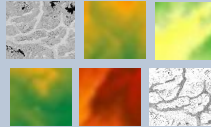
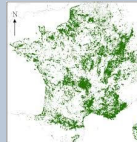
PlantCLEF



BirdCLEF



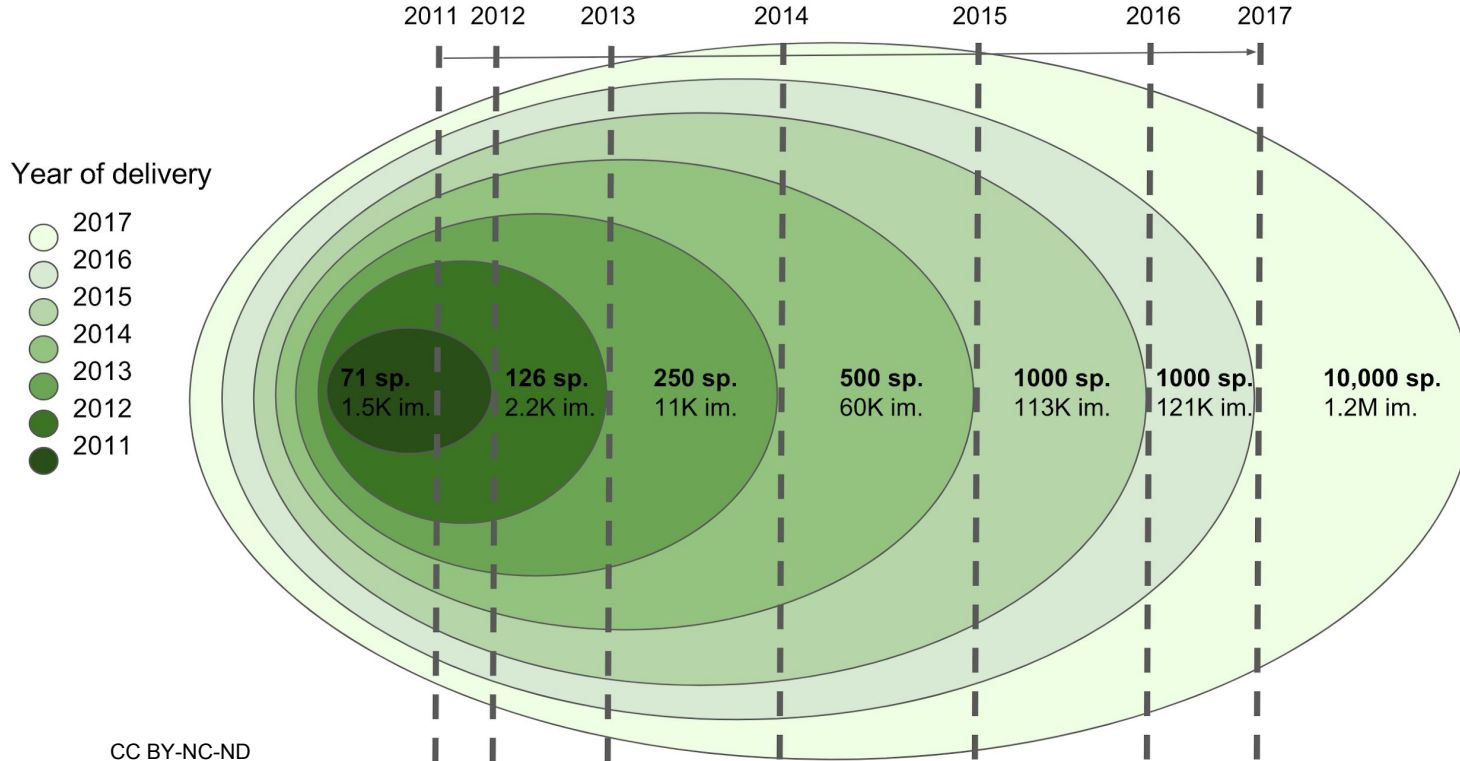
GeoLifeCLEF





PlantCLEF

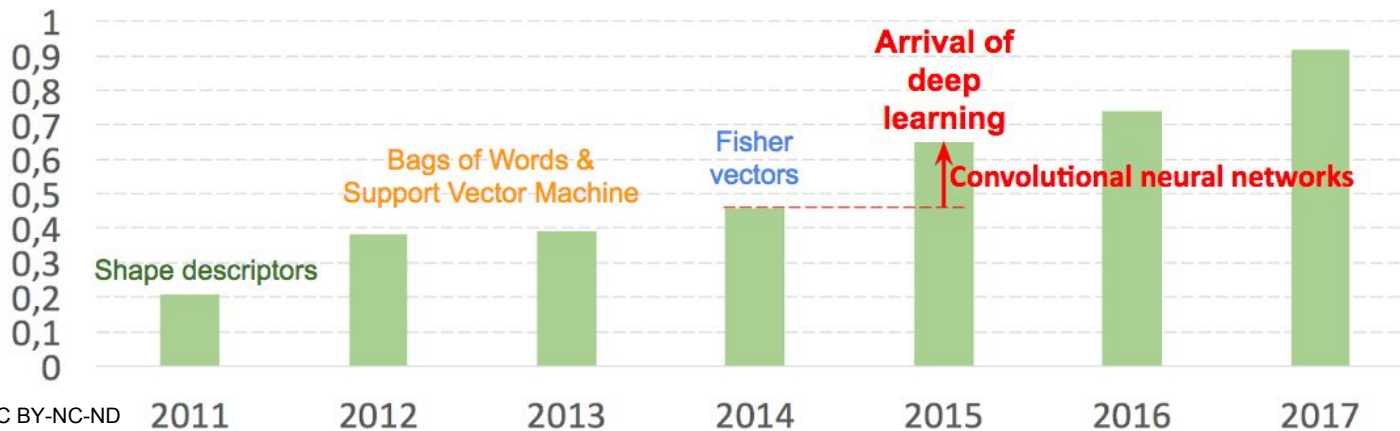
Yearly frontier between **training data (public groundtruth)** vs. **test data (private groundtruth)**





PlantCLEF

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|------------------|-------|--------|--------|--------|---------|---------|--------|
| Espèces | 71 | 126 | 250 | 500 | 1,000 | 1,000 | 10,000 |
| Images | 5,400 | 11,500 | 26,077 | 60,962 | 113,205 | 121,205 | 1.2 M |
| Nb. of particip. | 8 | 11 | 12 | 22 | 15 | 16 | 17 |
| Best perf. | 0,209 | 0,38 | 0,393 | 0,456 | 0,652 | 0,742 | 0,92 ! |

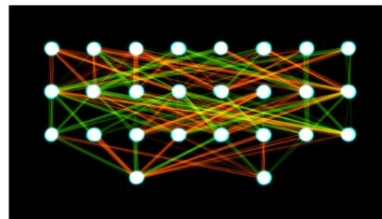




PlantCLEF

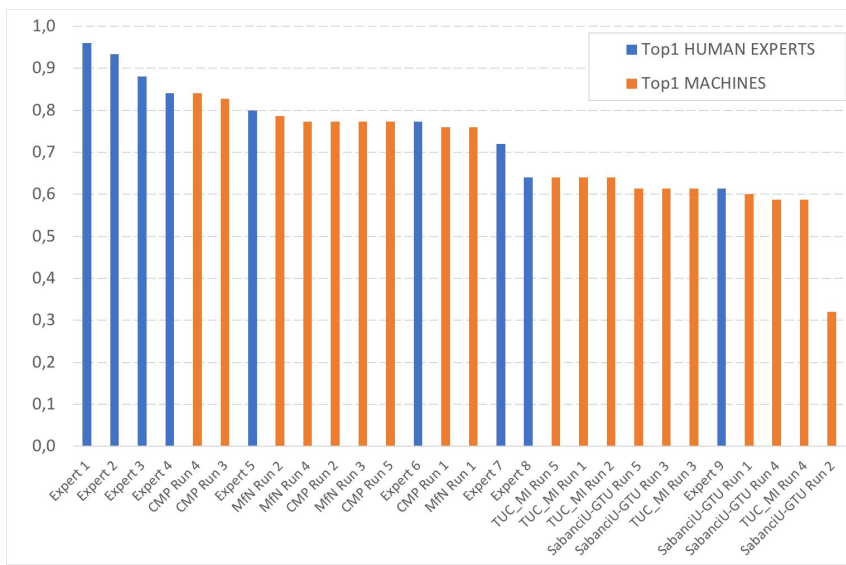


vs.



PlantCLEF 2018: Experts vs. Machines plant images identification

- 9 of the best of the best experts of the French flora
- 100 obs. including very difficult taxonomic groups

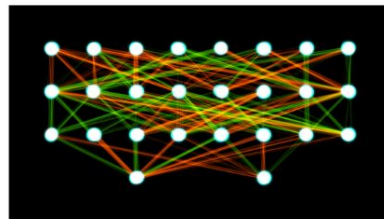




PlantCLEF

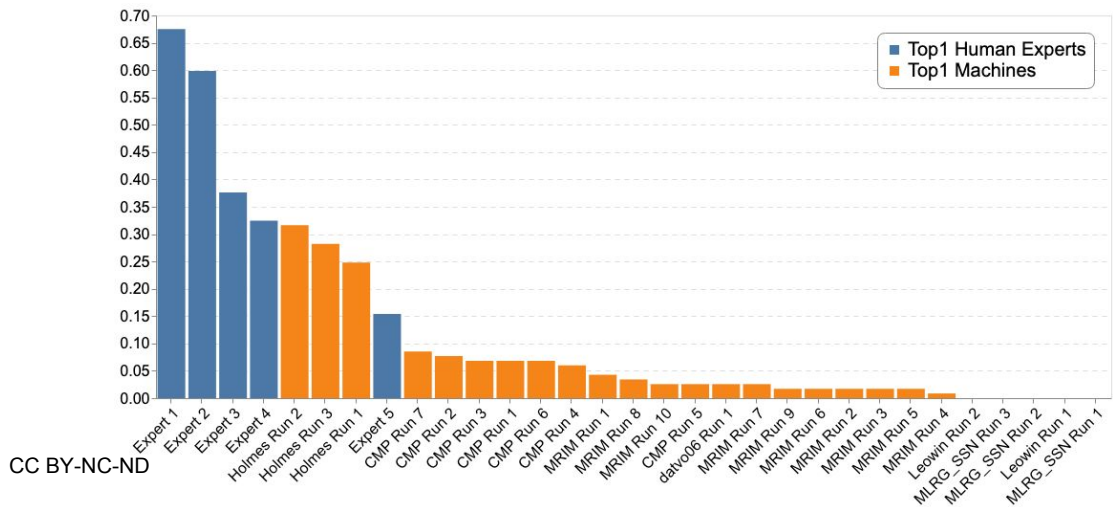


vs.



PlantCLEF 2019: Same experiment but on Amazonian flora

- 5 experts of the Amazonian flora
- 100 obs. including very difficult taxonomic groups



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Autres travaux de recherche en cours utilisant les données Pl@ntNet

- **Epidemio-surveillance des maladies des plantes (impact de la canicule)**
- **Indice de biodiversité à l'échelle nationale et européenne**
- **Impact des pratiques agricoles sur les milieux naturels limitrophes**
- **Identification des adventices des cultures pour limiter l'usage des produits phyto-sanitaires**

Pl@ntNet Partenaires

Modelling & Bio-statistics



AI for biodiversity



AI in Agriculture



Citizen Science



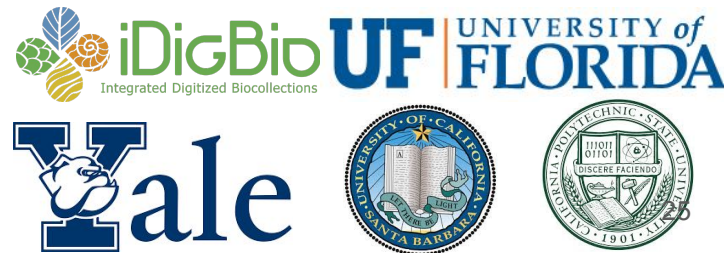
Computer science



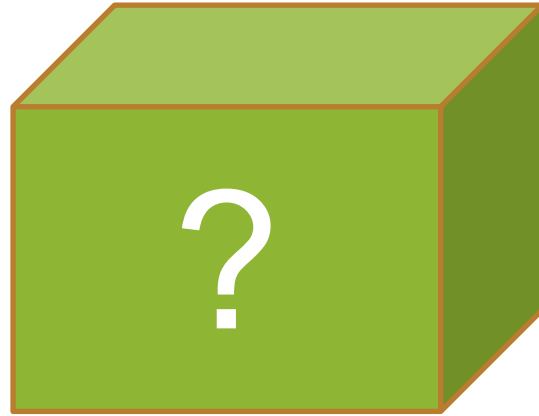
Biodiv. monitoring



Herbarium analysis



QUESTIONS ?



Thank you

Alexis Joly, CR Inria, ZENITH, LIRMM, Montpellier