UNIVERSITE GASTON BERGER
L'excellence au service du développement

ECOLE SUPERIEURE POLYTECHNIQUE

Early Detection of Eggplant Pests Based on the You Only Look Once (YOLO) App for Precision Agriculture

1. **Sarr O. M.** (2021). Gestion des populations de *Tuta absoluta* (Meyrick) et *Spodoptera frugiperda* (J. E. Smith), deux ravageurs exotiques au Sénégal. Thèse de doctorat, Université Gaston Berger, Laboratoire LaBAAM.
2. C. Nyasulu, A. **Diattara, A.** Traore, A. Deme, and C. Ba. 2022. Towards Resilient Agriculture to Hostile Climate Change in the Sahel Region: A Case Study of Machine Learning-Based Weather Prediction in Senegal. Agriculture, 12, 9 (2022), 1473. ACM, New York, NY, USA. https://doi.org/10.3390/agriculture12091473.
3. Nyasulu, C., **Diattara, A.**, Traore, A., Ba, C. (2021). Enhancing Farmers Productivity Through IoT and Machine Learning: A State-of-the-Art Review of Recent Trends in Africa. In: Faye, Y., Gueye, A., Gueye, B., Diongue, D., Nguer, E.H.M., Ba, M. (eds) Research in Computer Science and Its Applications. CNRIA 2021. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, vol 400. Springer, Cham. https://doi.org/10.1007/978-3-030-90556-9_10

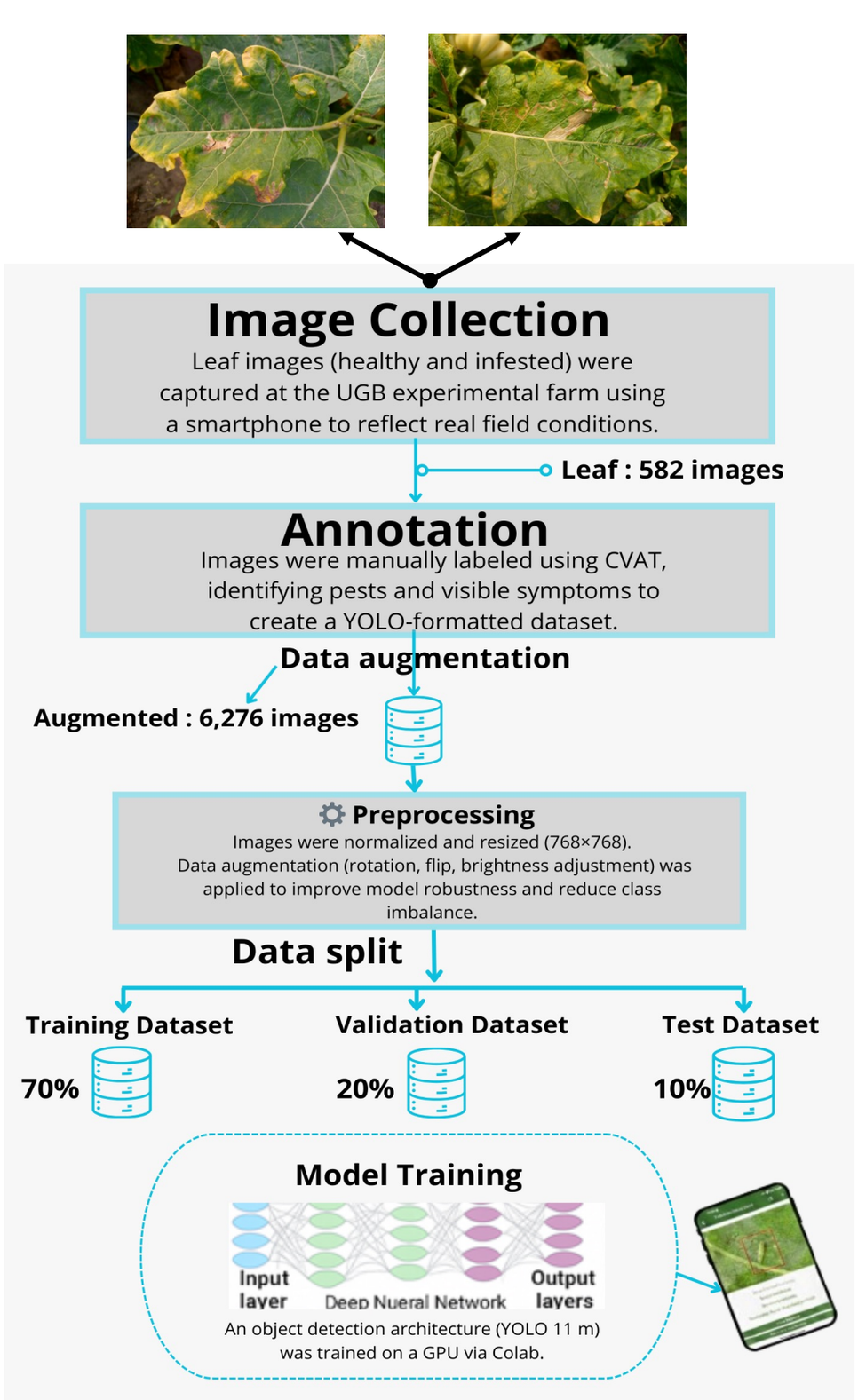
Introduction

Eggplants are one of the most common market gardening crops in Senegal, particularly in the Niayes region of northwest Senegal and the Senegal River Valley. They play a key role in food security and rural employment, but they are highly exposed to several pests such as Jassids (leafhoppers) and Tetranychus (spider mites).

On most farms, phytosanitary diagnosis is based on visual observation. This approach is often subjective and late, which leads to inappropriate and delayed interventions or even excessive use of pesticides.

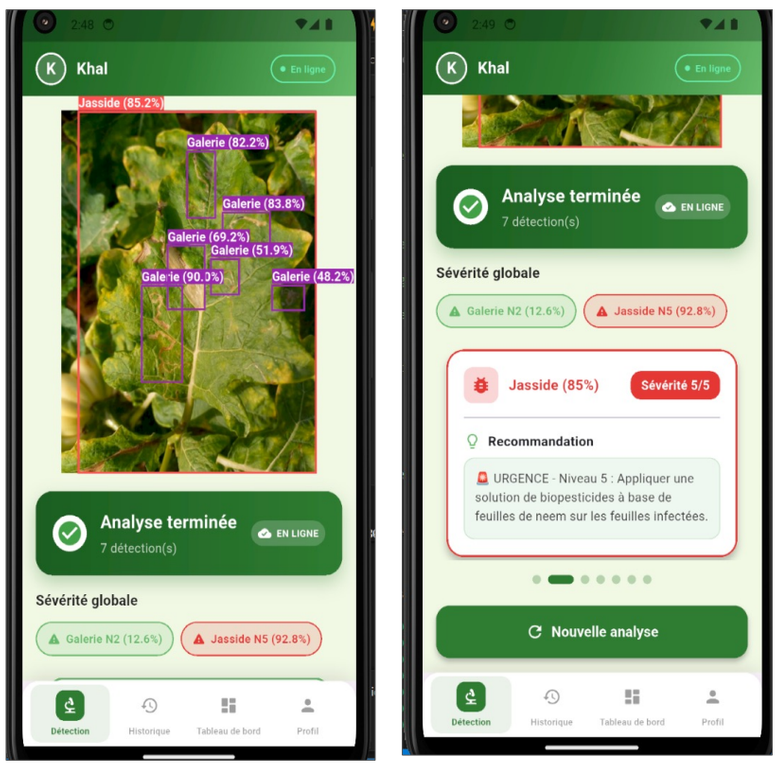
To address the inherent shortcomings of visual observation, we present an integrated decision-support system delivered through a mobile application based on artificial intelligence: You Only Look Once (YOLO). A field-ready application that enables early detection of priority eggplant pests from leaf images, combined with an estimation of the severity of attacks and decision support recommendations.

Materials & methods



Results and application

Split	Images	Instances	Precision(P)	Recall(R)	mAP50	mAP50-95
Validation	627	2 220	0.95	0.71	0.81	0.65
Test	336	1 406	0.91	0.82	0.88	0.78



- Pest identification with confidence scores
- Severity estimation
- Contextualized recommendations: Targeted control measures based on pest type and severity

Objectives

- Early detection of priority eggplant pests from leaf images;
- Estimate the level of severity of infestation according to an agronomic scale;
- Provide recommendations adapted according to the pest detected and the severity (integrated control);
- Deploy the solution in a hybrid mobile application working online and offline.

Conclusion

This study demonstrates the feasibility of real-time eggplant pest detection in field conditions using YOLO1m, enriched with severity estimation and decision-support recommendations. The hybrid mobile deployment (online/offline) supports continuous diagnosis even with limited connectivity, enabling early warning and improved crop protection practices.

Perspectives

- Expand the dataset across more seasons and regions (more diverse field images);
- Strengthen the recommendation module with additional validated integrated pest management rules;
- Extend to other vegetable crops such as okra.