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## THEME

**Plateforme robotique modulaire pour l'agriculture de précision**

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**Modular robotic platform for precision agriculture**

Presented by : REFAS Yassine Maachou

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## ABSTRACT

This thesis focuses on the development of a modular robotic platform designed to enhance precision agriculture, specifically targeting crop row detection and management. The research investigates the design and implementation of an autonomous movement system that utilizes the YOLOv8 model for accurate crop row detection. The platform integrates advanced machine learning algorithms and robotics to improve operational efficiency in agricultural practices. Key performance metrics, including precision and recall, were evaluated to assess the effectiveness of the system in real-world agricultural settings. The results indicate significant improvements in crop detection capabilities, demonstrating the potential of modular robotics to address current challenges in precision agriculture.

**Keywords:** Modular robotic platform, Precision agriculture, Autonomous movement system, Crop row detection, Agricultural robot.

## المخلص

تركز هذه الدراسة على تطوير نظام روبوتي معياري مصمم لتعزيز الزراعة الدقيقة، ويستهدف تحديدًا اكتشاف صفوف المحاصيل وإدارتها. يبحث البحث في تصميم نظام حركة ذاتي يستخدم نموذج YOLOv8 للكشف الدقيق عن صفوف المحاصيل. تدمج المنصة خوارزميات التعلم الآلي المتقدمة والاليات لتحسين الكفاءة التشغيلية في الممارسات الزراعية. وقد تم تقييم مقاييس الأداء الرئيسية، بما في ذلك الدقة والاستدعاء، لتقييم فعالية النظام في البيئات الزراعية في العالم الحقيقي. تشير النتائج إلى تحسينات كبيرة في قدرات الكشف عن المحاصيل، مما يدل على إمكانات الروبوتات المعيارية لمواجهة التحديات الحالية في الزراعة الدقيقة.

**الكلمات المفتاحية:** النظام الروبوتي المعياري، الزراعة الدقيقة، نظام الحركة المسنقة، الكشف عن صفوف المحاصيل، الروبوتات الزراعية.

## RÉSUMÉ

Cette thèse porte sur le développement d'une plateforme robotique modulaire conçue pour améliorer l'agriculture de précision, en ciblant spécifiquement la détection et la gestion des rangées de cultures. La recherche porte sur la conception d'un système de mouvement autonome qui utilise le modèle YOLOv8 pour une détection précise des rangées de cultures. La plateforme intègre des algorithmes avancés d'apprentissage automatique et de robotique afin d'améliorer l'efficacité opérationnelle des pratiques agricoles. Les principales mesures de performance, notamment la précision et le rappel, ont été évaluées afin de déterminer l'efficacité du système

dans le monde agricole réel. Les résultats indiquent des améliorations significatives dans les capacités de détection des cultures, démontrant le potentiel de la robotique modulaire pour relever les défis actuels de l'agriculture de précision.

**Mots-clés** : Plate-forme robotique modulaire, agriculture de précision, système de déplacement autonome, détection des rangées de cultures, robot agricole.