Cotton Disease Recognition Using YOLO

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Abstract: *Cotton cultivation is highly vulnerable to a range of diseases, which significantly affect both yield and crop quality. Traditional manual inspection methods are labor intensive, error-prone, and not scalable. This study introduces an automated cotton disease detection framework leveraging the advanced YOLOv8 (You Only Look Once version 8) architecture along with Google's Gemini AI for enhanced analysis. The system enables real-time image-based disease identification on low power devices such as smartphones. Transfer learning is applied to optimize detection accuracy while minimizing the requirement for large annotated datasets. Integrating Gemini AI provides intelligent insights and expert guidance, enhancing decision-making and field-level interventions. This approach improves productivity, reduces losses, and supports smart agricultural automation.*

Keywords: YOLOv8, cotton disease detection, Gemini AI, transfer learning, real-time image processing