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TreeSense: AI-Powered Tree Detection System Using Aerial Imagery

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Abstract: *TreeSense is a lightweight, AI-powered web platform designed to simplify and democratize environmental monitoring through satellite and aerial imagery analysis. Aimed at addressing the limitations of traditional tree and land-use surveys—which are often time-consuming, resource-intensive, and technically demanding—TreeSense offers an intuitive solution for users to detect tree count, assess vegetation health, and analyze land usage patterns with minimal effort. The system integrates advanced APIs such as Mapbox for geographic selection, OpenWeatherMap for contextual weather data, and the Gemini API for intelligent image interpretation. Operating entirely on the frontend without the need for backend storage or custom-trained machine learning models, the platform allows real-time image processing and visualization via interactive charts and descriptive insights. Users can compare two images taken at different times to observe environmental changes such as deforestation or urban expansion. Employing conceptual algorithms like YOLOv8 for object detection, NDVI estimation for vegetation health, and semantic segmentation for land classification, TreeSense presents a robust foundation for academic research, civic planning, and ecological monitoring. The system was developed using an agile methodology with React.js and is optimized for accessibility and deployment efficiency. Future work aims to enhance detection accuracy, incorporate historical analysis via backend storage, and support real multispectral NDVI inputs. TreeSense stands as a scalable and user-friendly innovation in AI-assisted environmental intelligence*

Keywords: TreeSense

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