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PROJECT PROPOSAL

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Smart Autonomous Wheelchair with Indoor Navigation and AI-based Obstacle Avoidance

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PROJECT SUMMARY

Smart Autonomous Wheelchair with Indoor Navigation and AI-based Obstacle Avoidance

Summary

This project aims to develop a Smart Electric Wheelchair equipped with indoor navigation, AI-powered obstacle detection, and remote control via mobile and web applications.

The system addresses a real challenge in hospitals: helping elderly and disabled patients move autonomously from one location to another, especially when they have medical appointments.

The wheelchair will automatically navigate inside the hospital, pick up the patient, and deliver them to the designated clinic or department — while avoiding obstacles, ramps, and people using computer vision and sensors

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Objectives

- Design and build an autonomous, motorized wheelchair.
- Implement real-time indoor localization using BLE beacons or visual tags.
- Integrate computer vision to detect obstacles, people, and ramps.
- Build a mobile app and website for appointment booking and system control.
- Ensure the system is safe, user-friendly, and adaptable in hospital environments.

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- Patient or staff books an appointment through the app.
- The wheelchair determines the patient's location indoors.
- The system sends a command to the wheelchair to move to that location.
- The wheelchair navigates autonomously, avoiding obstacles and reaching the destination safely.
- Real-time monitoring and manual override are available through the admin panel.

Key Functionalities

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System Components

Hardware:

- Electric Motor + Battery-powered Wheelchair
- **Microcontroller** (e.g., ESP32 or Arduino)
- **Raspberry Pi** for AI processing and camera input
- **Camera Module** (Raspberry Pi Camera or USB Camera)
- **Ultrasonic Sensors / LiDAR** for obstacle detection
- **BLE Beacons or QR Codes** for indoor localization
- Optional: **Depth Camera** for enhanced safety

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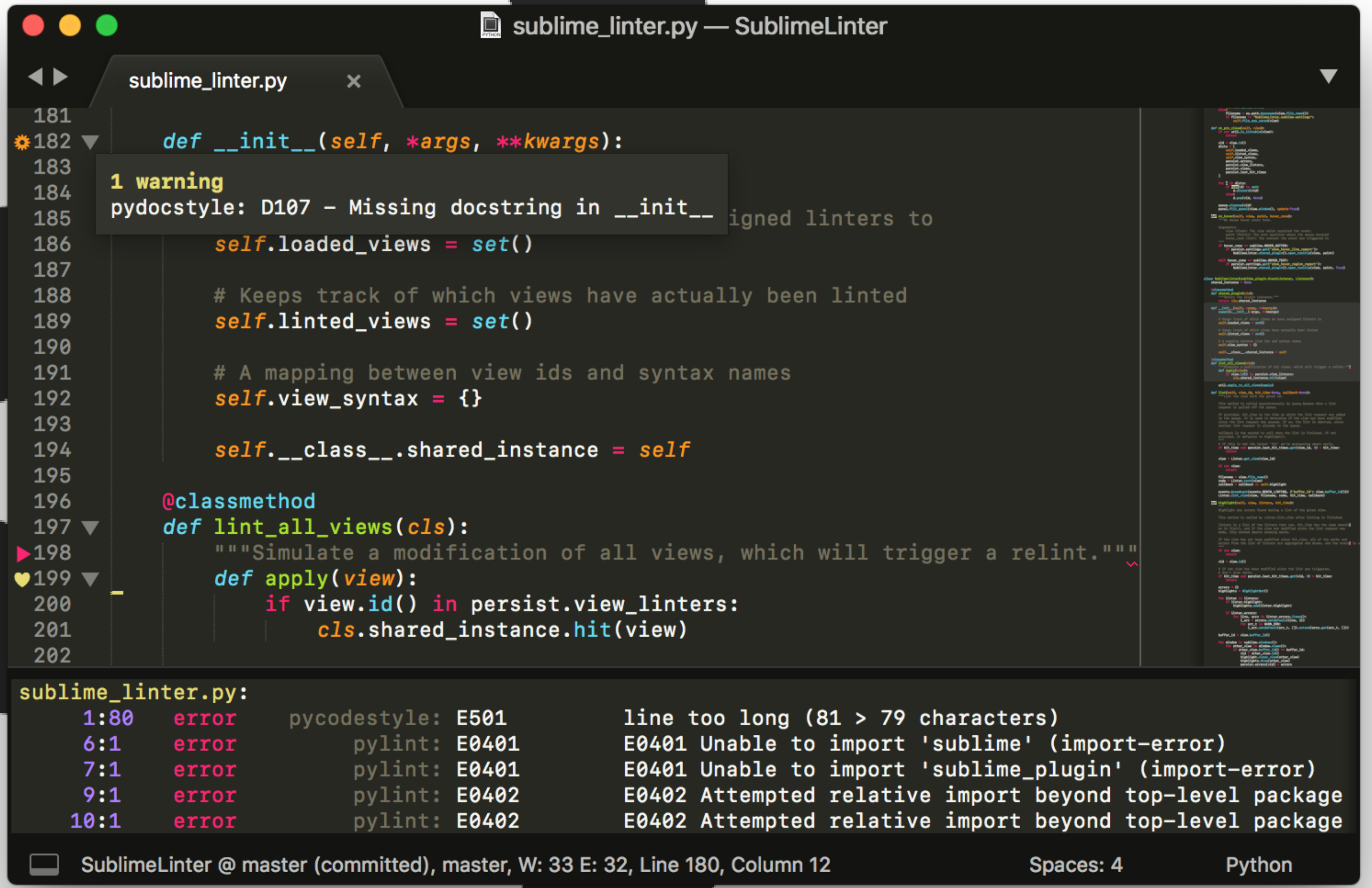
System Components

Software:

- **Mobile App** (Android/iOS) for patients or staff to book appointments
- **Web Dashboard** for hospital admin to monitor and control wheelchairs
- **Backend Server** (Node.js / Django / .NET Core)
- **Database** (Firebase / MySQL)
- **AI Models** (YOLO / OpenCV) for object and person detection
- Integration with BLE or QR tag libraries for indoor positioning



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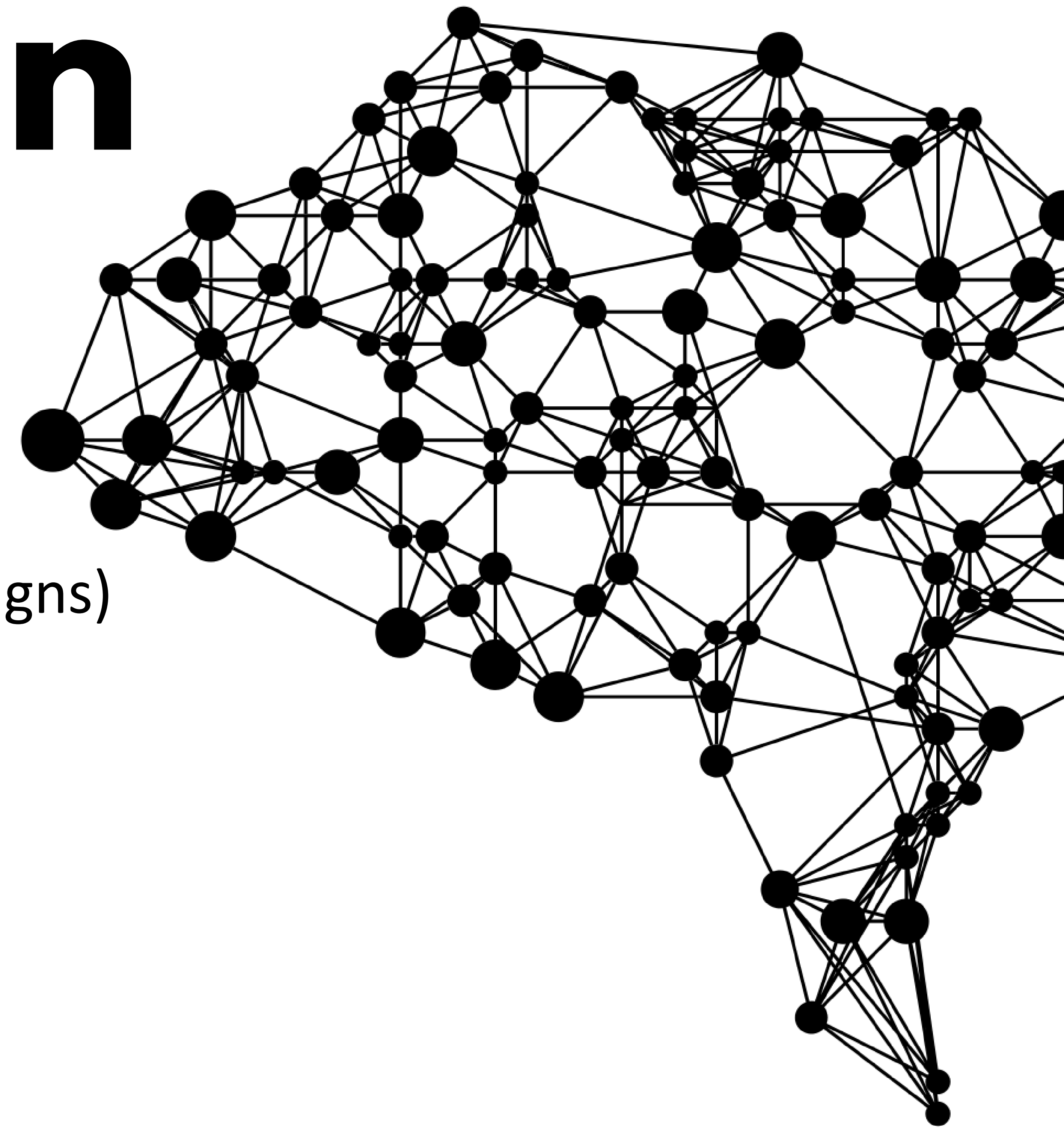
AI & Computer Vision

- Use **YOLO or OpenCV** to detect:
  Obstacles (chairs, beds, walls, etc.)
  Humans
  Ramps (based on shape, color, or surrounding signs)
- Implement **safe navigation logic**:
  Stop motor if someone is too close
  Reroute if the path is blocked



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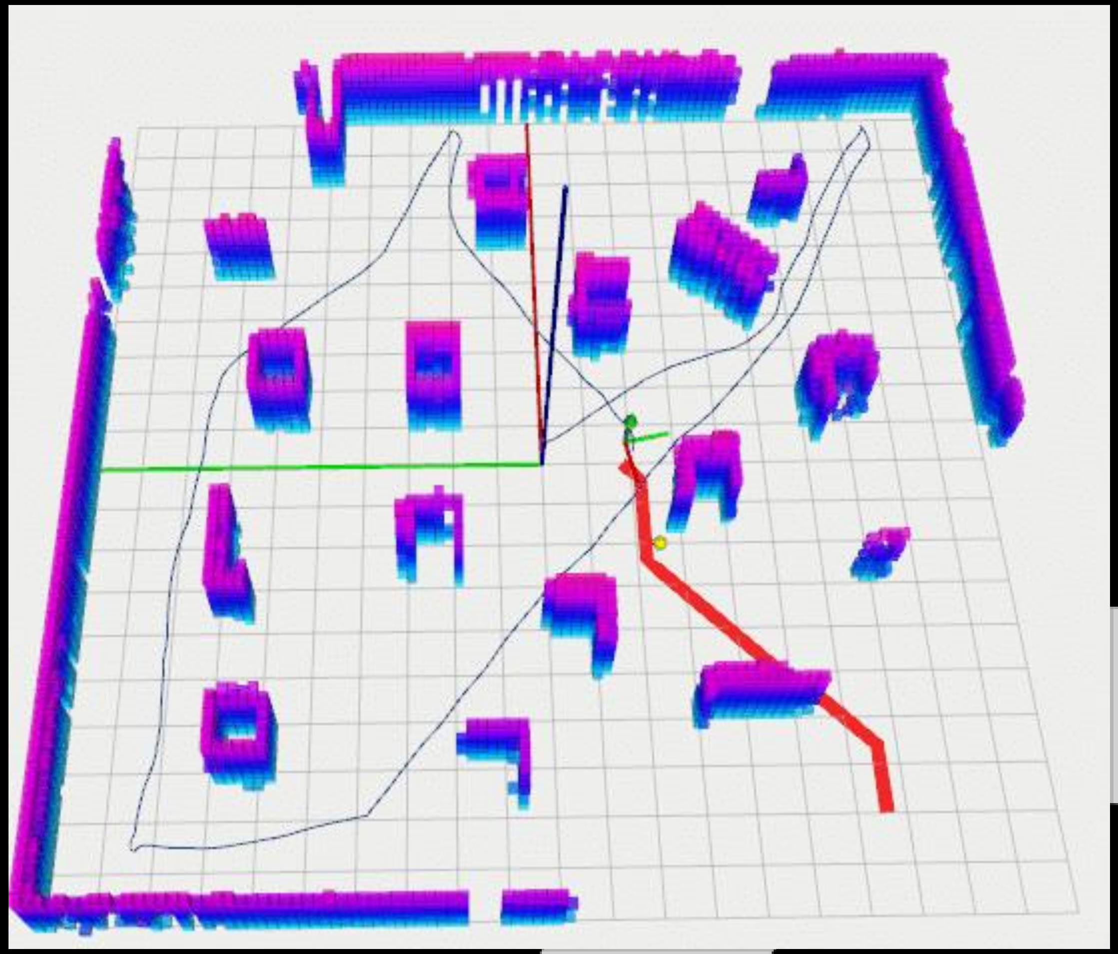
Indoor Positioning Solutions

- **BLE Beacons:** Small Bluetooth devices placed in fixed hospital locations to help estimate current wheelchair location.
- **AprilTags or QR Codes:** Visual markers scanned by the camera to determine the exact position.
- **SLAM** for advanced mapping and autonomous exploration.



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Expected Benefits

- Helps patients with mobility issues to move independently.
- Reduces hospital staff workload.
- Combines both hardware and software — making it a strong, innovative final year project.
- Can be scaled into a real startup product in the assistive technology field.

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Cost Of Project

Minimum: ~ 14,500 EGP
Maximum: ~ 24,999 EGP

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Conclusion

This project leverages modern technologies such as AI, computer vision, and IoT to create a smart assistive mobility solution. With a focus on improving hospital efficiency and patient comfort, the smart wheelchair has strong potential both academically and commercially.

THANK YOU

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