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TITLE PAGE

- **Problem Statement ID –** 25115
- **Problem Statement Title-** Student Innovation:

  Swadeshi for Atmanirbhar Bharat - Miscellaneous
- **Theme-** Miscellaneous
- **PS Category-** Hardware
- **Team ID-**
- **Team Name -** CLOVER

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HUMANOID CUSTOMER REPRESENTATIVE

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PROBLEM ADDRESSED & PROPOSED SOLUTION

In high-traffic service sectors like **hospitals**, **banks**, and **campus offices**, users often face delays due to **staff unavailability** or **overload**. **Non-tech users** struggle with **digital systems**, leading to confusion, long queues, and poor service experience.

SOLUTION

A **Humanoid Customer Representative**—a semi-autonomous assistant combining **voice interaction, touch interface, and physical presence**. It handles **routine queries**, **guides users**, and integrates with **institutional databases** for real-time, secure responses.

- **Voice + Touch Interface** for accessibility
- **Sensor-triggered activation** for walk-up interaction
- **Multilingual-ready architecture**
- Modular shell with **screen**, **mic**, **speaker**
- AI backend with **pre-fed FAQs** + **server integration**

INNOVATION & UNIQUENESS

- PHYSICAL presence builds trust, especially for non-tech users
- Low-cost, scalable b*u*ild using repurposed components
- Hybrid design: software intelligence + hardware interface
- Privacy-first architecture with local processing and secure data fetch
- Let me know when you're ready to move to Slide 2: Technical Approach. I'll keep it equally compact and impactful.

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TECHNICAL APPROACH

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TECH ARCHITECTURE OVERVIEW

SOFTWARE

- **Python** – backend logic & voice pipeline
- **JavaScript + HTML/CSS** – interface, animated face, touch menu
- **Rasa / Dialogflow CX** – conversational AI, intent handling
- **Vosk (offline STT)** – speech recognition in regional languages
- **gTTS / pyttsx3** – text-to-speech
- **SQLite / Firebase** – FAQ DB, logs, user interactions
- **REST API** – secure integration with org servers

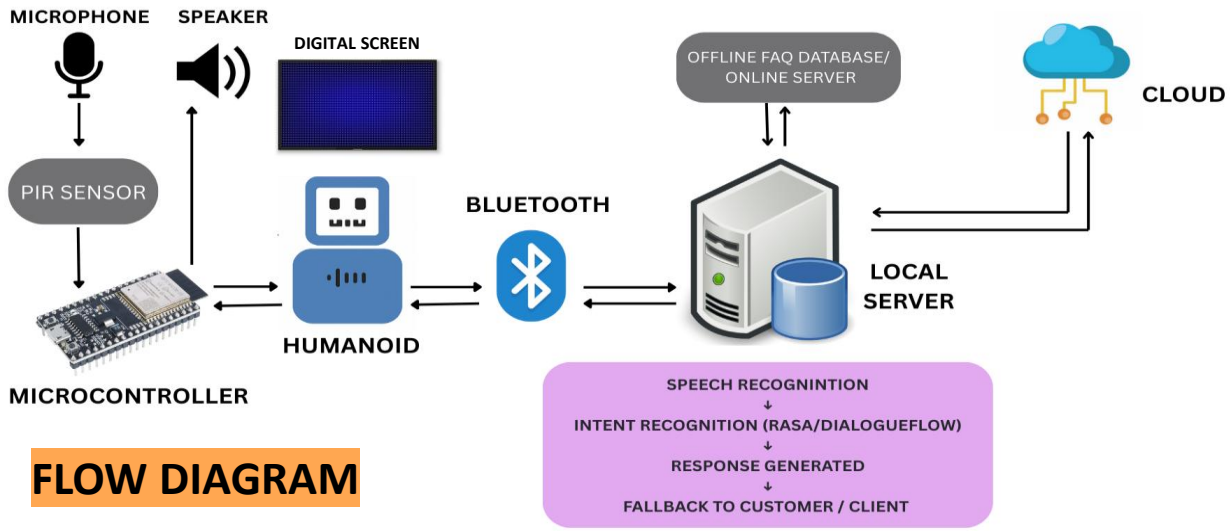
HARDWARE

- **Embedded board / PC**
- **Digital screen > Mic + Speaker**
- **Sensors (presence PIR / touch)**
- **Wi-Fi & Bluetooth**

SECURITY & PRIVACY

- **Local AI processing** – minimizes data leakage
- **Role-based access** – secure data fetch
- **Offline fallback** – handles queries without internet

FLOW DIAGRAM



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FEASIBILITY AND VIABILITY

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FEASIBILITY ANALYSIS

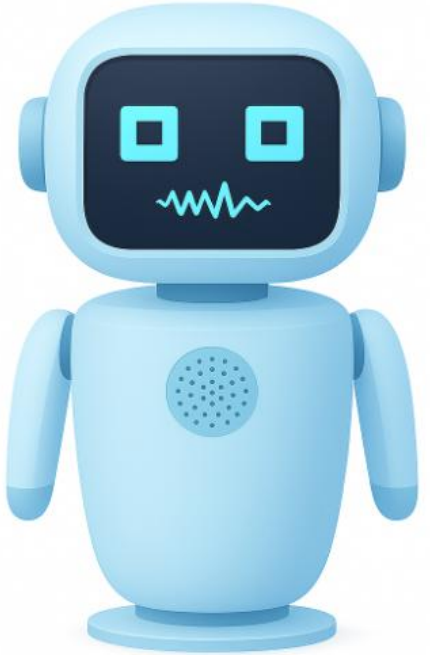
- **Multi-Sector Ready:** Deployable in hospitals, banks, and campuses with minimal reconfiguration.
- **Portable Power:** Runs on compact 3.7V Li-Po battery ensuring uninterrupted service.
- **Offline Core:** Essential functions operate locally, avoiding internet dependency.
- **IoT-Enabled:** Presence detection sensor triggers instant, automatic activation.
- **Modular Interface:** Dual support for touch and voice inputs for flexible user interaction.
- **Scalable Rollout:** Can function with or without database access—serving as receptionist, guide, or query agent.

IMPLEMENTATION CHALLENGES

- BATTERY life sustainability.
- Accurate speech recognition in noisy settings.
- Comfort level of first-time/non-tech users.
- Durability of the physical hardware in public spaces.

MITIGATION STRATEGIES

- Optimized low-power circuitry and smart sleep modes.
- Noise suppression algorithms for speech clarity.
- Guided onboarding with multilingual prompts and visual cues.
- Maintenance workflows via student volunteers or staff for routine upkeep.



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IMPACT AND BENEFITS

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IMPACT

- **Inclusive Access:** Intuitive interface for non-technical users, minimizing app/digital literacy barriers.
- **Reduced Wait Times:** Instant guidance for bank customers, hospital visitors, and campus users.
- **Staff Efficiency:** Automates repetitive queries, freeing personnel for priority tasks.
- **High-Footfall Service Enhancement:** Acts as a first-point assistant in crowded counters.
- **Accessibility:** Supports elderly, rural populations, and users with limited tech exposure.

BENEFITS

- **Time Efficiency:** Speeds up query resolution and navigation guidance.
- **Cost Savings:** Reduces need for additional staff for routine tasks.
- **Scalable Deployment:** Easily replicable across sectors with minimal configuration.
- **Trust & Comfort:** Physical presence + voice interaction enhances user confidence.
- **Offline Reliability:** Core functions operate without internet.
- **Modular Customization:** Interface, language, and responses adaptable per deployment.

FUTURE SCOPE

- **Multilingual Expansion:** Regional language support for broader inclusivity.
- **Biometric Integration:** Optional user verification for personalized responses.
- **Gesture & Emotion Recognition:** Non-verbal interaction and adaptive responses.
- **Sector-Specific Modules:** Tailored roles for hospitals, banks, and colleges.
- **Data Analytics:** Query logging for operational insights and continuous improvement.

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RESEARCH AND REFERENCES

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TOPIC	SOURCE TITLE	LINK
Conversational AI Framework	Rasa vs Dialogflow Comparison	https://botpenguin.com/blogs/rasa-vs-dialogflow
Offline Speech Recognition	VOSK Speech Recognition Toolkit	https://alphacephei.com/vosk
IoT Sensor Integration	PIR Sensor with ESP8266 & Arduino IoT Cloud	https://www.electroniclinic.com/pir-sensor-with-esp8266-nodemcu-and-arduino-iot-cloud
Modular Humanoid Design	Modularity in Humanoid Robot Design – DLR	https://elib.dlr.de/202909/1/wolf_modularity_copyright.pdf
Privacy-First AI Architecture	Privacy-First AI Architecture	https://macaron.im/privacy-first-ai-agent
Impact in Public Sector	Humanoid Robots in Government – Proven Robotics	provenrobotics.ai