Product features	Curent state	GAP	Future state	Action plan
Filter Life Monitoring	Most purifiers use fixed time-based alerts (e.g., "replace filter every 6 months") regardless of actual usage.	Technology Gap No real-time monitoring of filter wear based on water quality or flow volume.	Real-time filter life tracking using sensors for TDS (Total Dissolved Solids), flow rate, and total water processed.	• Integrate flow sensors + TDS sensors + usage log in microcontroller to compute real-time filter degradation. Trigger alerts via LED or app.
Water Quality Feedback	Users can't see the actual input/output water quality (e.g., TDS, pH).	Lack of transparent data on purification effectiveness.	Display or app shows incoming and outgoing water TDS/pH levels in real time.	Add input/output TDS and pH sensors. Display readings on a small LCD screen or sync with mobile app for real-time insights.
Predictive Maintenance & Alerts	Users only know there's an issue when water stops or taste changes.	No proactive diagnostics or predictive alerts before breakdowns.	System predicts faults before they happen: pump wear, sensor faults, leakage.	Use pressure sensors to detect flow anomalies, vibration sensors on pump, and machine learning to recognize fault patterns over time. Send predictive alerts via app.
Mobile App Integration	Controlled physically or via IR remote only	No mobile interface for viewing data or managing the purifier	Fully-featured mobile app for monitoring, control, alerts, and scheduling	Develop Android/iOS app; add Bluetooth/Wi-Fi to purifier; sync sensor/control data via secure protoco