PUREair: Smart Air Quality Monitoring Predicting and Alerting System

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Air pollution causes over 7.9 million deaths each year and significantly contributes to non communicable diseases worldwide. Despite its serious health effects, many people are unaware of the air quality around them. The PUREair aims to close this gap by creating a system that monitors, predicts, analyzes, and alerts users and authorities about hazardous air conditions. PUREair consists of multiple sensing device models, generating environmental data points for centralized analysis. These devices can be either indoor or outdoor and are installed by authorities or used by the general public. Outdoor devices continuously upload air quality data to the database. Indoor devices upload selected data based on their environment while also helping users understand the air quality around them. The collected data are stored in a centralized database accessible to authorities for environmental regulation and response planning. A predictive algorithm analyzes aggregated data points, historical trends, wind patterns, and weather conditions to forecast air quality and issue early warnings to the public and relevant authorities. To evaluate effectiveness, three tests were conducted. In testing early warning capability, the system alerted 55% earlier before air quality reached very unhealthy levels. In predicting AQI where sensors are not present, the system achieved 95% accuracy. When using indoor AQI sensors for prediction, the collected data showed that there is no significant difference in the selected indoor values and outdoor values in 95% confident level collected at the same time. PUREair enhances environmental awareness, emergency preparedness, and air quality management.

Awards Won:
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: Full Scholarship from King Fahd University of Petroleum and Minerals(KFUPM) (and a $400 cash prize)
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: NOT TO BE READ -- $400 cash prize for each Full Scholarship from King Fahd University award recipient