Introduction

Pollution is one of the biggest global killers, affecting over 100 million people. That’s comparable to global diseases like malaria and HIV. 4.2 million Deaths occur every year as a result of exposure to ambient (outdoor) air pollution. [1] Fuel combustion from motor vehicles (e.g. cars and heavy duty vehicles) is one of the major source of outdoor air pollution. The pollutants with the strongest evidence of health effects are particulate matter (PM), ozone (O3), nitrogen dioxide (NO2) and sulphur dioxide (SO2). Nitrogen dioxide and nitric oxide are referred to together as oxides of nitrogen (NOx). NOx gases react to form smog and acid rain as well as play a central role in the formation of fine particles (PM) and ground level ozone.  Long term exposure can decrease lung function, increase risk of respiratory conditions and increases the response to allergens. High levels of NOx can have a negative effect on vegetation, including leaf damage and reduced growth, making NOX the most harmful pollutant in the air. 40-65% of NOx emissions is contributed by road transportation across all continents and with increasing population and urbanisation this share is exponentially increasing.

The group of people most impacted by ambient air pollution due to NOx are daily commuters, particularly non – air conditioned public transport passengers, two wheelers and pedestrians. The primary step towards controlling NOX emissions is continuous monitoring of its emissions from various sources, both temporally and spatially and bringing to notice its alarming consequences to groups of people most affected by it, in a form easily understandable and decipherable by them to ensure maximum impact.

Real time monitoring stations have been set up by central authorities in India for continuous monitoring of four ambient air pollutants viz., Sulphur Dioxide (SO2), Oxides of Nitrogen as NO2, Suspended Particulate Matter (SPM) and Respirable Suspended Particulate Matter (RSPM/ PM10), however they are sparse in number as well as produce erroneous and inaccurate data. Their maintenance is often expensive and elaborate. There are only 28 live monitoring stations in Delhi including all government bodies, CPCB, IMD and DPCC. The average distance between two stations is twenty kilometers. The data acquired from these stations is extrapolated to predict air quality across Delhi. This method however popularly used, fails to predict local variations in pollutant concentrations accurately. Moreover, concentration of pollutants emitted by vehicles are significantly higher on major roads as compared to locations where most monitoring stations are situated.

Alternate methods are required which tackle all these problems and meet all aforementioned objectives simultaneously to provide consistent data which is both spatially and temporally dense.

The average time taken by a vehicle to travel between two coordinates on a road due to traffic conditions can be obtained through API. This is called the traffic time. The goal of this paper is to find relation between NOx concentrations in ambient air and traffic time so that values of NOx can be predicted using traffic parameters as the major variable. This would lead to prediction of NOx concentrations at all road coordinates where traffic time is available, thereby localizing data acquisition along roads. This will lead to greater accuracy in data and reduce absolute dependency on air concentration monitoring stations.

Delhi is chosen as the primary location for data collection and testing, specifically locations along the Ring Road with high vehicular traffic and ambient air quality monitoring stations – Punjabi Bagh, AIIMS, Mall Road(DU), Azadpur.

An android application is designed to provide users with current pollution status at the location coordinates of the device. The application functions by initially requesting for the current location of the user to select the nearest pollution station from the database of live monitoring stations. It simultaneously retrieves traffic data using the TOMTOM API for the current location and stores it in the same database. The database is stored in cloud using Firebase. Machine learning algorithm runs locally on the device to predict the NOx values of the next interval (of 15 minutes). Health effects and prevention solutions are provided to the user to reduce impact due to pollutant concentrations. An android application is chosen as a solution due to its ease of usability, customisation, accessibility and providing updates.