The detection and tracking of fires is commonly achieved through the use of satellite data, with models relying on abnormal heat signatures and bright spots on the Earth’s surface [1]. While this approach is effective for detecting large wildfires, it is not suitable for tracking urban fires which are more frequent and have a greater impact on people [2].

To address this, we propose a new fire tracking and forecasting platform, called “FireCOM.” This platform utilizes real-time data on fires and building footprints, combined with weather information, to accurately predict the smoke fallout one, two, and three hours after a fire incident. The FireCOM model has the potential to improve public health by warning people about lowered air quality conditions, as well as assisting fire departments and decision-makers in mitigating the effects of fire and smoke. The primary function of this model will be as an early warning system, providing citizens with crucial information about potential hazardous fires and smoke.

Figure 1: A VSmoke smoke simulation in-browser, with residences affected also highlighted according to smoke impact.

In our study, we showcase three main areas of novelty: data integration, 2D to 3D shifting, and use of public data. In shifting to a 3D perspective of the city, including footprints, air sensors, weather updates, and census information from various sources, such as building footprints, we were able to obtain a realistic understanding of how each fire will develop, providing citizens and firefighters with informed decisions when dealing with fires in their communities.

Our work was based entirely on public data, and the open-source code that we released makes this model easily generalizable and replicable to any city.

Figure 2: A diagram of the urban smoke prediction workflow.

Figure 3: A comparison of VSmoke and MantaFlow predicted smoke outputs.

Figure 4: A comparison of FireCATWildfire Risk Assessment (left) and our Fire Averages per tract (right).

Figure 5: Our 2D real-time fire and smoke map in-browser.

Figure 6: Our 3D real-time fire and smoke map in-browser.

Figure 7: An example supervised smoke fluid simulation in-browser, showing a potential fire and fallout at UT Tower.

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