# EMPLOYING MACHINE LEARNING AND AI TECHNIQUES TO DETERMINE EMISSION SOURCES

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# INTRODUCTION

As community and fence-line air monitoring initiatives expand nationwide, effectively utilizing the collected data is crucial.

Applying artificial intelligence and machine learning can greatly speed up the process of source identification.

# OBJECTIVES

Identify emission sources

Predict downwind community exposure

Assess health impacts on local communities

# HOW AI AND MACHINE LEARNING WORKS

## BASIC INPUTS AND SETUP PARAMETERS

- AI and machine learning utilize large data sets to predict outcomes
- Data must be recent high quality
- Data sources must be matched on a similar time interval
- Understanding of local site topography
- Data sets should include measured pollutants, meteorological parameters, location of instruments and potential sources

# HOW AI AND MACHINE LEARNING WORKS

## THE AI ENGINE

- Train the AI model on all data inputs – identify a pollutant with a known emission source
  - Examples - SO2 emission from a stack, data from a known release such as a spill
- Continuously record data from fenceline and met parameters during an event - this becomes training data
- Continue to do this throughout a known event
- These parameters are then used to help identify sources when then the actual source is unknown
- The more times you do this, the better the system gets at predicting where the source would be

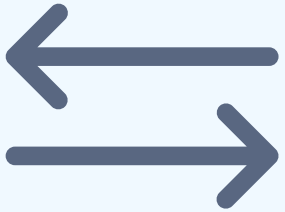
# HOW AI AND MACHINE LEARNING WORKS

## IN DEPTH ANALYSIS

- Identify correlations between long-path and point monitoring systems
- Use sophisticated statistical and data processing algorithms
- Pinpoint emission sources in near real-time

# DATA SOURCES – HIGH QUALITY

Open-source, real-time websites



Open-path systems

Monitoring stations operated by regulatory agencies

# CASE STUDY DEVELOPMENT

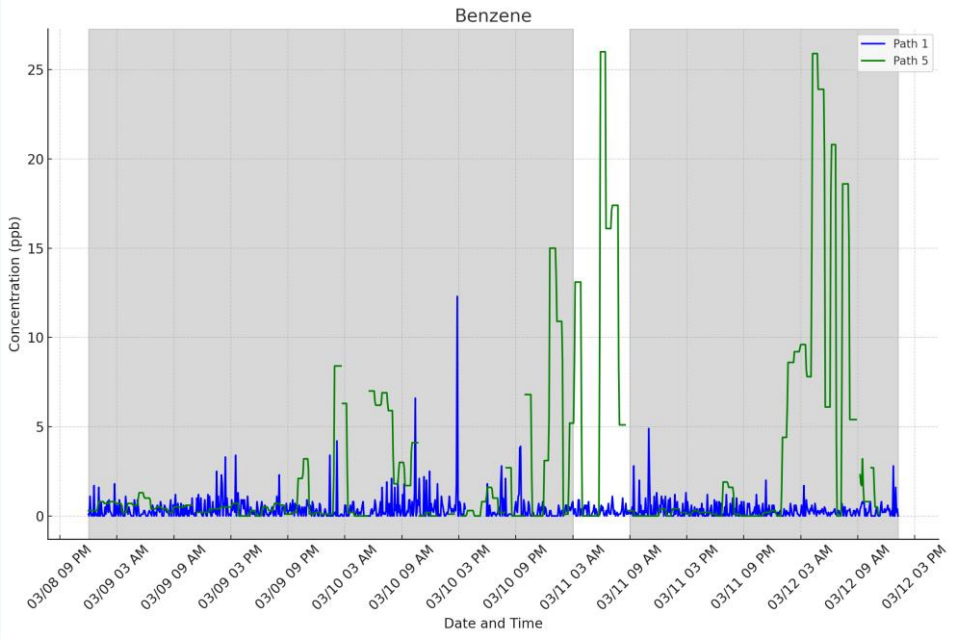
Large scale chemical release from a tank at a refinery in Southern California

We are initiating development on an AI system that uses specific detection events with known sources as training data.

Example: Tank rupture on March 9th, 2021, at P66 LA Wilmington.

Data includes fenceline data (open path UV and FTIR systems), meteorological data, and data from community air monitoring systems by South Coast AQMD.

# DATA EVALUATION METHOD




Collect data from known events to train the AI model

Use 90% of the data to evaluate a random 10%

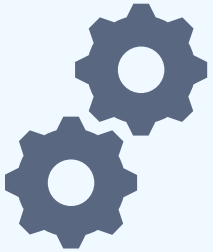
This iterative approach ensures robust evaluation of the AI system

# GOALS

- To perform source emission identification compliant with the requirements under Senate Bill 674.
- Plan to apply this approach in the Bay Area facilities using the same methodology.

# BENEFITS OF MACHINE LEARNING

Adaptable to available resources



Automated processes

Quick implementation

# CONCLUSION

Machine learning is a valuable tool for fenceline monitoring

- **Enhanced Source Identification -** Accurate and detailed emission source identification.
- **Refined Analysis -** Precise direction and location determination with meteorological data.
- **Continuous Improvement -** Better predictions with ongoing data integration.

# Q&A

# CONTACT

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