INFE²R (INVERSION FOR FINE-SCALE EMISSIONS AND EXPOSURE REFINEMENT)

Tech ID: 34024 / UC Case 2025-128-0

PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

Traditional air quality monitoring often lacks the resolution to pinpoint specific emission sources within a city, leaving "hyperlocal" pollution spikes undetected. To address this, researchers at UC Berkeley have developed INFE²R, a sophisticated method for detecting and refining airborne pollutant emissions at a neighborhood scale. The system utilizes a Weather Research and Forecasting (WRF) module to generate high-resolution meteorological inputs, which are then processed through a Stochastic Time Inverted Lagrangian Transport (STILT) module to create a source-receptor transfer matrix. By combining prior emission estimates with a cross-dimensional assimilation of both fixed and mobile sensor measurements, the platform employs Bayesian inversion to generate highly accurate posterior emission estimates. This allows for a granular understanding of how pollutants move and accumulate in specific urban localities.

SUGGESTED USES

- Environmental Justice Initiatives: Identifying specific "hotspots" where localized emissions disproportionately affect vulnerable communities to guide targeted mitigation.
- Urban Regulatory Monitoring: Enabling city officials to monitor industrial zones or shipping ports with high precision to ensure compliance with air quality standards.
- Public Health Research: Providing high-resolution exposure data to help epidemiologists link specific local pollutant sources to health outcomes in residents.
- Traffic and Infrastructure Planning: Assessing the real-world impact of new transit routes or low-emission zones on street-level air quality.
- Smart City Integration: Enhancing municipal sensor networks with predictive modeling to provide residents with real-time, hyperlocal air quality alerts.

ADVANTAGES

- Hyperlocal Resolution: Moves beyond coarse regional models to provide emission data at the scale of individual city blocks or specific emission cells.
- Data-Rich Assimilation: Successfully merges data from traditional fixed stations with mobile sensors (such as those mounted on vehicles) to create spatiotemporally dense observations.

CONTACT

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INVENTORS

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OTHER INFORMATION

CATEGORIZED AS

- **Computer**
  - Software
- **Environment**
  - Other
- **Sensors & Instrumentation**
  - Environmental Sensors
  - Scientific/Research

RELATED CASES

2025-128-0

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Advanced Transport Modeling: Accounts for complex urban wind patterns and atmospheric conditions by integrating the industry-standard WRF and STILT algorithms.

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Rigorous Statistical Analysis: Employs Bayesian inversion to reduce uncertainty, reconciling theoretical emission models with actual real-world measurements.

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Dynamic Refinement: Continually updates posterior estimates as new data is assimilated, allowing the system to adapt to changing urban environments and emission patterns.

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Optimization for Multi-objective Environmental Policymaking

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