

AI for Earth Grantee Profile

Breeze Technologies

Applying AI to improve the accuracy of air quality measurements

Summary

Air pollution is the single biggest environmental health threat of our time, killing 7 million people and costing the world economy USD5 trillion per year. Data-driven decision-making around air pollution mitigation has been unfeasible, as traditional sensing equipment is expensive, stakeholders lack necessary knowledge to analyze the data, and suitable interventions are difficult to define. Breeze Technologies aims to deliver hyperlocal comprehensive and accurate air quality data from public and private data sources and low-cost sensors, as well as insights based on recent scientific studies and actionable recommendations from a growing, self-learning catalogue of more than 3,500 air quality interventions.

Aggregating comprehensive air quality information

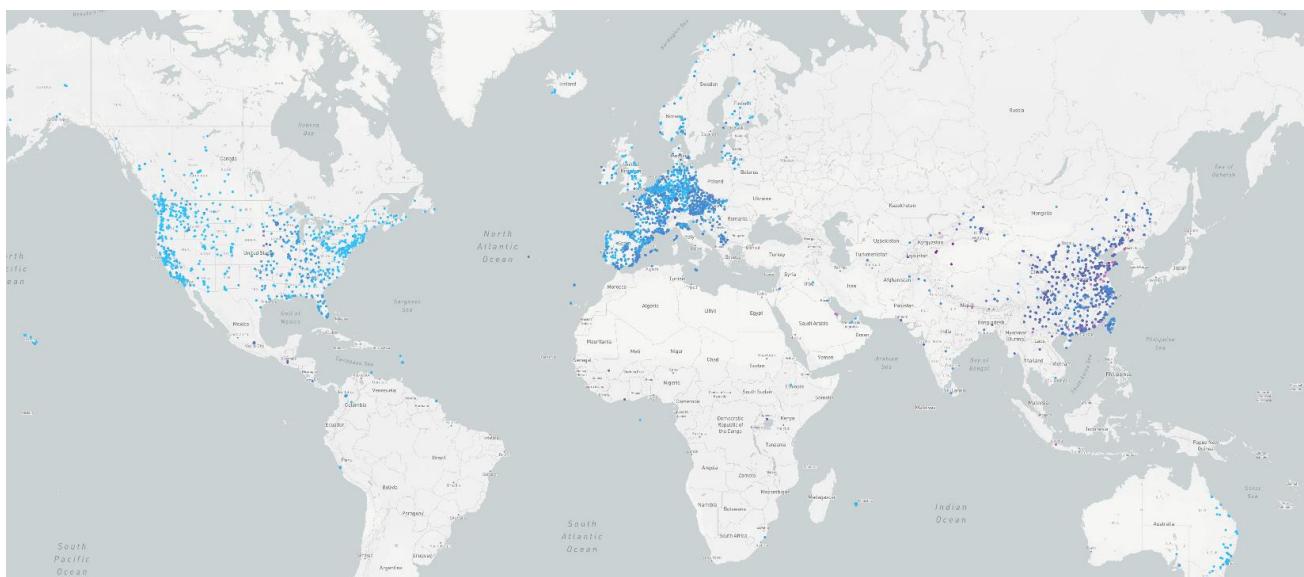
Air pollution is the single biggest environmental health threat of our time, [killing 7 million people and costing the world economy USD5 trillion](#) per year. However, most cities struggle to implement effective measures to mitigate air pollution because today's decisions aren't data-driven, and there are no information and communications technology systems in place that can assess the effectiveness of different interventions based on historic data. Traditional air quality monitoring stations are [expensive to implement and maintain](#). These

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large, fixed-in-place structures are often difficult to locate and require planning permission from the local authority. A key limitation is that they only provide air quality data from one fixed location, which may not be representative of local air quality as a whole. Until now, urban air quality maps have therefore depended heavily on air quality modelling with very few accurate data points. Because air quality sensors haven't been

ubiquitous, it has been difficult to aggregate air quality data, making it challenging to understand what air quality looks like on the ground. External data sources that surface air quality data currently exist, such as public measurement stations and satellite data, but often the outputs from these can't be viewed holistically or in real time to provide a comprehensive picture of air quality. "We have these big, bulky monitoring stations on the roadside, costing us a lot of money, requiring a lot of maintenance, and because they're so big and expensive, we have very few of them," says Robert Heinecke, the CEO of Breeze Technologies.

Founded in Germany in 2015, Breeze Technologies concentrates on urban air quality management, helping cities measure, manage, and improve their air quality. The company has identified data accuracy and reliability as roadblocks to hyperlocal air quality data availability and aims to use advanced AI to overcome these obstacles. Breeze has developed small (4.3-inch diameter) air quality sensors that can easily be installed in public places, including on streetlights and city furniture. These "dumb" sensors have had much of their hardware complexity removed, instead relying on software stored in and pushed from the cloud. The sensors are calibrated using AI in the cloud, and AI surfaces which sensors are likely to fail, allowing Breeze to exchange faulty hardware or push remote fixes. The crux of Breeze Technologies' work is its Environmental Intelligence Cloud that analyzes air quality data, monitors field sensors, and provides recommendations on how to mitigate air pollution.



*Breeze Technologies has more than 10,000 global data sources—providing real-time air quality data to improve its models.
[Image courtesy Breeze Technology]*

Breeze Technologies has access to data from more than 10,000 public air quality stations and has partnered with the European Space Agency (ESA) to capture satellite data and will combine this data with that from its own low-cost sensors. According to Heinecke, "If you have a metropolis like Hamburg, where we are based, and which has about a dozen measurement stations in a city of 1.8 million people, then this tells you basically

nothing about what the air quality really looks like except in the areas where those sensors are deployed.” Thus, the low cost, low profile sensors Breeze has developed are important to provide a more complete picture. One Breeze sensor generates approximately 1.051 million datasets per year of up to 13 different air quality indicators (including temperature, humidity, carbon dioxide, ozone, and fine particulates).

Digitalizing environmental sensing and data processing

Breeze is completely digitalizing the environmental sensing and data processing workstream and is therefore able to provide hyperlocal live data from the urban environment, compared to the sparse and delayed data points of the past. Breeze continuously measures air quality at a neighborhood-by-neighborhood level and is able to identify problems such as temporary and seasonal effects in real time. These processes will be made possible through Azure services provided by the Microsoft AI for Earth grant. “We are training scientific models on the infrastructure provided by AI for Earth to be able to forecast air quality for the next 24, 48, or even 72 hours,” says Heinecke. Advanced machine learning will allow AI-based sensor measurement correction, producing significantly improved data accuracy and reliability.

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Aggregating environmental data in the cloud allows Breeze to use Azure compute capabilities for air quality forecasting, temporal and geospatial interpolation, error detection, and predictive maintenance. Breeze Technologies is also working with the Microsoft AI for Good team to kick off a pilot program in Hamburg that will integrate air quality data with other urban data, such as traffic and mobility information, to provide municipalities with more embeddability into smart city management.

Improving data-driven air quality mitigation

The Breeze Technologies solution enables cities to make data-driven decisions about air pollution adaptation and mitigation policies for the first time. AI model training in the cloud will identify measurement errors based on external influences. Weighing and classifying measurement errors for hundreds of air quality sensors in real-time offers key challenges that AI can help solve, including identification of cross-sensitivities and unique effects (such as the influence of mist on particulate matter readings). Breeze then recommends database-supported intervention, policy planning, and implementation.

In addition to providing insights to municipal governments, the Breeze platform enables increased awareness and can move European citizens to more eco-friendly mobility and consumption behavior, as well as

promoting behavior modification on days with heavy air pollution. This data-driven approach also creates transparency in the often emotionally fueled debate about air pollution in our cities, thereby providing a foundation for sound decision-making and political responsibility. The AI for Earth grant allows Breeze to advance their machine learning and AI capabilities to scale their air quality monitoring initiatives. The funding helps Breeze invest into initiatives that don't directly or immediately provide a return on investment from generating additional revenue or winning new customers but do offer potential for high social and environmental impact in the future.

About Breeze Technologies

Breeze Technologies, a German industry leader in air quality sensors, data, and analytics, has been recognized as one of the most promising European startups by the European Parliament and the European Commission. Breeze's founders have been listed as Forbes 30 Under 30 and received the Hamburg Founders' Award and numerous other awards, including from the German Federal President.

About Robert Heinecke

Robert Heinecke is an entrepreneur, futurist thinker, and smart city expert. Heinecke co-founded Breeze Technologies in 2015. Before that, he worked for multiple international consultancies in strategy and IT and built up the digital division of an international NGO. He holds degrees in Computer Science and IT Management and Consulting. Heinecke was recognized in Forbes 30 Under 30 Europe in 2018 and is a member of the European Commission's Young Leaders of Industry sustainability panel and the scientific advisory board of the Federal Association for Electric Mobility in Germany.

Resources

Websites

<https://www.breeze-technologies.de/>

Press

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