The Analytics for Equity Initiative

Understanding Drivers of Inequality in Environmental Hazard Exposures in Overburdened Communities using Interpretable Machine Learning

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Research Theme: Environmental Stressors and Equity

Research Questions: What are the determinants of environmental hazard exposure inequality in overburdened communities? To what extent the determinants of environmental hazard exposures vary across different hazard types (i.e., air pollution, urban heat, toxic sites, and flooding), as well as across different areas?

Abstract:

Environmental hazards are increasingly prevalent and affecting communities nationwide. Socially vulnerable communities, especially, face heightened risks and experience pronounced disparities. To address this issue, this project will use various publicly available datasets in creating and testing interpretable machine learning models to better understand the drivers of inequality in environmental hazards exposures to overburdened communities. Multiple heterogenous features will be examined to investigate and describe the extent to which communities are disproportionately exposed to predominant environmental hazards such as air pollution, toxic sites, and urban heat hazards, across different regions. The interpretable machine learning models will then be implemented to model the complex interactions and non-linear mappings between the hazard exposures and a range of built environment, land use and sociodemographic features. The factors contributing to the various environmental hazards, as well as the exposure disparity, will then be specified through interpretation of feature importance. The effects of policies and strategies will be evaluated, through implementation of causal inference techniques using the models to facilitate evidence-based decisions for promoting environmental hazard exposure reduction in an equitable manner. The outcomes of our project outcomes will identify the disparities among vulnerable communities and formulate evidence-based policy recommendations towards hazard mitigations and societal equity.

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