

# Projecting future myocardial infarction events under changing environmental and demographic conditions using Machine Learning

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Myocardial infarctions (MI) are a major cause of death worldwide, and temperature extremes, such as encountered during heat waves and cold spells, lead to increases in MI events. The impact of climate on human health is complex, depending on the interaction of a multitude of climatic, environmental, sociodemographic and behavioral factors. Here, we present a Machine Learning (ML) approach combining multiple variables from different sources, with the aim of better predicting current and potential future MI events under changing environmental and demographic conditions. We received daily MI event numbers from the KORA MI registry for the Augsburg region of Bavaria, Germany between 1998 and 2015. Multivariable predictors include weather (e.g. air temperature, relative humidity), air pollution (particulate matter, nitrogen oxide, nitrogen dioxide, sulfur dioxide, and ozone), surrounding vegetation, as well as demographic data. We tested the following ML regression algorithms: Decision Tree, Random Forest, Gradient Boosting Regression, Ridge Regression, and Multi-layer Perceptron. The results show that the multivariable models are

able to predict the total annual number of events reasonably well, and inter-annual variations and long-term trends are largely captured. For most models, the most important predictors were air pollution variables as well as daily maximum and minimum air temperatures. In a next step, we plan to project future MI events by considering changes in environmental conditions, using scenarios for increasing air temperatures, stable or reduced air pollution levels. To increase the validity of the projections, we also aim to include the effects of anticipated future demographic changes in the population. We discuss the necessary steps to include such scenarios, to be able to estimate the effects of different autonomous developments as well as policy choices regarding air pollution and climate change mitigation on this health outcome.