

# Algorithms trained on historical data make more accurate forecasts of population changes than demographic modeling

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Machine learning algorithms can be used to make accurate forecasts about changes in population, according to research published in the *International Journal of Data Science*. The work demonstrates that the best of the available algorithms trained on historical data works better than conventional demographic modeling based on periodic census data.

Fatih Veli Şahinarslan, Ahmet Tezcan Tekin, and Ferhan Çebi of the

Department of Management Engineering at Istanbul Technical University, in Istanbul, Turkey, have compared the predictive power of various algorithms—extreme gradient boosting, CatBoost, linear regression, ridge regression, Holt-Winters, exponential, autoregressive integrated moving average (ARIMA) and prophet prediction model. They trained the algorithms using 1595 different demographic indicators from 262 countries recorded between 1960 and 2017. Indicators include age and gender distribution, labor force, education, birthplace, birth and death rates, and migration statistics.

Their demonstration to predict the population of Turkey for the year 2017 proved the value of the algorithmic approach over traditional modeling. Understanding [population dynamics](#) and forecasting how a population might change in years to come is a critical part of policymaking and planning for healthcare, education, housing, transport, and infrastructure. Ten-year census cycles are useful, but they do not give a fine-grained account of a changing population, especially in the light of changes in [life expectancy](#), migration, war, political upheaval, and pandemics, where the character of a population might change radically on a much shorter timescale.

The researchers suggest that machine learning algorithms, ensemble regression models in particular, can offer a "better estimate" of the future population of a country. They are able to do so because they can reduce the number of factors that otherwise make it difficult to make an estimate and also through analysis of any uncertainties in the [demographic data](#).

"Machine learning algorithms on [population](#) estimation will make an essential contribution to...the planning of national needs and pave the way for more consistent social, economic, and environmental decisions," the team concludes.

**More information:** Fatih Veli Şahinarslan et al, Application of machine learning algorithms for population forecasting, *International Journal of Data Science* (2022). [DOI: 10.1504/IJDS.2021.122770](https://doi.org/10.1504/IJDS.2021.122770)

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