

Statistical and Machine Learning Approaches for Municipal Population Forecasting in Gauteng, South Africa

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SUMMARY

Population data and population forecasts are crucial for planning all around the world, especially in urban areas as cities are expected to ensure basic service provision to communities. This is especially important for African cities which are experiencing rapid population growth and significant resource constraints. Despite the importance of accurate population forecasts, there is no consensus on the best approach for its modelling. While statistical time-series models have been widely used, machine learning approaches have shown promise in recent studies. The relative performance of both techniques is still an ongoing debate in the literature. We address this research gap by comparing the accuracy of ten (10) statistical and machine learning models in five municipalities of Gauteng Province, South Africa (Johannesburg, Tshwane, Ekurhuleni, Sedibeng and West Rand). The models were trained and tested using authoritative mid-year population estimates, and then future forecasts were generated. The trends in historical population are reasonably well captured by both approaches, although statistical models dominated in the forecasts. Application of these modelling approaches has the potential to stir up the urban governance paradigm by giving wider access to data-driven decision making in local municipalities. Further research is needed to provide more conclusive evidence on the comparative performance of both approaches, particularly under different data conditions, spatial contexts, and forecasting horizons.

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