



Graph Theory in Tanzania: Optimising Traffic Flow with Regularization and Cross-validated Model Selection

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Abstract

Graph theory is a branch of mathematics that deals with the study of graphs, which are mathematical structures used to model pairwise relations between objects. We will review existing applications of graph theory in transportation, focusing on the use of regularization methods for feature selection and cross-validation for hyperparameter tuning in models designed to predict or optimise traffic patterns. A key finding is that regularization helps mitigate overfitting by penalizing complex models, resulting in more generalizable traffic flow prediction models in Tanzania. This review identifies the effectiveness of regularization and cross-validated model selection for enhancing traffic optimization models in the context of graph theory applications. Future research should focus on validating these methods using real-world data from Tanzanian cities to ensure their applicability and efficacy. Tanzania, Graph Theory, Traffic Flow Optimization, Regularization, Cross-validated Model Selection Model selection is formalised as $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \{ L(\theta) + \lambda \omega(\theta) \}$ with consistency under mild identifiability assumptions.

Keywords: Tanzania, Graph Theory, Network Analysis, Optimization Models, Regularization Techniques, Cross-Validation, Graph Algorithms

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