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Modelling Conceptual Quantities Using Support Vector Machines

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Abstract : Uncertainty in cost is a major factor affecting performance of construction projects. To our knowledge, several conceptual cost models have been developed with varying degrees of accuracy. Incorporating conceptual quantities into conceptual cost models could improve the accuracy of early predesign cost estimates. Hence, the development of quantity models for estimating conceptual quantities of framed reinforced concrete structures using supervised machine learning is the aim of the current research. Using measured quantities of structural elements and design variables such as live loads and soil bearing pressures, response and predictor variables were defined and used for constructing conceptual quantities models. Twenty-four models were developed for comparison using a combination of non-parametric support vector regression, linear regression, and bootstrap resampling techniques. R programming language was used for data analysis and model implementation. Gross soil bearing pressure and gross floor loading were discovered to have a major influence on the quantities of concrete and reinforcement used for foundations. Building footprint and gross floor loading had a similar influence on beams and slabs. Future research could explore the modelling of other conceptual quantities for walls, finishes, and services using machine learning techniques. Estimation of conceptual quantities would assist construction planners in early resource planning and enable detailed performance evaluation of early cost predictions.

Keywords : bootstrapping, conceptual quantities, modelling, reinforced concrete, support vector regression
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