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ESTIMATE PROJECTS BETTER WITH MACHINE LEARNING TECHNOLOGY

The use of machine learning could improve the way we predict cost, quantity, schedule and outcomes for built environment projects. AECOM's **Tristan Harvey-Rice** and **Edward Day** explain why this branch of artificial intelligence (AI) that automates analytical model building is a big improvement on current classification and data collection methods.

Recent advances in processing power, storage capacity and cloud services have made machine learning an affordable tool for commercial organisations in the built environment. Its deep analysis has the potential to identify correlations between variables within potentially huge datasets, and the creation of models from those correlations which then facilitate predictions.

Machine learning packages don't require expertise in the statistical principles to use — and offer previously unobtainable levels of computing power at a fraction of the cost available 10–15 years ago. That's great news for the construction industry. Here are a few reasons why.

> MACHINE LEARNING TECHNIQUES CAN BE APPLIED TO A RANGE OF VARIABLES IN THE DESIGN AND CONSTRUCT PROCESS TO MEASURE FOR BESPOKE OUTCOMES.

1/ IMPROVE COST PREDICTIONS

Project costs in the built environment are traditionally separated into defined sections such as internal finishes or risks etc. An average rate is then calculated using the project-level gross internal floor area (GIFA) to output a cost per square metre for each element. With just one variable to measure, inaccurate estimations are often generated.

Machine learning algorithms identify interrelationships between all available building details — such as the differences between a one and ten-storey building even if they have the same footprint — allowing for far more accurate estimating with less analytical effort.

2/ PROVIDE QUALITATIVE AS WELL AS QUANTITATIVE PREDICTIONS

Qualitative data, from site complexities to material specifications and standards (BREEAM ratings etc), can be used as well as quantitative data to train machine learning algorithms.

The inclusion of data such as roof types and construction methodology is particularly effective for a more unusual scheme — i.e. projects with a smaller GIFA but a higher cost driven by location, specification or design choices — as it provides a more detailed and holistic picture of building data from the start of a project. But all projects will see improved predictions.

3/ BESPOKE PREDICTIONS FOR LESS RESOURCES

Machine learning techniques can be applied to a range of variables in the design and construct process to measure for bespoke outcomes. Moreover, they can extract data from Building Information Modelling (BIM) systems or other estimating systems (CostX, Global Unite, Candy, PRISM, etc.), without the need for manual input. Machine learning algorithms can be linked to these systems to analyse specific project outcomes, for example, to facilitate the cost estimate of a school on the number of student places it must provide for.

AECOM has successfully prototyped several machine learning solutions for the built environment, comparing the results to traditional cost and measurement classification systems as well as Rules of Measurement (NRM). Findings show that the prediction of costing, scheduling and performance were significantly improved.

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