

Accepted Manuscript

Improving the Prediction of Material Properties of Concrete using
Kaizen Programming with Simulated Annealing

Vinícius Veloso de Melo, Wolfgang Banzhaf

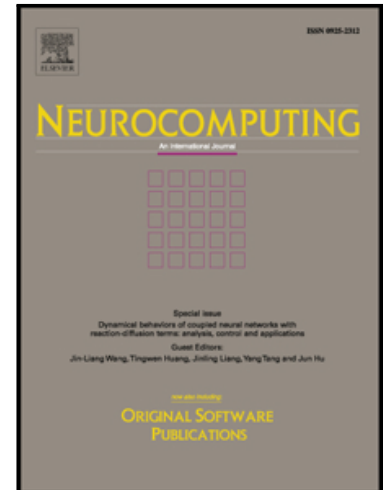
PII: S0925-2312(17)30231-X
DOI: [10.1016/j.neucom.2016.12.077](https://doi.org/10.1016/j.neucom.2016.12.077)
Reference: NEUCOM 18028

To appear in: *Neurocomputing*

Received date: 16 March 2016
Revised date: 7 November 2016
Accepted date: 2 December 2016

Please cite this article as: Vinícius Veloso de Melo, Wolfgang Banzhaf, Improving the Prediction of Material Properties of Concrete using Kaizen Programming with Simulated Annealing, *Neurocomputing* (2017), doi: [10.1016/j.neucom.2016.12.077](https://doi.org/10.1016/j.neucom.2016.12.077)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Improving the Prediction of Material Properties of Concrete using Kaizen Programming with Simulated Annealing

Vinícius Veloso de Melo^a, Wolfgang Banzhaf^b

^a*Institute of Science and Technology (ICT), Federal University of São Paulo (UNIFESP), São José dos Campos, SP, Brazil*

^b*Department of Computer Science and Engineering and BEACON Center for the Study of Evolution in Action, Michigan State University, East Lansing, MI, 48864, USA*

Abstract

Predicting the properties of materials like concrete has been proven a difficult task given the complex interactions among its components. Over the years, researchers have used Statistics, Machine Learning, and Evolutionary Computation to build models in an attempt to accurately predict such properties. High-quality models are often non-linear, justifying the study of nonlinear regression tools. In this paper, we employ a traditional multiple linear regression method by ordinary least squares to solve the task. However, the model is built upon nonlinear features automatically engineered by Kaizen Programming, a recently proposed hybrid method. Experimental results show that Kaizen Programming can find low-correlated features in an acceptable computational time. Such features build high-quality models with better predictive quality than results reported in the literature.

Keywords: Automatic feature engineering, Kaizen Programming, Linear Regression, High-performance concrete

1. Introduction

The production of concrete is an important technique in Civil constructing, and High-Performance Concrete (HPC) is a material that has been widely used in structural applications such as bridges, high-rise buildings, and pavement construction. As HPC results in good workability, high-strength and low permeability, it has replaced high-strength concrete [1] in several applications. Such concrete characteristics are directly related to long-term durability, making HPC more reliable [2]. HPC's compressive strength is considered its most

Email addresses: vinicius.melo@unifesp.br (Vinícius Veloso de Melo), banzhaf@msu.edu (Wolfgang Banzhaf)

Download English Version:

<https://daneshyari.com/en/article/4947434>

Download Persian Version:

<https://daneshyari.com/article/4947434>

[Daneshyari.com](https://daneshyari.com)