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A comparison of several machine learning techniques for the centerline segregation prediction in continuous cast steel slabs and evaluation of its performance

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Abstract

Centerline segregation in steel cast products is an internal defect that can be very harmful when slabs are rolled in heavy plate mills. Consequently, anticipate its presence is a matter of importance to prevent future risks. The aim of this study was to obtain a predictive model able to perform an early detection of central segregation severity in continuous cast steel slabs. This study presents a novel hybrid algorithm, based on support vector machines (SVMs) in combination with the particle swarm optimization (PSO) technique, for predicting the centerline segregation from operation input parameters determined experimentally in continuous cast steel slabs. This optimization technique involves kernel parameter setting in the SVM training procedure, which significantly influences the regression accuracy. Additionally, a multilayer perceptron network (MLP) and a multivariate adaptive regression splines (MARS) approach, this last method also in combination with the particle swarm optimization (PSO) technique, were fitted to the experimental data with comparison purposes. To this end, the most important physical-chemical parameters of this industrial process are monitored and analyzed. The results of the present study are two-fold. In the first place, the significance of each physical-chemical variables on the segregation is pre-

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