

Optimization of CNC Machining Parameters Using Machine Learning Techniques

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Abstract

The selection of suitable machining parameters is essential for achieving high-quality components and efficient CNC manufacturing processes. Conventional parameter selection often depends on experimental trials and operator experience, which can increase machining time and cost. This study proposes a machine-learning-based approach for predicting and optimizing CNC machining parameters. Experimental data are obtained by varying important parameters such as cutting speed, feed rate, and depth of cut, while corresponding machining responses such as surface roughness are recorded. The collected data are used to develop a machine learning model for predicting machining performance. The model is then applied to identify parameter combinations that can provide improved surface quality and machining efficiency. The performance of the proposed approach is evaluated by comparing predicted and experimental results. The study demonstrates the potential of machine learning as an effective tool for data-driven optimization of CNC machining processes.

Keywords: CNC machining, machine learning, parameter optimization, surface roughness, cutting speed, feed rate, predictive modelling, smart manufacturing.

