Analysis of Grain Size Effect of Titanium Ti-6Al-4V Depending on Surface Roughness at Different Cutting Parameters Using Artificial Intelligence Methods

V.F. Makarov[1] ⓘ **, M.V. Pesin[1]** ⓘ **, V.S. Danelian[1], V.Yu. Stolbov[1], A.V. Khabarova[1],**
A.V. Polyakov[2] ⓘ **, I.P. Semenova[2]** ⓘ

[1] Perm National Research Polytechnic University, 614990, Komsomolsky prospekt, 29, Perm, Russian Federation
[2] Ufa University of Science and Technology, 450076, Zaki Validi st., 32, Ufa, Bashkortostan Republic, Russian Federation

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Abstract. The article presents the results of a study of the effect of cutting modes of Ti-6Al-4V alloy with different grain size, including in the ultrafine-grained state obtained by severe plastic deformation, on the roughness of the machined surface using a neural network model. A neural network model has been developed that predicts the surface roughness of titanium alloy during cutting depending on the grain size and processing modes (speed, feed per revolution, and cutting depth). To form a data set of sufficient power for training neural networks, a data augmentation method was used, for which an auxiliary regression model was built. To select the most rational network architecture, a random search in the hyperparameter space was used. Testing the developed neural network model on actual data showed an error not exceeding 8.7% according to mean absolute percentage error.

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