

## DOCTORAL DISSERTATION ABSTRACT

**Title:** Development of the evaluation methodic for condition of the robotic workstations and their ability to perform technological processes, considering equipment and factors that affect them

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### **Abstract:**

The doctoral dissertation concerns the evaluation methodic for condition of the robotic workstations based on the analysis of the technological process parameters. The TIG welding operation for intermediate case of the Pratt&Whitney PW800 jet engine was studied. The devices and systems of the station were analyzed, and the most important input process parameters were defined, as well as the output states classification, specifying the types of defects and non-conformities occurring in the welds.

To assess the correctness of the welding process performed on the robotic station, descriptive statistics functions were used to calculate the characteristics values for the key parameters, which were then compared with the actual assessment of the welds quality. Thus, an indicator was determined whose values are correlated with the occurrence of specific weld defects. This made it possible to detect about 45% of non-compliance cases.

For further analyses artificial neural networks were used. The presented methodic of selecting the learning parameters of the neural network resulted in high efficiency of pattern recognition. The classification effectiveness of non-conforming weld types was 100%, which meets the assumptions of the research work.

The last chapter of the work presents the deployment of the presented solutions on the production station in W56 production department of Pratt&Whitney Rzeszów. The developed algorithms were implemented in the main controller of the station. The observation results from the first production batch were presented, which confirmed the validity of the conducted research work.