

# User Interface-Based in Machine Learning as Tool in the Analysis of Control Loops Performance and Robustness

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## Abstract

The monitoring of control loops in industrial processes is of great importance, considering that the correct operation of the productive procedures is related to the control loops that make up the system. Mostly, industrial processes are composed of a large amount of control loops that interact with each other, that means both are coupled, therefore, if one of the loops does not work properly it can negatively affect the system performance, leading the other loops into setpoints that were not designed for them. It has been found that many responsible causes for poor system performance can be identified by stochastic or deterministic performance indices. These performance indices, from a theoretical perspective, allow making relevant decisions, such as design parameters adjustment of the controllers or actuators maintenance. The most known are the stochastic performance index, it requires only normal operation and knowledge of the process. However, the performance analysis in a lot of cases is not conclusive and can present scale problems. On the contrary, deterministic performance index are easier to interpret, favoring the analysis and deduction of the operator. Nevertheless, it is necessary to perform invasive tests to get them, which makes it impractical. Therefore, this work obtains a deterministic index through a inferential model built with machine learning-based neural networks that use as input the stochastic index acquired throughout recollecting the normal operational data in closed loop and in the knowledge process. furthermore, count with a graphic interface that allows the operator interactively to get performance and robustness values represented in the deterministic indices. The strategy is put on test in a real study case of sensing levels for the industrial control process FESTO® MPS-PA Compact Workstation.

## Keywords

Control loop performance, Performance indices, Machine learning, Neural networks, User interface