Statistical Analysis of Tool Window Usage in PyCharm

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Abstract

This report presents a detailed analysis of data related to one specific tool window. No missing values were identified in any of the four columns. The data contains event logs from July 3 to July 23, 2025. The graphs demonstrate differences between medians and variances of manually opened windows versus those opened automatically, which have been confirmed by appropriate statistical tests.

1 Introduction

Tool windows in PyCharm provide quick access to development tasks without leaving the editor context. Understanding usage patterns between manually initiated and automatically triggered tool windows is crucial for optimizing user workflow and interface design. This analysis examines whether there are statistically significant differences in how long users interact with tool windows based on their opening method.

2 Methodology

2.1 Data Processing

Sorting the data first by the "user_id" column and then by "timestamp" enabled us to establish the true sequence of events. In the sorted data, we identified the opening and closing times for each user, unobstructed by any anomalous phenomena. If a closing occurred without a direct opening, this was marked accordingly and excluded from further analysis. The same applies to multiple consecutive openings. For further analysis, we only consider valid openings and closings made by the relevant users, noting whether the opening was automatic or manual. Subsequent analysis focuses on duration in seconds.

2.2 Data Analysis

Analysis of the collected data shows that most windows remain open for relatively short periods. However, some openings have significantly longer durations. In extreme cases, a single automatic opening lasted up to 96 hours. Additional assumptions could be introduced about operation length to justify removing such data, but we decided to retain it in our analysis.

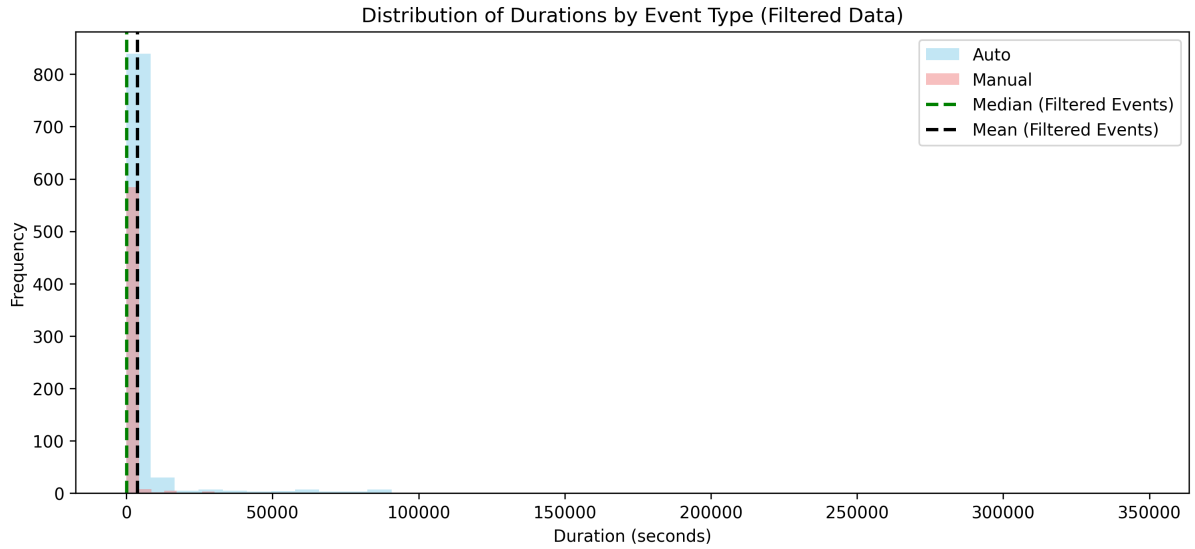

Figure 1: Comparison of duration distributions between Manual and Automatic Opens, showing selected median and mean values.

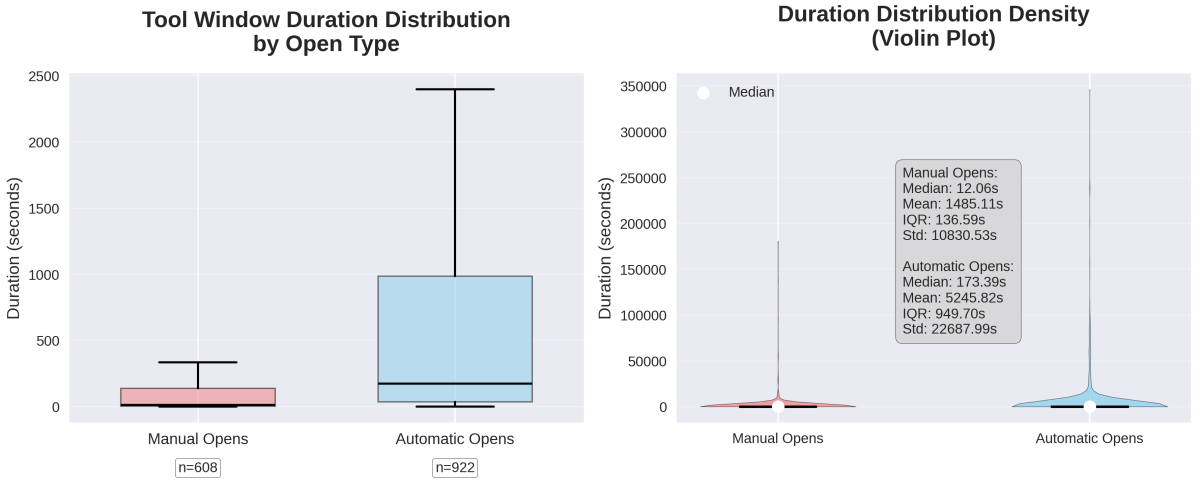

Figure 2: Boxplots without outliers and violin density plots, demonstrating that both distributions have heavy right tails.

3 Results

3.1 Statistical Tests

Table 1: Statistical Test Results with FDR Correction

Statistical Test	p-value	Corrected p-value	Significant
Levene's Test (Variances)	0.0000	0.0000	Yes
Mann-Whitney U Test (Medians)	0.0000	0.0000	Yes

Due to the heavy-tailed distributions observed in statistical tests, we decided to use the 95th percentile, considering only 95% of the data, which allowed elimination of the heavy tails (in practice, the time is then limited to 8 hours). Statistical tests for variance (Levene's test) and the Mann-Whitney test show extremely small p-values (0.0000), allowing us to conclude that the distributions are significantly different. The Benjamini-Hochberg correction was applied due to multiple testing. Such small p-values allow confident rejection of the null hypothesis without requiring additional statistical tests.

3.2 Key Findings

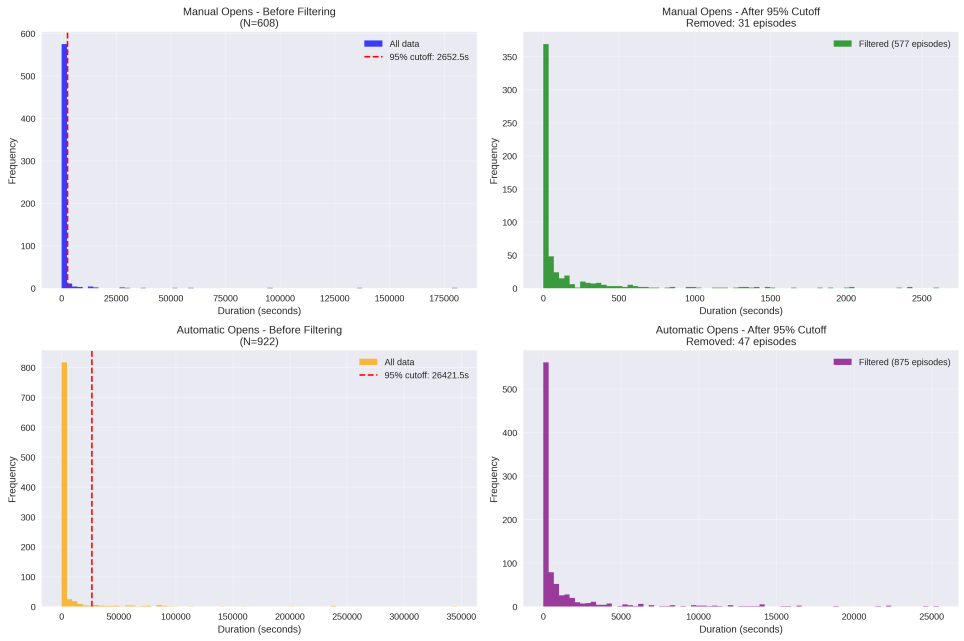

Figure 3: Duration distributions with 95% percentile filtering applied.

The analysis reveals that manually opened windows have significantly shorter durations than automatically opened windows. This finding can be interpreted through several behavioral patterns:

- **Efficient Usage**: Manual open interactions are intentional and goal-oriented, where users open tool windows for specific tasks and close them immediately afterwards.
- **Automatic Engagement**: Windows that open automatically often present complex information, such as errors, warnings or test results, which require a longer processing time and the user's attention.
- **Workflow Differences**: Manual openers are typically used for quick reference, while automatic openers often require problem-solving and analytical thinking.
- **User Control**: Users demonstrate efficient workflow management by minimising the time spent interacting with manually opened windows, which suggests that they have well-optimised user habits.

The significantly shorter duration of manual opens suggests that users engage with tool windows in a targeted and efficient manner when initiating an interaction. In contrast, system-triggered opens lead to more extended engagement with the content.