Software Requirements Specification (SRS)

Project: Process Mining of LMS Logs for Understanding Learning Behavior Patterns
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1.1 Purpose

This SRS defines the complete requirements for the system titled 'Process Mining of LMS Logs for Understanding Learning Behavior Patterns'. It covers functional, non■functional, system interfaces and constraints.

1.2 Document Conventions

Standard IEEE SRS formatting is followed. Headings represent sections and subsections. All requirements are written clearly, measurable, complete and traceable.

1.3 Intended Audience

This document is intended for developers, supervisors, students, testers, project evaluators and academic reviewers. Developers should read the full functional and interface sections.

1.4 Product Scope

The system analyzes LMS (Learning Management System) log data using Process Mining techniques to reveal behavior patterns, engagement levels, interaction flow, and bottlenecks.

1.5 References

• PM4Py Documentation • IEEE SRS Standard • Learning Analytics Research Papers

2.1 Product Perspective

This is a standalone analytical system. It extracts LMS logs and processes them to build process models and behavioral insights.

2.2 Product Functions

• Import LMS logs • Clean and preprocess data • Generate process maps • Analyze behavior flow • Export visualizations and reports

2.3 User Classes

• Students — View results (optional) • Teachers/Instructors — View analytics • Administrators — Upload logs and manage analysis

2.4 Operating Environment

• OS: Windows 10/11 • Python environment • Libraries: PM4Py, Pandas, NumPy • Hardware: 8GB RAM recommended

2.5 Constraints

• Data must follow LMS log format • Python-based environment only • Requires accurate timestamped logs

2.6 User Documentation

• User Manual • Installation Guide • System Usage Guide

2.7 Assumptions and Dependencies

• LMS logs will be correctly exported • No missing timestamps • PM4Py library must be functional

3.1 User Interfaces

A simple interface: upload log file, view analysis, download report.

3.2 Hardware Interfaces

No external hardware except a standard computer.

3.3 Software Interfaces

• LMS system exporting CSV logs • PM4Py backend • Python libraries

3.4 Communication Interfaces

Local system only. Internet optional for updates.

4.1 Feature: Log Import

Description: Allows users to upload LMS dataset. **Priority:** High

4.2 Feature: Process Model Generation

Description: Generates Directly-Follows Graphs and behavioral flows. **Priority:** High

4.3 Feature: Behavior Analysis

Description: Detects patterns, time spent, bottlenecks. **Priority:** High

5.1 Performance Requirements

System must process medium datasets (<200k rows) within acceptable time (1–2 minutes).

5.2 Safety Requirements

System must not delete or alter raw LMS logs.

5.3 Security Requirements

No logs should be shared externally. Sensitive data masked.

5.4 Software Quality Attributes

• Maintainable • Reliable • Accurate • Usable

5.5 Business Rules

Only authorized faculty may upload log data.

6. Other Requirements

Future extension: real-time process mining and predictive analytics.