MemFlow - Your Routine Wrapped Up

Abstract

This project introduces a Python-based AI agent designed to automatically detect the user's habitual workflows, including those you might not even be aware of. It helps users quickly resume tasks by deploying and utilizing predefined workflows—groups of programs designed to accomplish the same task.

By locally tracking user activity with ActivityWatch and integrating AI and machine learning techniques through **MemFlow**, the system recognizes patterns in the user's routine. It then suggests relevant workflows and provides a summary of past workflows to help the user stay efficient and focused.

Problem

In today's digital workflows, users frequently juggle multiple applications and tasks without a clear system to manage or their habits. This leads to reduced productivity, as users must manually reopen tools, remember past progress, and re-establish context after interruptions or long breaks.

This application addresses the problem by treating each workflow as a complete work environment — a group of applications and resources that the user consistently uses for specific contexts (e.g., work, study, coding or just thinking around).

When a user enters a workflow, it automatically brings up the tools they typically need, just like stepping into a prepared workspace. By locally tracking activity with tools like ActivityWatch and MemFlow, and applying AI and machine learning, the system detects routines, suggests relevant workflows, and even provides summaries of past sessions. This is especially valuable when returning to older projects — for example, reopening a GitHub repository after weeks — as the tool reminds the user what they were working on, reducing cognitive overhead and enabling faster task resumption.

Approach

The system is built around a modular architecture with three main components:

Activity Tracking Layer: This foundational layer is responsible for continuously recording user interactions with their device in real time. It utilizes **ActivityWatch**, which captures a rich set of telemetry including application launches, active window focus, and user activity intervals. Additionally, MemFlow integrates with ActivityWatch and adds semantic labeling and time-based structuring to the raw usage data. The tracking layer monitors app transitions, idle periods (AFK detection), and task switches, enabling high-resolution behavioral logging. All data is collected locally for privacy and stored in a MongoDB instance, enabling fast access and flexible querying for downstream analysis.

AI & Pattern Recognition Engine: Once usage data is collected, this layer performs analytical processing using unsupervised machine learning techniques. At regular intervals (e.g. hourly), MemFlow retrieves activity logs and applies association rule mining, a classic pattern recognition method that reveals correlations between frequently co-used applications or sequences of actions. These mined patterns are used to infer habitual workflows, detect repeated behavior,

and build usage models over time. The component also integrates with macOS-use, which enriches each session by generating summaries and prompts that help users understand their past activities in natural language or via visual dashboards.

Workflow Manager: acts as the dynamic front-end and control center of the system. Each workflow is modeled as a structured environment composed of applications that are frequently used together, along with temporal and contextual metadata. The manager allows users to view, retrieve, and interact with past workflows, offering capabilities such as automatic software suggestions, state restoration (i.e. re-launching tools used in a previous session), and context-aware summaries. These summaries include session duration, tool usage distribution, and possible next steps, helping users to seamlessly resume work with minimal cognitive load.

Opening of a Workflow
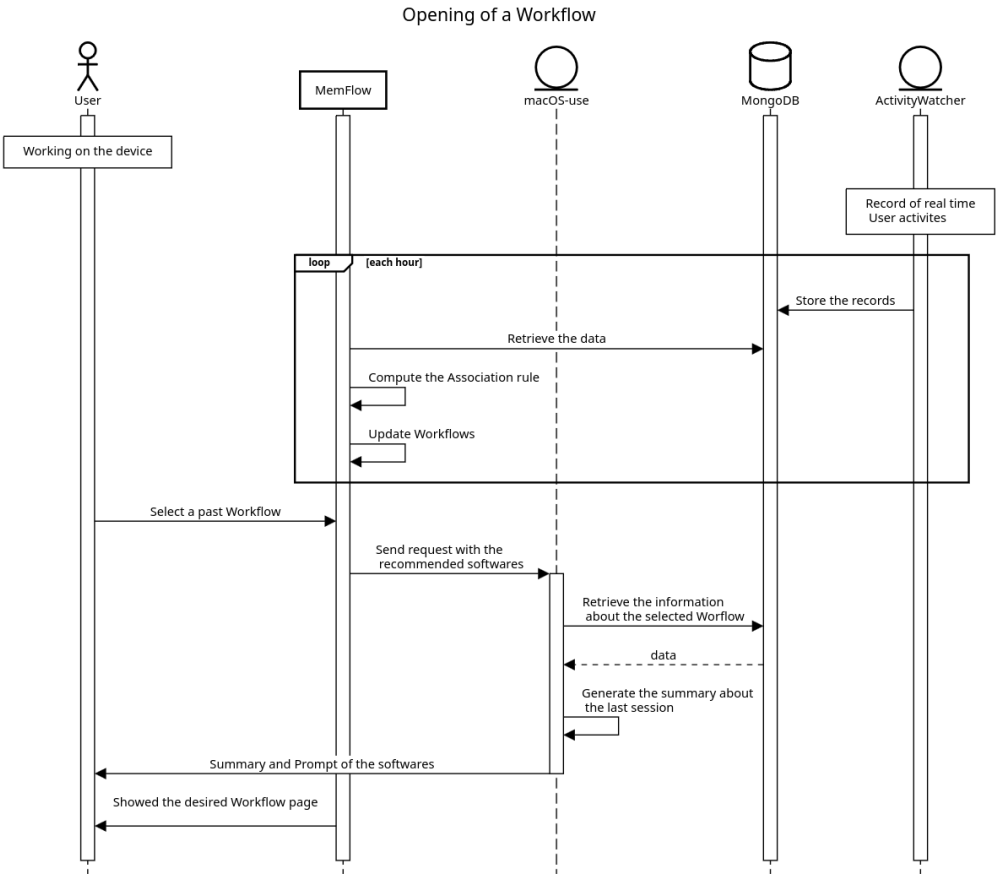
Agent Capabilities & Limitation

The prototype agent is able of continuously tracking across most macOS applications. It effectively logs app usage, window focus, and idle times in real time, with support for automated pattern extraction, workflow reconstruction, generation of summaries and software prompts based on previously mined behaviors.

However, there are several limitations. The system currently works only on macOS platforms, the browser tracking component relies on browser extensions and currently supports only Google Chrome and Mozilla Firefox. Workflow restoration is limited to recommending apps rather than automatically reopening them with saved state. Future versions aim to expand platform compatibility, deepen context awareness, and integrate with more third-party services.

Setup instruction

https://github.com/Lorenzo-Pigato/GDG2025