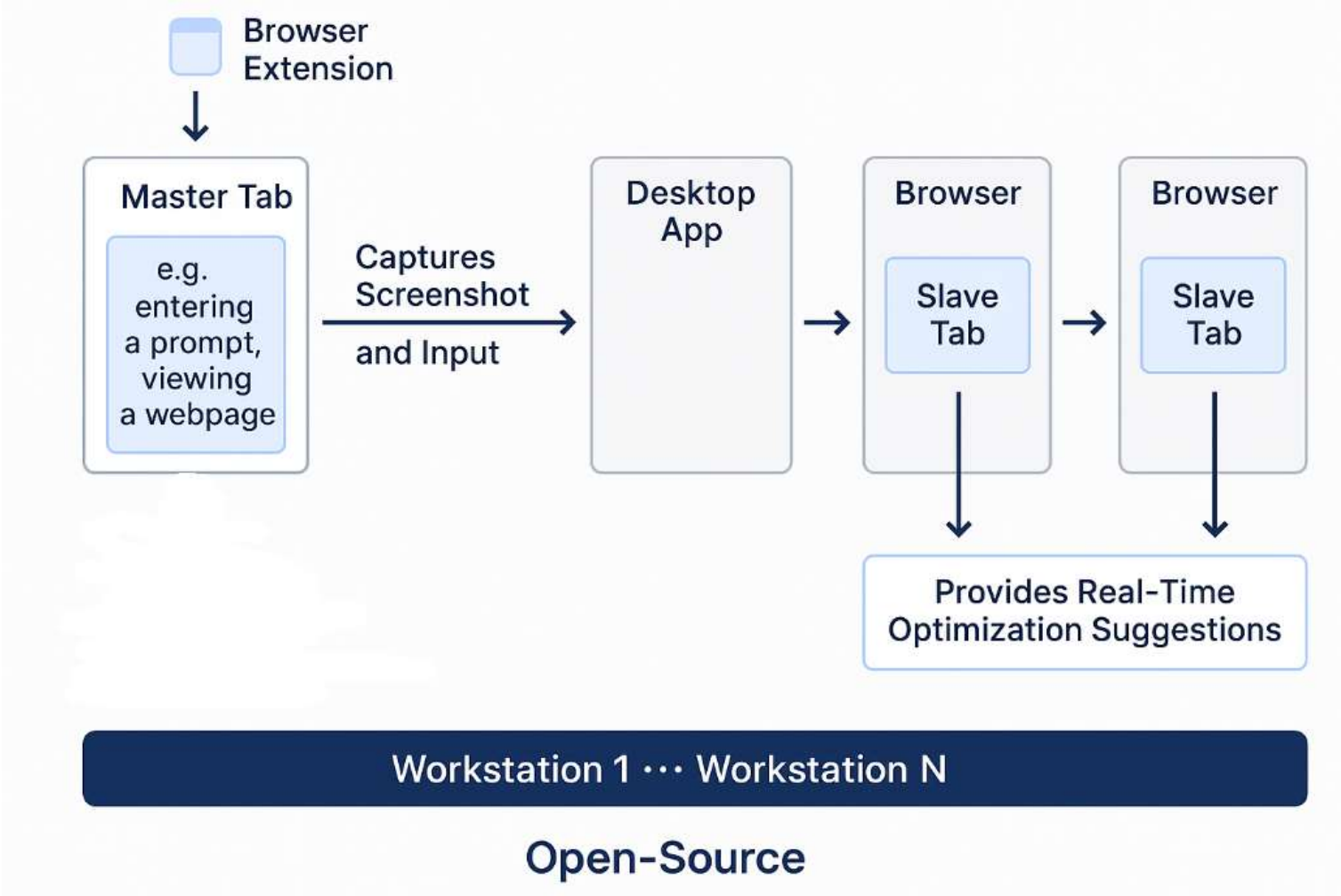
An Open-Source Browser-Based Master–Slave AI Agent Framework for Workspace Orchestration



Paper by

optimando.ai

Abstract We introduce a novel open-source framework for browser-based AI agent orchestration, designed to deliver context-aware, real-time optimization suggestions that proactively assist users across digital activities. These optimizations are guided by either community-defined templates or user-specific rules per simply text instruction, enabling flexible customization of agent behavior. Community templates will be curated and vetted to ensure safety, usefulness, and alignment with best practices. Each helper tab functions independently as an AI agent, capable of interpreting context and contributing to the orchestration logic. Developed under the direction of Oscar Schreyer and released under the open-source initiative of *optimando.ai*, a company specializing in AI automation integration for businesses —the system transforms the browser into a modular orchestration environment where distributed agents enhance user intent without requiring explicit commands.

The architecture uses a lightweight browser extension to connect tabs to a local orchestrator desktop app. Users assign roles as either **master interfaces**—the primary point of interaction—or **helper agents**, which are

exclusively implemented as browser tabs. This is a foundational design choice: all helper agents operate strictly within the browser, running dedicated AI models (e.g. ChatGPT, Claude, DeepSeek, Gemini, Mistral, Llama, Grok or even autonomous Agents like Project Mariner from Google) that analyze the content of the active master and provide automatic and real-time intelligent, proactive suggestions to improve goal achievement strategies, efficiency, productivity or brainstorming sessions.

While most setups use a browser tab as the master, the system also supports **user-defined external master inputs**, such as mobile apps, AR interfaces, or robotic camera systems. These can act as contextual input sources, linked to browser-based helper browser tab agents for coordinated support. This enables **distributed, device-agnostic workflows**. The system runs entirely on user-controlled devices—using a browser extension, a local desktop orchestrator app, and optional input apps on AR glasses, smartphones, tablets, vr devices, robots or any other device. There is no server-side logic involved, and all software components remain open source and locally executed. Users may explicitly select which input applications serve as master interfaces, while helper agents always remain browser-based.

The system is particularly effective in augmenting active digital workflows—whether interacting with LLMs, filling out forms, configuring automations, or managing content. It supports **real-time prompt refinement**, **tree-of-thought reasoning**, **structured brainstorming**, and **logic-driven output suggestions**. In LLM-based scenarios, the orchestrator can detect chatbot completion events and inject improved follow-up prompts automatically using DOM manipulation—enabling seamless, supervised multi-step interactions. In other use cases, it can offer contextual next-step optimizations, alternative strategies, or compliance-aware modifications—all delivered in real time based on the user's intent and setup.

Use cases span a broad range of digital activities, including—but not limited to—automation design, form completion, business logic configuration, knowledge work, research, business communication, training, live-coaching and brainstorming. The system dynamically observes the user's intent by analyzing the visible input and output context within the active master interface. Additionally, users can define a persistent global context that reflects broader goals, project parameters, or organizational constraints—enabling the helper agents to align their suggestions even more precisely with the intended outcome. Improvements range from GDPR-compliant alternatives to optimized strategies, refined decision paths, or context-aware workflow enhancements tailored to the user’s objectives.

The update interval for detecting chatbot completion, capturing screenshot or stream-based inputs, and triggering follow-up events can be precisely configured by the user.

Multi-tab orchestration

- **Multiple master tabs per session**, including support for distributed setups where multiple users, external apps, or even robotic camera systems can act as master input sources
- **Session templates** for reusable configurations
- **Autonomous and manual feedback loop triggers**: The orchestration logic allows for feedback loops between any combination of master and helper tabs. These loops can be triggered automatically based on predefined conditions, or manually by human-in-the-loop intervention. For instance, in a distributed setup, a team of AR device operators may continuously stream contextual data into the system. Desktop-based analysts or supervisors—acting as orchestrators—can monitor this data in real time and

provide direct feedback back to the AR operators. In parallel, helper tabs can exchange insights or findings among themselves based on logic rules, further enhancing the feedback cycle. This enables the creation of semi-autonomous or fully autonomous workflows, which can be toggled on or off depending on task complexity, user preference, or regulatory constraints

- **Local-only, GDPR-compliant design possible (local LLMs only)**
- A strict separation between **logic/control (master)** and **browser-based execution (helper tabs)**

Modern knowledge work often involves frequent switching between browser tabs and applications, resulting in cognitive overhead and productivity loss. Studies suggest users switch between digital interfaces over 1,000 times per day, often losing several hours weekly to simple reorientation.

Agentic AI systems seek to reduce this friction by acting as intelligent intermediaries across applications. Users can instruct such systems to retrieve data, automate steps, or manage multistep workflows across interfaces. Recent efforts such as OpenAI's *Operator*, DeepMind's *Project Mariner*, and Opera's *Neon* browser illustrate growing capabilities in web-based agentic interaction using large language models (LLMs).

Architectures across these projects vary—ranging from browser-integrated assistants to cloud-hosted control environments. Common capabilities include form handling, navigation, summarization, and task execution using multimodal input. While promising, deployment remains subject to broader industry challenges such as session continuity, transparency, and user-aligned control structures.

The Optimando.ai framework introduces a modular, open-source orchestration concept designed to operate within standard browser environments, optionally backed by locally hosted LLMs. It enables **real-**

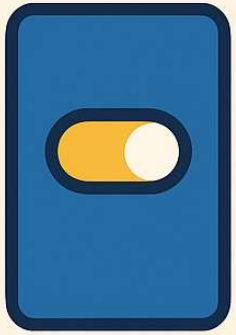
time, context-driven optimization using multiple **independent AI helper agents**, each operating in its own browser tab. These helper tabs may host **distinct LLMs such as the web-based versions of ChatGPT. Gemini, Project Mariner, Claude, Mistral, Grok, Llama and many more** selected by the user based on the task's privacy, cost, or reasoning complexity.

For example, lightweight or low-cost LLMs can be used in helper tabs handling repetitive or less critical tasks; advanced reasoning models can be reserved for complex, high-value workflows; and locally hosted LLMs may process sensitive or private information in fully self-contained tabs.

Input data to this system can be **multimodal**, including text, audio, screenshots, UI events, or camera streams. These triggers can originate from within the desktop browser or be activated remotely via smartphones or AR devices acting as **remote master agents**. Once toggled active, such devices send live input to a workstation.

Users may operate directly at the orchestration workstation or remotely initiate tasks from other locations. The system supports both **autonomous execution** and **human-in-the-loop workflows**, enabling oversight, corrections, or adaptive feedback. This flexibility allows real-time augmentation, background execution, and hybrid workflows tailored to user preferences.

Input Data /
Screenshots



AR Glasses

Helper Tabs for
Contextual Realtime
Optimization
with AI

The overall architecture transforms the browser into a **distributed optimization surface** — a live environment where specialized AI agents process inputs contextually and reactively in real time. It emphasizes modularity, transparency, and cross-device orchestration, giving users full control over how intelligence is distributed and applied across their digital environment.

While still conceptual, the framework provides a **directionally unique and open model** for AI orchestration — enabling scalable, secure, and customizable workflows through heterogeneous agents and devices.

Contemporary AI agent tools are typically designed around a **primary agent architecture**, operating within a browser interface or cloud-based environment. For example, Google's *Project Mariner* (2025) has been described as an experimental browser assistant that allows users to interact via natural language. Based on public reports, it can autonomously navigate websites to perform actions such as purchasing tickets. More recent updates suggest that Mariner operates in a cloud-based environment, enabling concurrent task handling — though the interface remains structured around a single active agent session.

Similarly, OpenAI's *Operator* (also referred to as the "Computer-Using Agent") utilizes GPT-4o with vision to interpret and interact with web pages. Operator appears to manage multiple tasks by launching separate threads or sessions, but each instance represents a distinct agent working within its own conversational context.

Browsers themselves are beginning to integrate AI agents. Opera Neon (2025) is billed as the first "agentic browser": it embeds a native AI that can chat with the user and a separate "Browser Operator" that

automates web tasks (forms, shopping, etc.). Opera also demonstrates a more ambitious “AI engine” that, in the cloud, can work on user-specified projects offline and do multitasking in parallel. However, Opera’s agents are proprietary, deeply integrated into one browser, and not open for user modification. Opera One (a related product) has introduced AI Tab Commands: a feature where a built-in assistant can group or close tabs on command (e.g. “group all tabs about ancient Rome”). This helps manage tab clutter, but it still uses a single AI interface per browser to organize tabs, without supporting multiple cooperating agents.

Outside the browser domain, research on LLM-based Multi-Agent Systems (MAS) is rapidly growing. Tran et al. (2025) survey LLM-MAS and note that groups of LLM-based agents can “coordinate and solve complex tasks collectively at scale”. Emerging orchestration frameworks (e.g. AWS Bedrock’s multi-agent service or Microsoft’s AI Foundry) allow specialized agents to collaborate under a supervisor, and enterprises are experimenting with central “Agent OS” platforms that integrate many agents. But these systems operate at the level of backend services or applications, not at the level of coordinating a user’s browser environment. Crucially, we found no published work on orchestrating multiple AI agents distributed across browser tabs as a unified workspace.

Privacy and Control. As AI agents increasingly interact with web interfaces and user data, privacy and control have become central design concerns. Existing projects such as Opera's *Neon* emphasize that automation runs locally to preserve users' privacy and security. Similarly, OpenAI's *Operator* allows users to manually intervene in sensitive interactions via a "takeover mode" and is designed to avoid capturing private content without user intent.

The framework developed by Optimando.ai adopts a similar privacy-first philosophy. All orchestration components are **self-hosted** and run within the user-controlled environment. **No data is transmitted to any Optimando.ai server**. The coordination logic and agent communication infrastructure are open-source and designed to operate under user ownership and configuration. Users may choose to deploy the framework on local machines, private servers, or trusted edge devices depending on their needs.

While remote input streams (e.g., from smartphones or AR devices) may transmit data over the internet to the orchestrator, all transmission paths and endpoints are defined and controlled by the user. Optimando.ai **does not operate or provide any backend services** that receive, log, or process this data. The system's observation is also strictly limited to in-browser content in explicitly configured tabs. There is **no tracking of desktop activity or full-device behavior**.

Each helper tab in the browser may be assigned a task-specific AI agent, using either a locally hosted LLM interface or a third-party web-based LLM (e.g., ChatGPT, Claude, Gemini). The **choice of LLM, its operational mode (cloud or local), and any associated data sharing are entirely the responsibility of the user**. Optimando.ai has no control over the behavior, data retention, or processing methods of any third-party services the user may connect.

The orchestration system itself is published as an open-source project under a permissive software license **(e.g., Apache 2.0 or MIT),** while the conceptual framework described in this paper is released under the **Creative Commons Attribution-ShareAlike 4.0 International License (CC BY-SA 4.0).**

This dual licensing approach ensures both academic openness and practical reusability, while preserving attribution and openness for derivative conceptual work.

In summary, the architecture emphasizes **transparency, modularity, and user-level sovereignty**. It supports a wide range of deployment models while providing strong safeguards for those who require private, auditable AI automation without reliance on external orchestration infrastructure.

Master/Slave Roles and Feedback Loop Users can tag tabs as master (leading tasks, direct user focus) or slave (dedicated to background sub-tasks). These background tasks run automatically, triggered by activity in the master tab. Masters are often user-facing tasks (e.g. a chatbot or any browser-based application). Slaves provide assistance: for example, while a user debates a business strategy in a chat (master), one slave agent might track the user's goal progression, another might fetch relevant statistics, and a third might generate a relevant infographic.

For example, imagine a user completing a complex online tax declaration form in the browser (master tab). Prior to starting, the user can preload relevant information—such as financial records, identifiers, or past filings—into the system's global context to enable accurate real-time assistance. As the user progresses through the form, helper agents in background tabs analyze the visible content in real time. One agent might flag commonly misinterpreted sections, another could cross-check figures against preloaded values, and a third might suggest missing documentation typically required for the current section. The AI system understands the user's intent—to complete the form accurately and efficiently—and delivers targeted, context-aware suggestions along the way.

To ensure data privacy, users are advised to **anonymize personal information** before inclusion in the global context or to **assign sensitive fields to locally hosted language models** within secure browser tabs. The framework is designed to give users full control over how and where data is processed. This transforms the

browser into an **automatic real-time support**—a private, intelligent layer of guidance for high-stakes digital workflows.

Even more broadly, if a user watches a YouTube video (master tab)—for example, a product walkthrough of a new AI tool—slave agents can assist by cross-referencing this information with the user's current goals or projects. One agent might highlight how the showcased tool could be integrated into the user’s existing tech stack. Another might suggest more efficient or better-suited alternatives based on predefined system constraints or preferences. A third agent could retrieve relevant use cases or success stories, helping the user assess practical value. Together, they act as a live research and recommendation engine—turning passive content consumption into actionable insights aligned with the user’s broader objectives.

The user sees slave outputs as suggestions or context inserts in real time. This creates an optimization loop: the user steers the main task, slaves continuously augment it, and the user approves or refines the results. The human stays “in the loop” at every step, aligning with best practices in trustworthy AI.

Technical and Ethical Considerations The extension only captures the browser’s visible content (screen images and user-entered text), not the full desktop. This guarantees all agent inputs are limited to in-browser context, protecting unrelated private data. Captured content is sent through the orchestrator to slave agents. No data is ever sent to outbound servers or external services unless explicitly configured by the user. Being fully open source, the software’s code is transparent and available for public review, ensuring accountability and trust. The connected LLMs may communicate externally (e.g., web-based LLM chatbot), but this behavior is entirely under user control. Alternatively, local LLMs can be used based on the user’s preferences or requirements.

Feature Comparison

Feature	Proposed Framework	Opera Neon	Google Project Mariner
Realtime backend optimization suggester	Yes (context-aware AI suggestions tied to global user goals)	No	No
Multi-agent coordination	Yes (multiple slaves per tab)	Partial	Partial
Browser tab as agent	Yes (users tag tabs)	No	No
Open-source	Yes (user-run)	No	No
User-controlled LLM selection	Yes (any open or cloud LLM)	No	No
Data sovereignty	High (all local, opt-in cloud)	Medium	Low
Man-in-loop by design	Yes	Yes	Yes
Unique agent IDs (multi-user)	Yes	No	No
Multitasking / parallel tasks	Yes (multiple slaves)	Yes	Yes

Evaluation and Distinction:

Novelty of optimando.ai's Approach

Given the landscape above, **optimando.ai's** combination of features **does appear to be novel and unmatched**. In particular, no known system offers *all* of the following in one package:

- **Fully local, browser-native multi-agent orchestration:** Many systems run in the cloud or require server components. Those that are local (browser extensions like Nanobrowser or RPA tools) don't typically orchestrate multiple autonomous agents across several browser tabs without user direction. Optimando's design of a local master tab coordinating slave tabs for different subtasks is unique.

- **By integrating directly into the browser landscape—the primary interface for digital activity worldwide—optimando.ai enables real-time optimization or intelligent, context-aware, goal-driven optimization suggestions at scale, putting AI orchestration into the hands of every user without relying on proprietary platforms, cloud dependencies, or specialized infrastructure**

- **Autonomous, proactive assistance:** Most current solutions are *reactive*. They await user queries or commands. A system that observes the user's context and proactively generates suggestions or carries out optimizations (e.g. automatically augments your task flow across multiple sites) is not mainstream yet. Yutori's "Scouts" come close conceptually (monitoring in the background)github.com, but those operate on specific user-defined goals (like watching a particular site or alert type) **rather than generally optimizing any ongoing browsing activity**. **An *AI that feels like a colleague actively helping unprompted* is largely aspirational right now.**

- **Multi-agent parallelism in a user-facing application:** While research and some closed prototypes leverage multiple agents in tandem, typical user-facing AI assistants are single-agent. Optimando.ai's vision of parallel agents (each potentially with specialized roles or focusing on different tabs) coordinating in real time to help the **user is cutting-edge**. We see early signs of this in Opera Neon's ability to multitask and in Nanobrowser's planner/navigator duo, but these are either constrained or not autonomous. **No product fully utilizes a swarm of browser-based agents to continuously adapt to what the user is doing.**

- **Context-aware cross-tab optimization:** This implies the system maintains a high-level understanding of the user's objectives across multiple browser tabs or tasks. None of the surveyed tools truly does this.

For instance, if a user is doing research with several tabs, current AI assistants might summarize one tab at a time when asked, but they won't *on their own* consolidate information from all tabs or reorganize them for the user's benefit. **Optimando.ai** aiming to provide "**real-time, context-aware optimization**" suggests it would do exactly that – **something quite novel**.

In conclusion, the core architecture of ***optimando.ai*** – a local master–slave tab framework enabling an autonomous multi-agent assistant system – **is novel**. Existing systems offer pieces of the puzzle (cloud-based autonomy, local extensions, multi-tab tools, etc.), but none delivers the same integrated experience. Therefore, **optimando.ai's** implementation would represent a distinct advancement in browser AI orchestration and autonomy. Its closest peers (Google's Mariner, OpenAI's Operator, Opera's Neon, academic Orca, and various extensions) each lack at least one crucial element (be it full local execution, open-source, proactivity, multi-agent parallelism, or deep context integration). As such, optimando.ai's concept stands out as unmatched in combining all these features into one system, **marking a potentially significant innovation in the AI browser assistant space.**

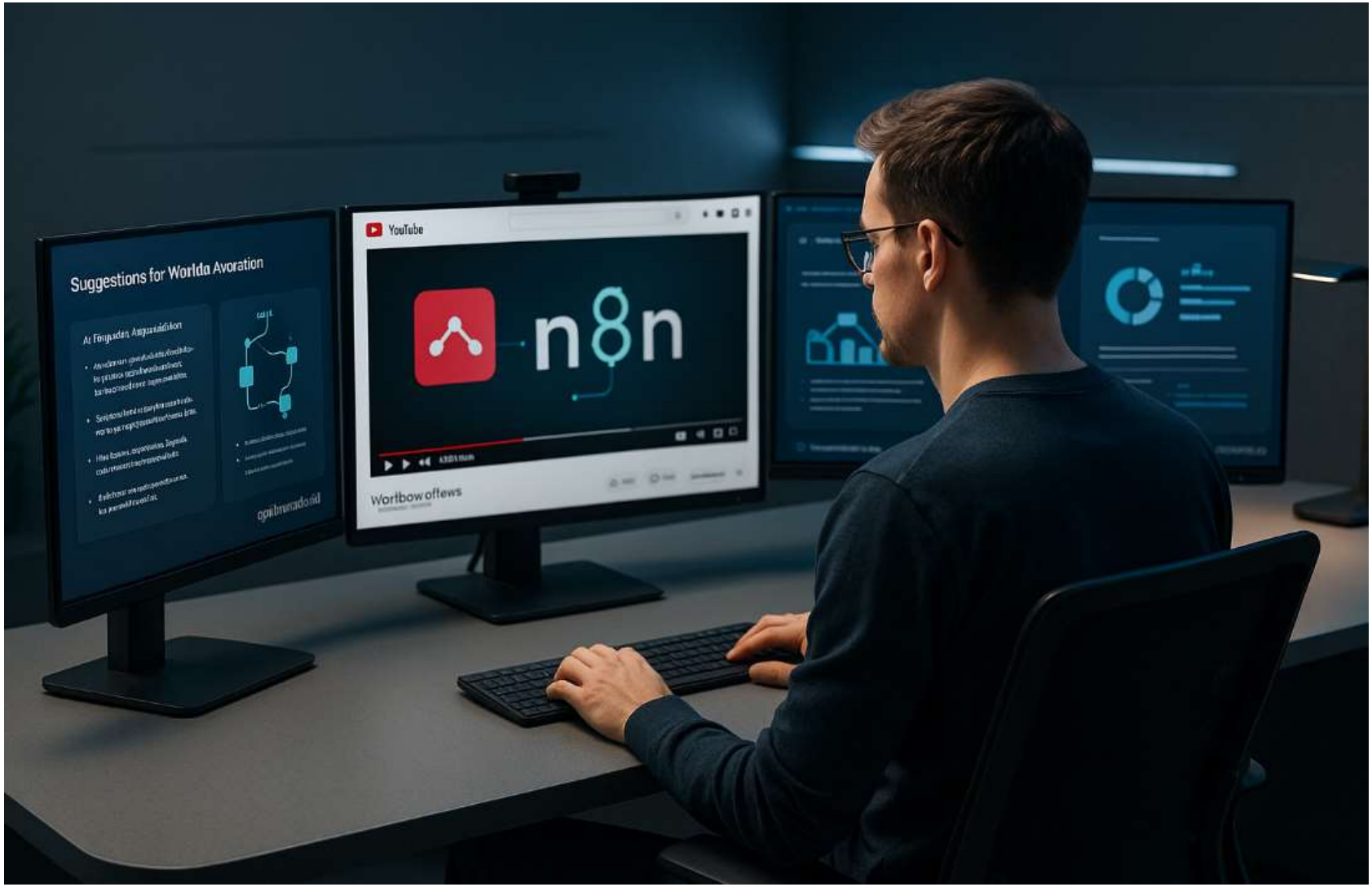
References: The analysis above references key details from current systems, including Google DeepMind's Project Marinertechcrunch.comtechcrunch.com, OpenAI's Operatortechcrunch.comtechcrunch.com, UCSD's Orca browser researcharxiv.orgarxiv.org, the Nanobrowser open-source projectgithub.comgithub.com, Opera's AI initiatives (Aria and Neon)press.opera.compress.opera.com, and curated lists of web AI agents and automation toolsgithub.comgithub.com. Each of these informs the feature comparison and underscores the novelty of optimando.ai's approach.

Key innovations of the optimando.ai framework include:

- Master–slave tab architecture, where each browser tab runs a dedicated AI agent with a defined role in the workspace.
- Real-time, context-aware optimization, where agents interpret and enhance user workflows without explicit commands.
- Parallel agent execution across tabs, allowing intelligent coordination of tasks like data entry, content drafting, monitoring, and summarization.
- Global goal propagation, enabling all agents to align with high-level objectives defined by the user or inferred from context.
- Local-only architecture, ensuring full privacy, transparency, and auditability—no hidden cloud inference or data leakage. The user has full control over the data flow.
-

Unlike Mariner or Orca, optimando.ai does not wait for the user to act. It acts with the user, continuously enhancing workflows as they unfold—across tools, content types, and digital services. It is not a helper or assistant. It is a real-time orchestration layer for the modern web workspace.

To our knowledge, no existing system—academic or commercial—combines autonomous multi-agent orchestration, tab-based modularity, proactive real-time augmentation, and privacy-first, local execution. This positions optimando.ai as a breakthrough platform in browser-native AI automation.


Suggestions for Worlda Avoration
YouTube
n8n
Wortbow oftews