

Aurora Workflow Orchestration — Method Specification v1.2

Shawn C. Wright, Aurora Research Initiative / Waveframe Labs Division

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Aurora Workflow Orchestration (AWO) — Method Specification v1.2 (Final)

Abstract

Aurora Workflow Orchestration (AWO) defines a structured, audit-first methodology for AI-assisted research. It establishes deterministic roles, reproducible artifacts, and falsifiability gates to ensure transparent scientific progress. This release (v1.2.0) finalizes automation for documentation builds and institutional alignment **within Waveframe Labs’ Aurora Research Initiative**, establishing the foundation for **CRI-CORE**, the runtime layer that operationalizes continuous research verification.

Keywords: reproducible research, AI orchestration, falsifiability, provenance, audit automation

Author:

Shawn C. Wright

Affiliation:

Waveframe Labs — Aurora Research Initiative (Independent Researcher)

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Purpose

Define a **repeatable, falsifiable, and auditable** methodology for AI-assisted research and analysis such that any independent party can reproduce both the process and the evidence supporting its outcomes.

Scope

AWO governs the structure of AI-assisted research into falsifiable claims, audited iterations, and immutable, citable releases.

It defines the **methodological layer** that enforces reproducibility and auditability.

CRI-CORE provides one possible **implementation layer** automating AWO-compliant runs and manifests, but AWO remains valid independently of it.

Normative Requirements

1. **Falsifiability** — Every claim **MUST** define a testable procedure that could falsify it.
 2. **Full Logging** — Every reasoning step **MUST** be timestamped and schema-validated when applicable.
 3. **Independent Audit** — Logic, data, and peer reviews **MUST** be performed by separate agents or processes.
 4. **Rejection Loop** — Failed audits **MUST** trigger revision or withdrawal, not defense.
 5. **Portability** — Artifacts **SHOULD** be domain-agnostic and reusable across contexts.
 6. **Version Locking** — All claims and outputs **MUST** reference immutable identifiers (tags, hashes, DOIs).
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Roles

- **Orchestrator (Human)** — Frames questions, defines falsifiability criteria, resolves conflicts, approves releases.

- **Main Model (Continuity)** — Maintains project context, synthesizes results, integrates audit feedback.
 - **Auxiliary Auditors (Independent)** —
 - *Logic Auditor* — Validates reasoning consistency.
 - *Data Validator* — Empirically tests claims.
 - *Peer Critic* — Conducts adversarial conceptual review.
 - **System Auditor (Optional)** — Verifies runtime integrity and provenance (e.g., CRI-CORE logs).
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Core Artifacts

- **Falsifiability Manifest** (`/docs/FALSIFIABILITY_MANIFEST.md`) — claim IDs, tests, datasets, thresholds, status.
- **Workflow Logs** (`/logs/*.md`) — dated entries with actions, insights, next steps, skills.
- **Decision Records (ADRs)** (`/decisions/*.md`) — context, decision, consequences, evidence links.
- **Evidence Registry** — actual repo folders:
 - `/figures/` — images/plots referenced by ADRs.
 - `/models/` — optional saved model artifacts.
 - `/scripts/` — helper scripts used in iterations.
 - `/workflows/` — executable workflow specs.
 - `/schemas/` — validation and reproducibility schemas.
- **Run Manifests** (`/runs/run_*/run_manifest.json`) — canonical runtime records.
- **Attestation & Sums** (`/runs/run_*/ATTESTATION.txt`, `SHA256SUMS.txt`, `.sig`, `.cert`) — cryptographic proof and checksums.
- **Release Artifacts** — `CHANGELOG.md`, `CITATION.cff`, `.zenodo.json`, Git tag, Zenodo DOIs.

Note: This specification intentionally omits `/notebooks` and `/data`

because they are not present in this repository.
If future projects require them, add explicitly and document via ADRs and Manifests.

Lifecycle (One Iteration)

0. **Setup** — Define claims, initialize Manifest, assign auditors.
 1. **Draft (Main Model)** — Produce reasoning and outputs tagged with claim IDs.
 2. **Audit (Independent)** — Logic, data, peer auditors record pass/fail results.
 3. **Synthesis (Main Model)** — Reconcile audits, revise claims or methods.
 4. **Decision** — Record outcome in ADR (accepted / revised / withdrawn).
 5. **Evidence Capture** — Save figures, scripts, models; update Manifest status.
 6. **Release Gate** — Validate reproducibility, verify attestations, confirm cross-refs, tag release, archive on Zenodo.
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Logging Schema

- **Log Entry:** date, action, lesson, next step, skills.
- **Audit Record:** claim ID, auditor, check type (logic | data | peer), criteria, result, evidence links.

All logs SHOULD conform to JSON schemas under `/schemas/` when available.
Schema version SHOULD match the repository release tag (e.g., v1.2).

Rejection Handling

Any failed audit → revise draft or withdraw claim.
Partial failures → enter **conditional revision** state until all criteria pass.
Update Manifest and ADR accordingly. No appeals without new evidence.

Portability Guidelines

- Keep templates generic; avoid domain jargon.
 - Parameterize datasets and metrics in Manifest only if they exist in repo.
 - Use Model Roster to swap models or auditors without changing process.
 - Derived projects (e.g., CRI-CORE or domain forks) MUST preserve schema compatibility.
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Conformance Checklist

- ☐ Manifest exists with 1 falsifiable claim and test.
 - ☐ Logs present for each iteration (draft → audit → synthesis → decision).
 - ☐ 1 ADR captures a non-trivial decision or trade-off.
 - ☐ Release artifacts present; latest tag archived with Concept + Version DOIs.
 - ☐ Attestation artifacts verifiable (ATTESTATION.txt, SHA256SUMS.txt, signatures).
 - ☐ (If schemas present) Validation passed for logs and manifests.
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Example Reference

Waveframe v4.0 — Canonical case study demonstrating AWO artifacts and citable release within the Aurora Research Initiative.

File and Folder Conventions

- /templates/*.md|yaml — Reusable templates.
- /schemas/*.json — Validation and reproducibility schemas.
- /decisions/ — Governance records.
- /logs/ — Execution history.

- `/docs/` — Whitepapers, manifests, specifications.
- `/runs/` — Runtime results and attestation.
- `/figures/`, `/models/`, `/scripts/`, `/workflows/` — Evidence and execution assets.

Maintained by Waveframe Labs

`swright@waveframelabs.org`

`https://waveframelabs.org`

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Future changes appear only as *Implementation Notes*, not method revisions.