SPACETIMEML — HELD-OUT 3D CAD CUA & B-REP RLVR VAULT

Zero-Contamination Unpublished Evaluation & Post-Training Inventory | https://spacetimeml.com

1. Executive Inventory Summary

Beyond the 63-episode open benchmark on Hugging Face (spacetime-ml/cad-cua), SpacetimeML maintains an unpublished, zero-web-crawl-contamination reserve of 200+ human-engineered 3D CAD trajectories, paired 2D ISO-128 orthographic engineering blueprints, native parametric feature trees, and watertight ISO-10303-21 .STEP B-Rep solids graded by our deterministic <10ms geometric reward engine (verify_step.py).

2. Held-Out Vault Splits & Modality Breakdown

Split / Package	Episodes	CAD Software Suites	Deliverables & Telemetry
Public Baseline (HF)	63	SolidWorks, PTC Creo 10, Inventor	35,041 PNGs | 277k GUI Events | 221 CAD/.STEP
Held-Out Eval Split A	110+	SolidWorks, PTC Creo 10, Inventor	670k+ GUI Events | 532 Watertight .STEP & Native
Full Research Vault B	200+	SW, Creo, Inventor, Fusion, FreeCAD	1.1M+ GUI Events | 1,000+ B-Rep DPO Pairs
Procedural RLVR Gym	5,000+	Parametric Feature-Tree Mutations	Paired 2D ISO-128 Blueprints + Exact GT .STEP

3. Four Synchronized Modalities Per Episode

Modality 1 — 2D Orthographic Engineering Blueprints (.png & .pdf):
Multi-view Third-Angle orthographic projections with explicit dimensional tolerances, hole callouts, and section views.

Modality 2 — Native Parametric CAD + Watertight ISO-10303-21 .STEP Solids:
Every episode includes native feature-tree parts (.sldprt, .prt, .ipt) and manifold closed-shell .STEP solids (Euler chi = 2).

Modality 3 — Deterministic B-Rep Reward Engine (verify_step.py):
Zero-dependency mathematical verifier scoring Principal-Axis BBox IoU (35%), Volume/Area (25%), Euler Topology (20%), & Surfaces (20%).

Modality 4 — Synchronized GUI Viewport Observations & Action Telemetry:
9-pass OCR privacy-scrubbed viewport frames (0 PII leaks), 16-FPS continuous cursor preview videos, and millisecond events.jsonl.

4. Interactive Sample Inspection & Access

- **Browser Sample Inspector (16-FPS Video, Blueprints, Telemetry & STEP Verifier): https://spacetimeml.com/sample-preview.html**
- **Direct Sample Pack ZIP (27.6 MB): https://spacetimeml.com/samples/SpacetimeML-CAD-CUA-Sample-Lite.zip**
- **Public Hugging Face Baseline (15.53 GB): https://huggingface.co/datasets/spacetime-ml/cad-cua**
- **Held-Out Vault & Licensing Inquiries: ai@spacetimeml.com | https://spacetimeml.com/partner**