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Teach by Doing (TbD) V6 — One-Page Summary

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Role: Machine Learning Engineer • Systems Architect

Tech Stack: Python • OpenCV • Optical Flow / SSIM • LLMs (Gemini / GPT) • Temporal Encoding (LSTM-style) • Streamlit • GCS • Pub/Sub • JSON

Overview

Teach-by-Doing (TbD) V6 is the ingestion and understanding engine behind FreeFuse's Pathways-as-Data (PAD) platform. It takes unstructured task videos from subject-matter experts and turns them into machine-readable workflows ("Pathways") that can be consumed by humans, AI agents, and eventually robotics systems. The same output powers living SOPs for people, training data for LLM-based agents, and semantic scripts for automation.

Problem and Solution

Organizations sit on mountains of unstructured "how-to" knowledge: recorded Zoom calls, tutorials, and tribal workflows. None of it is in a form that AI systems or automation can reliably consume.

TbD V6 solves this by turning "doing" into data: it watches how an expert performs a task, segments the process into steps, adds natural-language explanations, and encodes the temporal relationships between steps. The result is a standardized Pathway.json asset that becomes the unit of work for documentation, training, and automation.

How TbD V6 Works (High Level)

1. **Ingest:** An expert records a task (e.g., software configuration or a hardware procedure) and uploads the video via UI or API.
2. **Segment:** TbD uses computer vision (SSIM, optical flow, UI-change heuristics) to detect meaningful step boundaries.
3. **Understand:** An LLM generates clear, human-readable descriptions for each step, extracting actions, objects, tools, and context.
4. **Ground in Time:** A temporal encoder processes the ordered steps to learn transitions, branching, and dependencies, producing a contextual embedding per node.
5. **Export:** TbD writes a Pathways-as-Data artifact (Pathway.json) with nodes, edges, timestamps, metadata, and temporal vectors, which can be visualized, edited, or consumed by downstream systems.

A Streamlit demo at tbd-v6.streamlit.app showcases the full flow: upload a clip, run TbD, then inspect both the visual pathway and the raw JSON output.

Business Impact

TbD V6 highlights my ability to design and implement platform-level ML systems, not just isolated models:

- Turning vague product goals ("make workflows teachable to humans and machines") into a concrete architecture and schema.
- Combining computer vision, LLMs, and temporal modeling into a cohesive pipeline with a clean API.
- Designing a reusable data format (Pathways-as-Data) that can support documentation, agent behavior, and future robotics integrations.

In short, TbD V6 shows how I approach problems where workflow intelligence, ML engineering, and product thinking all have to come together in one system.