

Syllabus-to-Schedule (S2S) Agent

Final Report for DS Internship Assignment

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1 Overview

The Syllabus-to-Schedule (S2S) agent ingests syllabi (PDF/HTML/txt), reasons over the content to extract structured assignments with a LoRA-tuned `t5-small` model, plans milestone tasks, and executes exports (ICS, CSV, SQLite). This end-to-end reason \rightarrow plan \rightarrow execute pipeline aligns with the internship brief.

2 Architecture Summary

Ingest `pdfplumber` / `BeautifulSoup` normalise files into `Document` objects (`src/s2s/ingest/`).

RAG MiniLM embeddings stored in ChromaDB (`src/s2s/rag/index.py`) for retrieval support during planning.

Extraction LoRA-adapted `t5-small` plus robust rule-based fallback emit per-assignment `AssignmentRecords` (`src/s2s/extract/`).

Validation `pydantic+dateparser` enforce schema and ISO datetimes (`src/s2s/schemas.py`, `src/s2s/extract/validate.py`).

Planning Heuristic `TaskPlanner` (optional LLM) builds 2–5 milestone tasks with dependencies (`src/s2s/plan/planner.py`).

Execution Scheduler backfills timelines; exporters create ICS/CSV/SQLite (`src/s2s/execute/`).

Interface Typer CLI orchestrates stages; Streamlit UI previews results (`src/s2s/cli.py`, `ui/app.py`).

Logging All prompts/responses recorded in `logs/interactions.log`.

3 Data & Training

- **Seed dataset:** 50 hand-labelled syllabus snippets (`training/data/seed.jsonl`).
- **Synthetic dataset:** 150 deterministic examples (`training/make_synth.py`).
- **Collation:** `training/collate.py` builds HF dataset splits.
- **Fine-tuning:** `training/train_lora_t5.py` (LoRA $r = 16$, $\alpha = 32$, dropout 0.05, $lr = 2 \times 10^{-4}$, batch 4, epochs 5). We chose `t5-small`+LoRA for syllabus-specific extraction accuracy while keeping the adapter lightweight.
- **Evaluation:** `training/eval_extraction.py` reports field exact match, deliverable micro-F1, and mean absolute due-date error (hours) to quantify reliability.

4 Usage

4.1 Setup

1. `python3 -m venv .venv`
2. `source .venv/bin/activate`
3. `pip install -e .`

4.2 Pipeline

1. Add syllabus files to `data/raw/`.
2. Run `make run` (ingest \rightarrow index \rightarrow extract \rightarrow plan \rightarrow export).
3. Inspect `out/` (`default_assignments.json`, `default_plan.json`, `tasks.csv`, `calendar.ics`, `tasks.db`).

4.3 Optional

- `make ui` for Streamlit preview/export.
- `pytest` for regression tests.
- `python3 training/train_lora_t5.py` to retrain adapters.

5 Verification Status

- Latest run produced 24 coherent assignments across four syllabi (distinct titles, courses, due dates).
- ICS/CSV exports align with each source document.
- `pytest` passes (warnings only from UTC timestamp deprecation).

6 Requirement Coverage

Reason–Plan–Execute	Extraction interprets syllabus text (reason), TaskPlanner decomposes work (plan), scheduler/exporters materialise calendars (execute).
Fine-Tuned Model	LoRA-tuned <code>t5-small</code> integrated via <code>AssignmentExtractor</code> ; chosen to specialise on academic phrasing while staying lightweight.
Evaluation Metrics	<code>training/eval_extraction.py</code> measures field EM, deliverable micro-F1, and due-date error.
Multi-Agent Collaboration (optional)	Planner and Executor operate as cooperating agents handling task decomposition and execution.
External Integrations (optional)	Chroma RAG index (MiniLM embeddings) provides retrieval; CLI/Streamlit deliver user-facing tools.
User Interface (optional)	Typer CLI for scripted workflows; Streamlit UI for interactive review/export.

7 Deliverables Map

Source code	Repository root (installable package, tests, UI).
Architecture doc	<code>docs/architecture.md</code> .
Data science report	<code>docs/ds_report.md</code> .
Fine-tuning scripts	<code>training/*.py</code> , datasets in <code>training/data/</code> .
Interaction logs	<code>logs/interactions.log</code> .
Prompt history	<code>deliverables/prompts.txt</code> .
Final report	This <code>report.tex</code> .
Deliverables	<code>deliverables/README.md</code> .
README	
Exports	<code>out/</code> (ICS, CSV, JSON, SQLite).

8 Future Work

- Extend extraction to capture rehearsal vs final submissions when both are present.
- Load LoRA adapters during evaluation for quantitative reporting on tuned model performance.
- Add confidence calibration and retrieval-backed planner prompts for ambiguous assignments.

9 References

- *DS Internship Assignment.pptx.pdf*, project briefing.
- Anthropic, *Building Effective Agents*, referenced design guidance.