Evolving the Edison Papers

A Human-in-the-Loop AI Platform for Transcription and Indexing

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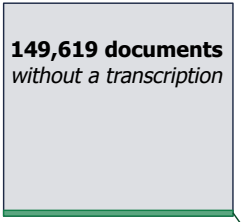
Rutgers University · WINLAB · Thomas A. Edison Papers

The Problem

The Edison Papers Digital Edition hosts ~**154,000** digitized documents.

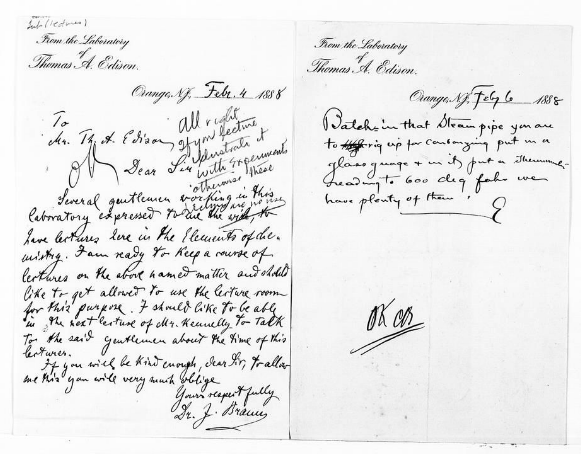
Browsing works. Metadata is rich.

But almost none of it is transcribed — so none of it is searchable as *text*.



2.7% transcribed.

Why This Is Hard



Sub (lectures)

From the Laboratory of Thomas A. Edison.

Orange, N.J. Feb. 4 1888

To Mr. Th. A. Edison

All right if you lecture & illustrate it with experiments otherwise these lectures are no use

Dear Sir

Several gentlemen working in this laboratory expressed to me the wish, to have lectures here in the Elements of chemistry. I am ready to keep a course of lectures on the above named matter and should like to get allowed to use the lecture room for this purpose. I should like to be able in the next lecture of Mr. Kennelly to talk to the said gentlemen about the time of this lectures.

If you will be kind enough, dear Sir, to allow me this you will very much oblige

Yours respectfully
Dr. J. Braun

From the Laboratory of Thomas A. Edison.

Orange, N.J. Feby 6 1888

Batch – in that Steam pipe you are to rig up for condensing put in a glass guage & in it put a Thermometer reading to 600 deg fahr we have plenty of them.

E

OK CB

One real page from the archive (et0976):

- Cursive, 1888, two different hands
- Marginal notes **crammed between lines**
- Words crossed out and replaced
- Printed letterhead mixed with handwriting

This is the *normal* case, not the worst case.

How Transcriptions are Measured

Both metrics are **edit distance**, normalized by the reference length:

$$\text{CER} = \frac{S + D + I}{N_{\text{chars}}}$$

$$\text{WER} = \frac{S + D + I}{N_{\text{words}}}$$

S, D, I = substitutions, deletions, insertions.

Note: insertions count on top but not below — so **CER can exceed 1.0**. A model that hallucinates scores 6.11, not 1.0.

Worked example

reference: dear sir, i enclose the report
prediction: dear si, i enclose the report now

	Characters	Words
Deleted	1 (r)	0
Inserted	4 (now)	1 (now)
Substituted	0	1 (sir,)
Reference length	30	6
Score	**0.167**	**0.333**

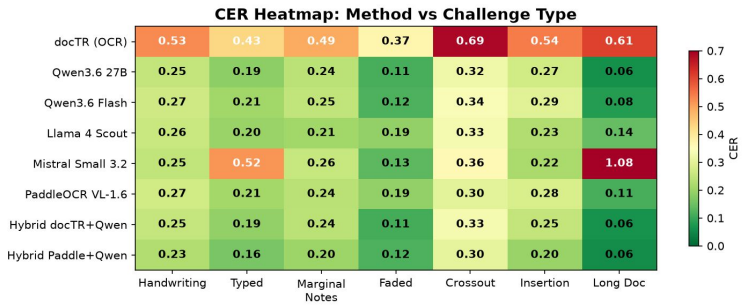
WER is harsher — one wrong character condemns a whole word.

Benchmarked 8 Methods

Method	Type	Docs	CER↓	WER↓	$/doc
PaddleOCR-VL → Qwen	Hybrid	26	**0.198**	**0.261**	0.0076
docTR → Qwen	Hybrid	26	0.220	0.278	0.090
Qwen3.6-27B	VLM	26	0.218	0.276	0.0223
Qwen3.6-Flash	VLM	26	0.235	0.299	0.0069
Llama-4-Scout	VLM	26	0.234	0.324	0.0005
PaddleOCR-VL	OCR-VL	26	0.244	0.320	*free*
Mistral-Small-3.2	VLM	26	0.452	0.503	0.0003
docTR	OCR	26	0.516	0.823	*free*

26 documents from **Volume 9**, ground truth from the published book edition, every document hand-labeled with challenge tags.

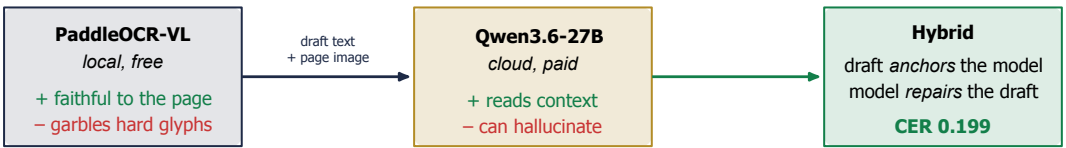
Where Each Method Breaks Down



Green = lower error = better.

- Crossouts and handwriting are hard for *everything*
- Classical OCR (top row) simply cannot read 19th-century script
- The hybrid (bottom row) is the greenest band overall

Why the Hybrid Performs Best in Our Benchmark



- The model never sees a blank slate — it sees a draft it must justify *against the image*
- That constraint is what suppresses runaway hallucination
- **The free half does the reading; the paid half only corrects**

Archive Specific Prompting and Guardrails

1. Structural separation

Tag what the author *didn't* write, inline: [Letterhead] [Stamp] [Marginal note]. Otherwise a researcher can't tell Edison's words from a mailroom stamp.

2. Entity gazetteer

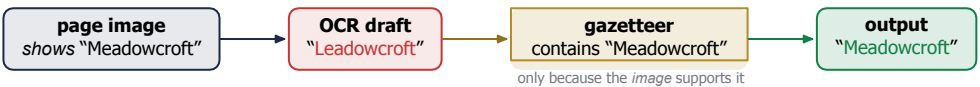
A curated gazetteer repairs "Leadowcroft" → "Meadowcroft" – but only where the page image supports the correction

3. Conservative splitting

"When uncertain, prefer **continuation** over inventing a split" — a missed boundary is one click to fix; a spurious one is a mess. Duplicate scans are flagged on a *separate* axis.

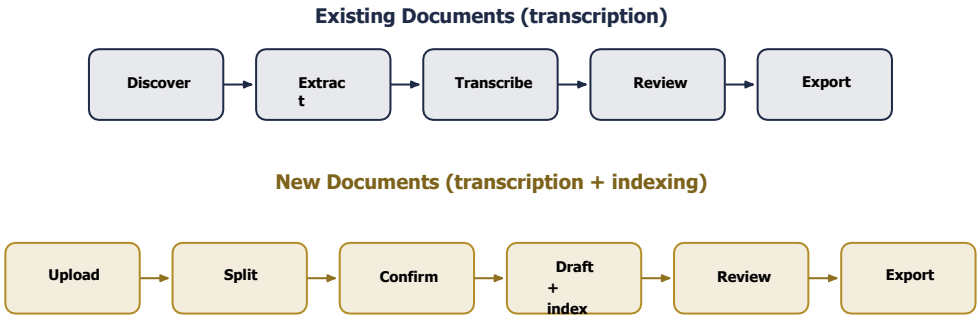
4. Deterministic fields in code

Titles follow a fixed pattern on the live site, so they're **computed in code**, never generated.



All three prompts are versioned files; every stored transcription records which version produced it.

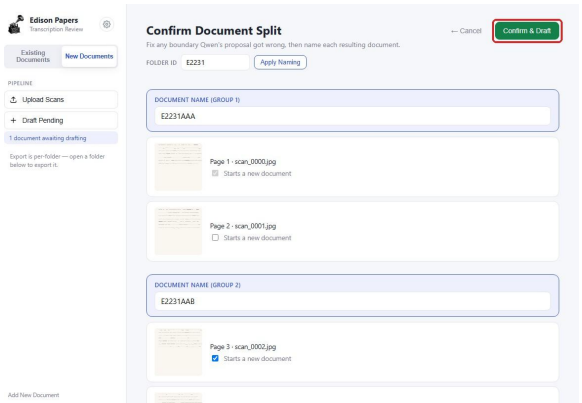
What Was Built: Two Pipelines



Shared: the same hybrid engine, the same storage layer (file:// today, s3:// by config), the same review UI.

New on the bottom row: bulk scans have *no document boundaries* and *no metadata* — both have to be produced.

Where Does One Document End?

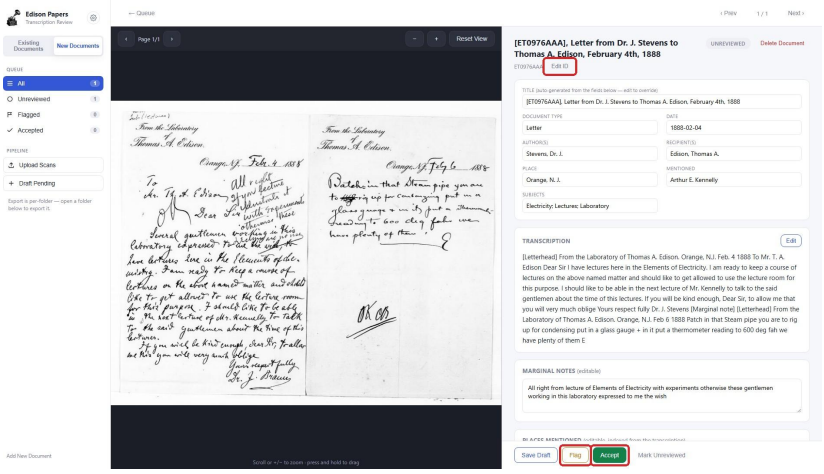


A scan folder is an ordered pile of images. Nothing records where one letter ends and the next begins.

The model proposes boundaries page by page; **the reviewer confirms or corrects every one** before anything is transcribed.

Scaling: a 70-page folder exceeds the request-size limit, so it is split into overlapping windows dispatched **3 at a time** — **2.26×** faster on a real 71-page batch.

Nothing Counts Until a Human Accepts It



Real output — the same 1888 page from earlier. It read the cursive, tagged the letterhead, pulled the angled marginal note, dated it **1888-02-04**. Cost $**0.0016**.

Every field editable, raw AI output **never overwritten**, export takes only **accepted** documents.

What It Costs to Run

Measured cost	
One single-page letter	$0.0016
Benchmark avg (multi-page)	$0.0076
PaddleOCR-VL draft pass	*Free*

Projected: all 149,619 documents	
If mostly single-page	~$245
If multi-page average	~$1,420

Why it can't run away

- A hard **all-time spend cap**, checked before *every* model call — not per run. Reached ⇒ drafting stops.
- Adjustable live in the Settings menu, no restart
- **Human-paced:** nothing runs in a background loop — a reviewer clicks, a bounded batch runs
- Split proposal is **resumable** — a mid-batch failure never re-bills finished pages

The bottleneck isn't cost — it's review throughput.

What's Done

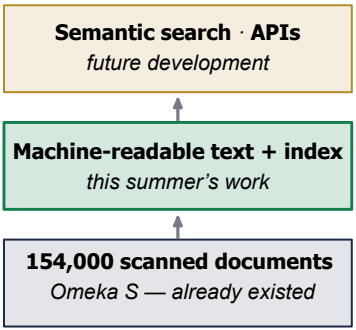
- ✓ Benchmarked 8 methods; picked the hybrid on evidence, not intuition
- ✓ Both pipelines working end to end against the live archive
- ✓ AI split proposal + full metadata indexing
- ✓ Filtered Discovery - the reviewer picks what to transcribe
- ✓ Cost caps, resumability, remote multi-device access
- ✓ **343 automated tests passing**

149,619 documents
have a working path to transcription

$245 – $1,420
projected for the entire backlog

Every output provisional
a human accepts it before it counts

For Future Development: Archive → Research Platform



Each layer needs the one beneath it to exist first.

The original goal was to move the site from a *static repository* to a *dynamic research platform*. Semantic search and public APIs were always the destination — but neither is possible over images.

Now that the text and metadata exist:

- **Semantic search** — embed the transcriptions so a researcher can search by meaning, not just keyword; the indexed places, names and subjects give it structure to filter on
- **Public APIs** — expose transcriptions and their entity index for external digital-humanities work
- **Write-back to Omeka** — close the loop so accepted transcriptions land on the live site, not just a CSV
- **Corpus-scale analysis** — correspondence networks, topic and place trends across 150,000 documents

Questions?