

# Module 5: Final Project Documentation v.1

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AME 486, Professor Kuznetsov

## Challenge and Rationale

Since my mother was diagnosed with dementia in late 2023, my goal has been to learn more about the wicked problem of cognitive degeneration, and come up with a concept for and then build a technology platform using web, mobile, and communication technologies to bring people experiencing cognitive decline, families, and care providers together to improve lives, improve treatment outcomes, and preserve shared histories while doing so. Is this something technology can help solve or at least mitigate? Can something as purely mathematical as software help families emotionally or even practically? Could it even warn people of potential cognitive health issues before things progress too far to ameliorate? This is not just a problem for my family. It is a growing global problem with 2% of the entire population of Earth suffering from some form of dementia - and 60-80% of that is Alzheimer's (Alzheimer's Association). By 2050, that number is expected to triple due to the aging of the world's population (GBD 2019 Dementia Forecasting Collaborators).

## Solution

My design solution combines both mobile and browser-based applications to schedule consistent calls with loved ones who may have cognitive issues. Social engagement is one of the most effective known ways to slow cognitive decline, and a caller can ask for stories, recipes or other types of structured conversation, and otherwise engage on a regular basis. Calls are transcribed, summarized, organized thematically, parsed for names, dates, and locations using AI, and saved in a family archive. For those who give permission, those calls are also securely analyzed for linguistic and speech indicators, called "linguistic markers", that correlate with cognitive function. This data can be shared in a user-friendly way with privileged family members.

A separate, HIPAA-compliant web portal for care providers will integrate our cognitive analyses with electronic health records using industry-standard schemas and APIs (HL7 International).

Capturing audio and video of people telling treasured stories provides a legacy for families, while at the same time potentially improving care and understanding by quantifying cognitive fitness. Sheaf can be used remotely, or in person, or even process pre-recorded audio. Family members will be able to create print or audiobooks and even videos with the help of AI-enhanced tools, impacting current and future family and friends of every Sheaf participant.

Now for the demo. Everything other than the logo you see in this demo I built for this capstone.

## Process

### Conceptual

In order to understand the difficult issues surrounding cognitive health, and how to support families with elderly relatives suffering, or potentially suffering, cognitive decline, I interviewed domain experts in health, neurology, linguistic marker technology, and natural language processing by phone, videoconference, and in person.

### Technical

For a tech stack, I went with Python, React, Postgres, and am using APIs for transcriptions, plus AI for story analysis. How did I make it? Many long days and nights.

### Evolution of Concept

The project has already evolved in many directions, and many aspects. It began as a VR concept for brain games, virtual travel and conversation, but the technical complexity of both the headsets, the setup, the software seemed far too involved for elderly people suffering from cognitive issues. Next it evolved to the idea of a storytelling app, to increase social engagement and preserve stories that might be lost. Once we came across the idea of adding cognitive analysis with storytelling, we finally felt we had something unique and powerful. A serendipitous Uber ride with medical software salespeople led to the final piece - a portal with longitudinal cognitive data that care providers could use to evaluate the effectiveness of their treatment plans.

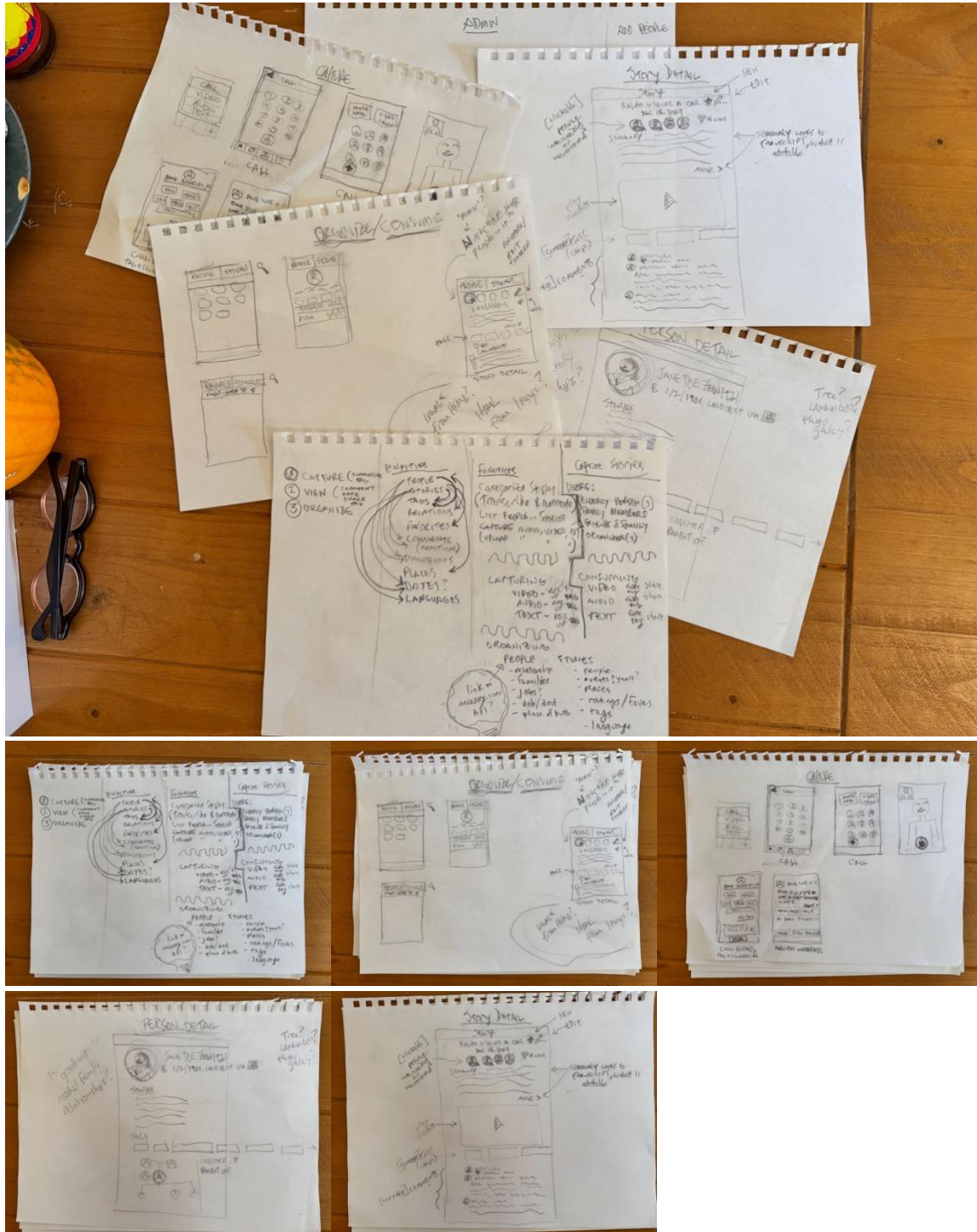
## Process

Overall, my development process is very organic, which is a euphemism for “idiosyncratic and disorganized”. I get a rough idea of what I feel is most important to bang away at first, and dive in, expanding or changing direction as I go, getting feedback and inspiration (or hitting brick walls) along the way. It’s sort of a low-grade agile process.

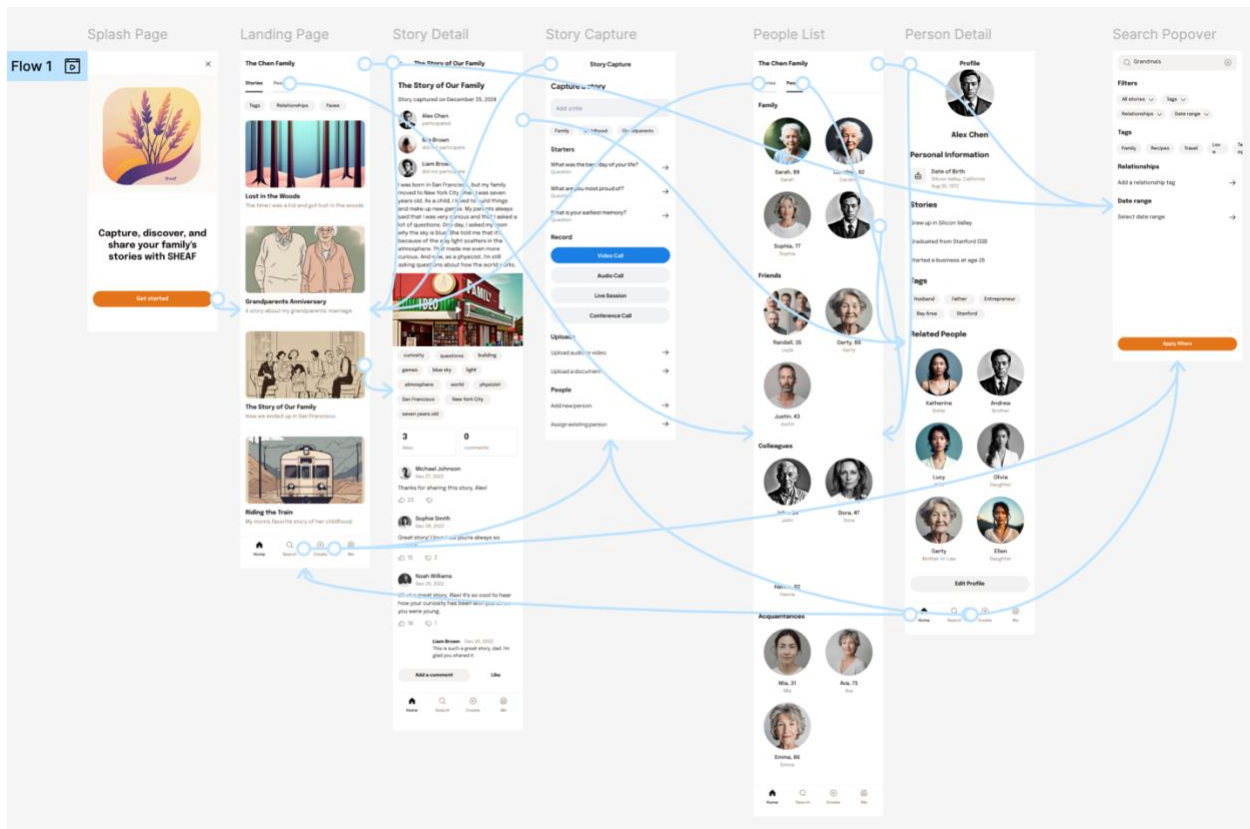
My target has been to have core pieces working in time for this assignment deadline, and I feel I’m there or close to it. It’s been many long, late nights but things are beginning to take shape. At this point, one can place a call, record audio in browser, or upload an audio file, have those be processed for story content and for cognitive markers, and the system returns that data to show in charts and story-derived metadata. I also have the basics for a Provider Portal that would enable privileged care providers to view the cognitive data Sheaf captures juxtaposed with their care plans over time.

# Additional Resources

## Early Sketches:



## Early UX Modeling & Wireframes (Mobile):



Codebase:

sheaf-inc / sheaf-web

Code Issues Pull requests Actions Projects Security Insights Settings

sheaf-web (Private) Edit Pins Unwatch 2 Fork 0 Star 0

story-analysis-ai 3 Branches 0 Tags Go to file Add file Code Contribute

This branch is up to date with master.

petejacobson Merge pull request #5 from sheaf-inc/family aa55ab3 · yesterday 39 Commits

api	AI story analysis works!	yesterday
database	working EHR SYstems dropdown for linking patients	3 days ago
frontend	AI story analysis works!	yesterday
migrations	patient linking troubleshooting	3 days ago
node_modules	everything broken	last week
scripts	login, fakes, basics work	2 weeks ago
services	AI story analysis works!	yesterday
sheaf_backup_20250319_163944	not really working but closer	3 weeks ago
test_output	recording fixed, stats linked from person, etc	last week
tests	everything broken	last week
twilio_calls	twilio and schema fixes	4 days ago
twilio_responses	basic twilio calling implemented! But not saving to databa...	5 days ago
.dockerignore	initial commit	last month

web API server and frontend

Readme Activity Custom properties 0 stars 2 watching 0 forks

Releases

No releases published  
[Create a new release](#)

Packages

No packages published  
[Publish your first package](#)

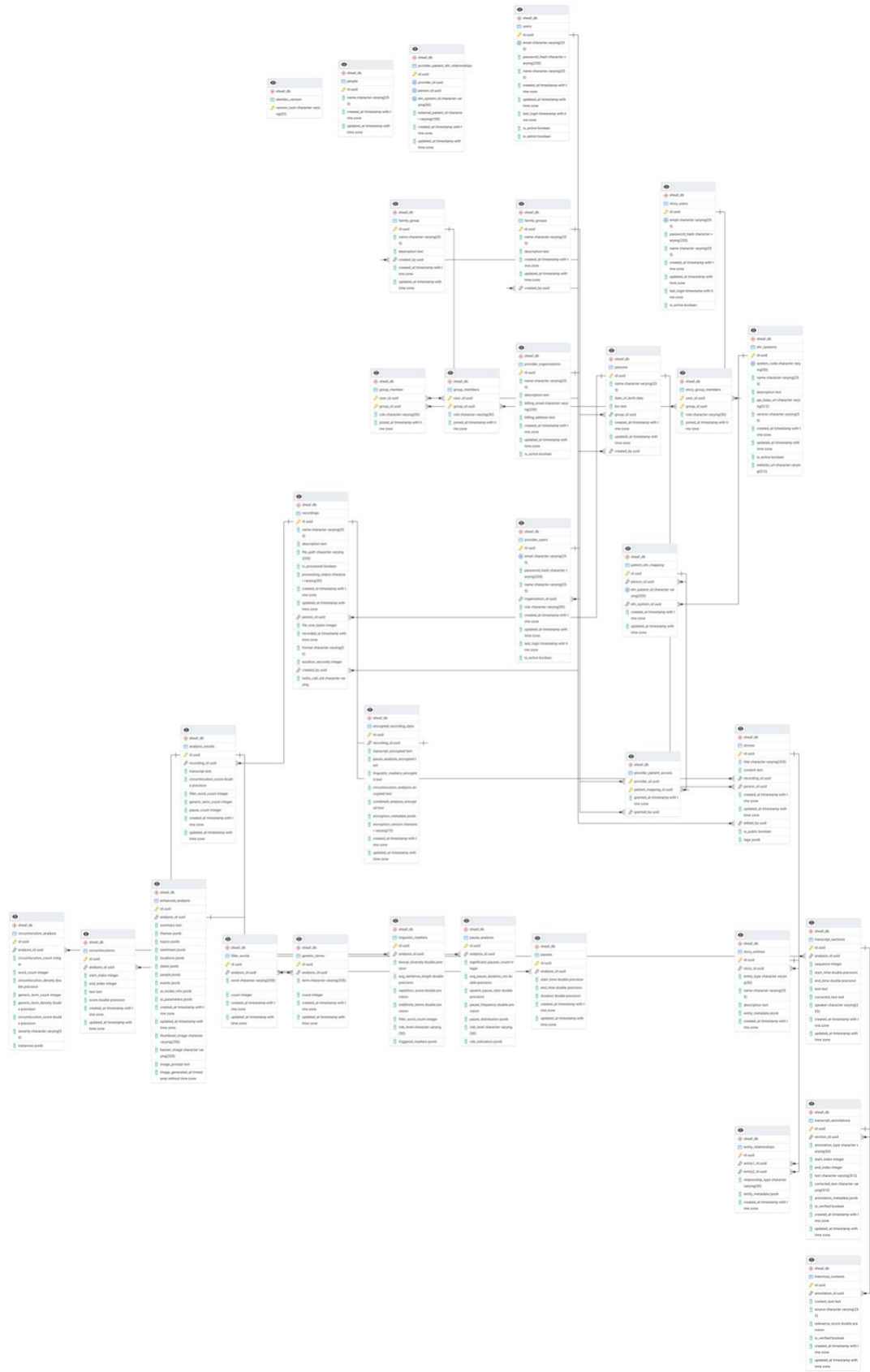
Languages

Python 54.9% JavaScript 36.2% Shell 4.1% HTML 2.9% TypeScript 1.2% PLpgSQL 0.4% Other 0.3%

Suggested workflows

Based on your tech stack

Database Scheme (ERD):





## References

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[8/fulltext](http://www.thelancet.com/journals/lanpub/article/PIIS2468-2667(21)00249-8/fulltext), [https://doi.org/10.1016/s2468-2667\(21\)00249-8](https://doi.org/10.1016/s2468-2667(21)00249-8). Accessed 13 Apr.

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