MICHIGAN STATE UNIVERSITY

Project Plan Presentation
On-Premises ASR Pipeline for Michigan English

The Capstone Experience

Team Michigan State University Linguistics

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From Students…
…to Professionals

MSU LiLaC

- MSU Linguistic, Language, and Cultures (LiLaC)
  - Offers degree programs and research in linguistics
- MI Diaries Project done by the Sociolinguistics Lab
  - Aims to chronicle language changes over the course of the pandemic
  - Aims to provide primary sources on the pandemic to historians as well
  - Takes volunteer audio

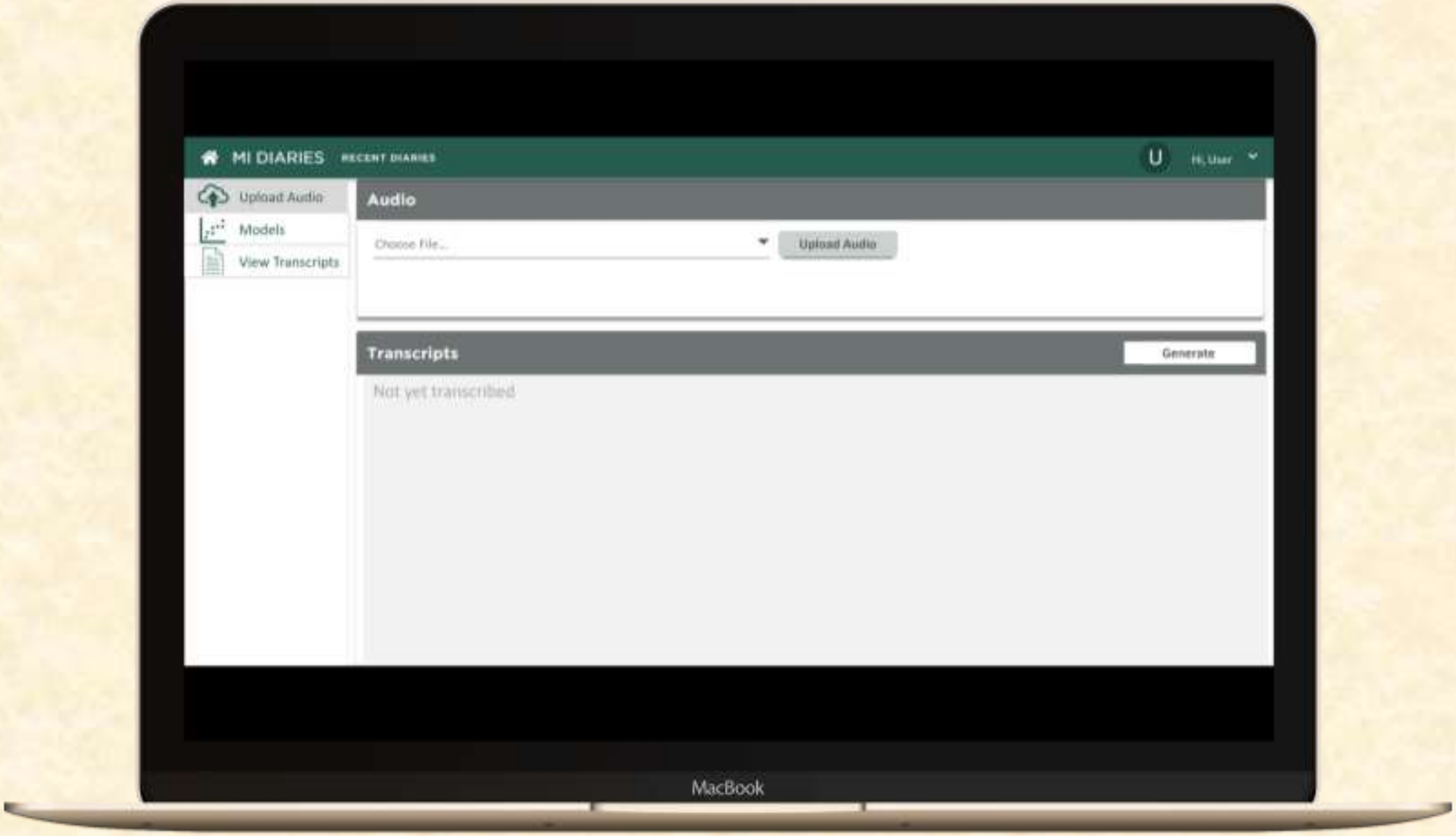
Functional Specifications

- Creating an Automatic Speech Recognition (ASR) to fit into the current pipeline for the MSU Linguistics
- Replacing Google's role in the pipeline
  - Saves money
  - Protects data
  - Improves accuracy with dialectal differences
- ASR
- Speaker Diarization (speaker differentiation)
  - Time-aligned transcript
- Model Retraining
  - Handling inaccuracies

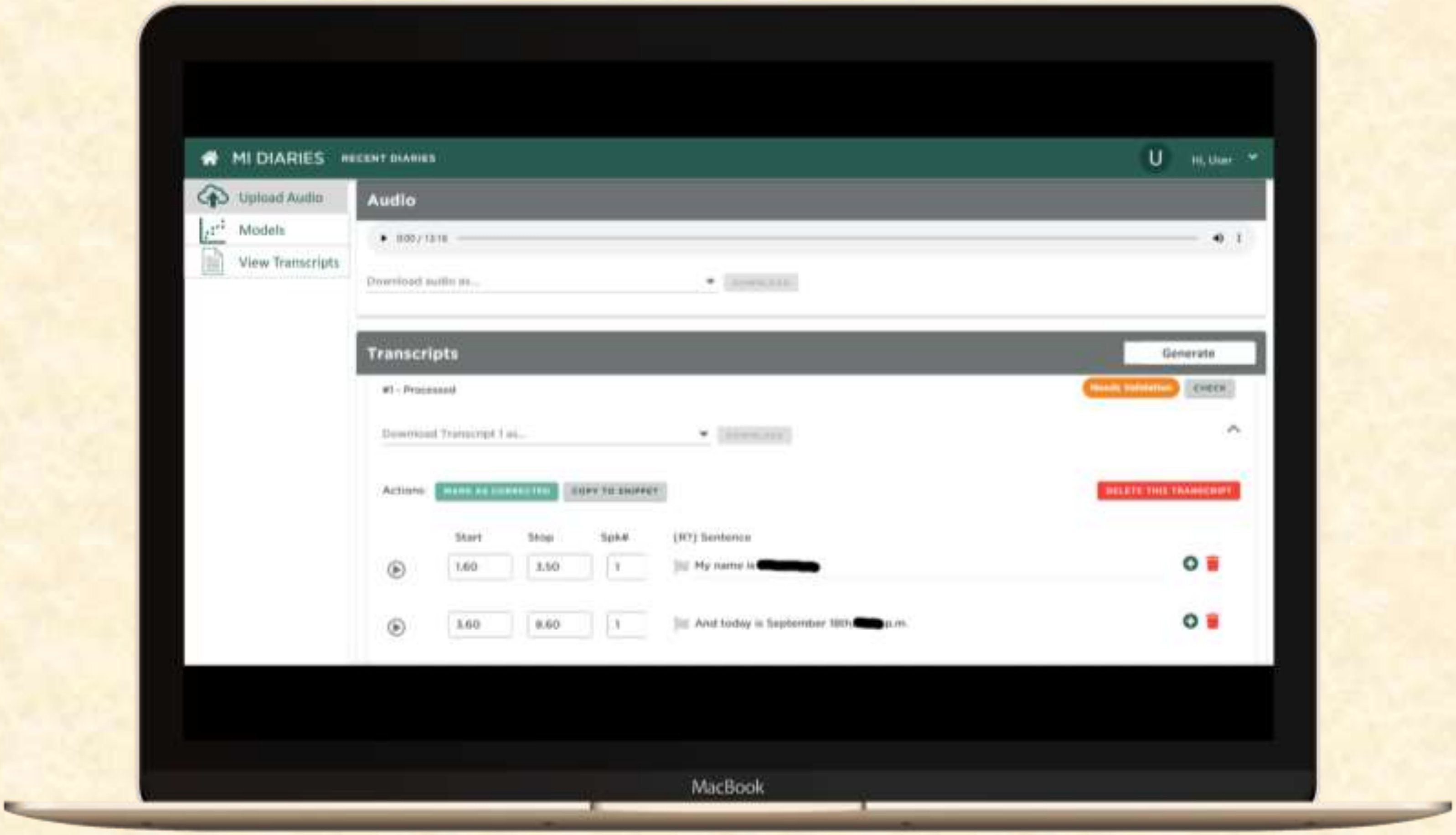
Design Specifications

- Audio Upload
- Hand-Correction Interface
- Sensitive Information Flagging
- Diarization View
- Retraining

Screen Mockup: Transcription

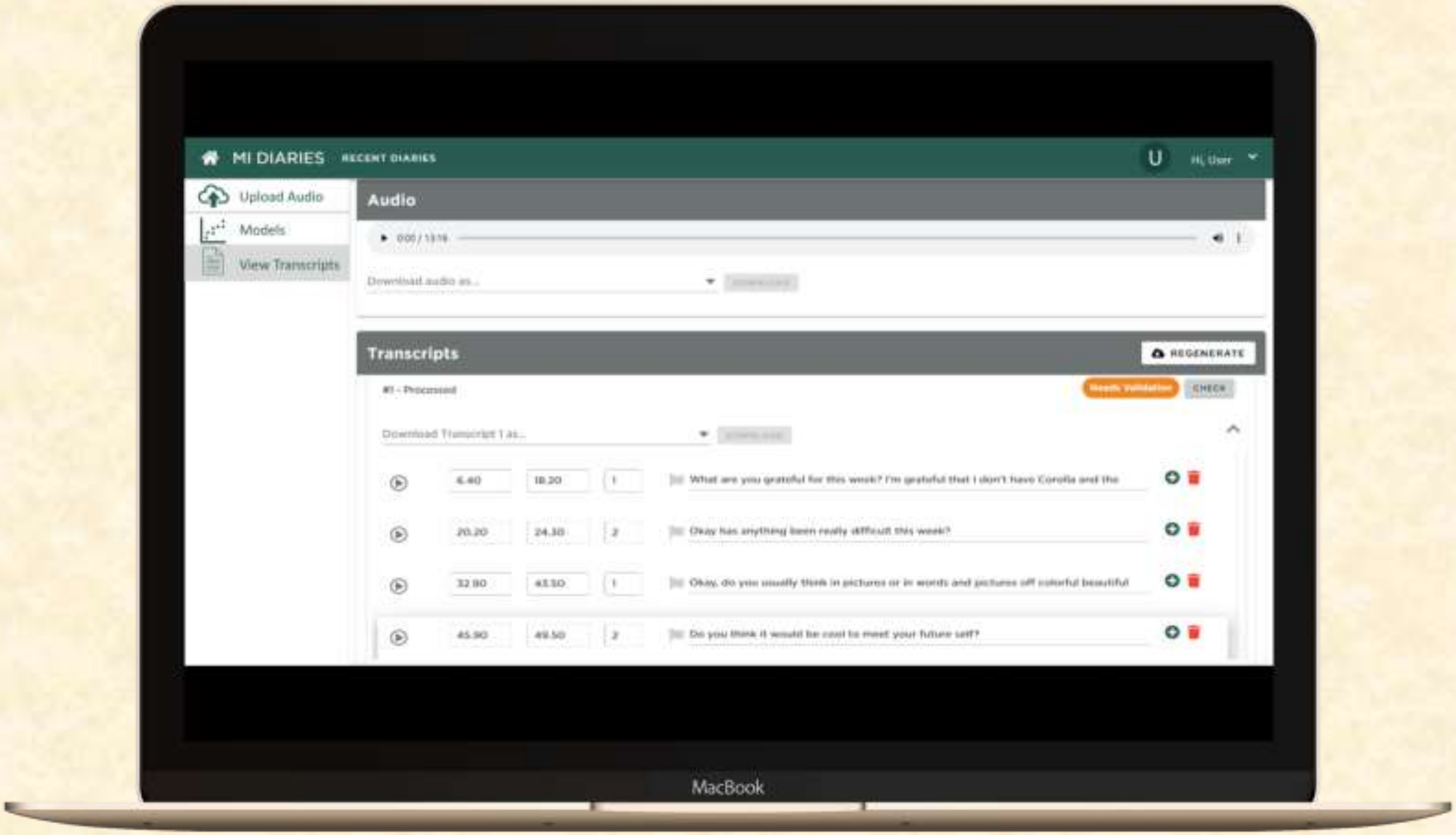


Screen Mockup: Transcription (2)



Start	Stop	Spk#	(R?) Sentence
1.60	3.50	1	My name is [redacted]
3.60	8.60	1	And today is September 18th [redacted] p.m.

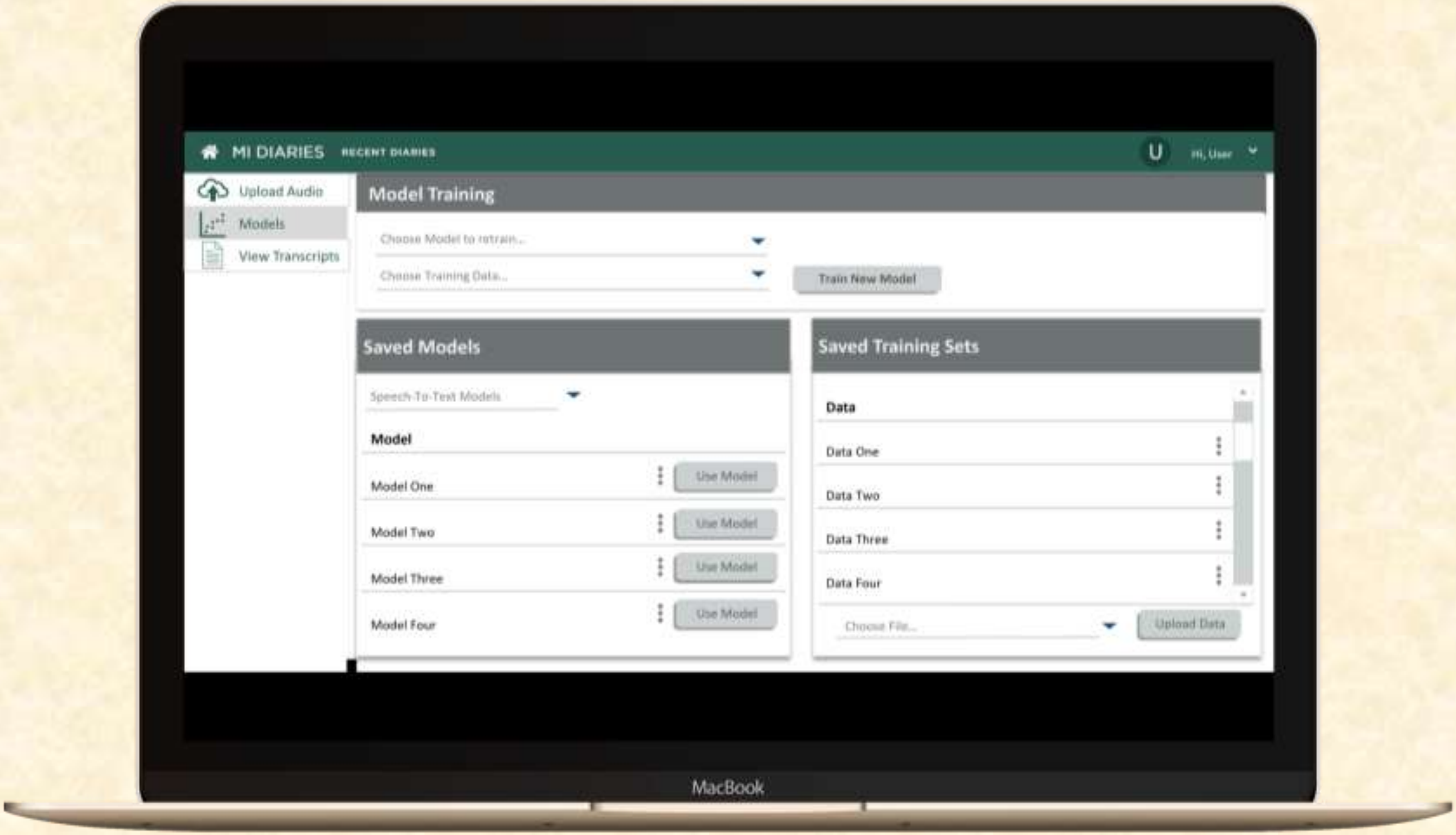
Screen Mockup: Diarization View



#1 - Processed

6.40	18.20	1	What are you grateful for this week? I'm grateful that I don't have Corolla and the
20.20	24.30	2	Okay has anything been really difficult this week?
32.80	43.50	1	Okay, do you usually think in pictures or in words and pictures off colorful beautiful
45.90	49.50	2	Do you think it would be cool to meet your future self?

Screen Mockup: Retraining



Model Training

Choose Model to retrain...

Choose Training Data...

Saved Models

Speech-To-Text Models

Model
Model One
Model Two
Model Three
Model Four

Saved Training Sets

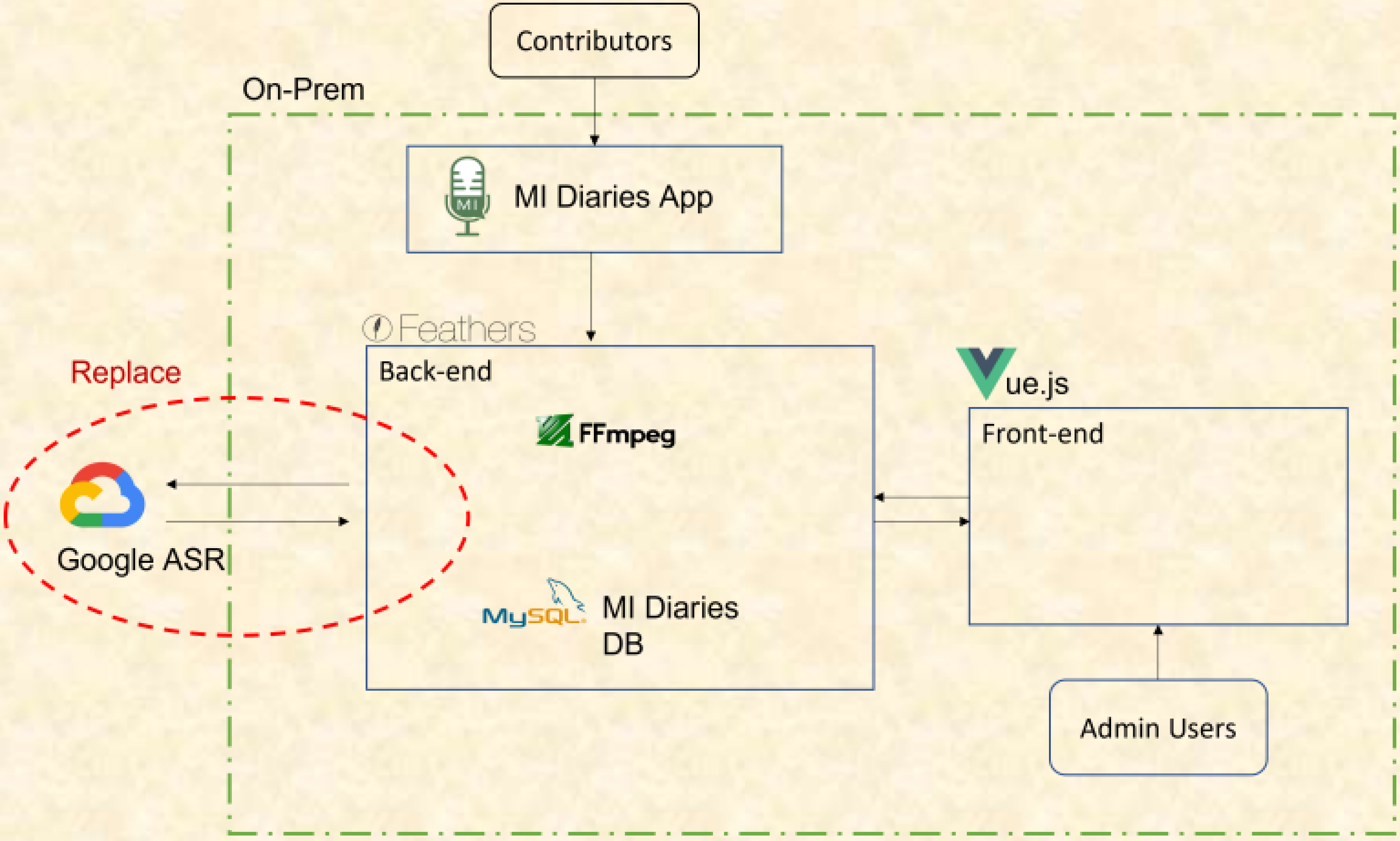
Data
Data One
Data Two
Data Three
Data Four

Choose File...

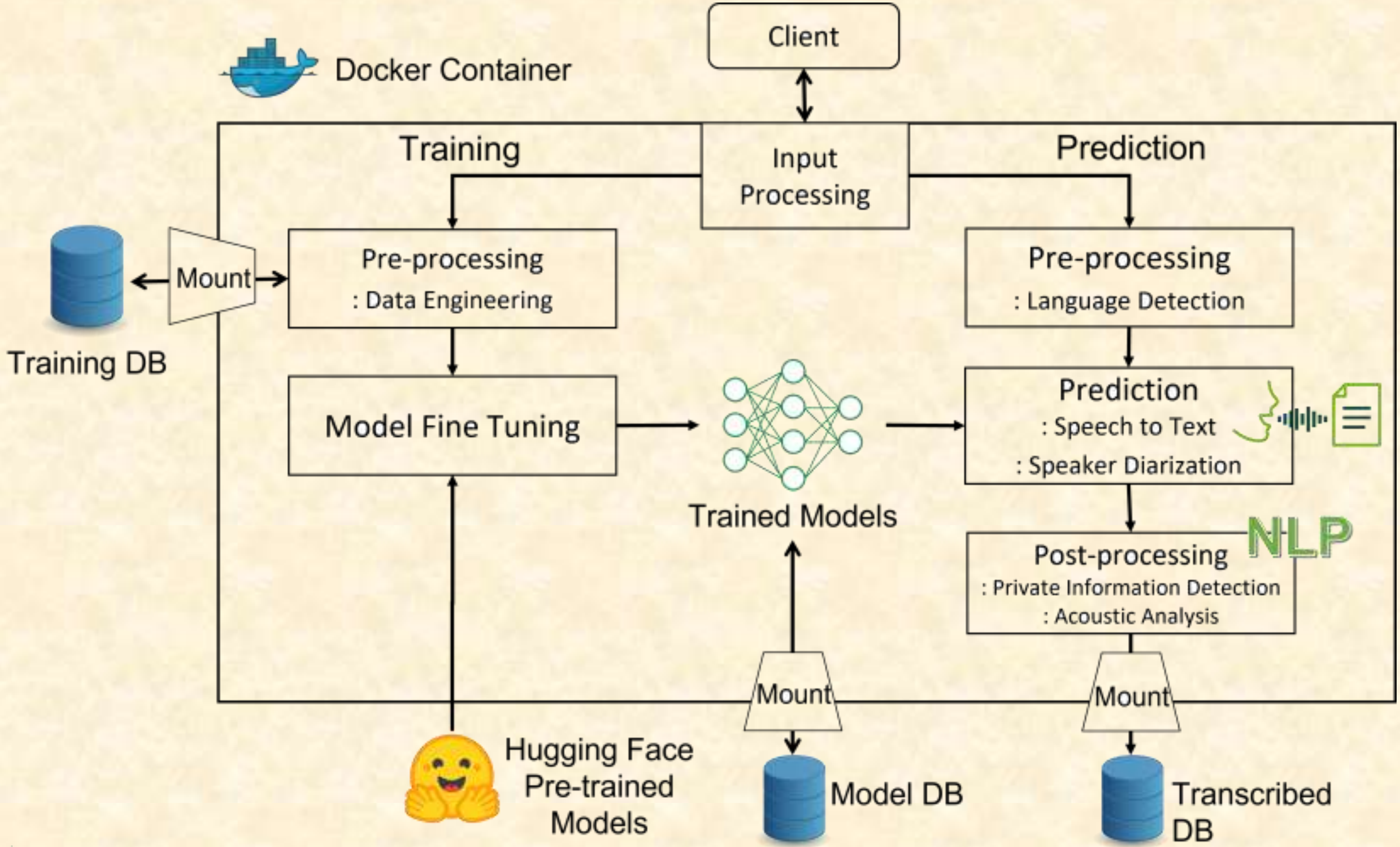
Technical Specifications

- ASR Pipeline consists of two processes
  - Training and Prediction
- Training
- Prediction
  - Pre-processing, prediction, and post-processing
  - Combines both models
- Docker
  - Portability
  - Potential GPU Acceleration

System Architecture



System Architecture



System Components

- Hardware Platforms
  - iMacs
  - MSU EGR GPU Computes
- Software Platforms / Technologies
  - Machine Learning
    - HuggingFace
      - PyTorch
      - Wav2Vec2, WavLM
    - Natural Language Processing
      - NLTK, spaCy, Gensim
  - Docker
  - GitHub
  - Python and PyCharm

Risks

- **Inadequate Data for Speaker Diarization**
  - Currently not enough labeled data for supervised learning in speaker diarization
  - Mitigation: Self-supervised models or using publicly available labeled datasets
- **Training and Predictions Times without GPUs**
  - Speed for training and prediction models is bottlenecked by the model architecture
  - Mitigation: Possible to use a smaller model which may be less accurate if speed is critical.
- **Extending to different dialects and languages**
  - Extension to different dialects is dependent on data we don't have
  - Mitigation: We will create features for users to upload their own training datasets which can fine-tune ASR models provided by Hugging Face.

Questions?

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