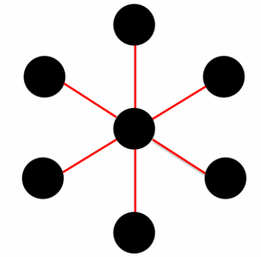
NaN.ai



A general purpose AI and machine learning startup leveraging federated learning to perform analytics on data that you can't see

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Situation

There exists many organizations that would like to leverage AI and machine learning to make predictions, perform analytics and extract insights. There is more data out there than ever before, sitting in individual silos specific to these organizations.

Complication

Though many organizations would benefit from cooperating with one another, they are unable to share data across different silos due to legal and privacy constraints. As a result, many organizations implement models based on data local to their specific silo, which results in lower performance and less robust models.

Data Silos for Voice Assistants

Hospital A has a voice assistant for patients Jack, Jill, and Nir. Their voice assistant is trained using a classical machine learning model on a centralized data source. While the model performs well, the voice assistant is not able to discern whether or not Jack is calling "Hey Siri" in his low pitched voice, or Jill is calling "Hey Siri" with her high pitched voice. Furthermore, because the voice assistant was trained on a local and biased dataset, the model can not understand Nir's voice, as he has a rough Israeli accent. This is problematic because the data that patients Jack, Jill and Nir talk about is private, and contains sensitive Protected Health Information (PHI) and Personal Identifiable Data (PID). The information that these patients talk about with the voice assistant are mission critical to their health.

What do people do currently for voice assistants?

Option A) Train models based on centralized training datasets, and distribute these models to voice assistants in local silos

These models are biased, in that the centralized training data does not obtain audio from a wide variety of voices.

Hospitals/providers/plans provide data when they can, and Data Scientists must strip out the PHI/PID data. There are tools to automate the process, but they are not 100% accurate. As a result, oftentimes voice assistants in the healthcare space must leverage synthetic data.

Apple Voice Recognition - Hey Siri

Why was federated learning needed?

A) Personalization

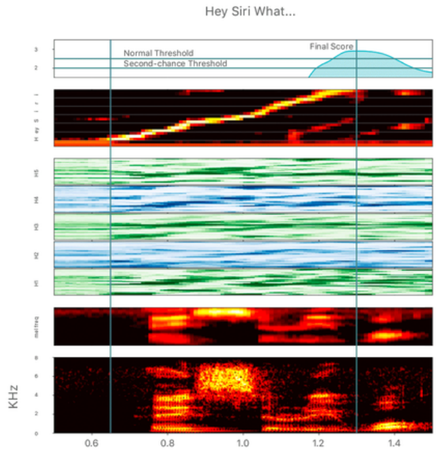
Not personalized to different users voices

B) User Privacy

People talk about Personal information

C) Limited amount of centralized training data

Biased datasets where certain accents are misunderstood



Hey Siri takes in raw audio, which is passed through a threshold detector and Mel filter bank. The summation of layers of the RNN results in the output of the acoustic model, which is encoded into text, inputted into a Q/A NLP model, where the response is decoded back to an audio output.

How does Hey Siri work?

Federated Learning used for Client - Server Communications

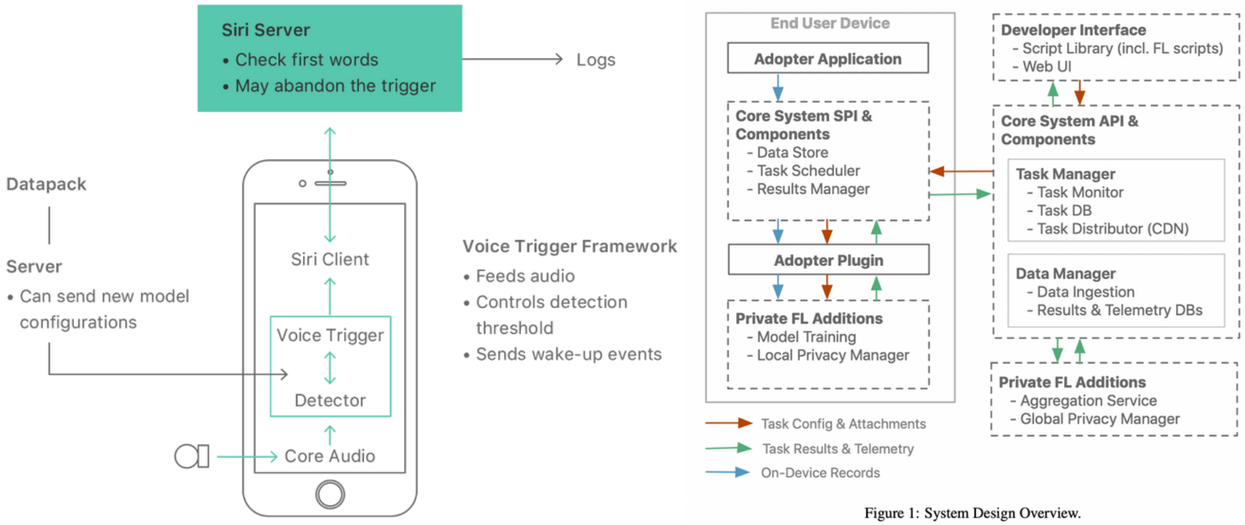


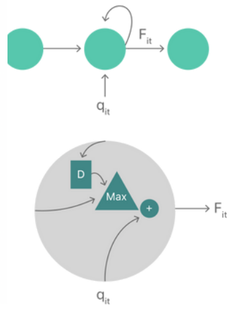
Figure 1: System Design Overview.

RNN / HMM to convert sequences of words to sentences

$$\mathbf{F}_{i,t} = max\{s_i + \mathbf{F}_{i,t-1}, m_{i-1} + \mathbf{F}_{i-1,t-1}\} + q_{i,t}$$

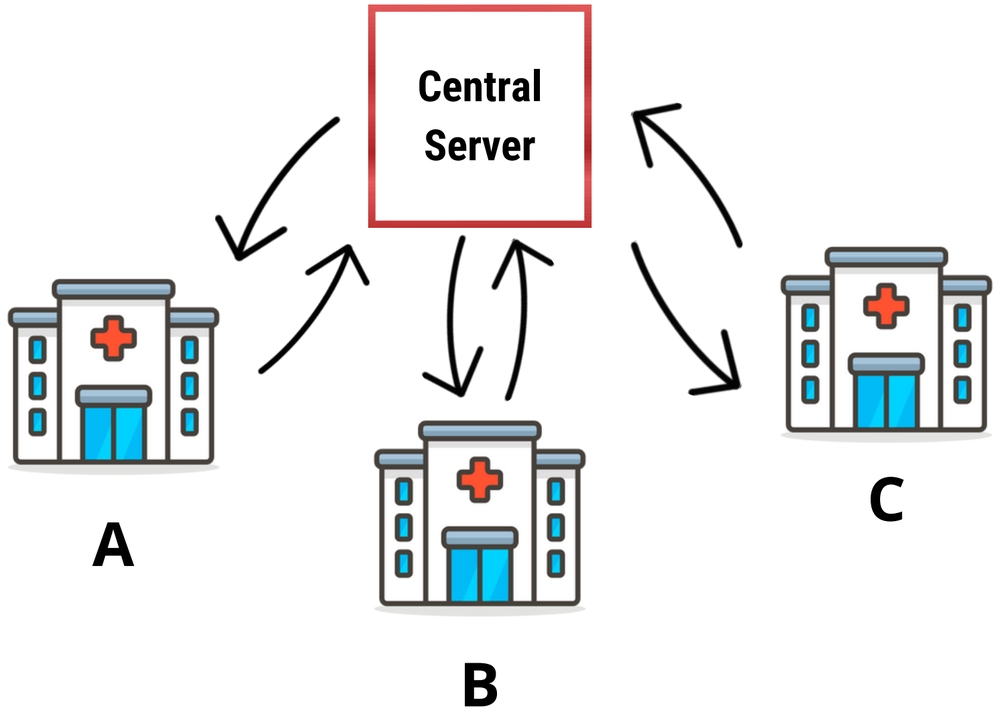
where

- $F_{i,t}$ is the accumulated score for state *i* of the model
- $q_{i,t}$ is the output of the acoustic model—the log score for the phonetic class associated with the *ith* state given the acoustic pattern around time *t*
- s_i is a cost associated with staying in state *i*
- m_i is a cost for moving on from state *i*



What is Federated Learning?

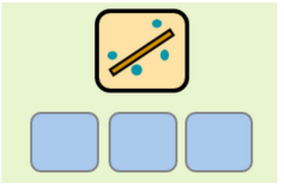
Federated learning is a privacy preserving approach to training machine learning models across a decentralized network of data providers



How does Federated Learning Work?

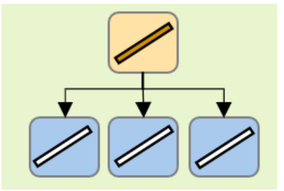
1) Initialize Global Model

A central server creates an initial model using only locally available data



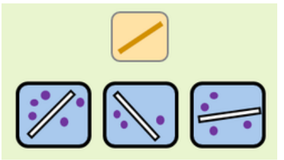
2) Broadcast Global Model

Initial model is sent to each data provider



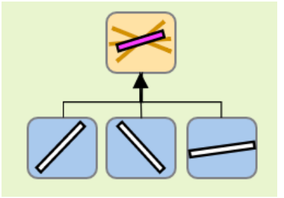
3) Retrain Locally

The data providers update the model by training on their own local data



4) Update Global Model

The model updates *only* are sent back to the central server and aggregated into an improved model



How can you make money from this?

Data Centric

Provide organization's models access to data sources (audio) for a fixed or variable cost

Model Centric

Provide hospital A access to enhanced modeling capabilities for voice recognition

Hospitals and Health Plans are using conversational AI and voice assistants today

HCSC Health Care Service Corporation
Anthem BlueCross
CVS Health
HCA Healthcare
KAISER PERMANENTE
Mount Sinai

Who else is using voice assistants in the healthcare space?

Frameworks/Enablers

Amazon
IBM Watson
Microsoft
Google
DialogFlow

Point Solutions

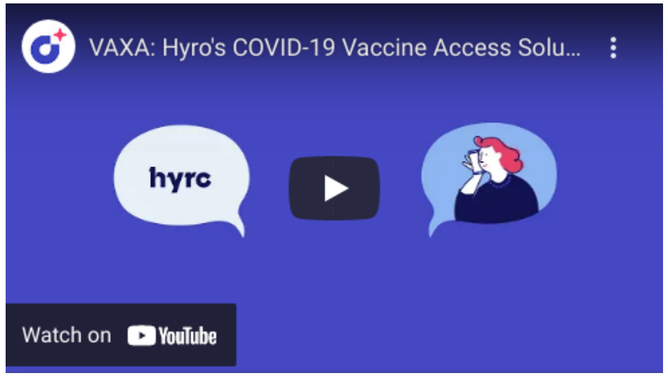
Hyro
Klara
Diagnostic Robotics
Cognility
Conversation Health
Optra Health
Orbita
Replicant

Orchestrators

OneReach.ai
BotCore

Platforms

Amelia
Nina
Avaamo
Kore
Artificial Solutions

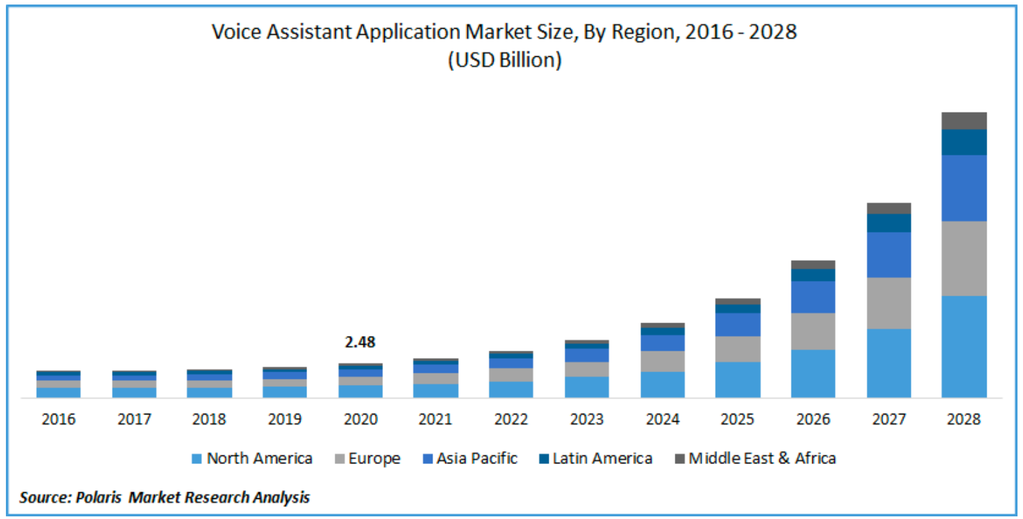


Hyro is using a voice assistant today in call centers related to COVID-19 Vaccines FAQ's and scheduling appointments

Voice Assistant Market Opportunity

What is the Total Addressable Market (TAM)?

- **$2.48B TAM in 2020**
- **CAGR of 32.7%**
- **Projected TAM of $20.66B in 2028**



Who are the key players?

Apple (Hey Siri)

Amazon (Alexa)

Samsung (Bixby)

What is the vision of NaN.ai?

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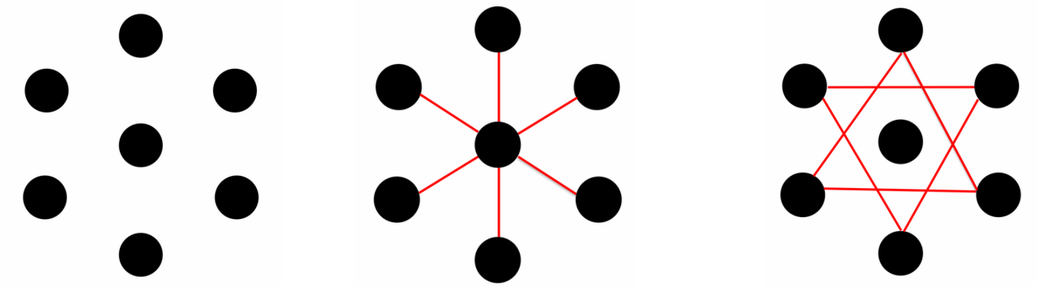

Classical ML Federated ML Fully Decentralized ML

And here is a bit about me: Natan Vidra (vidranatan@gmail.com)

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