WORKSHOP ON AUTOMATIC SPEECH RECOGNITION (ASR) ON EMERGENCY MEDICINE

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COMMUNICATION

Typical communication episode

S (speaker) wants to convey P (proposition) to H (hearer) using W (words in a formal or natural language)

Speaker

Intention: S wants H to believe P

Generation: S chooses words W

Synthesis: S utters words W

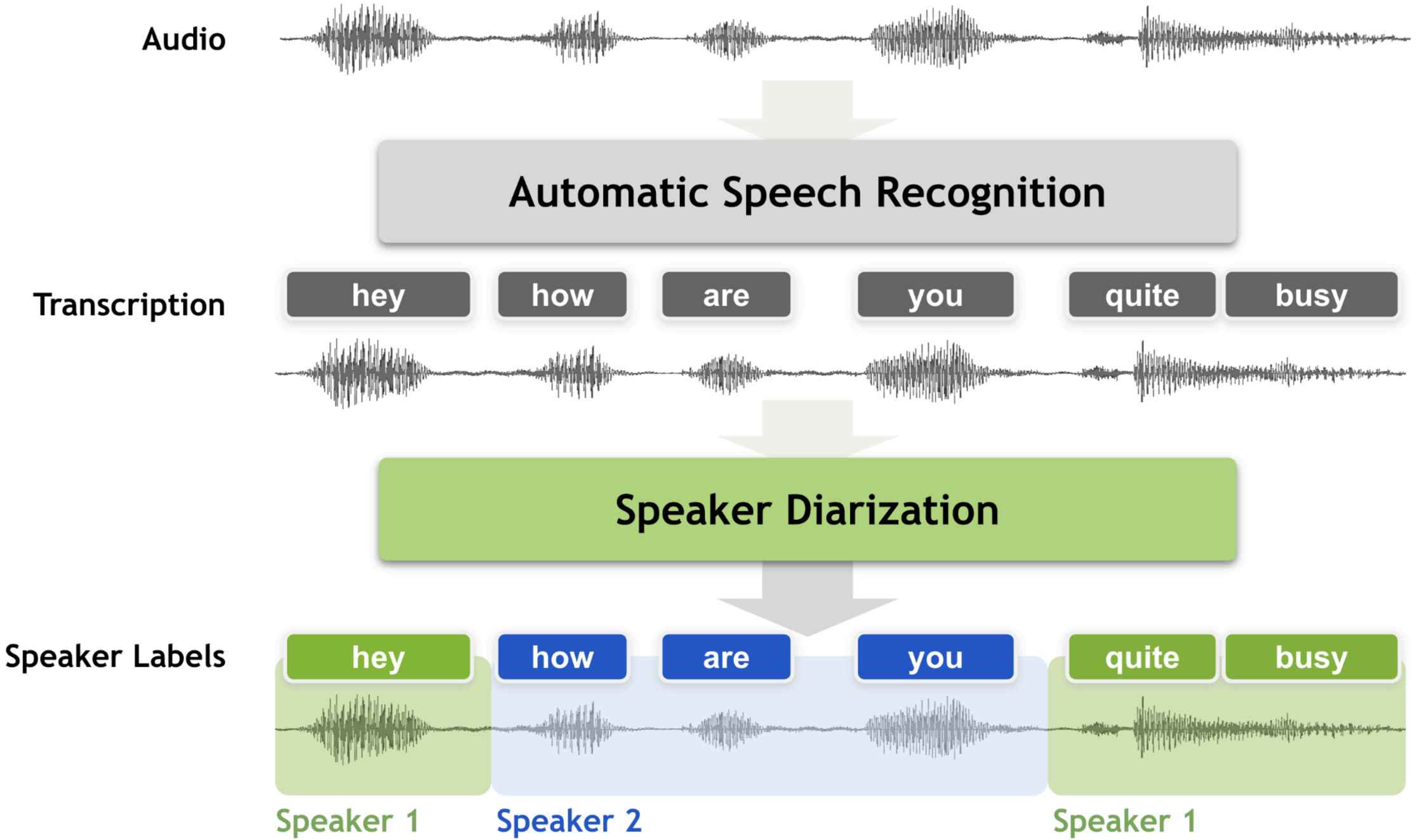
Hearer

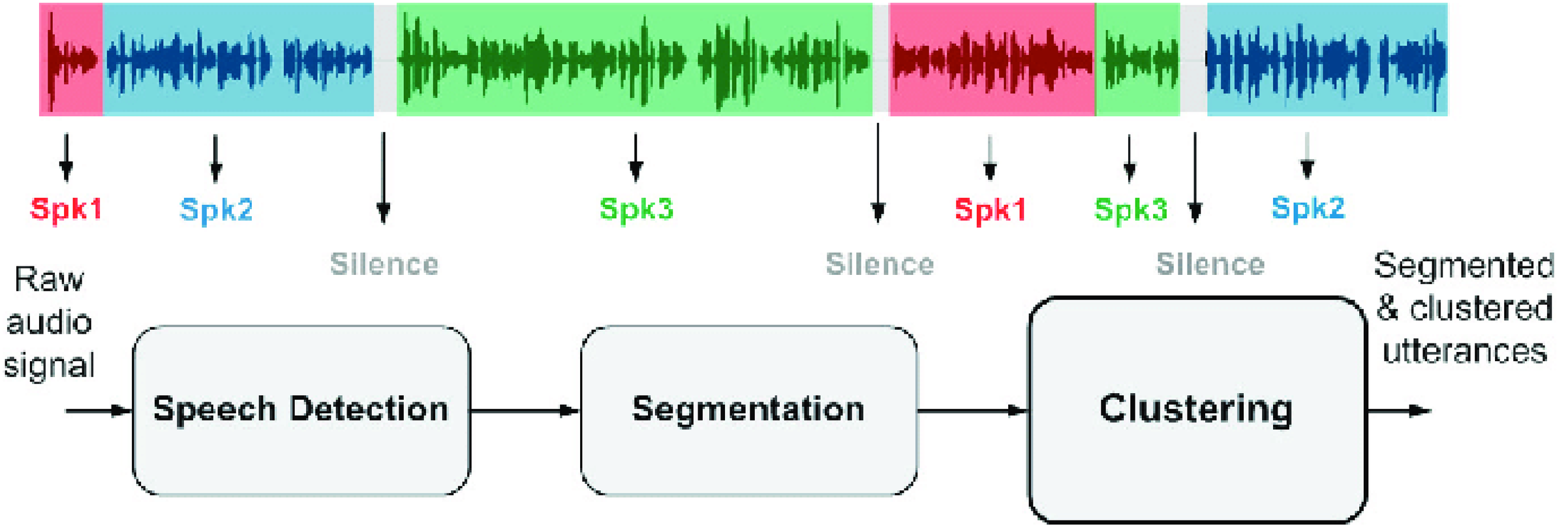
Perception: H perceives words W” (ideally W” = W)

Analysis: H infers possible meanings P1,P2,…,Pn for W”

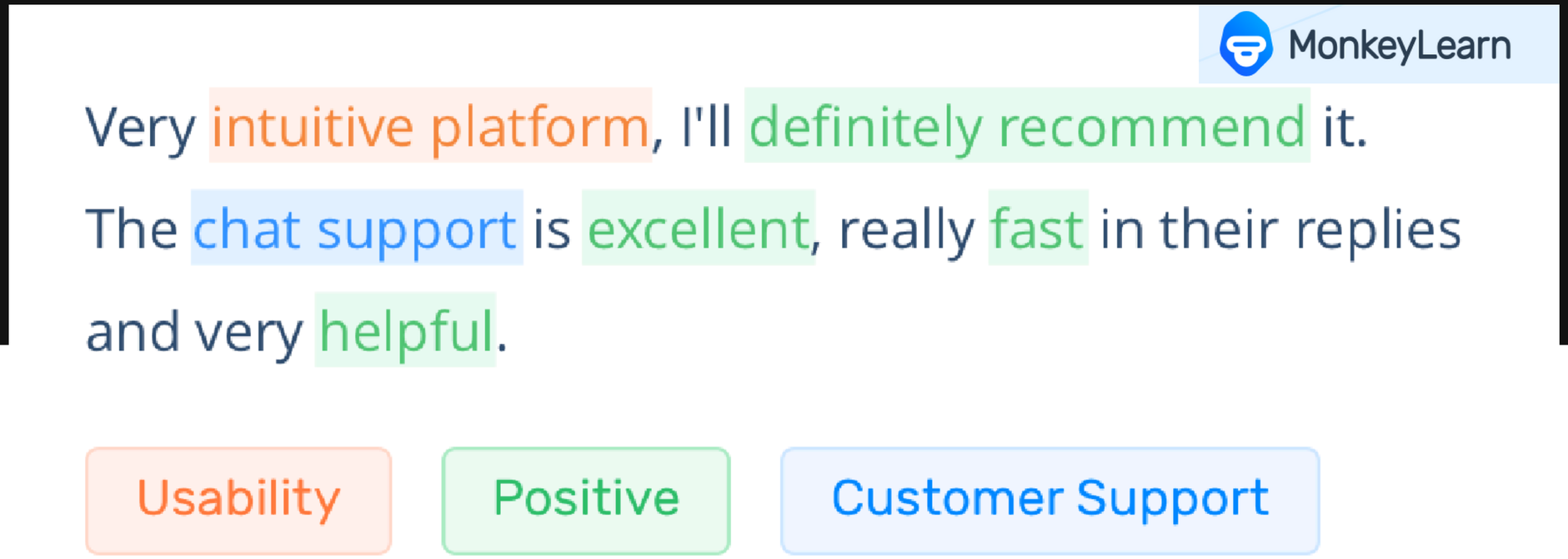
Disambiguation: H infers that S intended to convey Pi (ideally Pi=P)

Incorporation: H decides to believe or disbelieve Pi


Audio
Automatic Speech Recognition
Transcription
hey
how
are
you
quite
busy
Speaker Diarization
Speaker Labels
hey
how
are
you
quite
busy
Speaker 1
Speaker 2
Speaker 1


Spk1
Spk2
Silence
Spk3
Silence
Spk1
Spk3
Silence
Spk2
Raw audio signal
Speech Detection
Segmentation
Clustering
Segmented & clustered utterances

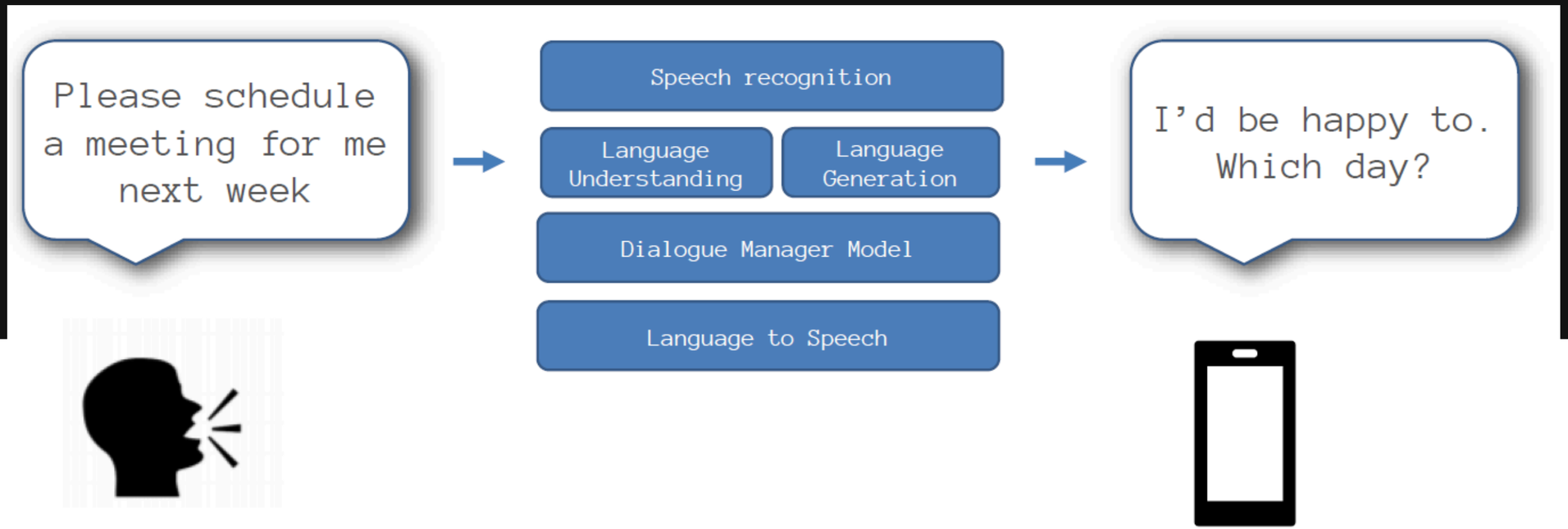
NATURAL LANGUAGE PROCESSING



understanding

Taking some spoken/typed sentence and working out what it means

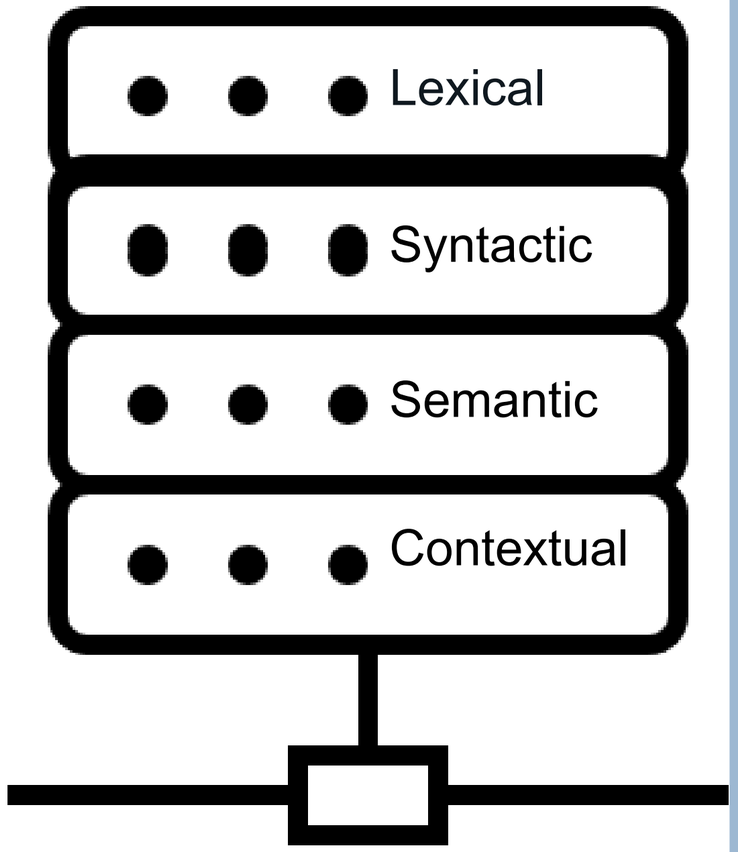
NATURAL LANGUAGE PROCESSING



generation

Taking some formal representation of what you want to say and working out a way to express it in a natural (human) language (e.g., English)

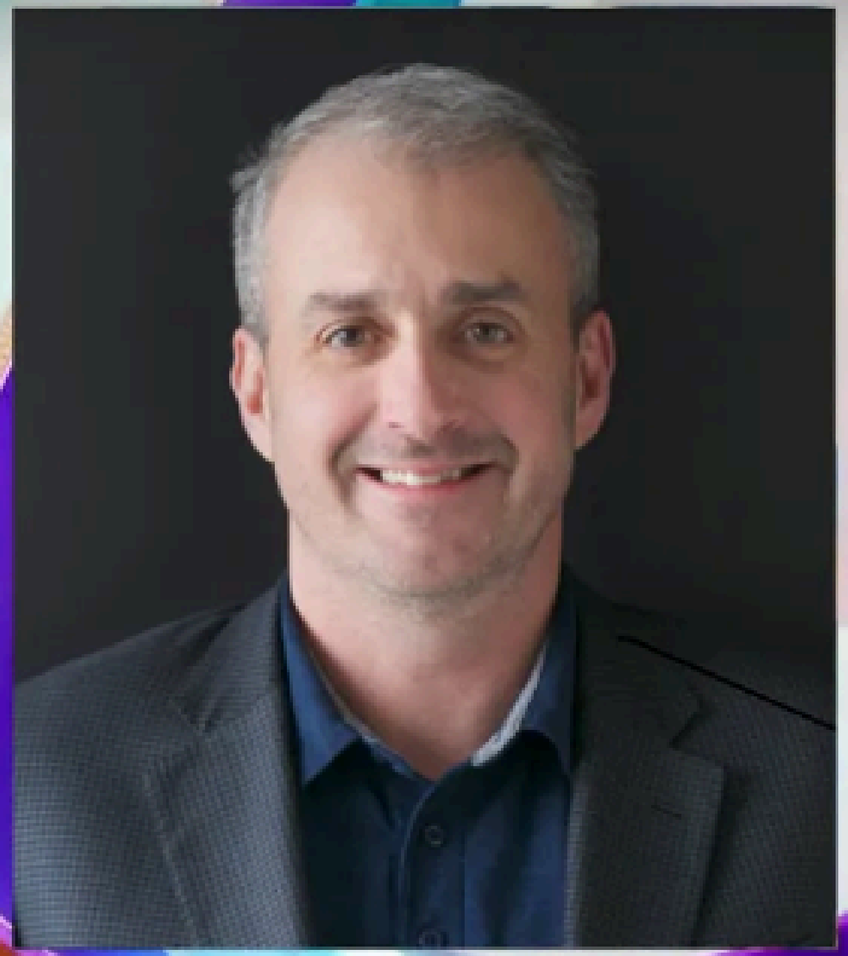
NLP Layers

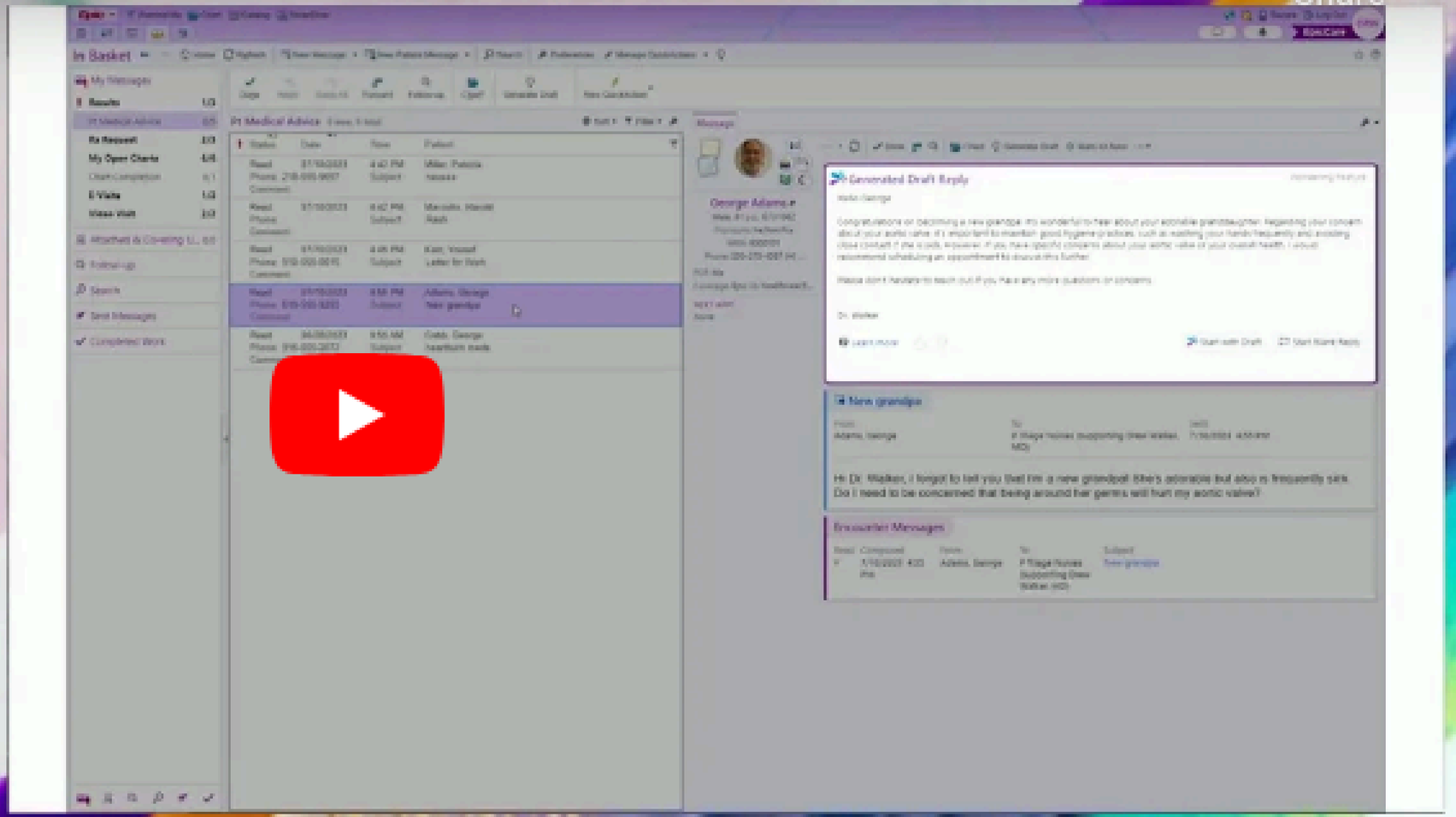


Basic properties of words	Spell check, NER
Order and structure of words	Grammar check
Meaning of words	WordNet, etc.
Overall meaning of text	Topic modeling, sentiment analysis

Generative AI in Healthcare with Nuance and Epic at Microsoft Inspire 2023

Share





Watch on YouTube

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HEALTHCARE AREAS FOR ASR

5 areas in healthcare where ASR and analytics can create value

diagnosis, detection, and tracking of disease

improve quality of lives for senior and the disabled

enhance adherence to plan of care among patients

medical transcription and digital transcribing

customer communication insights for payers and providers

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MEDICAL TRANSCRIPTION

- Transforms physicians' or patients' **voice input into consistent written reports**, **appointment summaries**, **treatment plans, mood journal entries, symptom summaries**, etc.
- Then, this data is uploaded to EHR, a patient or RPM app, or other target software.
- **Reducing time spent in documenting** patient visits into electronic health record (EHR) systems
- **Language support** for Tagalog, English, and Taglish variants

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DIAGNOSIS, DETECTION OF DISEASES

- Use of **vocal biomarkers to detect and diagnose diseases** ahead of time
  - Vocal biomarkers → patient's voice, speech patterns and breathing rhythm hold clues to underlying conditions
- Possible **early detection of Alzheimer's and Dementia by using a patient's speech patterns**

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IMPROVE PATIENT'S QUALITY OF LIFE

- Doctors use **speech recognition-powered virtual assistants** to schedule appointments, tests, and diagnostic procedures, create and retrieve health records on the go.
- Patients with speech or hearing difficulties can be improved by converting speech to text or vice versa

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CUSTOMER COMMUNICATION AND ANALYTICS

- **Voice analytics** helps provide inputs to such programs by:
  a. Making highly **accurate call transcripts** available by using appropriate speech-to-text technologies
  b. Applying **text mining** (keyword spotting, etc.) and natural language processing methods or NLP (sentiment analysis, entity extraction, summarization, etc.) to provide intelligence and insights.
- Command center quality audits to assess agent/patient behavior and conversation flow during a call

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IMPROVE PATIENT ADHERENCE

- Routinely asking questions regarding a patient’s condition and offering reminders
- **AI assistants** that can provide clinically approved advice and recommendations at home, etc.

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SPEECH RECOGNITION

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CASE STUDIES
(DEMONSTRATION)

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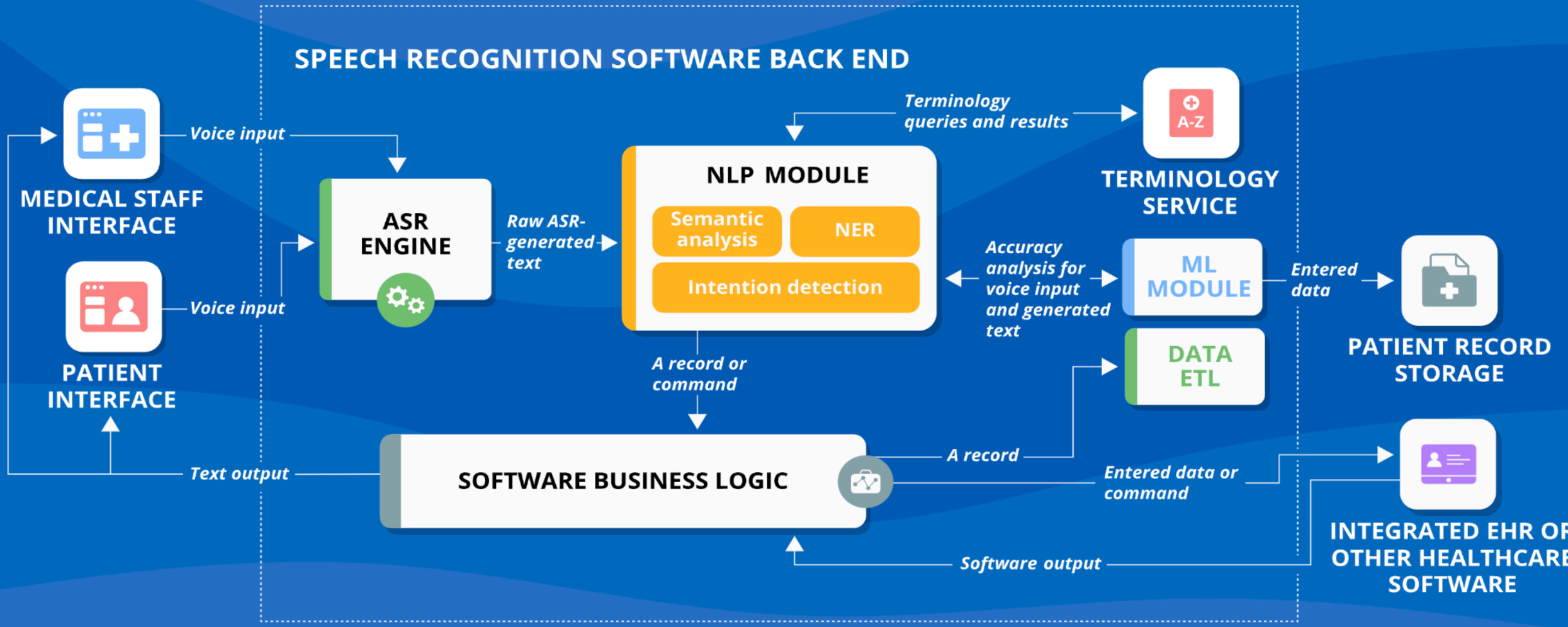

ScienceSoft

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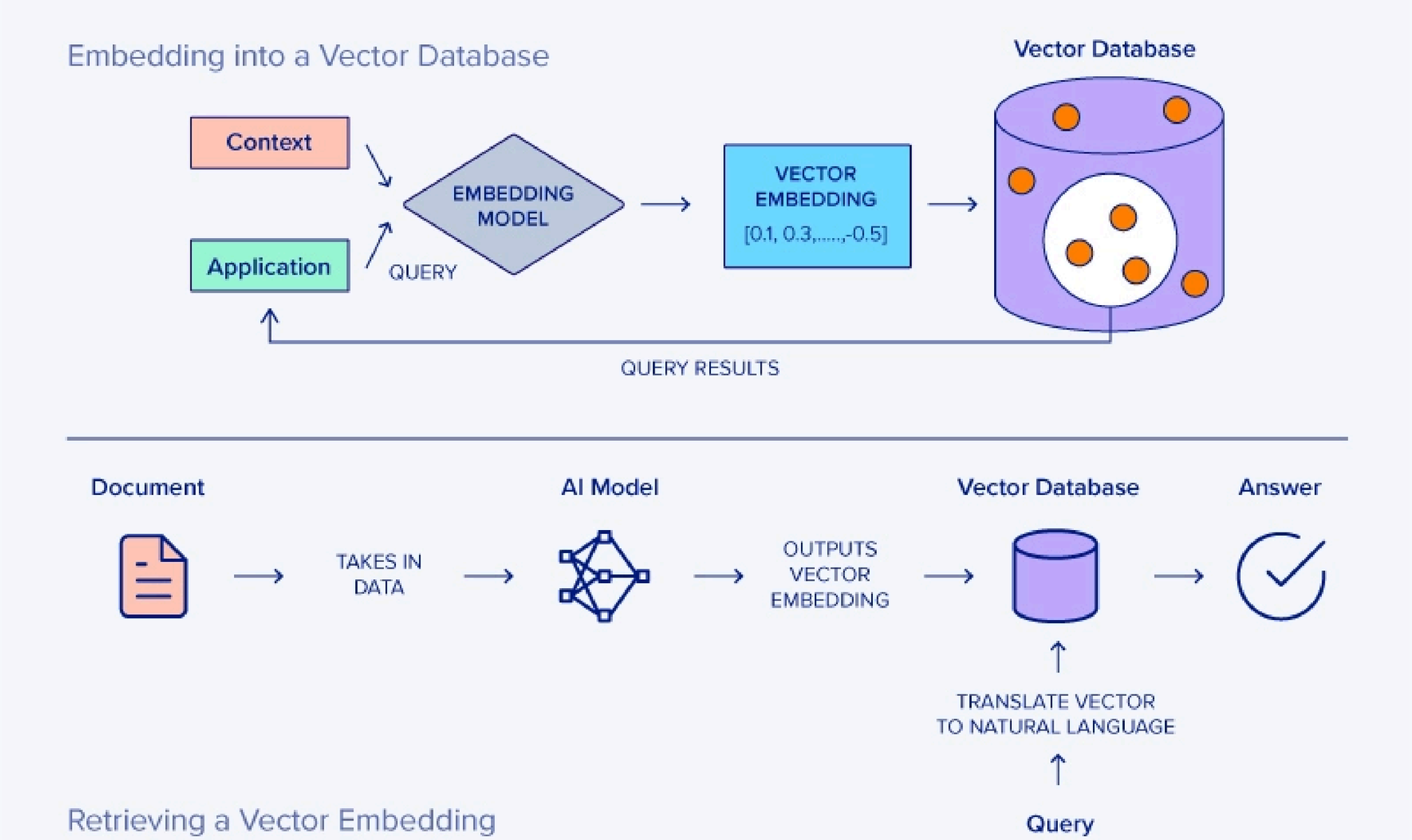
GENERATIVE AI ON AUDIO TRANSCRIPTS



INTEGRATION

- An **automatic speech recognition (ASR) engine** transforms **voice input into text**. Then, a **natural language processing (NLP)** module helps interpret the voice data by using:
  - **Semantic analysis** that helps adjust the ASR-generated text based on the context and make it cohesive
  - **Named entity recognition (NER)** technology that detects certain entities within the text (e.g., a person, a health organization, a condition) and checks the text against publicly available knowledge bases (e.g., Unified Medical Language System) to generate a health record.
- Intention detection that identifies voice commands and sends them to the software business logic for execution.

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INTEGRATION

- The **NLP module** is connected to a terminology service featuring various medical terms, popular abbreviations, etc.
- The **voice recognition software** may be powered by an additional machine learning module to improve speech recognition quality or adjust to specific speech patterns and accents.

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ASSESSING YOUR CURRENT SYSTEM

- Estimated **volume** (ie. number of patients, incoming phone calls)
- Describe your **patient information journey:**
  - patient conversation --> transcription -->archiving --> integration to other hospital systems
- What **EHR system** are you using? Other software for your patient records management?

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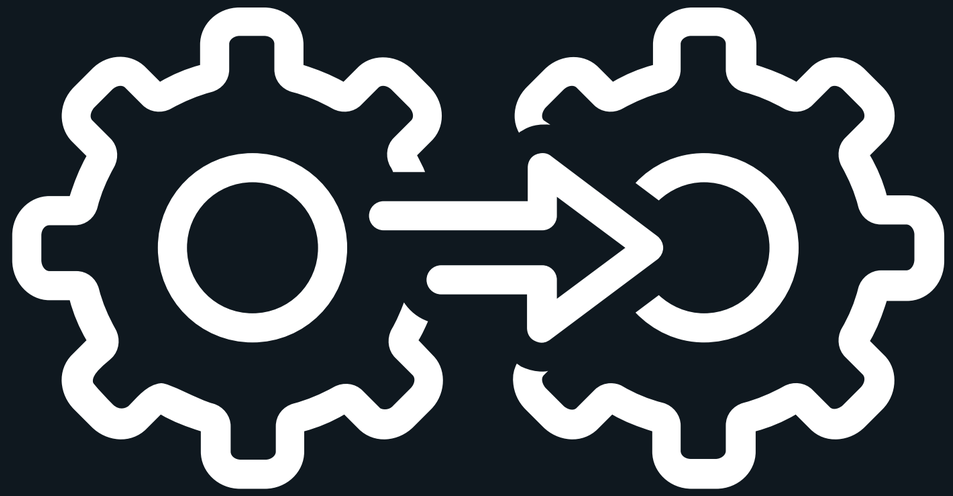
How do we integrate our Speech Recognition system within the hospital system?

via API service
separate interface
separate hardware



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THANK YOU!

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