15.05.2025

Listen who‘s whispering

Speech recognition with APEX and Whisper

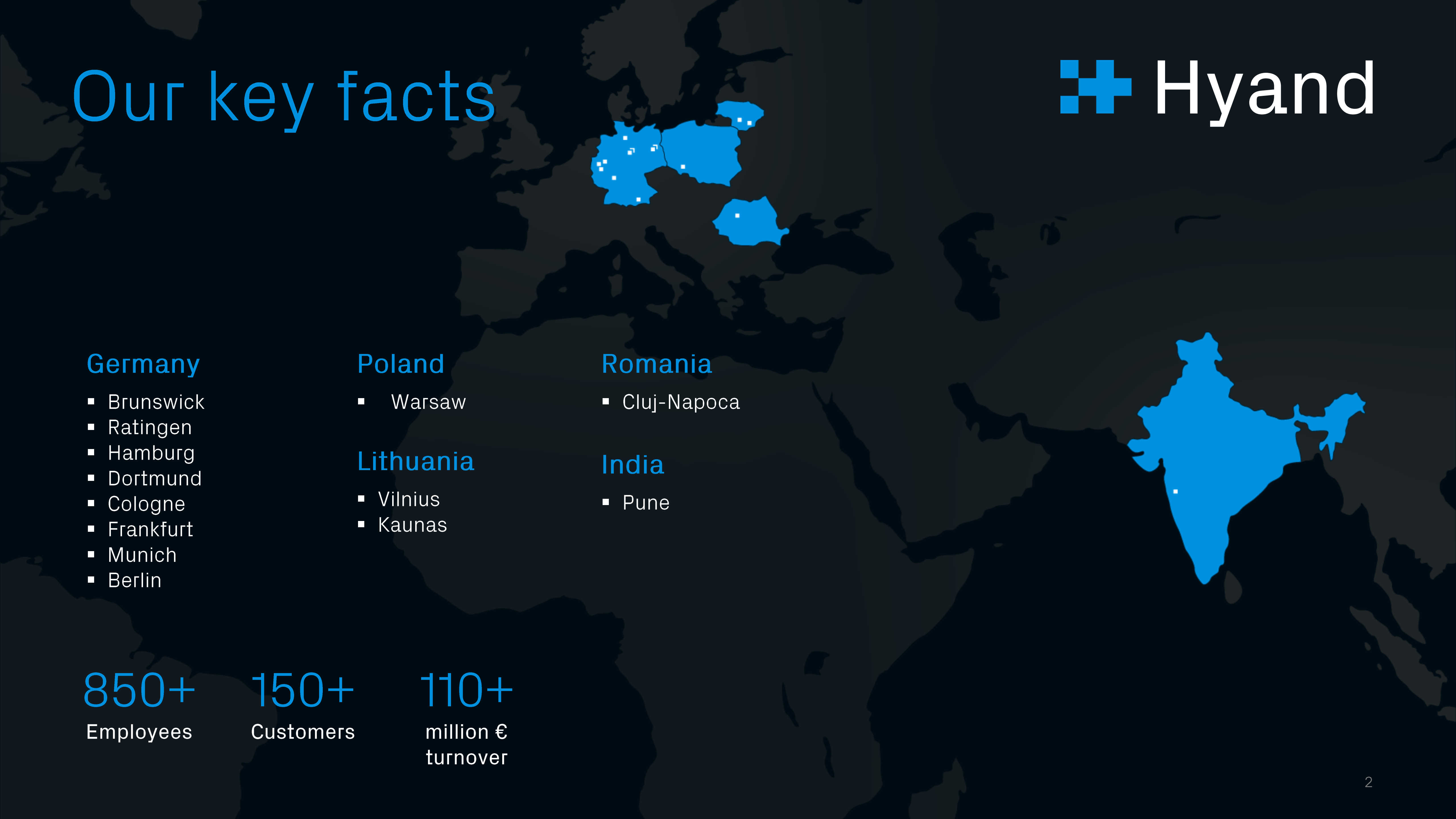
Dennis Amthor, APEX Connect 2025

code of change

Hyand

Our key facts

Hyand



Germany

- Brunswick
- Ratingen
- Hamburg
- Dortmund
- Cologne
- Frankfurt
- Munich
- Berlin

Poland

- Warsaw

Lithuania

- Vilnius
- Kaunas

Romania

- Cluj-Napoca

India

- Pune

850+
Employees

150+
Customers

110+
million €
turnover

Speaker

Dennis Amthor

Consultant APEX/JavaScript

Idea/Motivation

Idea/Motivation

- Voice as data input inside APEX
  - Forms, meeting transcripts, notes
- Controlling APEX functions via voice
  - Searching, filtering
- ➢ Feasibility test
  - Complexity
  - Cost
  - Precision
  - Performance
  - Offline capability

What is Whisper?

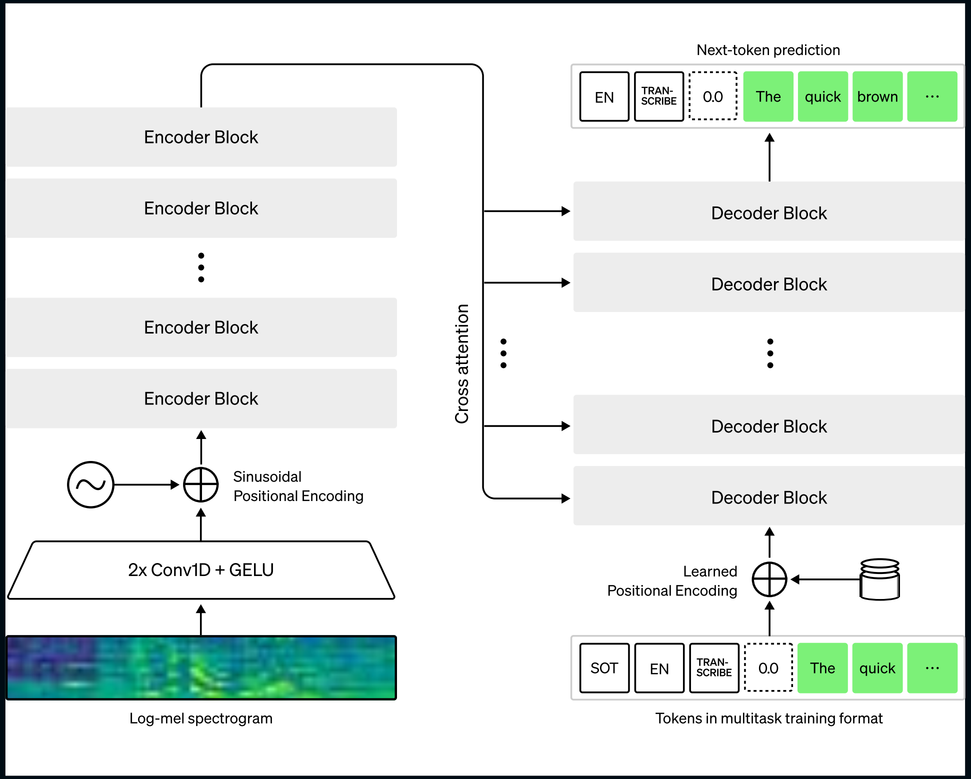
What is Whisper?

- Automated Speech Recognition System (ASR) by OpenAI
- Trained with 680,000 hours of audio data (2/3 of which are English)
- Transcription and translation (in English)
- OpenAI: Data source larger and more "diverse" than on other models
  - ➢ As a result, less precise overall, but better handling of accents and background noise

Source: https://openai.com/index/whisper/

How it works

- Chunking the audio input into blocks of 30 seconds
- Conversion to Mel-Spectogram
  - Representation of frequencies/time while taking human hearing ability into account
  - Higher resolution in a lower (=audible) frequency range
- Encoder-Decoder-Transformer-Model
  - Audio information as vectors
  - Self- and Cross-Attention
  - Different token types (Text, control, language, timestamps)



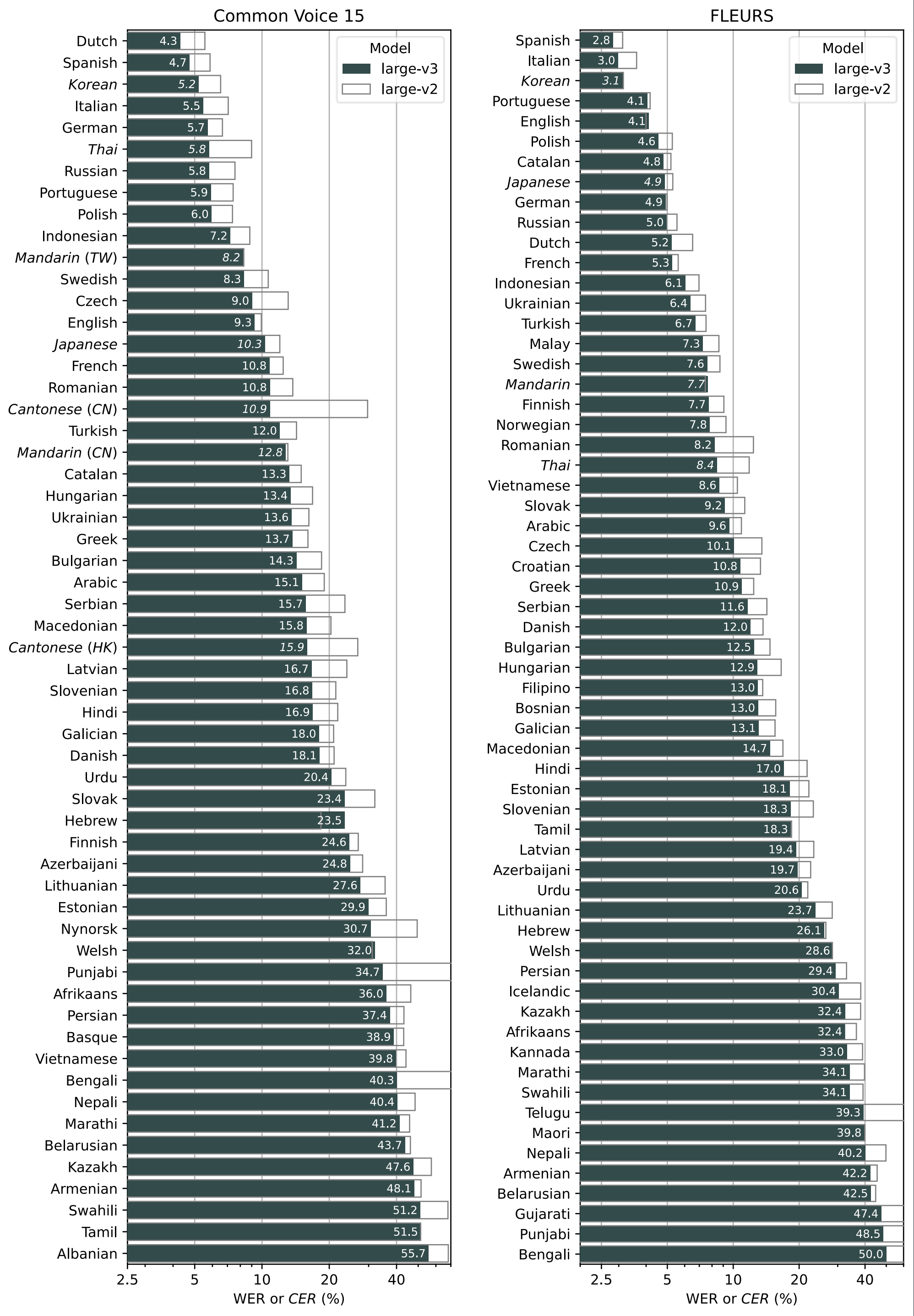
Sources: https://openai.com/index/whisper/, https://github.com/openai/whisper

Models

- 6 models available
  (tiny, base, small, medium, large, turbo)
- Differences in regard to
  - Performance
  - Storage
  - Error rate
- Alternative faster English-only variants available for tiny to medium
- Error rate also highly dependent on the language used

Hyand

Source: https://github.com/openai/whisper



Usage

Whisper

- Calls to OpenAI API
- Model: whisper-1 ($0.006/minute)
- Alternative: Local integration in Python using PyTorch

Whisper Web

- Web integration using Transformers.js
- Pre-trained models
- Stored in the local cache
- Usage of own models possible after conversion

Sources: https://platform.openai.com/docs/pricing, https://github.com/openai/whisper, https://github.com/huggingface/transformers.js

Transformers

Huggingface.co

Transformers (Huggingface.co)

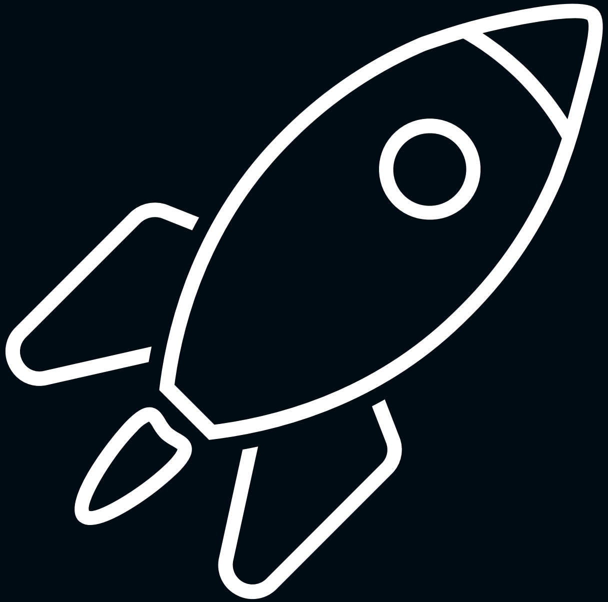
- Library of pre-trained models
  - Text, image, audio, video
  - Various NLP and multimedia tasks
- Models can be used directly and replaced in a modular way (no own training required)
- Unified API and JavaScript integration (Transformers.js)
- Usable directly in the browser (ONNX Runtime)

Sources: https://github.com/huggingface/transformers, https://github.com/huggingface/transformers.js

Implementation

Implementation

- Calls towards Whisper Web/Whisper API using JavaScript (Webpack)
- Integration as APEX plugins
  - Region Plugin for testing/comparison (input methods, technologies)
  - DA plugin for direct use with buttons (examples)
- Whisper Web: Transformer.js with pre-trained model (Xenova/whisper-base)
- Whisper: OpenAI API: AI Service & apex_ai.generate
- Comparison with similar technologies
  - Web Speech API/Speech Recognition
  - (OCI Speech)



Source: https://github.com/huggingface/transformers.js

Demo

Result

Result

S	
A	
B	
C	

Implementation effort

S	Web Speech API
A	Whisper Web Whisper API
B	
C	

Configuration/Options

S	
A	Whisper Web
B	Whisper API
C	Web Speech API

Precision/Error rate

S	Whisper API
A	Web Speech API
B	Whisper Web
C	

Performance

S	Web Speech API
A	Whisper API
B	
C	Whisper Web

Cost

S	Whisper Web Web Speech API
A	Whisper API
B	
C	

Privacy

S	Whisper Web
A	
B	Whisper API
C	Web Speech API

Result

	Whisper Web (base model)	Whisper API	Web Speech API
Implementation effort	A	A	S
Configuration/Options	A	B	C
Precision/Error rate	B	S	A
Performance	C	A	A
Cost	S	A	S
Privacy	S	B	C

Result

	Whisper Web (base model)	Whisper API	Web Speech API
Implementation effort	A	A	OCI Speech
Configuration/Options	A	B	?
Precision/Error rate	B	S	
Performance	C	A	
Cost	S	A	
Privacy	S	B	C

Any questions?