



ONDEWO

CONVERSATIONAL AI

**Teaching machines to understand
natural language conversations**

Dr. Jason Hoelscher-Obermaier
Data Scientist & Software Developer
jason.hoelscher@ondewo.com

www.ondewo.com

The Current State of AI

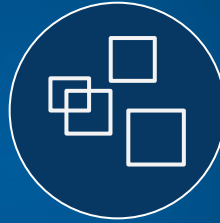
Computers can see, listen, talk and learn strategy – thanks to advances in Machine Learning / Deep Learning.



General Predictive
Modelling



**Natural Language
Processing**



Computer
Vision



Speech



Reinforcement
Learning

What is conversational AI?

AI which enables natural-language conversation between humans and machines

Simple example

“Please **fetch me** the **coffee mug** from the **top of my desk**”

entity recognition → **object: coffee mug** **location: top of desk**

intent detection → **intent: retrieve object**

What is conversational AI?

AI which enables natural-language conversation between humans and machines

Components of a conversational AI system

- *speech2txt* ← useful, not easy for German, especially dialects;
(research project with  AUSTRIAN INSTITUTE OF TECHNOLOGY)
- **NLP preprocessing**
- **Named entity recognition**
- **Intent detection**
- *Response generation*
- *txt2speech* ← easy, not our business

What is conversational AI?

AI which enables natural-language conversation between humans and machines

Components of a conversational AI system

- *speech2txt* ← useful, not easy for German, especially dialects;
(research project with  AUSTRIAN INSTITUTE OF TECHNOLOGY)
- **NLP preprocessing**
- **Named entity recognition**
- **Intent detection**
- *Response generation*
- *txt2speech* ← easy, not our business

} Dialogue manager

What is conversational AI?

AI which enables natural-language conversation between humans and machines

Components of a conversational AI system

- *speech2txt* ← useful, not easy for German, especially dialects;

(research project with  AUSTRIAN INSTITUTE OF TECHNOLOGY)

- **NLP preprocessing**
- **Named entity recognition**
- **Intent detection**
- *Response generation*
- *txt2speech* ← easy, not our business

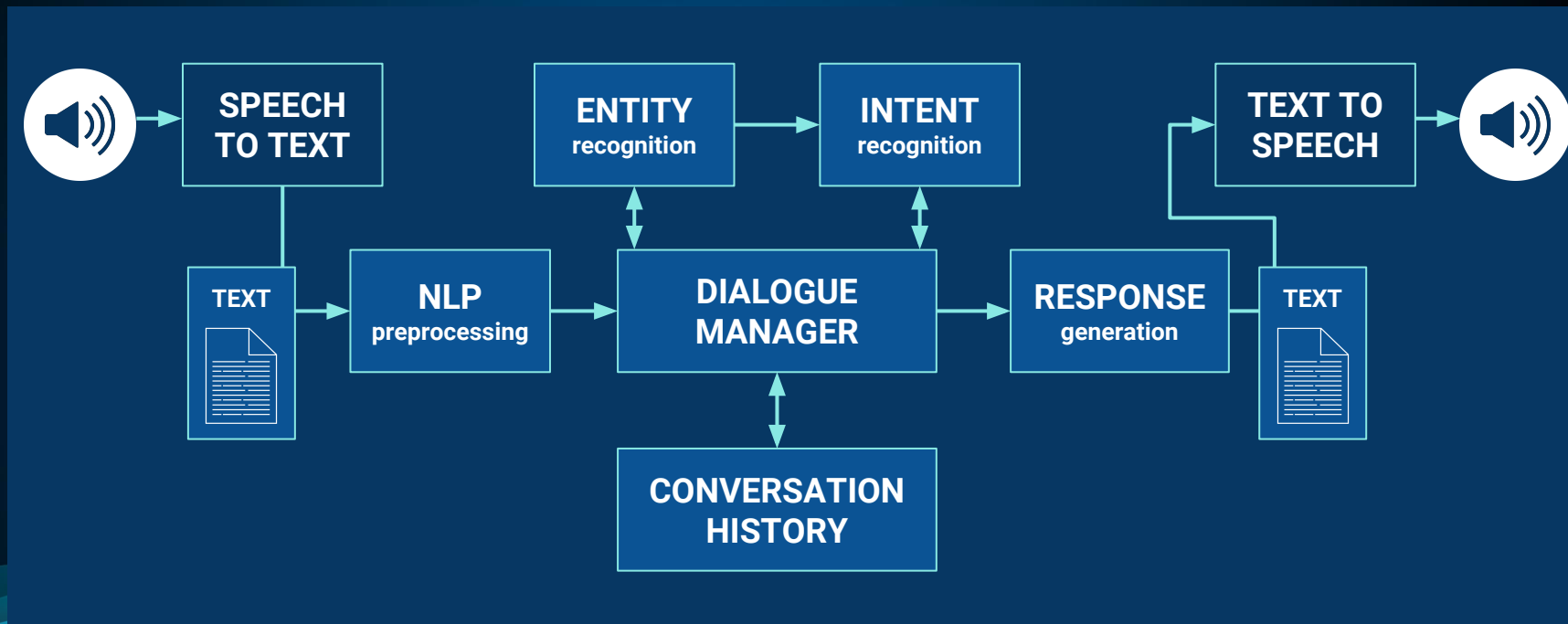


Presentation Outline

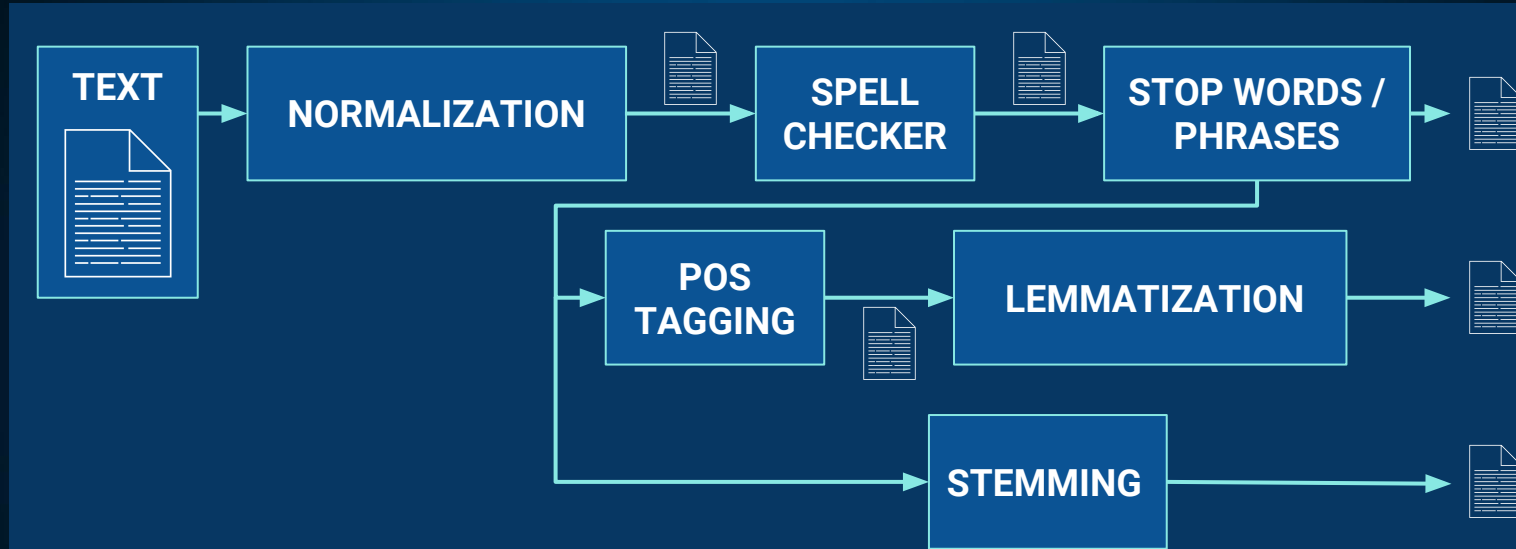
- NLP preprocessing
- Named entity recognition
- Intent detection
- How well does it work?
- Challenges and solutions
- Where do we stand and where do we want to go?



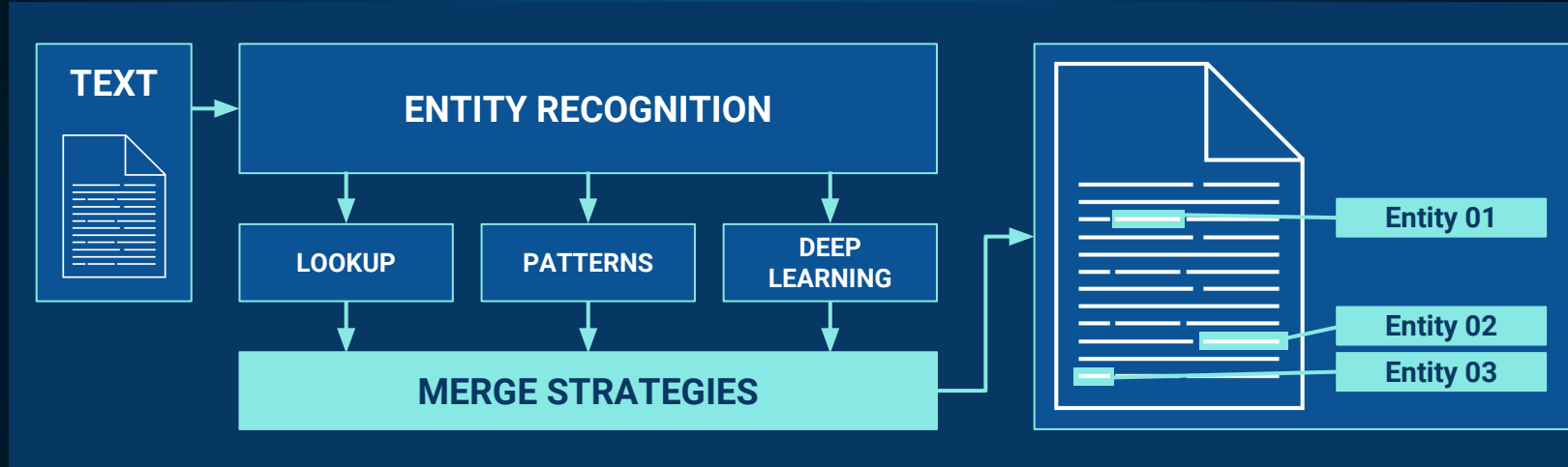
Overview detection pipeline



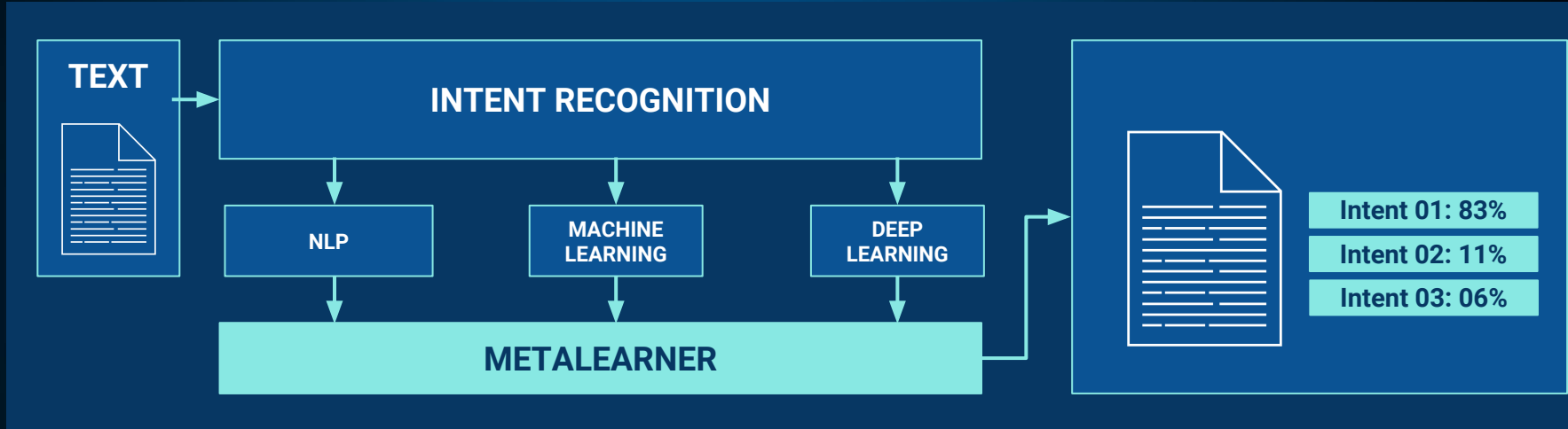
Overview NLP preprocessing



Overview named entity recognition



Overview intent detection



How well does it work?

RasaFrankenBot

“im looking for a restaurant in the **west** part
of town that serves **moroccan** food”
intent : “inform” **cuisine** **location**

- 6 intents, 5 entities
- Imbalanced in both intents & entities
- Small (Train: 598; Test: 150)





Data:
https://github.com/RasaHQ/rasa_core/blob/master/examples/restaurantbot/data/nlu.md

SNIPS small

- English
- 7 intents, 39 entities
- Intents balanced, entities imbalanced
- Medium (Train: 2223, Test: 556)

Data:
<https://github.com/snipsco/nlu-benchmark/tree/master/2017-06-custom-intent-engines>

How well does it work for entities? (preliminary results)

Entity f1 (μ -averaged)		Datasets (a-z sorted)	
Platform (a-z sorted)		Rasa Franken Bot	Snips (small)
		68,3%	75,7%
		97,9%	90,8%
		68,9%	74,7%
		71,4%	82,8%

Challenges and solutions

- **Data quality: usually very sparse and biased**
 - Data augmentation
 - Pre-trained models
 - Pre-trained word embeddings
- **Too many degrees of freedom**
 - Normalization
 - Stop word / stop phrase removal
 - Spell checking
 - Lemmatization / stemming
 - Word embeddings
 - Bag of words
- **Datasets quite heterogeneous**
 - Fine-tuning of algo configurations
 - Hybrid approaches: meta-classifier / merge strategies



Outlook

- **Today: Conversational AI works**
 - for restricted domains
 - with considerable manual work required to
 - create suitable training data (diverse, annotated)
 - define hard-coded responses
- **Tomorrow: Conversational AI capable of**
 - self-learning (reinforcement learning)
 - natural conversations
 - ... with very broad conversational domains
 - ... and auto-generated responses (seq2seq)
 - ⇒ **“Self-learning conversational brains”**



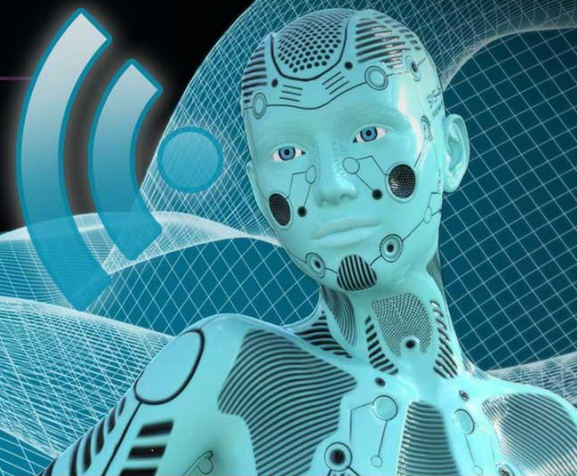
Got 5 exclusive tickets - let me know afterwards if interested



Limitierte
Tickets!

CONVERSATIONAL AI

17. APRIL 2019 DEMO EVENT



Besonderen Dank
an unseren
neuen Partner

ORACLE®

Vielen Dank
unseren Partnern
und Unterstützern

austria
wirtschafts
service



Catalysts

INiTS
Innovation Into Business

vienna
business
agency

A service offered by
the City of Vienna



NLP Vienna Meetup

Interested? Get in touch!

We need you!



jason.hoelscher@ondewo.com

THANK YOU FOR YOUR ATTENTION!



ONDEWO
CONVERSATIONAL AI