

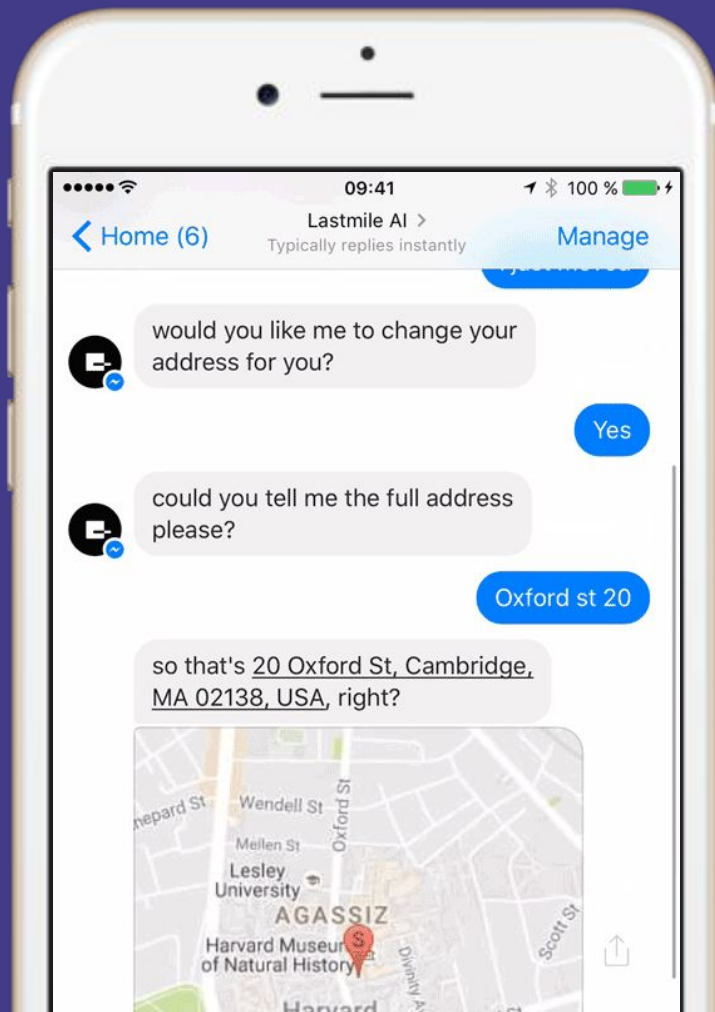


# Conversational AI: Building clever chatbots

*Tom Bocklisch, Lead ML Engineer @ LASTMILE*

# Conversational AI will dramatically change how your users interact with you.

**Example of a live Skill:**  
A customer can change her address via Facebook Messenger



# An open source, highly scalable ML framework to build conversational software

The screenshot shows the GitHub repository page for `golastmile/rasa_nlu`. The repository is described as "turn natural language into structured data" with a link to <https://rasa.ai>. It features a list of topics including `nlp`, `machine-learning`, `machine-learning-library`, `bot`, `bots`, `botkit`, `rasa`, `luis`, `wit`, `nlu`, `conversational-bots`, `conversational-agents`, `conversational-ai`, `spacy`, `mitie`, `chatbot`, `chatbots`, `chatbots-framework`, `bot-framework`, and `Manage topics`. The repository statistics show 976 commits, 4 branches, 11 releases, 19 contributors, and the Apache-2.0 license. The interface includes navigation tabs for Code, Issues (38), Pull requests (5), Projects (0), Wiki, Pulse, Graphs, and Settings. At the bottom, there are buttons for "Branch: master", "New pull request", "Create new file", "Upload files", "Find file", and "Clone or download".

golastmile / rasa\_nlu

Unwatch 99 Unstar 1,371 Fork 227

Code Issues 38 Pull requests 5 Projects 0 Wiki Pulse Graphs Settings

turn natural language into structured data <https://rasa.ai> Edit

nlp machine-learning machine-learning-library bot bots botkit rasa luis wit nlu conversational-bots

conversational-agents conversational-ai spacy mitie chatbot chatbots chatbots-framework bot-framework Manage topics

976 commits 4 branches 11 releases 19 contributors Apache-2.0

Branch: master New pull request Create new file Upload files Find file Clone or download

tmbo Replaced deep conv. Fixes #343 Latest commit 13b78c3 17 hours ago

## Introduction

We work on the core technology for next-generation conversational AI



is a **technology company** developing **conversational AI**.

**Goal:** next-generation intelligent bots

**Team:** tight-knit, fast-moving team of researchers, engineers, designers and product people 🦋

**Location:** everywhere (honestly: Berlin, Edinburgh, Beijing)

### *Founders:*

Dr. Alan Nichol (CTO)

Alexander Weidauer (CEO)



### *Advisory Board:*

Chad Fowler (MD & CTO @ Wunderlist)

Matthaus Krzykowski (former Co-Founder @ Xyo)

Cat Noone (Designer & Founder @ Iris)

### *Investors:*



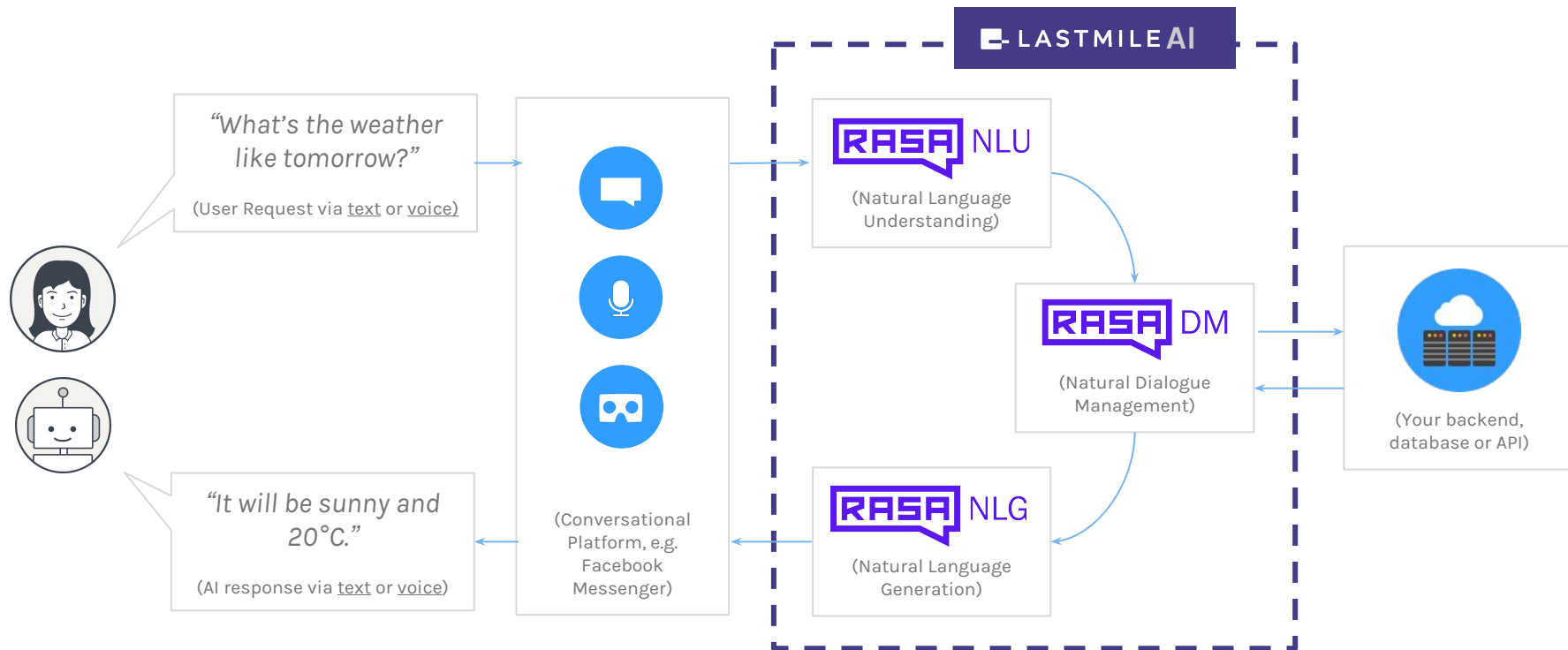
### *Reference customers:*

**RAIFFEISEN**

**ERGO**

SwissLife 

# Architectural Overview



# Under The Hood

# Natural Language Understanding



What's the  
weather like  
tomorrow?

Natural Language  
Understanding

## Example Intent Classification Pipeline

"What's the weather like tomorrow?" { "intent": "request\_weather" }

Vectorization

Intent Classification

## Example Entity Extraction Pipeline

"What's the weather like tomorrow?"

{ "date": "tomorrow" }

Tokenizer

Part of Speech  
Tagger

Chunker

Entity Extraction

Named Entity  
Recognition

# Demo



# 1. Create your training data

E.g. using the contributed rasa NLU gui at

<https://golastmile.github.io/rasa-nlu-trainer/>

The screenshot displays the Rasa NLU GUI interface. At the top, there is a minus icon in a box, followed by a text input field containing 'restaurant\_search'. To the right, a text input field contains the sentence 'show me a mexican place in the centre', with 'mexican' highlighted in light blue and 'centre' highlighted in yellow. Below this, a large rectangular area contains two rows of entity extraction results. The first row shows 'location' in a box, 'centre' in a box, and 'centre' with a trash icon. The second row shows 'cuisine' in a box, 'mexican' in a box, and 'mexican' with a trash icon. Below these results is a light gray rounded rectangle containing the text 'select some part of the text to create a new entity'. At the bottom right of this area is a blue button with the text 'Delete example'. At the bottom of the interface, there is a plus icon in a box, followed by a text input field containing 'goodbye', and another text input field containing 'bye'.

Entity	Text	Action
location	centre	trash
cuisine	mexican	trash

'select some part of the text to create a new entity'

Delete example

## 2. Configure the model

Configure the  
model

```
In [2]: 1 model_config = {  
2     "pipeline": ["nlp_spacy",  
3                 "ner_crf",  
4                 # "ner_spacy",  
5                 "intent_featurizer_spacy",  
6                 "intent_classifier_sklearn"],  
7     "language": "en"  
8 }
```

### 3. Train

#### Training the model

```
In [3]: 1 # Train NLU model
2 config = RasaNLUConfig(cmdline_args=model_config)
3
4 trainer = Trainer(config)
5 training_data = load_data("example-data/demo-rasa.json")
6
7 # run the training
8 interpreter = trainer.train(training_data)
9 logging.info("done")
```

```
INFO:root:Trying to load spacy model with name 'en'
INFO:root:Added 'nlp_spacy' to component cache. Key 'nlp_spacy-en'.
INFO:root:Training data format at example-data/demo-rasa.json is rasa_nlu
INFO:root:Training data stats:
    - intent examples: 38 (4 distinct intents)
    - found intents: affirm, goodbye, greet, restaurant_search
    - entity examples: 7 (2 distinct entities)
    - found entities: cuisine, location

INFO:root:Starting to train component nlp_spacy
INFO:root:Finished training component.
INFO:root:Starting to train component ner_crf
INFO:root:Finished training component.
INFO:root:Starting to train component intent_featurizer_spacy
INFO:root:Finished training component.
INFO:root:Starting to train component intent_classifier_sklearn
[Parallel(n_jobs=1)]: Done 12 out of 12 | elapsed: 0.1s finished
INFO:root:Finished training component.
INFO:root:done
```

Fitting 2 folds for each of 6 candidates, totalling 12 fits

## 4. Use Model

Playing around  
with the trained  
model

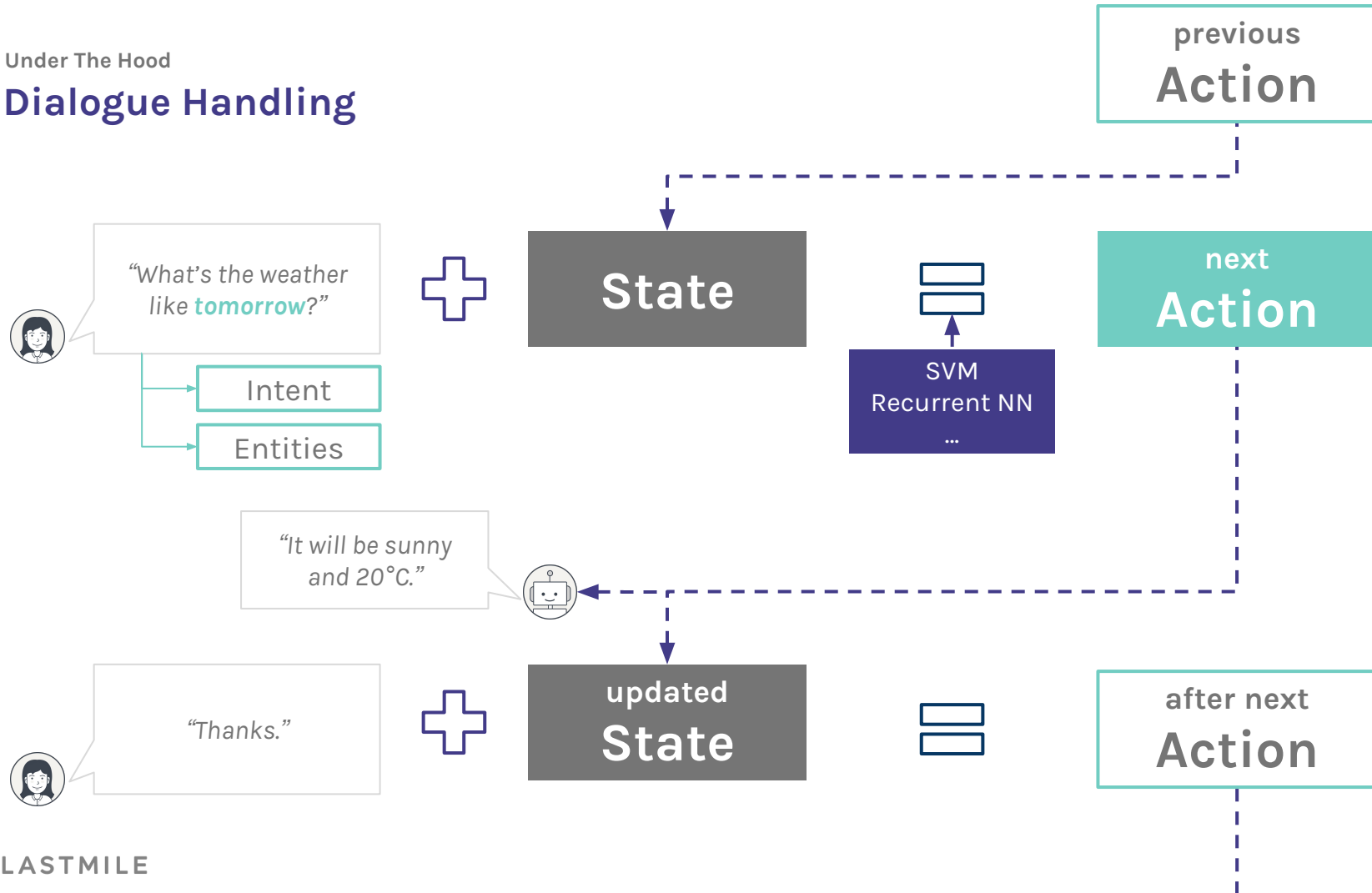
In [27]:

```
1 # i am looking for an italian restaurant in Vienna
2 result = interpreter.parse(
3     "i am looking for an italian restaurant in Vienna")
4 pprint(result)
```

```
{
  "entities": [
    {
      "start": 20,
      "extractor": "ner_crf",
      "end": 27,
      "value": "italian",
      "entity": "cuisine"
    },
    {
      "start": 42,
      "extractor": "ner_spacy",
      "end": 48,
      "value": "Vienna",
      "entity": "GPE"
    }
  ],
  "intent": {
    "confidence": 0.80703667042349947,
    "name": "restaurant_search"
  },
  "text": "i am looking for an italian restaurant in Vienna",
```

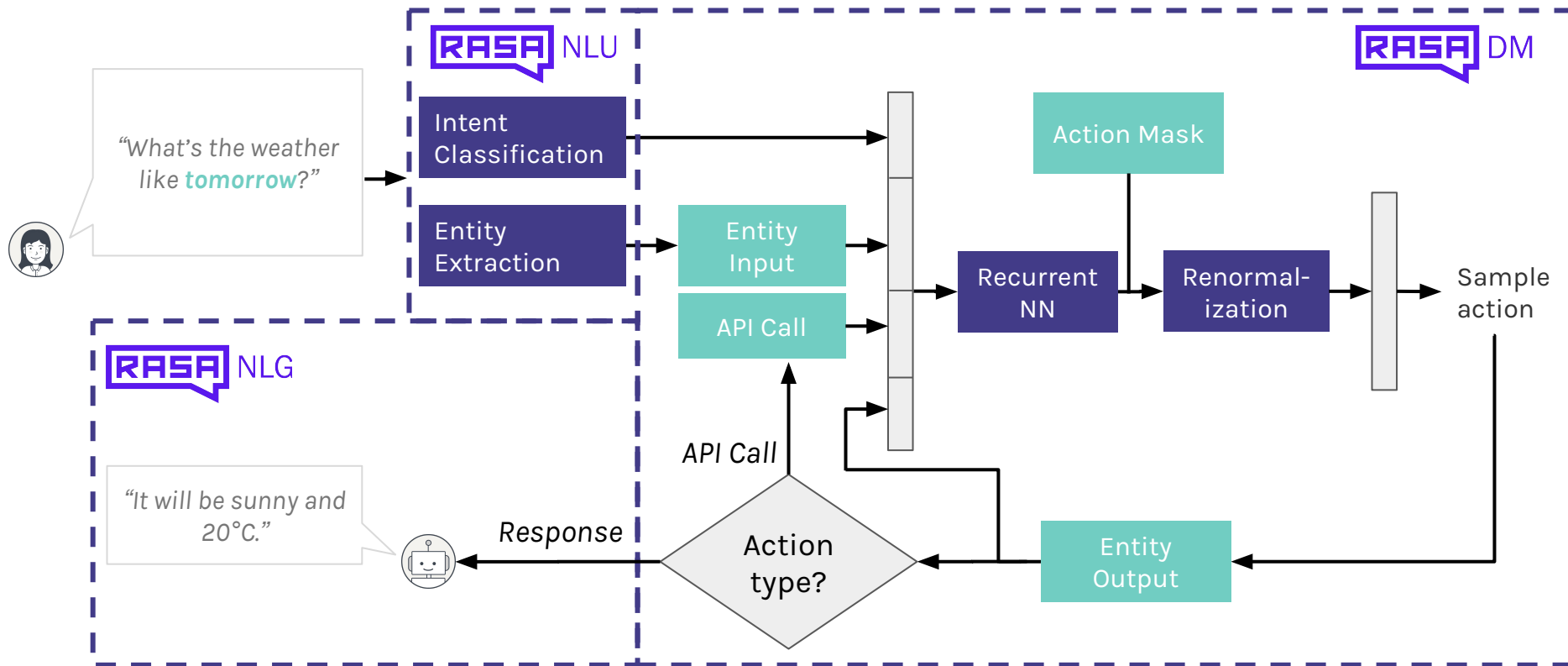
# Under The Hood

## Dialogue Handling



## Detailed Dialogue Handling

Similar to LSTM-dialogue prediction paper: <https://arxiv.org/abs/1606.01269>



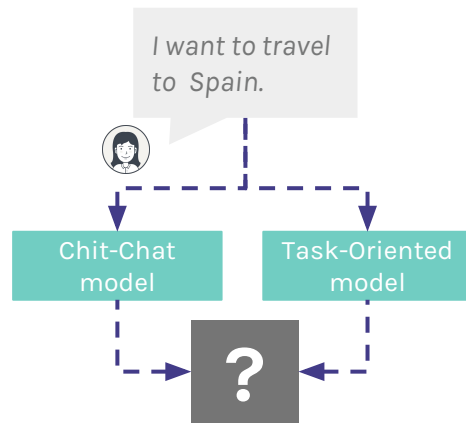
# Final Thoughts



## Open Challenges

Challenges for curious minds:

- Combination of different dialogue models
- Unsupervised multi-language entity recognition
- Dialogue generalisation (e.g. optional questions)



## Current Research

Good reads for a rainy day:

- Last Words: Computational Linguistics and Deep Learning ([blog](#))  
<https://goo.gl/lGSRuj>
- Memory Networks ([paper](#))  
<https://arxiv.org/pdf/1410.3916>
- End-to-End dialogue system using RNN ([paper](#))  
<https://arxiv.org/pdf/1604.04562.pdf>
- MemN2N in python ([github](#))  
<https://github.com/vinhkhuc/MemN2N-babi-python>

## Summary

3 take home thoughts:

- Conversational AI is a big part of the future
- Deep ML techniques help advance state of the art NLU and conversational AI
- Open source is strategically important for enterprises implementing AI

Get in  
touch!



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