# Building contextual AI assistants using machine learning and open source tools

Ty Dunn, Product Manager @ Rasa

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# Rasa is building the standard infrastructure for conversational AI

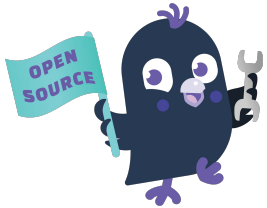
Level 1:
**Notifications**

Level 2:
**“Chatbots” - FAQs**

Level 3:
**Contextual Assistants**

Level 4:
**Personalized Assistants**

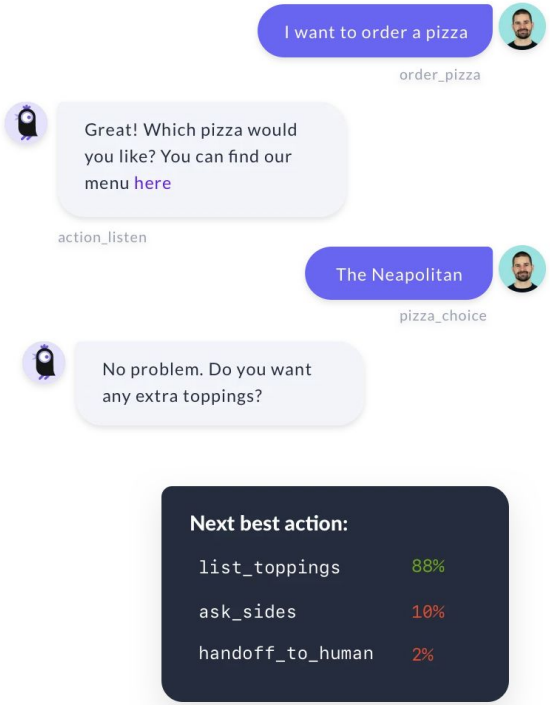
Level 5:
**Autonomous Organization**



# Rasa: Open source tools for developers to build text and voice assistants in-house

**Rasa** is a set of open source machine learning tools for developers for conversational AI:

- **NLU**: a an open-source natural language processing tool for intent classification and entity extraction
- **Core**: framework for machine learning-based, contextual decision making



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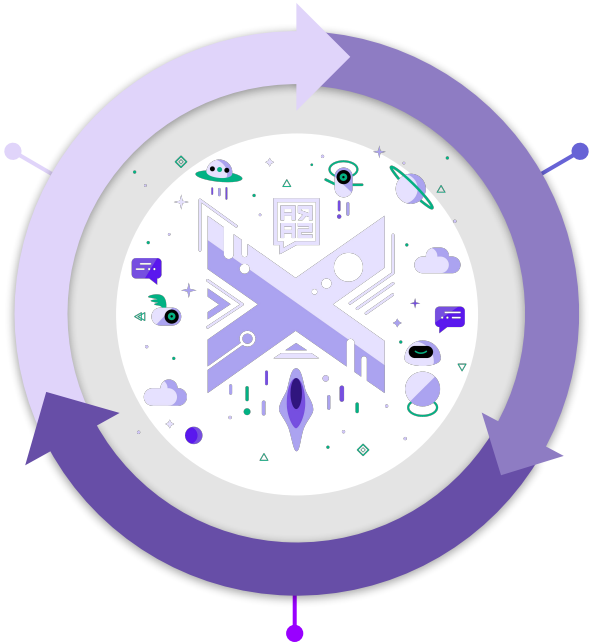
# Improving your assistant using real conversational data with Rasa X

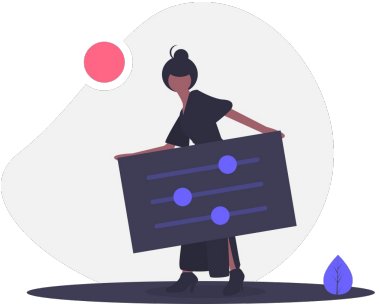
Deploy an assistant in production



Collect real conversations between the users and your assistant.

Use collected conversational data to improve your assistant

# Why do developers love Rasa today?

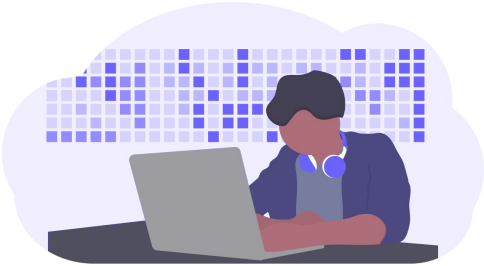


## Customizable

**Tune models** and get **higher accuracy** on your data set. Integrate into your existing infrastructure.

## Open source and free

**No risk of vendor lock-in**. No “AI fairy dust” - can see all ML components.



## Empowers developers

**Get started with very little ML knowledge**, look under the hood and learn more about ML.



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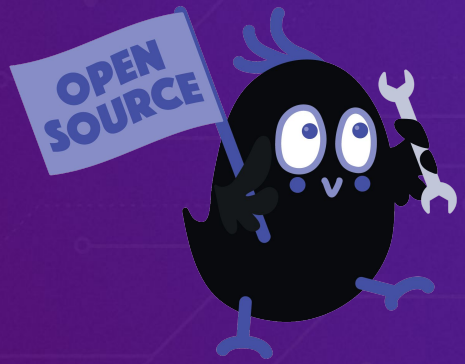
# Join the Rasa open source community!

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**Open Source** **Community** **Applied Research**

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# Understanding Rasa

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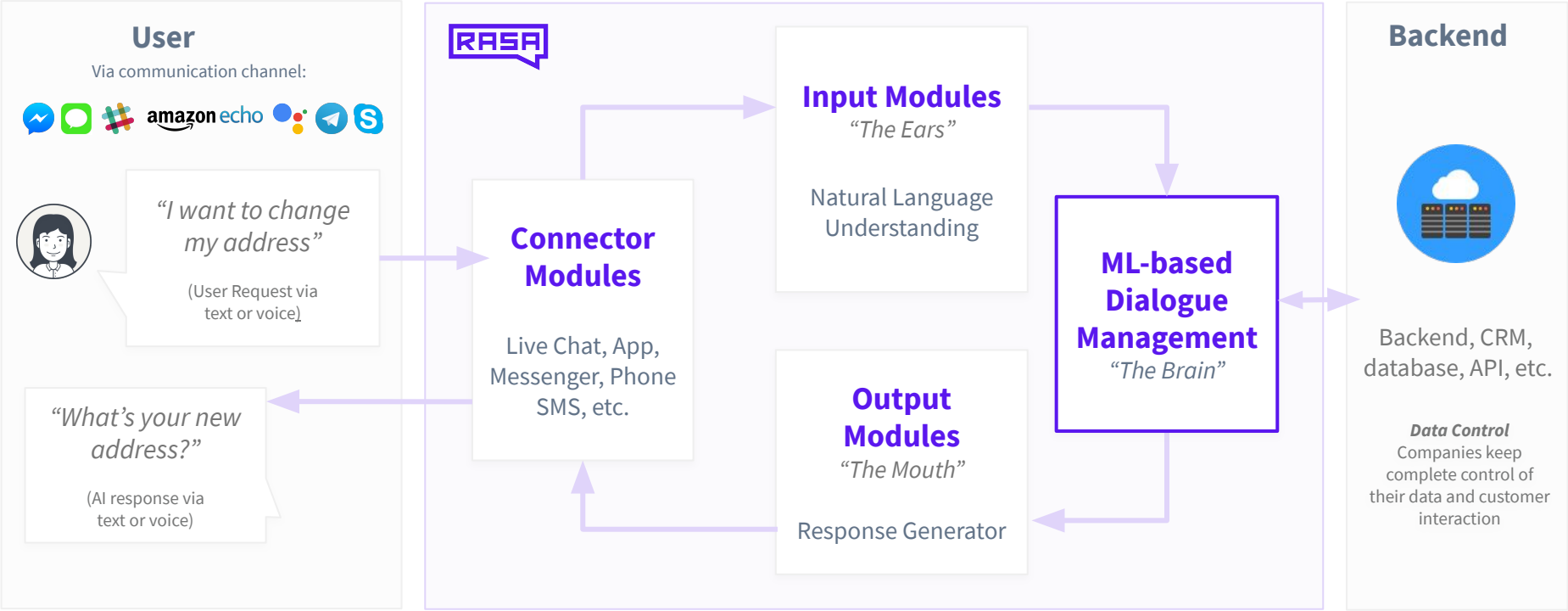
Under the Hood

# Rasa's technology can understand natural language and decide about the next best action based on the context of the conversation using Machine Learning



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# Rasa NLU: Natural Language Understanding

The goal of Rasa NLU is to extract the structured data from unstructured user inputs

**Data:**

intent: order_pizza
- I would like to order a large pizza
- Want some pizza please

intent: greet
- Hello
- hi



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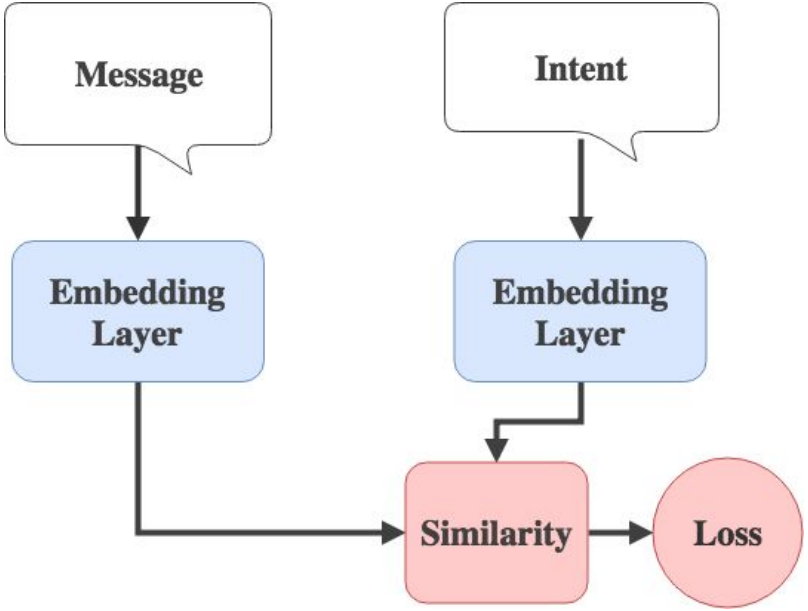
# Supervised Word Vectors from scratch

References:

WSABIE (Weston, Bengio, Usunier)

StarSpace (Wu et al)




$$\sum_{(a,b)\in \mathbf{E}^+ \; b^-\in \mathbf{E}^-} L^{batch}\left(\mathrm{sim}(a,b), \mathrm{sim}(a,b_1^-), \ldots, \mathrm{sim}(a,b_k^-)\right)$$



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# Understanding multi-intents

A user input can have more than one intention. Enabling the assistant to understand them leads to more natural conversations.

| Message | Intent |
|---|---|
| Sounds great! Can you also tell me what is the price? | affirm+ask_price |
| What about tomorrow? I feel too tired today. | inform+chitchat |
| Yes, book it. Also, please book me a taxi. | affirm+book_taxi |



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# Rasa NLU: Entity Extraction

*What's the weather like tomorrow?*

**Natural Language Understanding**

Example Entity Extraction Pipeline

"What's the weather like **tomorrow**?"

Tokenizer

Feature extractor

Named Entity Recognition

Entity Extraction

{ "date": "**tomorrow**" }



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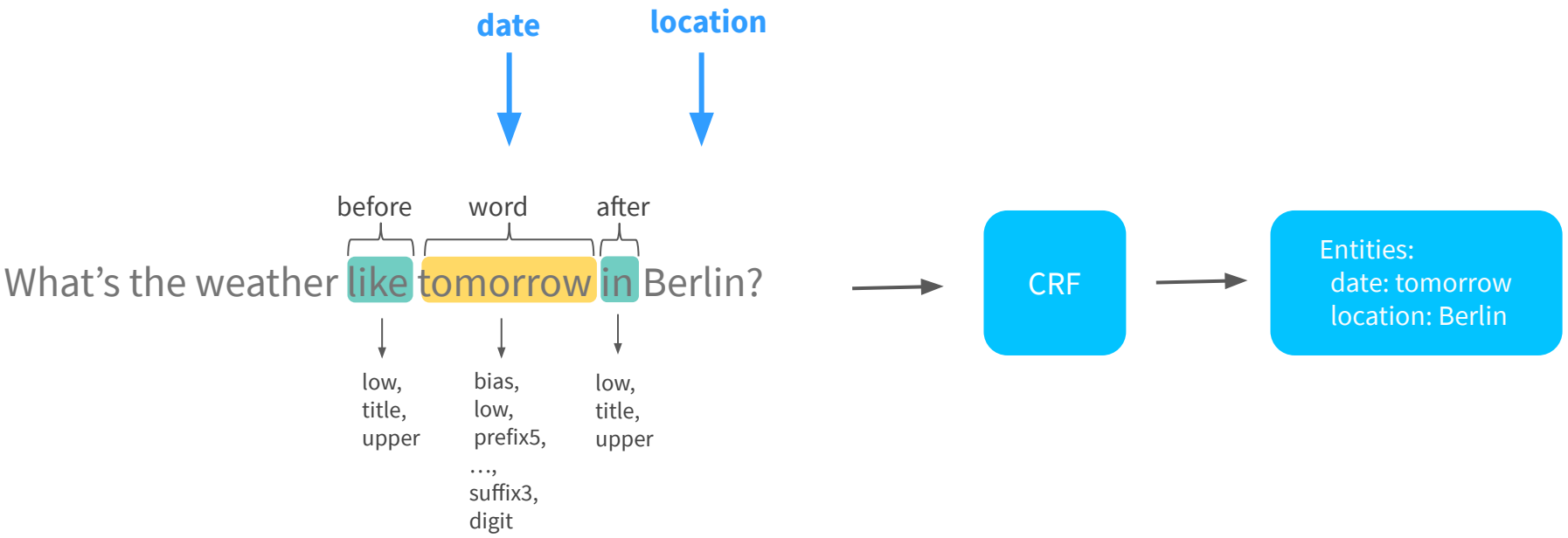
# Rasa NLU: Entity Extraction



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# Context is king - NLU is not enough to handle that

```
## New story
* greet
  - utter_greet_user
  - utter_ask_name
```

Hello!

greet

Hey there! My name is Sara!

What's your name?

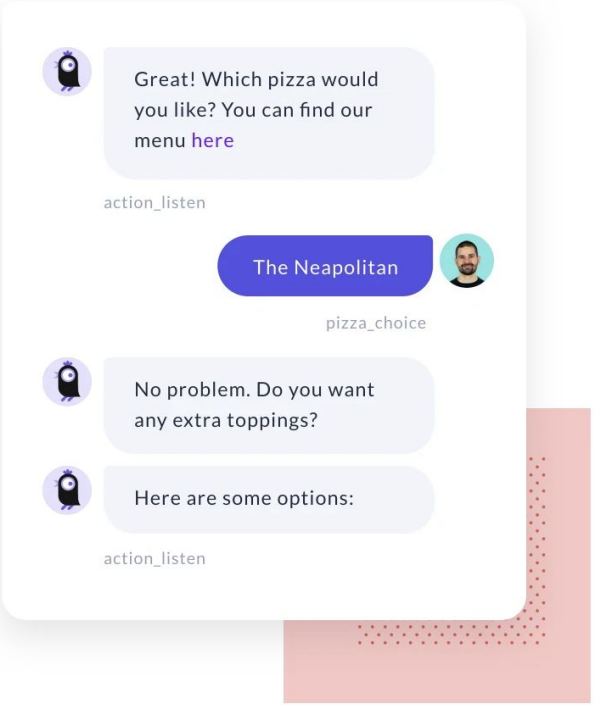
action_listen

**Next best action:**

| | |
|---|---|
| utter_ask_name | 89% |
| utter_greet_user | 11% |

# Why Dialogue Handling with Core?

- Learn from real conversational data instead of enforcing rules
- Leverage the power of ML to build assistants that scale in production
- Hold back-and-forth conversations that remember context
- Add business logic when needed



# Core learns to Converse from real conversational data

U: Hello

B: Hello. I am Sara and I would like to help you get started with Rasa. What is your name?

U: I am Juste

B: And where are you from?

U: From Berlin

B: Have you used Rasa before?

U: Yes.

B: Then, you should check out our latest blog.

U: Thanks.

*greet
- utter_greet

* name
- utter_ask_location

* location
- utter_used_rasa

* affirm
- utter_send_blog

* thanks



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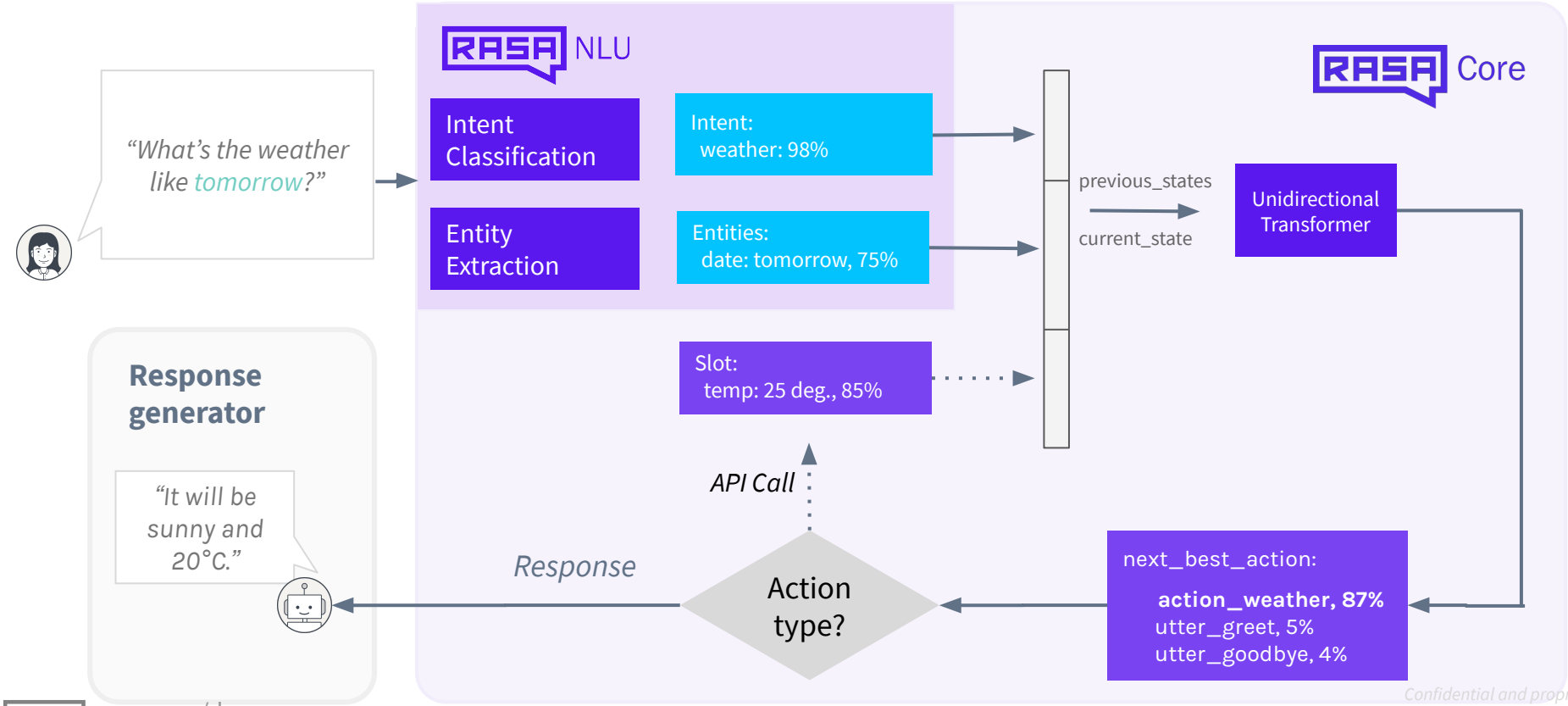
Under The Hood

# Rasa Core: Dialogue Handling

Our recent Dialogue Transformers paper: https://arxiv.org/abs/1910.00486



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# Enable your assistant to learn from real conversational data

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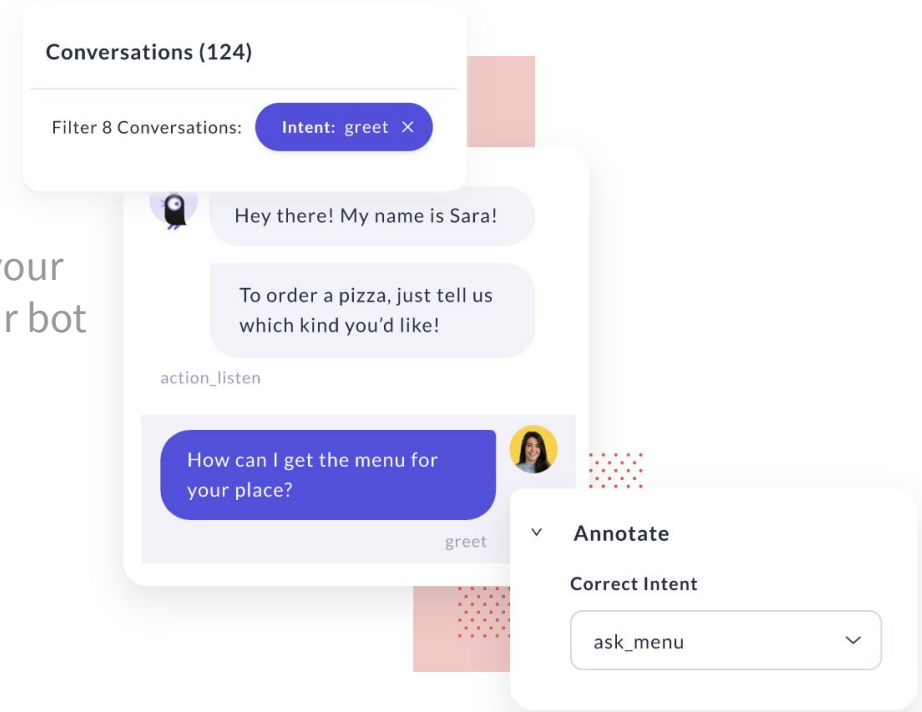
Rasa X

# Use real conversations to improve your assistant

Collect conversations between real users and your assistant, correct and use them to improve your bot over time.



## Let’s see how it all works in practice!

It’s demo time!

# Key takeaways and tips

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# Key takeaways

- Allow your assistant to learn from real conversations early on
- Start small and make sure your assistant nails the happy path first
- Leverage the freedom of customization the open source tools give you
- When needed - use business logic to build your best conversational AI



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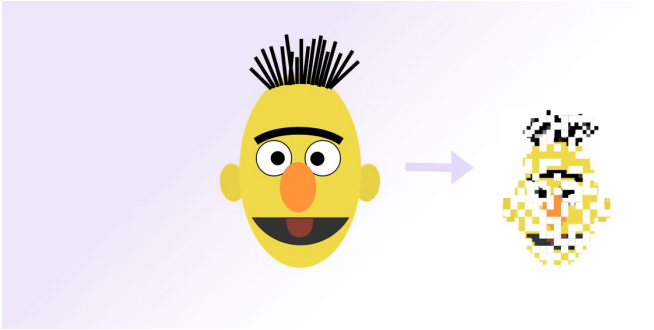
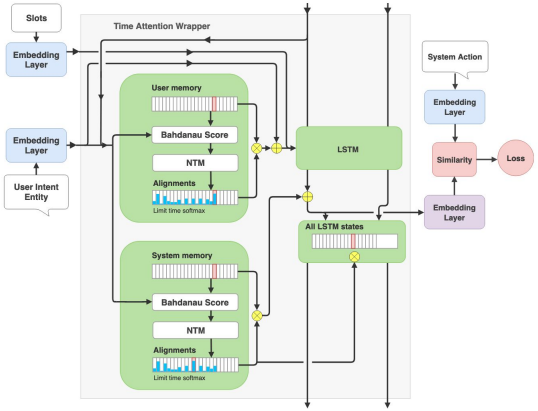
## Compressing BERT to make it fast (to train and run)



## Transfer learning of reusable dialogue patterns




## Mixing retrieval-based and task-oriented dialogue

# Become a contributor to Rasa!

## Rasa Contributor Program

The Rasa Contributor program consists of three stages, each based on different levels of involvement and each with a bunch of different perks:

### Contributor

**WHO ARE THEY?**

Contributors are community members who help us improve the Rasa software by contributing to Rasa codebase or developer resources.

### Hero

**WHO ARE THEY?**

Rasa Heroes are experienced Rasa contributors who have made multiple high-quality contributions and champion Rasa within other communities.

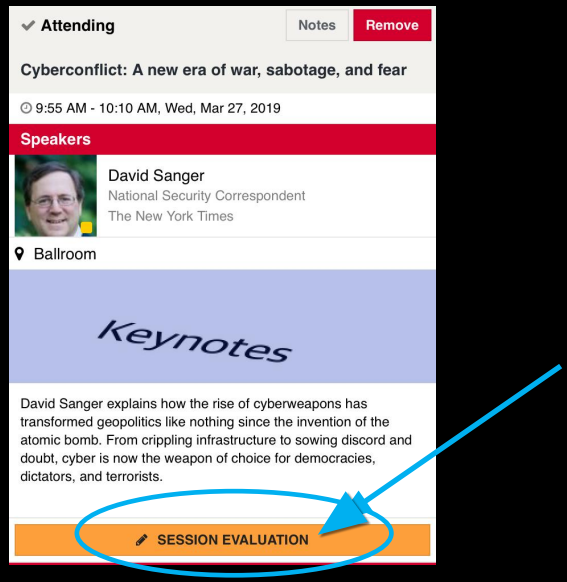
### Superhero

**WHO ARE THEY?**

Rasa Superheroes are Rasa community leaders who grow Rasa community in their local area and bring people interested in conversational AI together.

# Rate today’s session

Session page on conference website




O’Reilly Events App

# *Get in touch - we are hiring!*

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