TravelX:
NLP model for a task-oriented Intelligent assistant

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1.

Motivation

Original contribution

- → Combine three AI models in order to create a task-oriented conversational AI
- → Compare two different approaches for our NLP models
- → Provide a user-friendly application that solves a real-world problem by means of our integrated models

Motivation and goals

- ✗ Custom real-life application based on a relatively new NLP model (BERT)
- ✗ Intuitive and user-friendly interface
- ✗ Create a model and interface easy to extend and integrate with external parties (Amazon Alexa)

2. Theoretical background and Related work

BERT

- Bidirectional Encoder Representation from Transformers
- Built on top of the Transformer Architecture
- State-of-the-art accuracy on 11 NLP tasks
- Brings state-of-the-art to regular users
- Fine-tuning vs feature based

BERT Pretrained model

- Masked Language Model

Input: The man went to the $[MASK]_1$. He bought a $[MASK]_2$ of milk .
Labels: $[MASK]_1$ = store; $[MASK]_2$ = gallon

- Next Sentence prediction

Sentence A = The man went to the store.
Sentence B = He bought a gallon of milk.
Label = IsNextSentence

Sentence A = The man went to the store.
Sentence B = Penguins are flightless.
Label = NotNextSentence

Related work

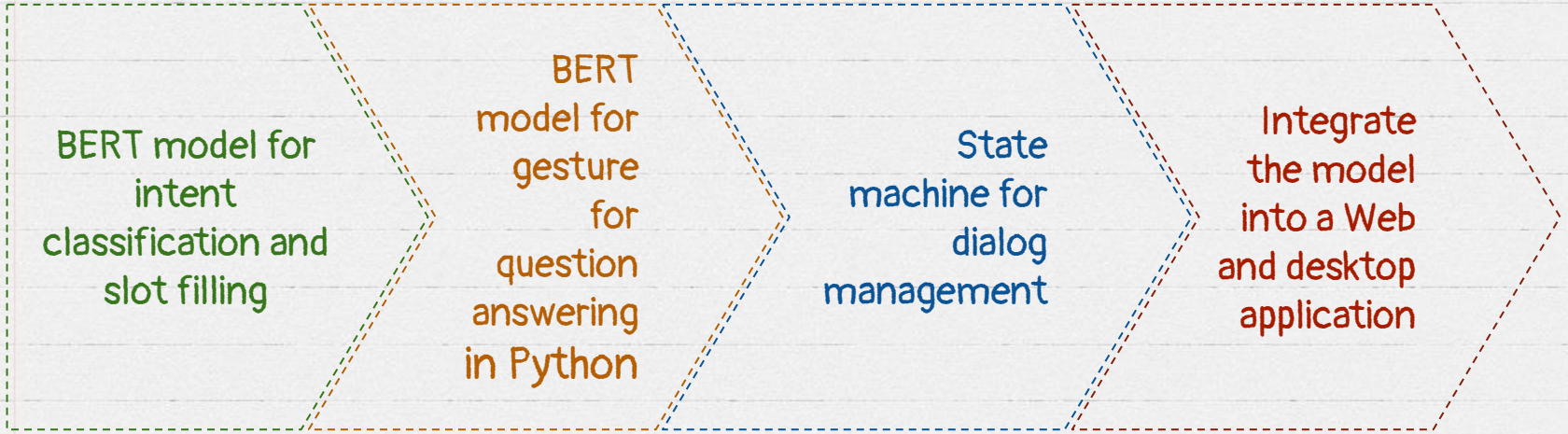
Real-world Conversational AI for Hotel Bookings

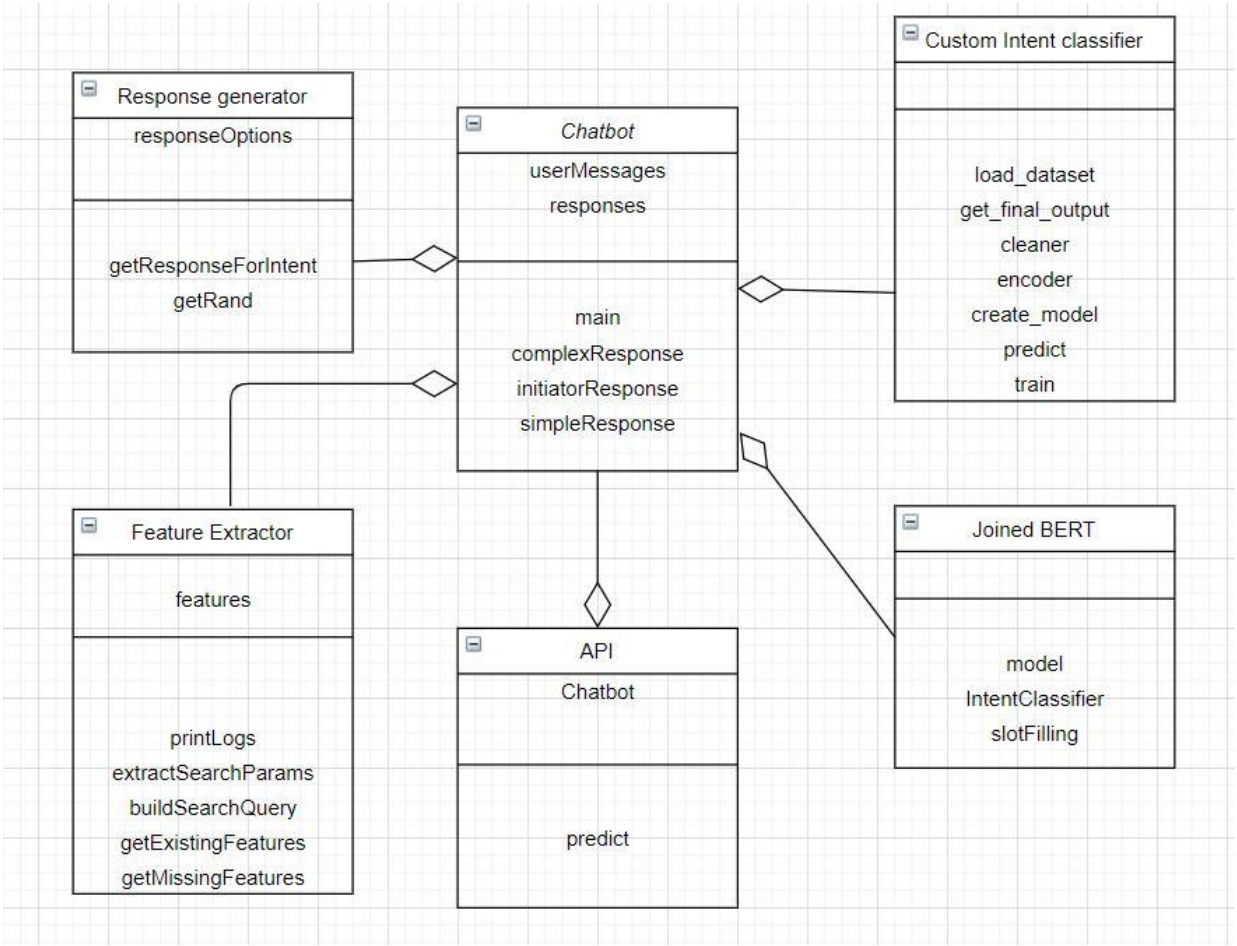
- ✗ Commercially used app in the real world
- ✗ Intent Classifier - Bidirectional LSTM
- ✗ Named Entity Recognition - SpaCy2
- ✗ Top-1 Recall: 89% Top -3 Recall: 96%

3.

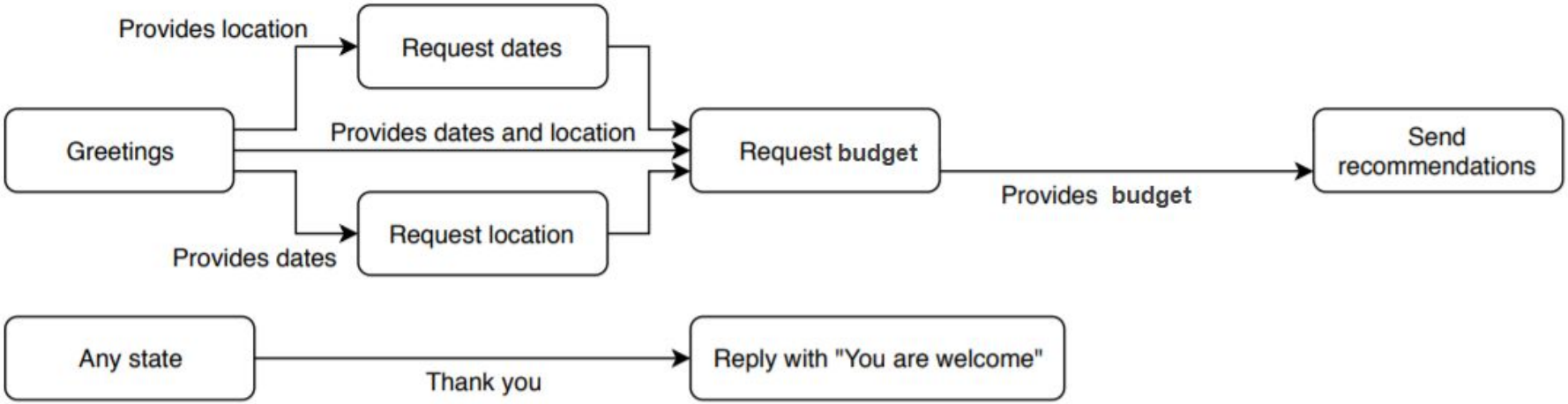
Proposed solution and results

Proposed approach

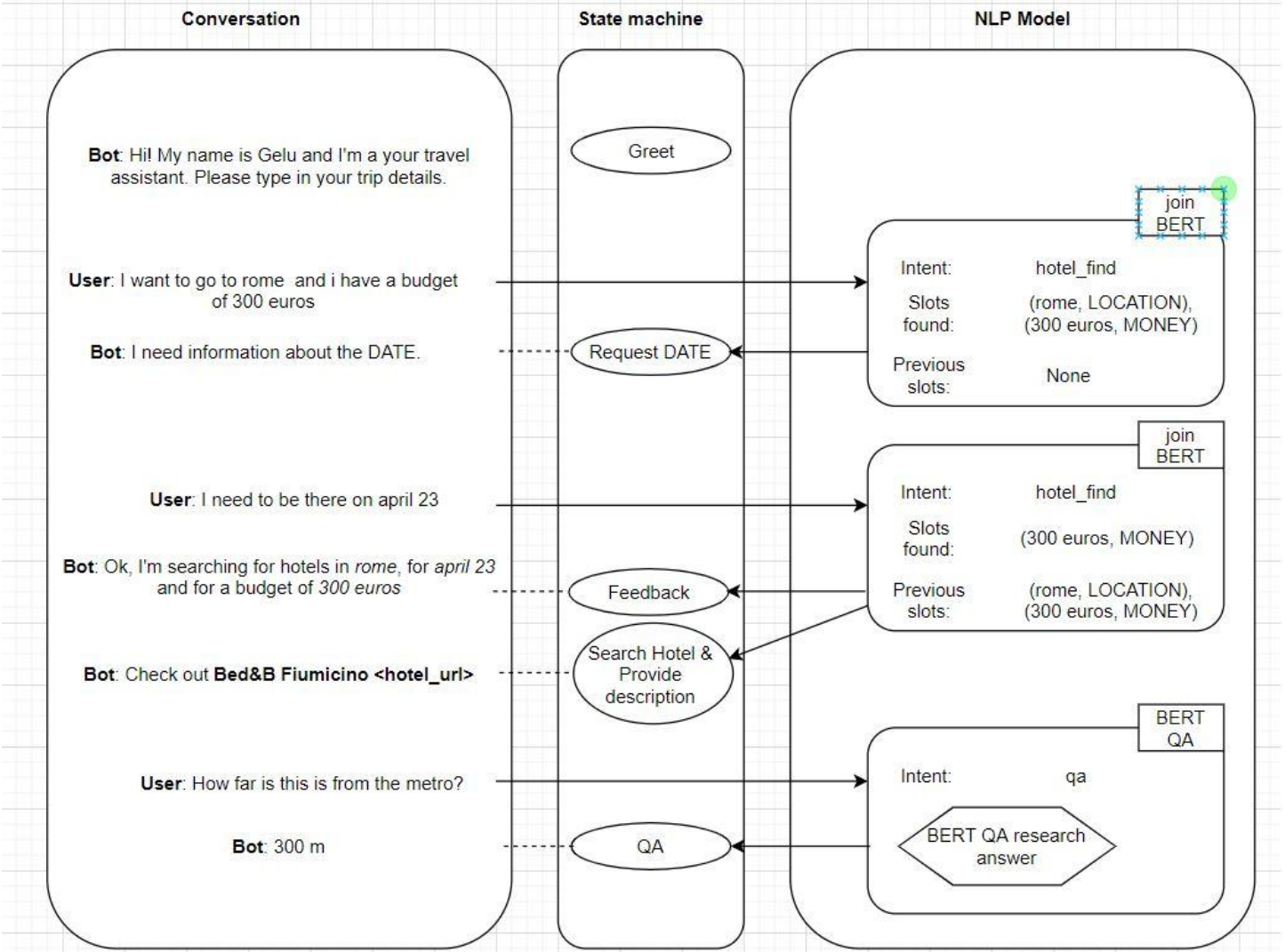




Class diagram of the Backend application



State transitions example

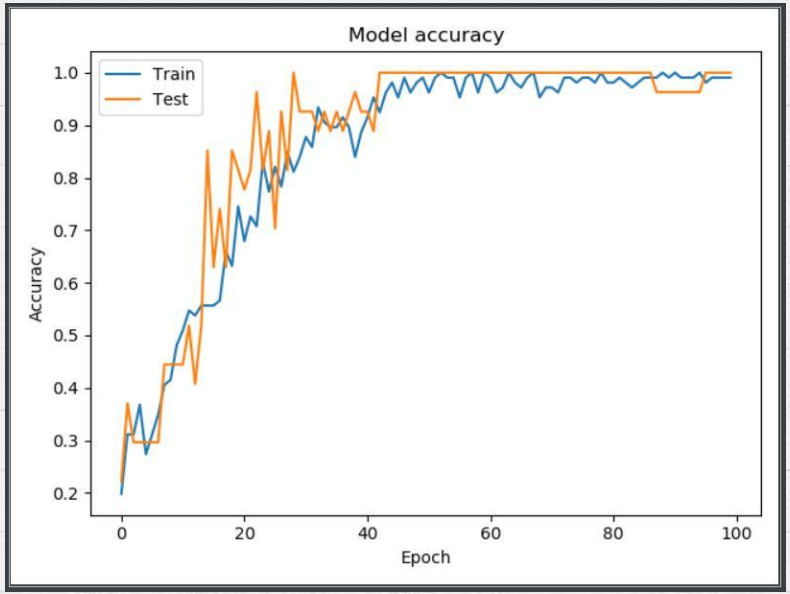


Example of a conversation with our bot, with corresponding state transitions and model logic.

Implementation

- ✗ Python model: ScyPy, pytorch, tensorflow, Keras, BERT
- ✗ User interface: React, Electron, Axios

Experimental results



Our bert: 92.59%

Our bi-LSTM: 87.23%

State-of-the-art: 97.87%

Algorithm improvements

- ✗ Memory footprint reduction: decrease resource utilization
- ✗ Response time improvements:

  3.8 seconds avg. -> 1.1 seconds avg.

  (request completion-time measured in Chrome dev tools)

Conclusions and achievements

- ✓ **Real-life application** for a task-oriented chatbot
- ✓ **User-friendly** interface
- ✓ **Proof of concept** for further development
- ✓ Ability to **integrate** with other existing interfaces

Difficulties and limitations

- ✗ Hardware resources
- ✗ Complex dialog flows
- ✗ Lack of free datasets for our problem, increased time of data collection and dataset construction

What's next? Future work

- ✗ Support more complex dialog flows
- ✗ Support more hotel features
- ✗ Extends dataset
- ✗ Detect the need to defer task to human
- ✗ Performance improvement:
  - Model
  - Resource utilization
- ✗ Integrate with speech recognition models / systems (Alexa)

To Do!

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Thank you!

Next:

Application Demo