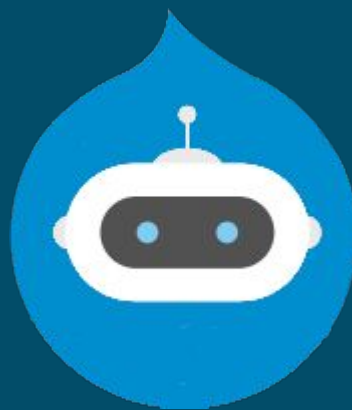




Creating a Custom Rasa Conversational AI Chatbot for Drupal Websites



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Sponsored by Esteemed



About Me

I've been a Drupal Developer for 13+ years, currently working on United States government agency Drupal websites. I have worked on healthcare Drupal websites, machine learning applications, and Ecommerce websites.



Senior Drupal Developer



Drupal Developer at
Florida Blue



Senior Software Engineer

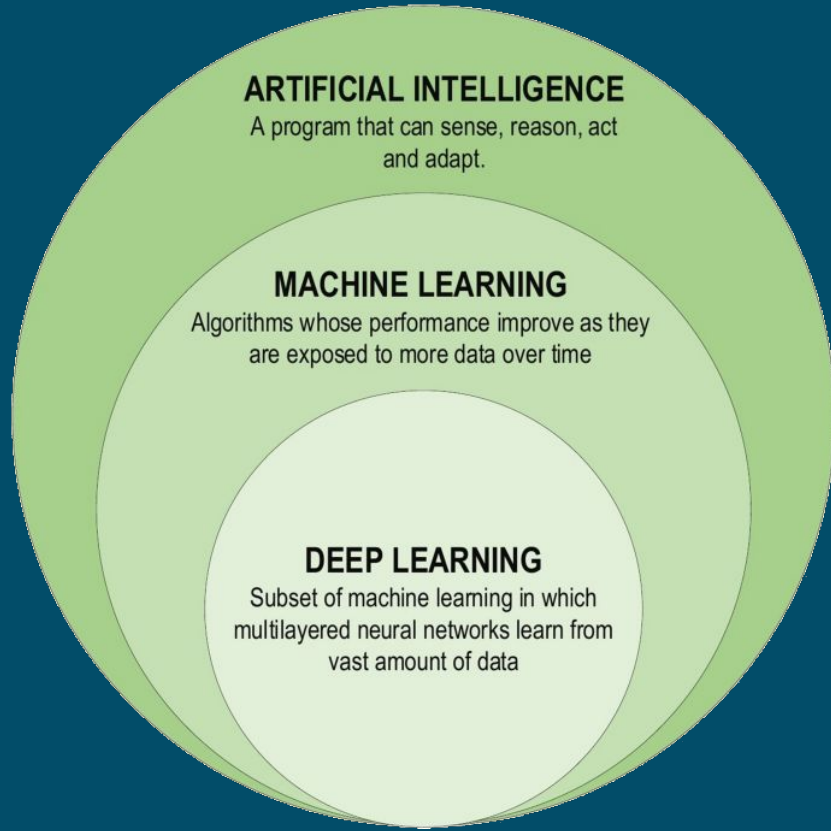


Drupal Username: mandolinrick

Our Agenda

- ❖ Gentle Introduction to ML and NLP
- ❖ How Chatbots Work
- ❖ Brief Discussion of Different Chatbots
- ❖ Overview of Rasa Conversational AI
- ❖ Create a Knowledge/Conversation Base
- ❖ How to Add a Rasa Chatbot to a Drupal Website
- ❖ Conversation Driven Development
- ❖ Questions?

Machine Learning



"Machine learning focuses on applications that learn from experience and improve their decision-making or **predictive** accuracy over time." - IBM

Machine Learning

❖ Types of Machine Learning

- Supervised Learning - for a set of data, the outcome is known (linear regression, classification)
- Unsupervised Learning

❖ Programming Paradigm

- Traditional Programming
 - Data/Input + Rules = Answers
- Machine Learning
 - Data/Input + Answers = Rules

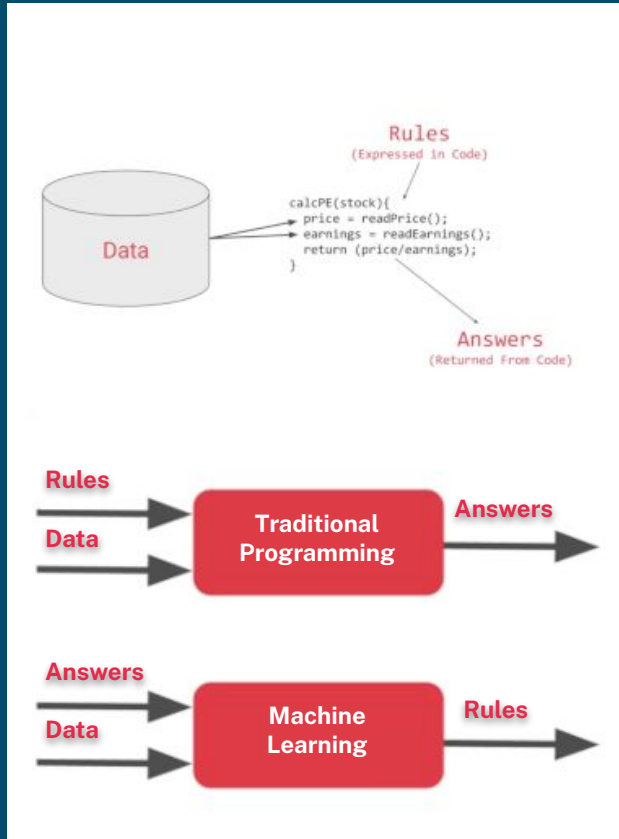
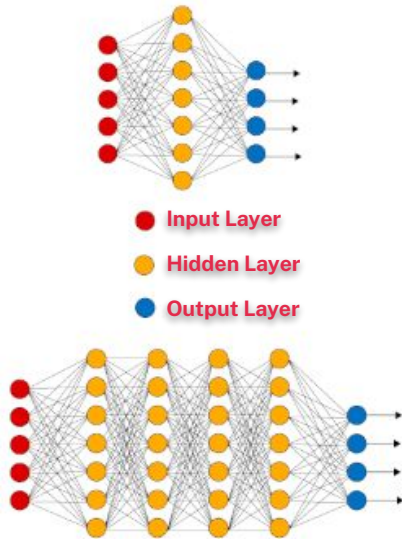


Diagram: Moroney, L. (2021). AI and Machine Learning for Coders: A Programmer's Guide to Artificial Intelligence. O'Reilly.

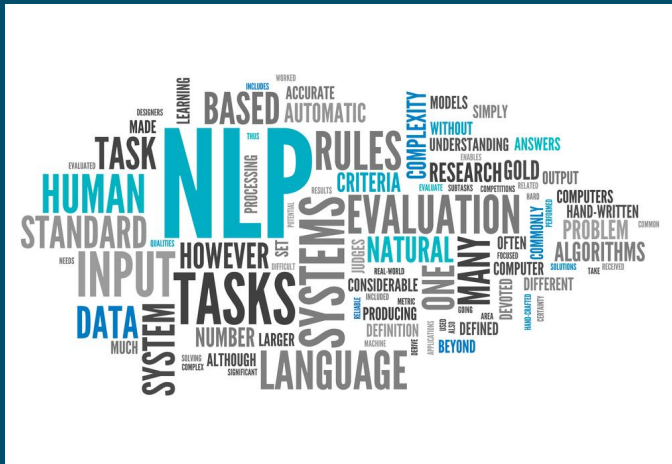
Deep Learning

“A subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks.”



- ❖ **Input Layer** - Images, text, audio, video, numbers, etc. Must be quantifiable.
- ❖ **Hidden Layers** - Filters for feature extraction
- ❖ **Output Layer** - Classification, prediction
- ❖ **Activation Function** - takes in the output signal from the previous cell and converts it into some form that can be taken as input to the next cell.
 - Sigmoid, ReLU and Softmax

Components of NLP



❖ Natural Language Processing (NLP)

- NLP is a subset of AI and is what happens when computers read language. NLP turns language into structured data.
- Parsing, tokenizing, stemming, text summarization, text categorization, wordclouds etc.

◆ Natural Language Understanding (NLU)

- NLU is a subset of NLP and is what happens when computers understand language.
- Sentiment detection, topic classification, intent classification, and entity detection are examples

❖ Natural Language Generation (NLG)

- NLG is what happens when computers write language. NLG turns structured data into language.
- Examples include text generation, story generation, music generation and chatbot responses.

[illegible]

- What the user wants to do
- Raw text in, machine readable information out
- Can also be rule-based or regex
- Neural Models such as transformer models (BERT, DIET)

- Dialogue Policy - what should the chatbot do next based on the conversation
- Uses some rules
- Transformer Embedding Dialogue (TED) Policy - selects which action to take next
- Requires training examples

- Action can be utterance
- Action could be an automated process or call to another API
- Another step in the conversation

Components of Intent Based Chatbot

❖ Intents

- What the user wants to do

❖ Entities

- Important pieces of information

❖ Stories

- Ways the conversation can go
- Training data

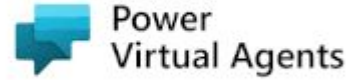
❖ Actions

- What action the chatbot can take

❖ Slots

- Key, value pair acts as memory of the chatbot

Chatbot Providers and Frameworks



Why Choose Rasa?

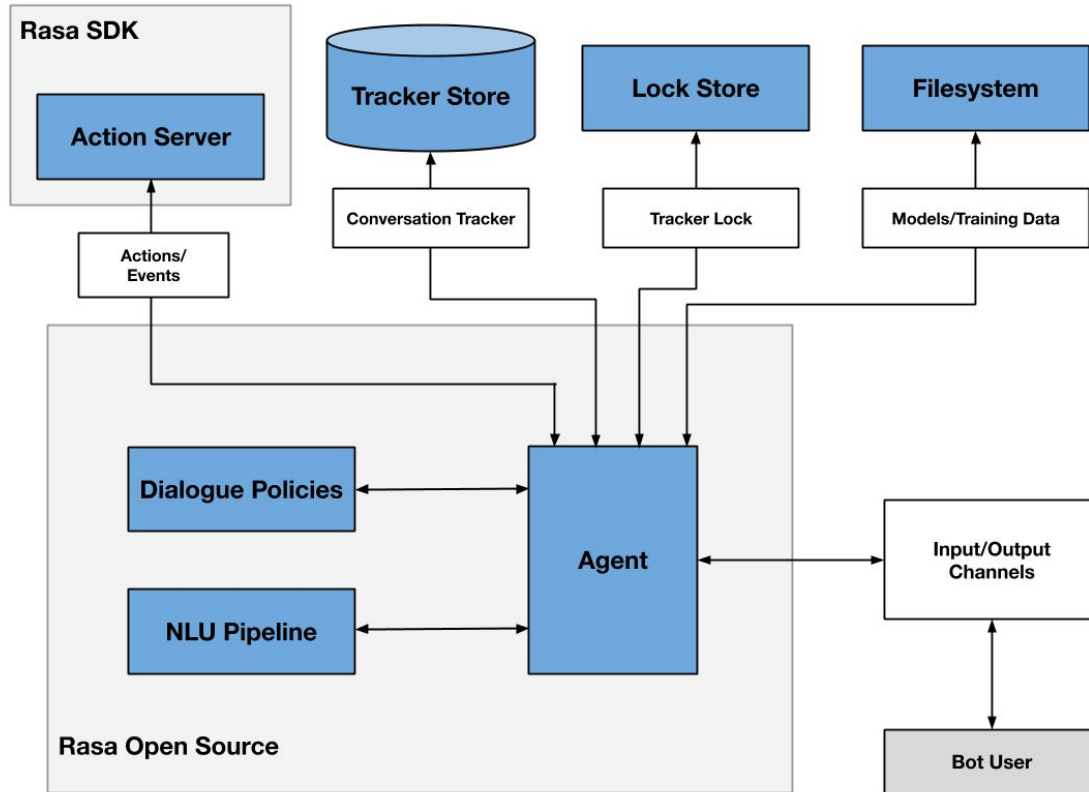
Pros

1. Open source
2. Uses YAML for configuration and content files
3. Well documented RESTful API
4. Active development
5. Excellent support
 - a. Documentation
 - b. Active YouTube channel
 - c. Office hours
6. Cutting edge models and pipelines
 - a. Graph based development pipeline in 3.0 to greatly reduce training time
7. Customizable

Cons

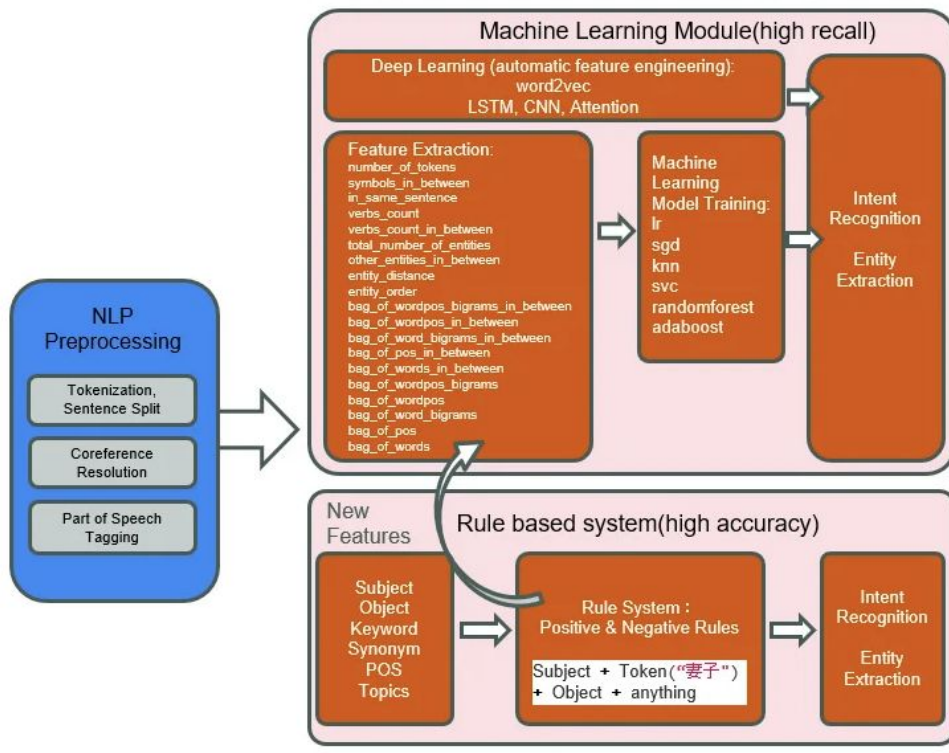
1. Written in Python
 - a. Model development - Python
 - b. Model inference - JavaScript
2. Requires machine learning education/development
 - a. Needed for meaningful development
3. Complex
 - a. Needed for extreme customization
4. Requires creation of knowledge base/training stories
 - a. Single domain chatbot
 - b. AnswerThePublic.com
 - i. Excellent source material

Rasa Architecture



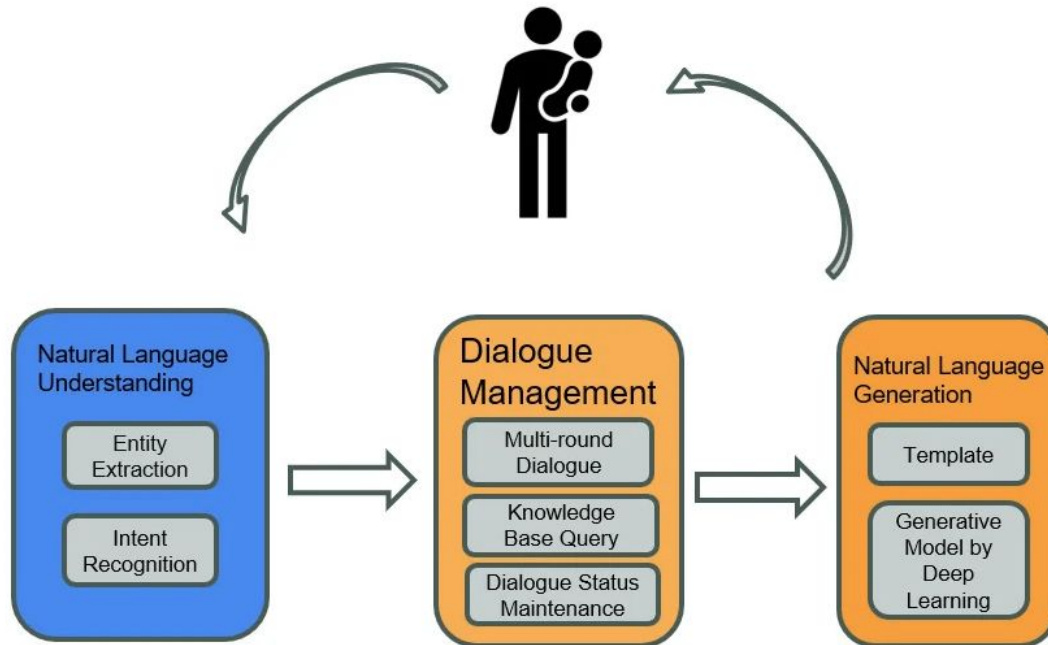
Rasa - NLU

Natural Language Understanding (NLU)



Rasa - DM

Dialogue Manager (DM)



User: Kid is sick, what should I do?

NLU Intent Recognition : Sickness

NLU Entity Extraction : Child

DM : No Age, No Symptom, No Gender

NLG

Bot: How old is your child? Boy or girl?

User: 6 months. Boy.

NLU Entity Extraction : 0.5 years old; Male

DM : No Symptom

NLG

Bot: What symptom does he have?

User: He is having a fever.

NLU Entity Extraction : fever

DM : Query on Knowledge Base, Define and Finish task

NLG

Bot: Please call Dr. Cai at 13333333333

Installing Rasa

1. For Ubuntu
`$ sudo apt update`
2. Install python3
`$ sudo apt install python3-dev python3`
`$ sudo apt install python3-venv`
3. Create virtual environment
`$ python3 -m venv ./venv`
4. Activate venv environment
`$ source ./venv/bin/activate`
5. Install Rasa and Upgrade pip
`(venv)$ python -m pip install --upgrade pip rasa`
`(venv)$ python -m pip install protobuf==3.20.*`

Guidelines for First Knowledge Base

1. ~10 Intents to start with
2. Simple Intents
3. Use expert knowledge (Business Analyst)
4. Use AnswerThePublic.com to get list of most popular domain questions

Answer The Public

<https://answerthepublic.com>

[Answer the Public Results](#)

Who

1. who's online
2. who uses
3. who owns drupal
4. who created drupal
5. who makes drupal

What

1. what drupal theme is that
2. what drupal is used for
3. what drupal version do i have
4. what drupal version
5. what drupal site

Which

1. which drupal stack is used for installation
2. which drupal version
3. which drupal theme is used
4. which drupal version am i running
5. drupal which database

Where

1. where is settings.php
2. where are the images stored
3. where is php.ini
4. where is database configuration
5. where are pages stored

Creating Knowledge Base for Rasa Chatbot

1. Create new chatbot
\$ rasa init
2. Create data/nlu.yml
3. Create data/stories.yml
4. Create domain.yml
5. Train Model
\$ rasa train
6. Start up rasa server:
\$ rasa run --enable-api --model
./models --endpoints ./endpoints.yml
--cors "*"

```
.../Rasa/chatbot
    .../actions
        .../actions.py
        .../__init.py
    .../config.yml
    .../credentials.yml
    .../data
        .../nlu.yml
        .../rules.yml
        .../stories.yml
    .../domain.yml
    .../endpoints.yml
    .../tests
        .../test_stories.yml
```

Creating Intent and Utterance

1. Create intent in nlu.yml
2. Add response in domain.yml
3. Add the intent to the list of intents in domain.yml
4. Add story to stories.yml

Installing and Creating Custom Component Module

Create AI Chatbot Rasa Component

1. Install Component Module
2. Enable Component Module
3. Create custom ai_chatbot module
4. Create Page content type
5. Add AI Chatbot Comp Rasa block to body section.

File Structure

```
.../web/modules/custom/ai_chatbot  
  
.../ai_chatbot  
.../ai_chatbot.info.yml  
.../components  
.../comp_rasa  
.../comp_rasa.component.yml  
.../index.html  
.../css  
.../Chatroom.css  
.../js  
.../Chatroom.js  
.../rasa.js
```

What Does the Component Module Do?

1. Allows easy integration of JavaScript libraries
2. Create Components as blocks
3. Auto discovery of custom Components
4. Configuration through Block Configuration UI
5. Each component is also available as a library
6. Key to integrating machine learning into Drupal

Domain Knowledge of DropBot

1. greet - hello
2. goodbye - bye
3. affirm - yes
4. deny - no
5. bot_challenge - who are you?
6. define - what is drupal?
7. creator - who created drupal?
8. creation - when was drupal created?
9. release_7 - when was drupal7 released?
10. release_8 - when was d8 released?
11. release_9 - when was d9 released?
12. release_10 - when will d10 be released?
13. end_of_life_7 - when does d7 reach end of life?
14. end_of_life_8 - when does d8 reach end of life?
15. end_of_life_9 - when is d9 no longer supported?
16. end_of_life_10 - when will d10 reach eol?
17. number_of_sites - number of drupal sites
18. drupal_logo - show drupal logo

Drupal DropBot

Demo: <https://drupalml.com/rasa-chatbot>

Sample Questions

Who are you?

Who created Drupal?

When was it created?

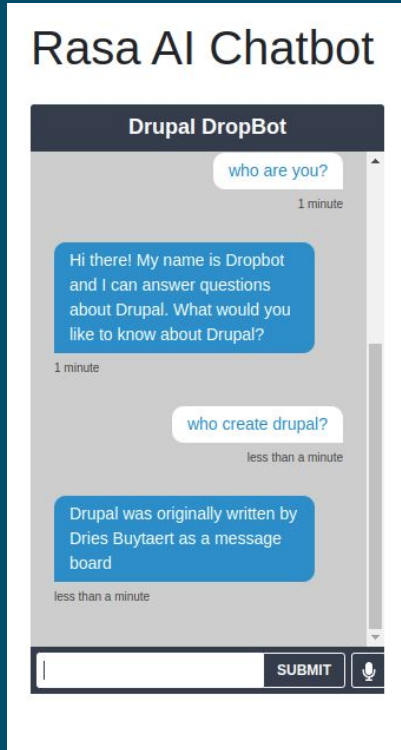
When was Drupal7 released?

When was D8 released?

When does D8 reach end of life?

When was d10 released?

Rasa uses port 5005 by default



Looking to the Future

- Continue to build up Drupal DropBot's knowledge base
- Add a real front-end to DropBot
- I would like to start an initiative for integrating machine learning and AI into Drupal. If you would like to help with this, please let me know: ricktorzynski@gmail.com
- I would like to start a YouTube channel featuring tutorials on integrated machine learning into Drupal

Thank You!

- ❖ Matt Pritchard, Chris McGrath and my colleagues at Esteemed!
- ❖ Drupal Camp Asheville for allowing me to be a remote presenter