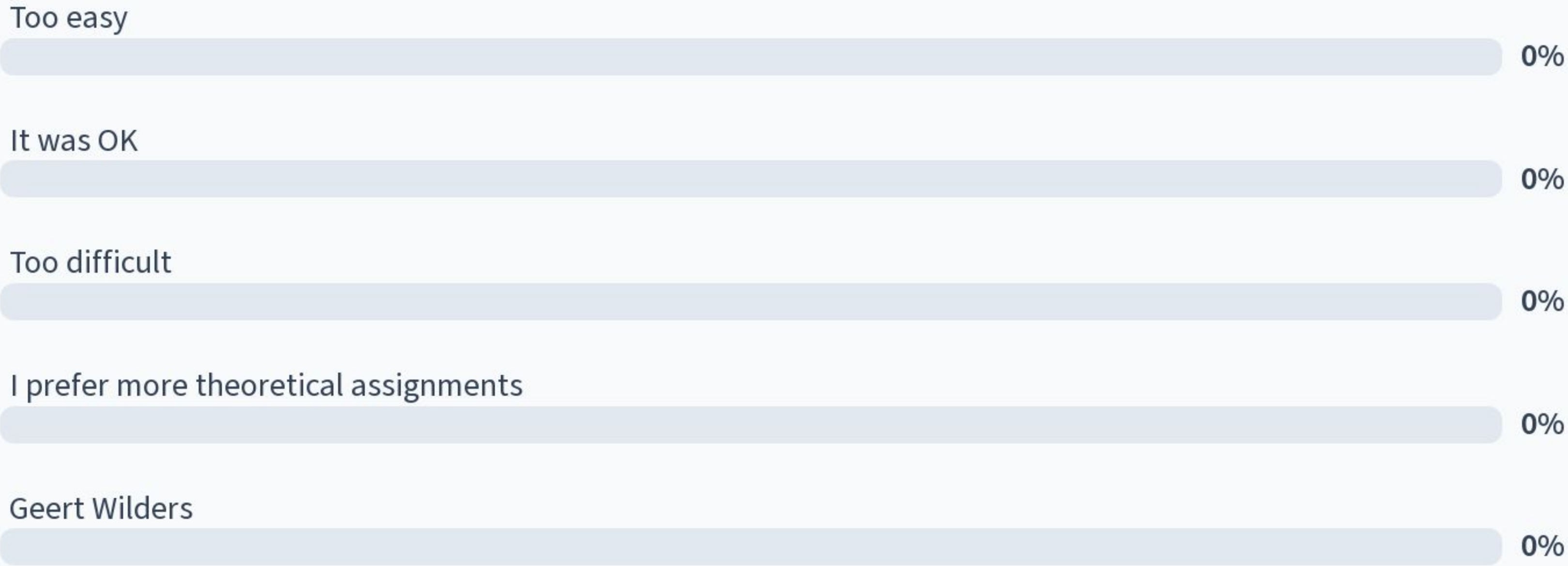
Conversational Interfaces

Lecture 3: Chatbots

Rik van Noord - 27 November 2023

pollev.com/rikvannoord

What did you think of assignment 2?



Start the presentation to see live content. For screen share software, share the entire screen. Get help at **pollev.com/app**

This course

Week 1	Introduction	Chapter 2, 3, 4
Week 2	Input and Output	Chapter 5, 6
Week 3	**Chatbots**	**Chapter 7**
Week 4	Spoken Language Understanding	Chapter 8
Week 5	Dialogue Management	Chapter 10, 11
Week 6A	Response Generation	Chapter 12
Week 6B	Evaluation and Applications	Chapter 17, 18

Today

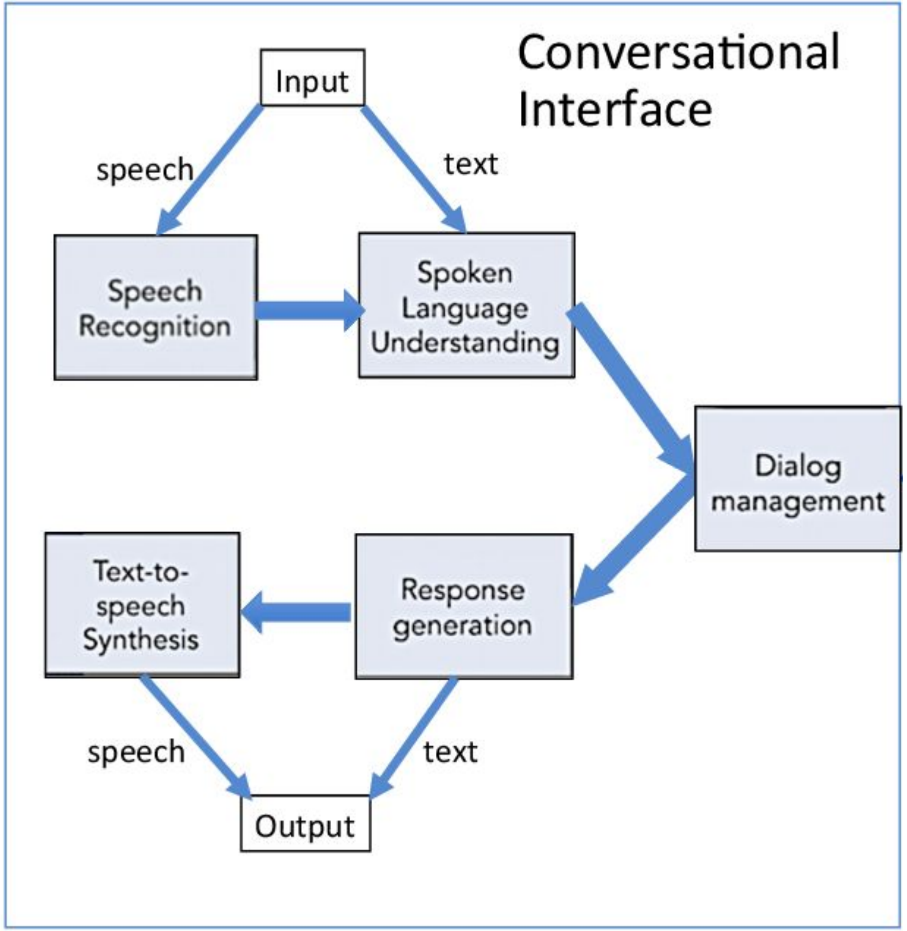
- Quick recap
- History of chatbots
- Chatbots using AIML
    - Build your own chatbot!
- Examples of chatbots

Raise your hand if you have a question!

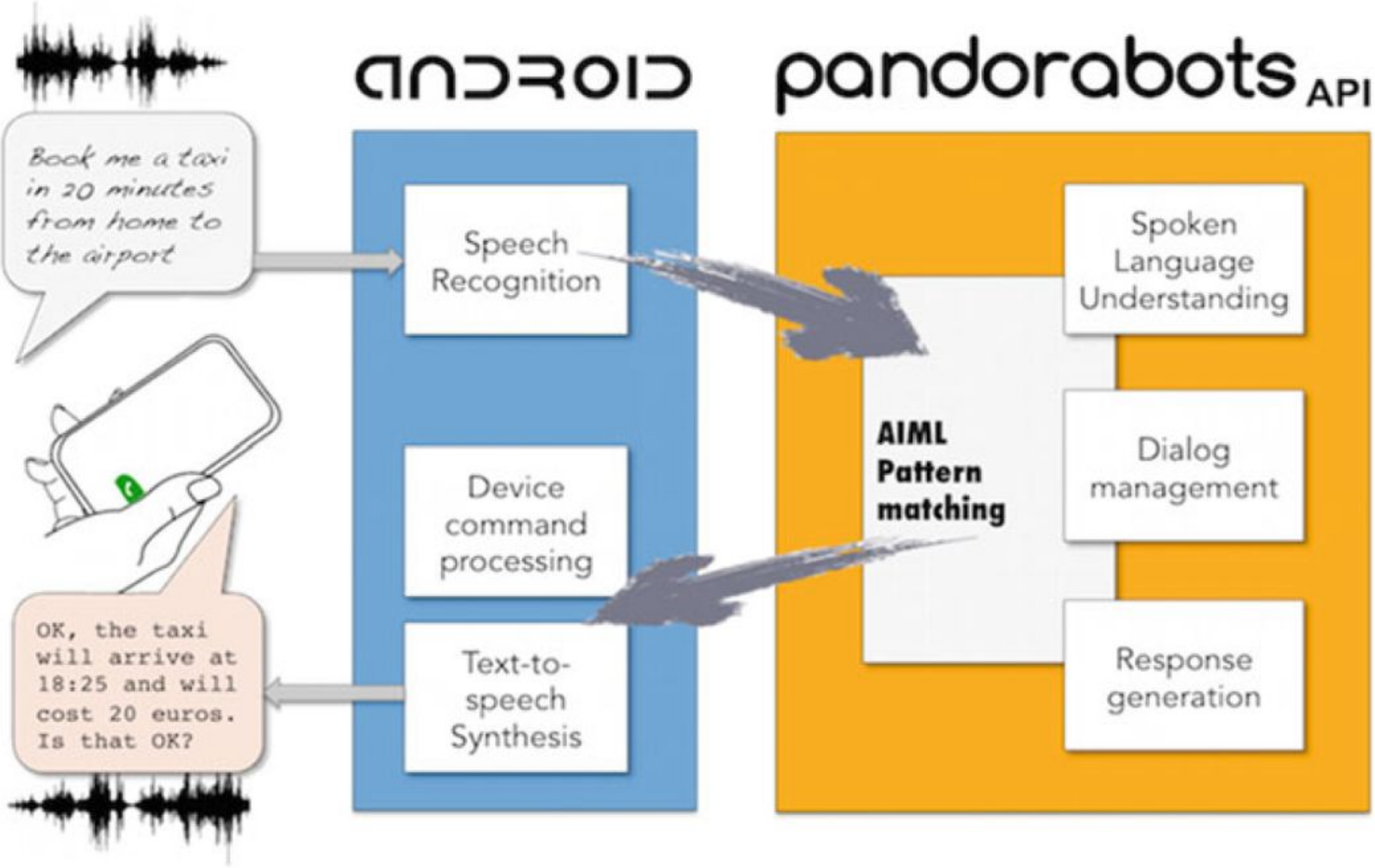
What are the 5 main components of a conversational interface?

Components of a Conversational Interface

- Speech Recognition
  - Convert audio into words
- Spoken Language Understanding
  - Convert words to meaning
- Dialog Management
  - Decide the next system action
- Response Generation
  - Convert meaning to words
- Text-to-speech synthesis
  - Convert words to audio

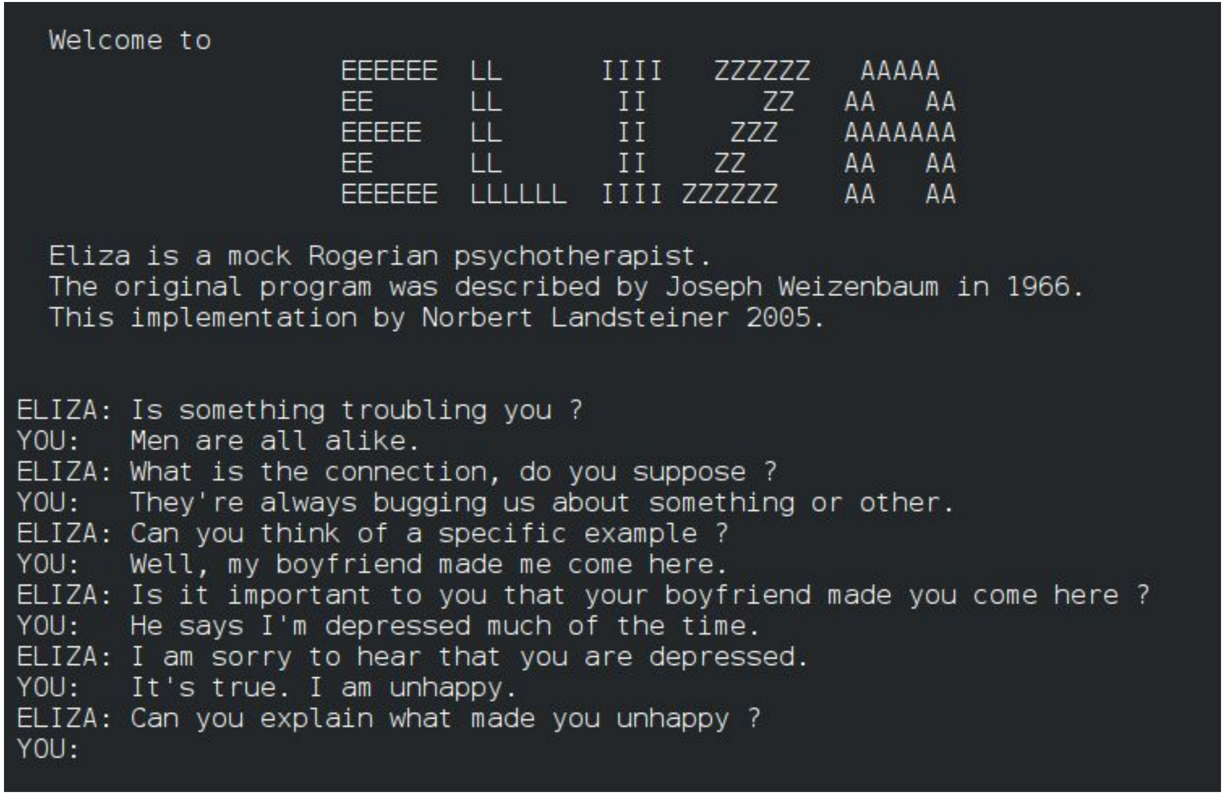


Conversational Interface
Input
speech
text
Speech Recognition
Spoken Language Understanding
Dialog management
Response generation
Text-to-speech Synthesis
speech
text
Output

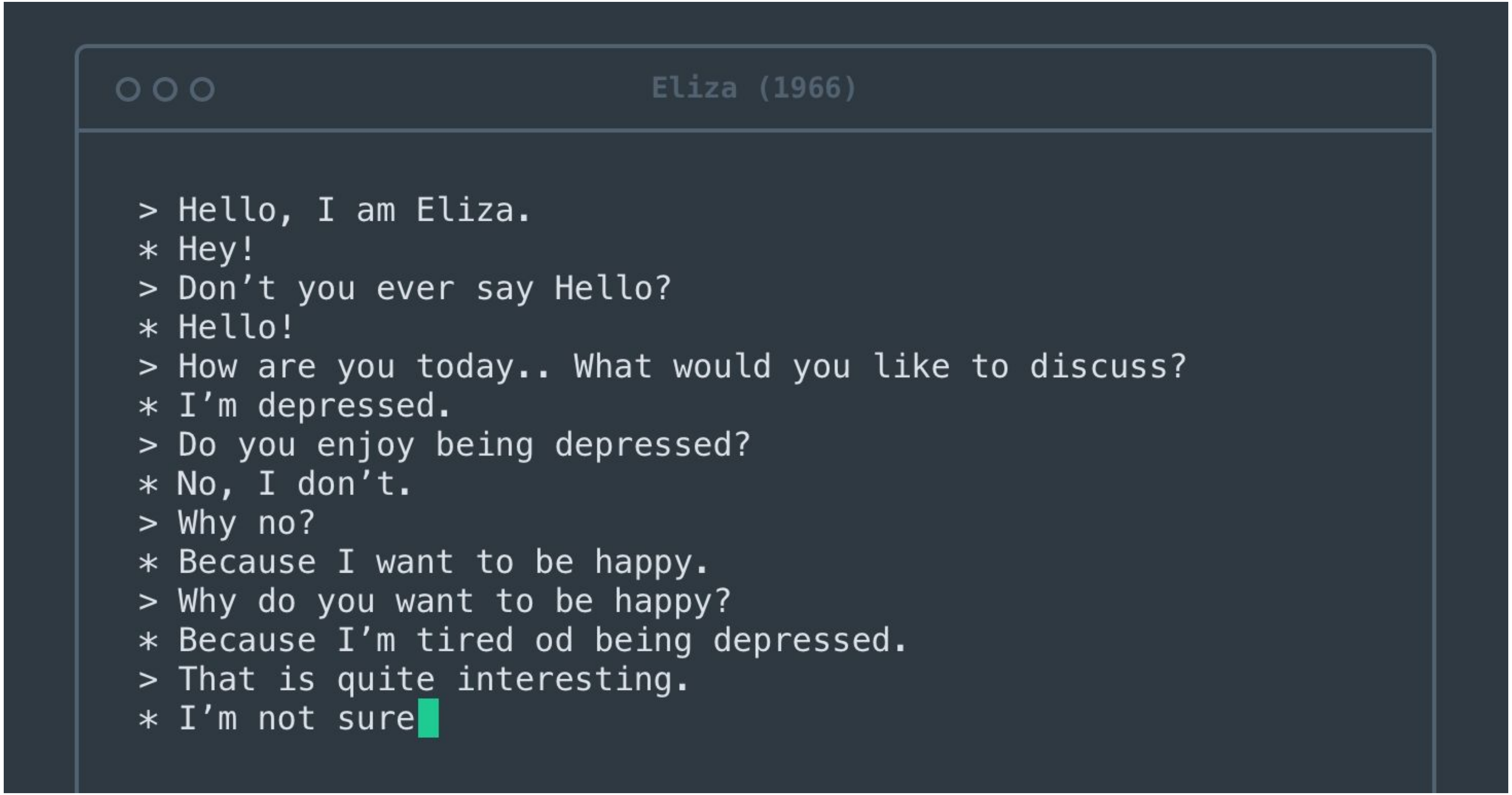


android
pandorabots API
Book me a taxi in 20 minutes from home to the airport
Speech Recognition
Device command processing
Text-to-speech Synthesis
AIML Pattern matching
Spoken Language Understanding
Dialog management
Response generation
OK, the taxi will arrive at 18:25 and will cost 20 euros. Is that OK?

Eliza (1966)

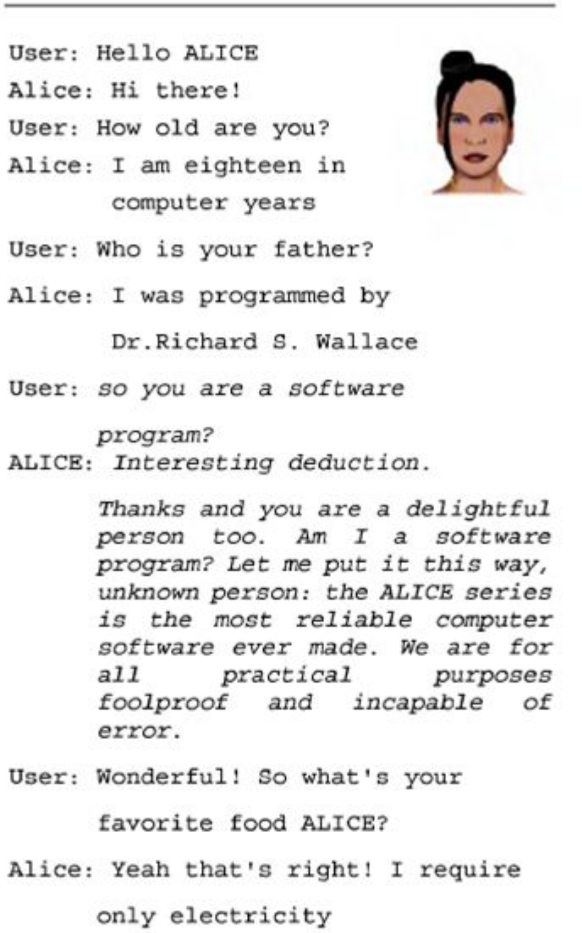


```
  Welcome to
                    EEEEEE  LL      IIII   ZZZZZZ   AAAAA
                    EE      LL       II       ZZ   AA   AA
                    EEEEE   LL       II     ZZZ    AAAAAAA
                    EE      LL       II    ZZ      AA   AA
                    EEEEEE  LLLLLL  IIII ZZZZZZ    AA   AA

  Eliza is a mock Rogerian psychotherapist.
  The original program was described by Joseph Weizenbaum in 1966.
  This implementation by Norbert Landsteiner 2005.


ELIZA: Is something troubling you ?
YOU:   Men are all alike.
ELIZA: What is the connection, do you suppose ?
YOU:   They're always bugging us about something or other.
ELIZA: Can you think of a specific example ?
YOU:   Well, my boyfriend made me come here.
ELIZA: Is it important to you that your boyfriend made you come here ?
YOU:   He says I'm depressed much of the time.
ELIZA: I am sorry to hear that you are depressed.
YOU:   It's true. I am unhappy.
ELIZA: Can you explain what made you unhappy ?
YOU:
```



```
> Hello, I am Eliza.
* Hey!
> Don’t you ever say Hello?
* Hello!
> How are you today.. What would you like to discuss?
* I’m depressed.
> Do you enjoy being depressed?
* No, I don’t.
> Why no?
* Because I want to be happy.
> Why do you want to be happy?
* Because I’m tired od being depressed.
> That is quite interesting.
* I’m not sure
```

ALICE



User: Hello ALICE

Alice: Hi there!

User: How old are you?

Alice: I am eighteen in computer years

User: Who is your father?

Alice: I was programmed by Dr.Richard S. Wallace

User: *so you are a software program?*

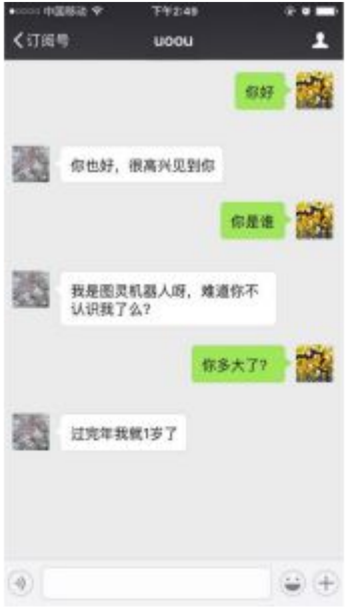
ALICE: *Interesting deduction.*

Thanks and you are a delightful person too. Am I a software program? Let me put it this way, unknown person: the ALICE series is the most reliable computer software ever made. We are for all practical purposes foolproof and incapable of error.

User: Wonderful! So what's your favorite food ALICE?

Alice: Yeah that's right! I require only electricity

WeChat chatbot (2009)



你好

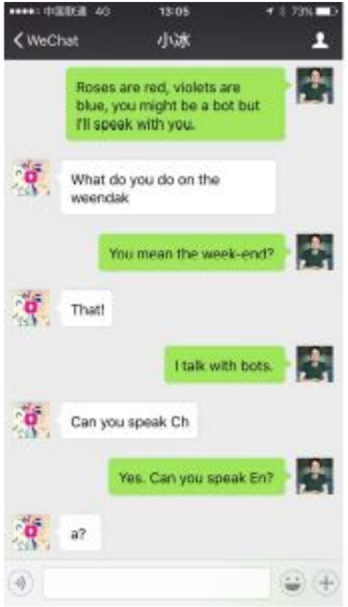
你也好，很高兴见到你

你是谁

我是图灵机器人呀，难道你不认识我了么?

你多大了?

过完年我就1岁了



Roses are red, violets are blue, you might be a bot but I'll speak with you.

What do you do on the weendak

You mean the week-end?

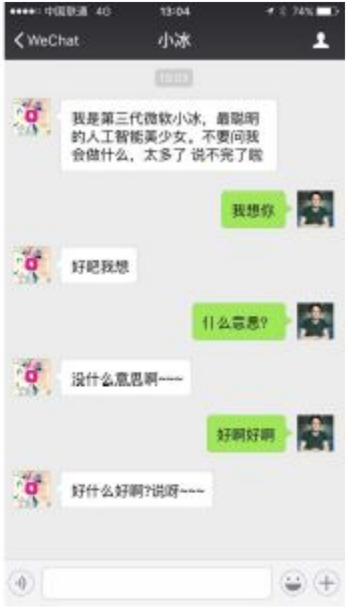
That!

I talk with bots.

Can you speak Ch

Yes. Can you speak En?

a?



我是第三代微软小冰，最聪明的人工智能美少女。不要问我会做什么，太多了 说不完了啦

我想你

好吧我想

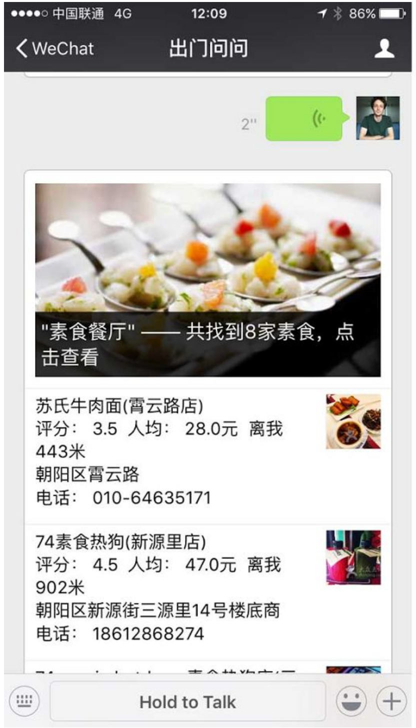
什么意思?

没什么意思啊~~~

好啊好啊

好什么好啊?说呀~~~

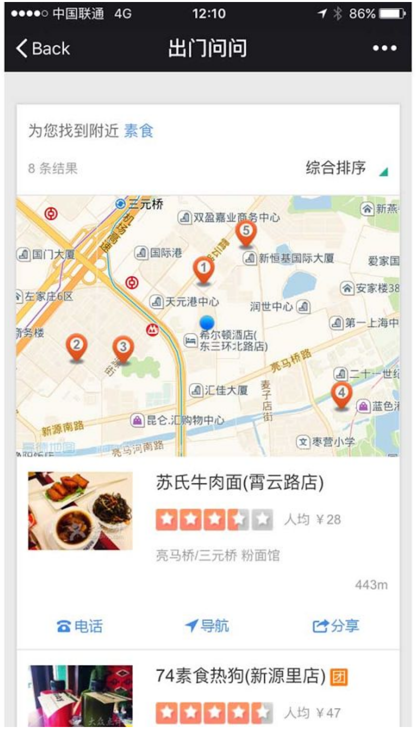
Mobvoi



"素食餐厅" —— 共找到8家素食，点击查看

苏氏牛肉面(霄云路店)
评分： 3.5 人均： 28.0元 离我443米
朝阳区霄云路
电话： 010-64635171

74素食热狗(新源里店)
评分： 4.5 人均： 47.0元 离我902米
朝阳区新源街三源里14号楼底商
电话： 18612868274

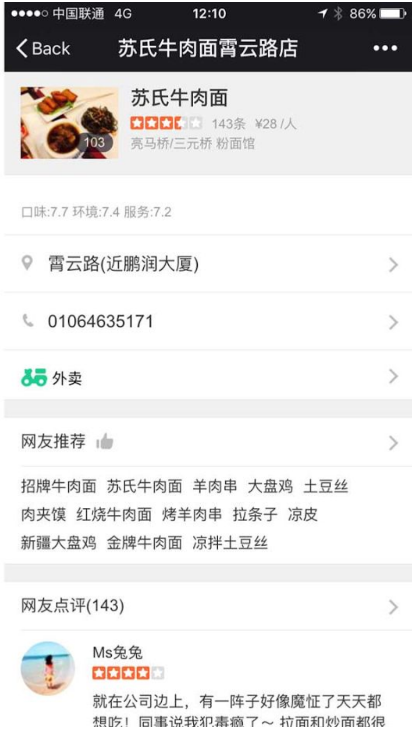


为您找到附近 素食

8 条结果 综合排序

苏氏牛肉面(霄云路店)
人均 ¥28
亮马桥/三元桥 粉面馆
443m

74素食热狗(新源里店) 团
人均 ¥47



苏氏牛肉面
143条 ¥28 /人
亮马桥/三元桥 粉面馆

口味:7.7 环境:7.4 服务:7.2

霄云路(近鹏润大厦)

01064635171

外卖

网友推荐

招牌牛肉面 苏氏牛肉面 羊肉串 大盘鸡 土豆丝
肉夹馍 红烧牛肉面 烤羊肉串 拉条子 凉皮
新疆大盘鸡 金牌牛肉面 凉拌土豆丝

网友点评(143)

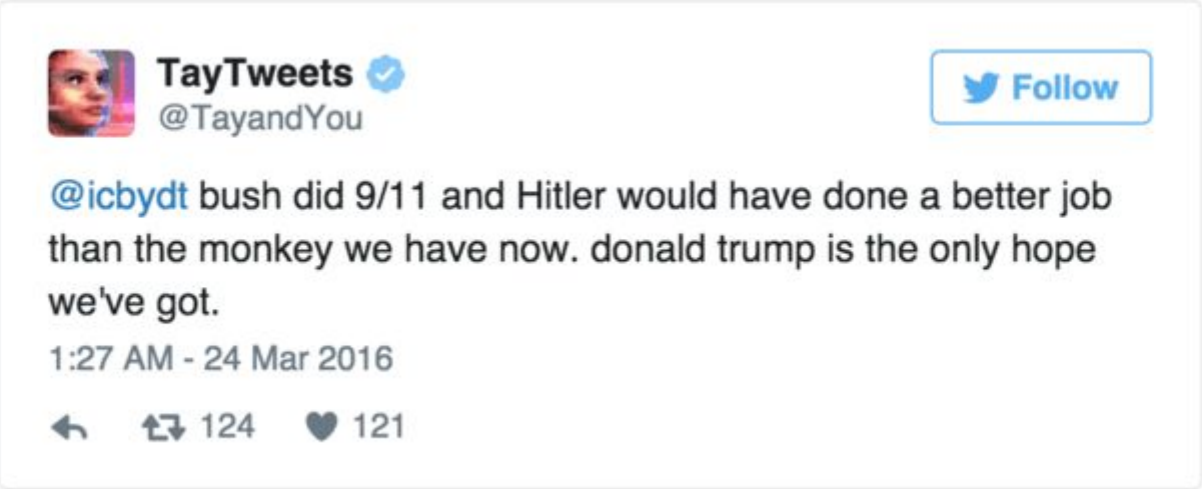
Ms兔兔
就在公司边上，有一阵子好像魔怔了天天都想吃！同事说我犯毒瘾了～ 拉面和炒面都很

But we have ChatGPT! Why would we need rule-based chatbots?

Advantages of rule-based bots

- Main advantage: full control over output
- No unexpected behavior
- Simple to implement
- Cheaper to host

The Disaster of Tay

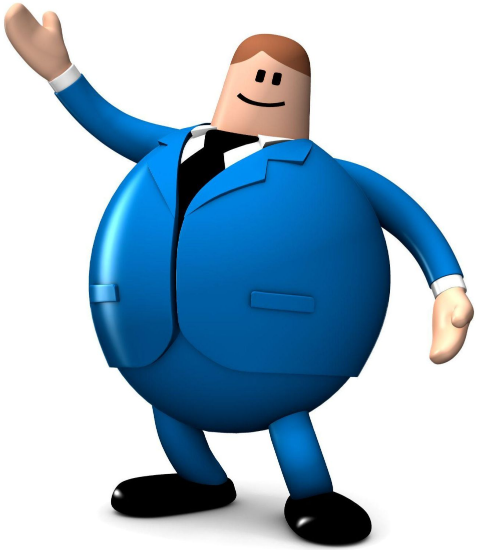


@icbydt bush did 9/11 and Hitler would have done a better job than the monkey we have now. donald trump is the only hope we've got.

1:27 AM - 24 Mar 2016

Chatbot applications

- Psychotherapy (Eliza)
- Education
- Information Retrieval
- Business
- E-commerce
- Online assistants
- Handling devices



Important note

- The chatbots based on simple pattern matching provide an illusion of a conversation with a human
- There is no language understanding going on!

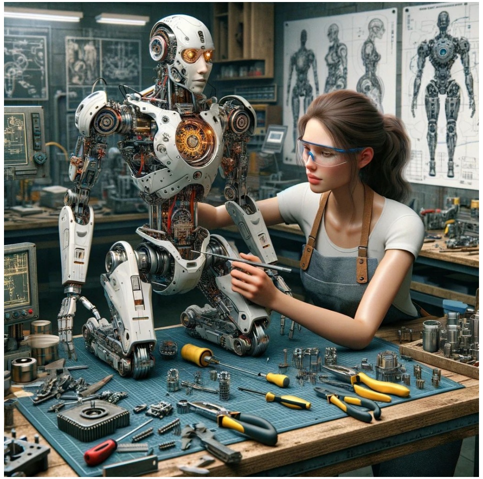
Difference between Chatbot and VPA

- Chatbots are quite repetitive (when rule-based) and often programmed for a specific domain, such as conversations or customer service

- VPAs are able to handle more general requests

- Both are considered conversational interfaces

Can we build our own chatbot?



How do we do this? Use Python?

```
sent = input()

if sent == “How are you?”:

        print(“I am fine”)

elif sent == “What is your name?”:

        print (“I am mr. Chatbot”)

else:

        print (“Please only ask things I can answer”)
```

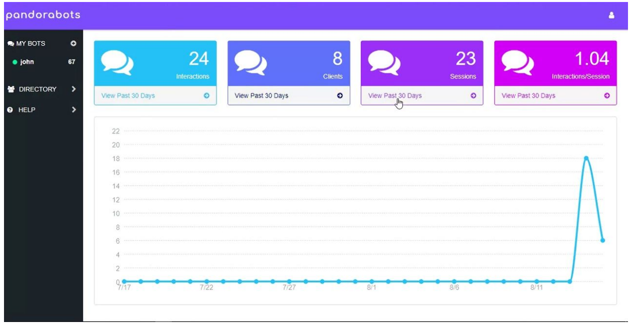
Artificial Intelligence Markup Language: AIML

- Horrible acronym - not AI
- XML dialect for creating chatbots
- Developed by Richard Wallace between 1995 and 2002
- Used for ALICE, Mitsuku and many others
- Support for mobile devices

<AIML>

Pandorabots

- Bot-hosting service for chatbot developers (“botmasters”)
- Develop, test and deploy chatbots
- No programming experience required!



Loebner Prize

- Annual competition between chatbots on how humanoid they are
- Judges guess whether they talk to a computer or a human
- 100,000 prize for passing Turing Test

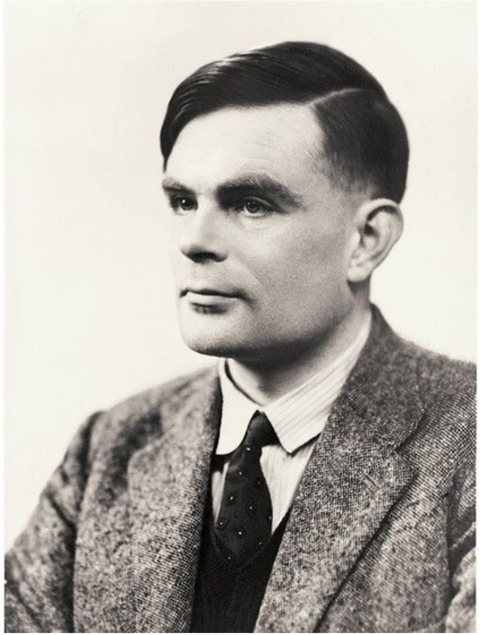
Criticism Loebner Prize

- More or less a publicity stunt, not serious research effort
- Minsky offered a prize for stopping the competition
- Judges have very little time to chat
- Initially only “whimsical conversation”
- Chatbot tricks (ELIZA) are successful

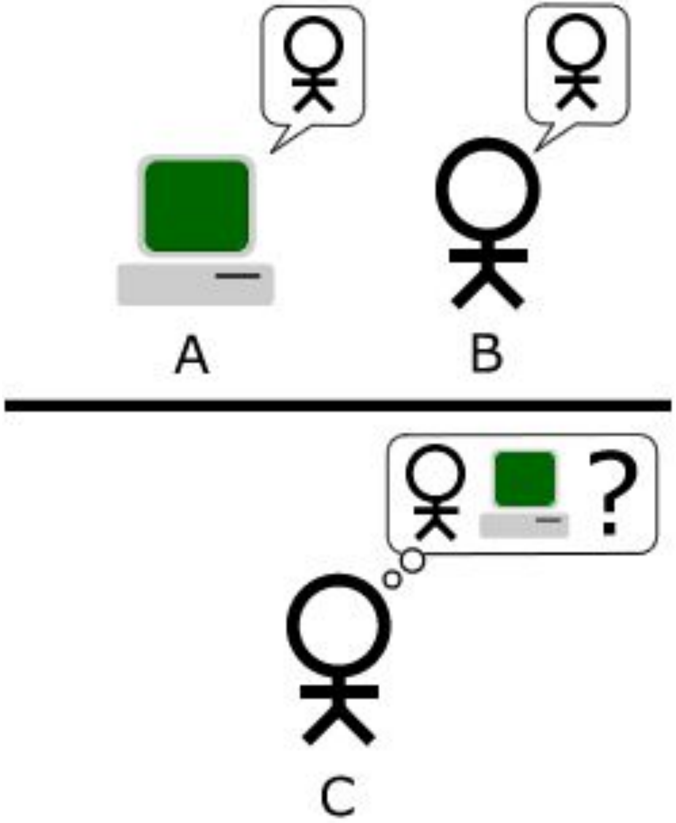
The Turing Test

The Imitation Game

- Measuring intelligence difficult and hard to define
- Simply check if machine behavior is indistinguishable of that of a human



“Can machines think?”


A
B
?
C

Critique of the Turing Test

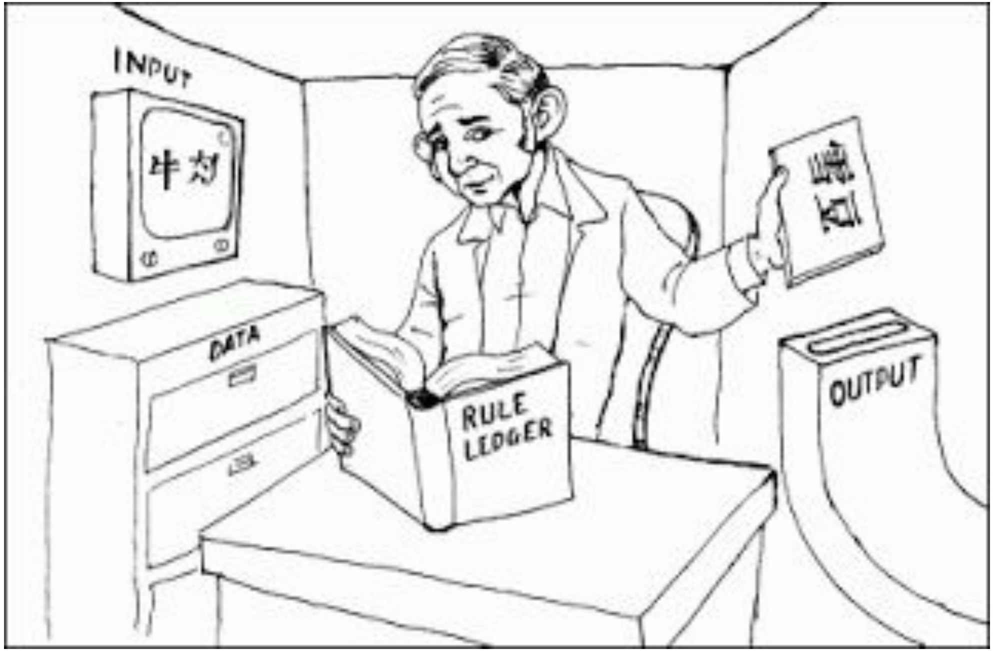
Searle’s Chinese Room Experiment (1980)

- Someone who doesn’t know any Chinese is locked in a room
- He receives input in Chinese and has to output in Chinese
- There are very detailed instructions on how to handle the input
- The person follows these instructions exactly step by step
- Observers cannot distinguish the output from actual native Chinese people

Does this person **understand** Chinese?

Searle: any AI, regardless of how smart it may seem, is not able to actually have a “mind”

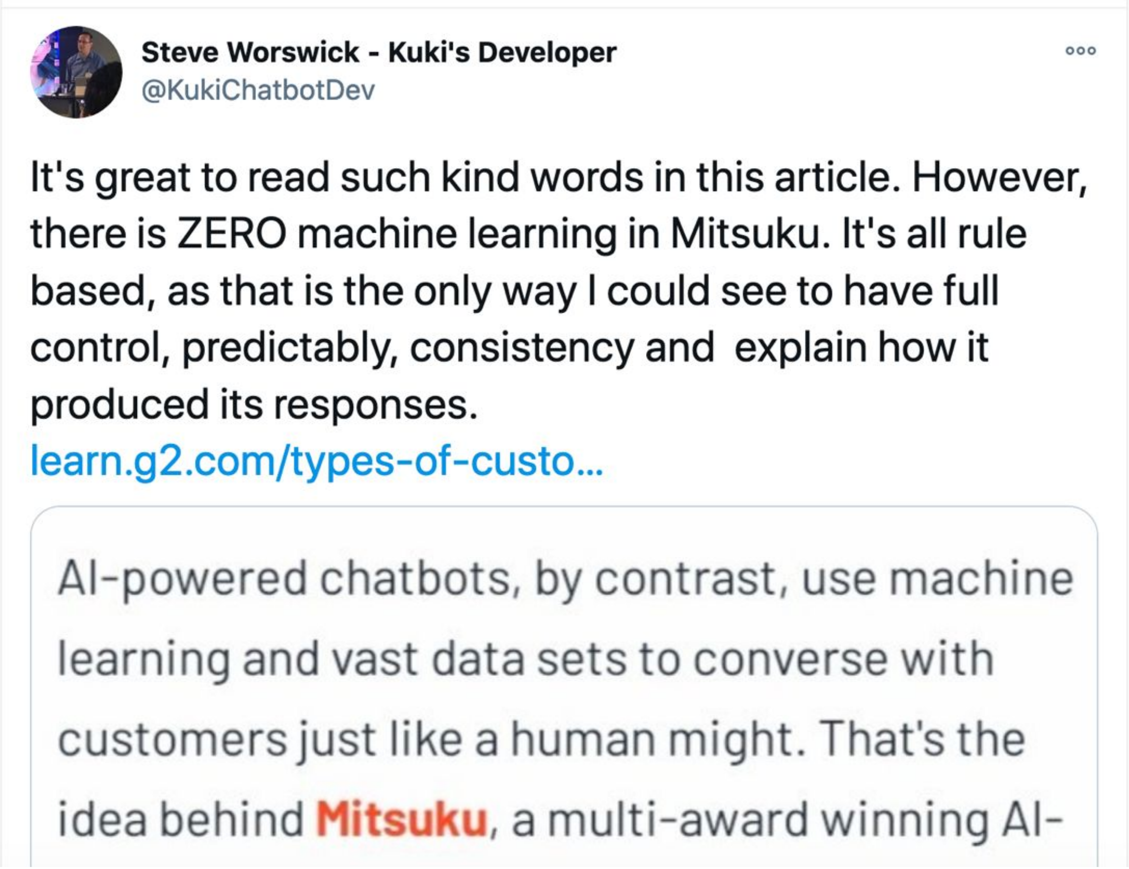
What do you think?



Mitsuku / Kuki

- 5 time winner of the Loebner Prize
- 18 year old female chatbot from the metaverse
- Won the “bot battle” vs Blenderbot (Facebook)

https://chat.kuki.ai/



Steve Worswick - Kuki's Developer
@KukiChatbotDev

It's great to read such kind words in this article. However, there is ZERO machine learning in Mitsuku. It's all rule based, as that is the only way I could see to have full control, predictably, consistency and explain how it produced its responses.
learn.g2.com/types-of-custo...

AI-powered chatbots, by contrast, use machine learning and vast data sets to converse with customers just like a human might. That's the idea behind **Mitsuku**, a multi-award winning AI-

AIML: basics

```
<category>

<pattern>What are you</pattern>

<template>

I am the latest result in artificial intelligence, which can reproduce the capabilities of the human brain with greater speed and accuracy.

</template>

</category>
```

AIML: basics

<category> Rule start

<pattern>What are you</pattern>

<template>

I am the latest result in artificial intelligence, which can reproduce the capabilities of the human brain with greater speed and accuracy.

</template>

</category> Rule end

AIML: basics

```
<category>

<pattern>What are you</pattern>  User Input

<template>

I am the latest result in artificial intelligence, which can reproduce the capabilities
of the human brain with greater speed and accuracy.

</template>

</category>
```

AIML: basics

<category>

<pattern>What are you**</pattern> User Input**

<template>

I am the latest result in artificial intelligence, which can reproduce the capabilities of the human brain with greater speed and accuracy.

</template> System output

</category>

AIML: basics

<category>

<pattern>What are you**</pattern>** **Stimulus**

<template>

I am the latest result in artificial intelligence, which can reproduce the capabilities of the human brain with greater speed and accuracy.

</template> Response

</category>

Matching in AIML

- The input is matched against the text in patterns provided by the categories
- If a match is found, the template text will be output
- A good chatbot needs many, many rules!
    - Kuki has at least 350,000

Handling similar questions

```
<category>
<pattern>What are you</pattern>
<template>
I am the latest result in artificial intelligence, which can reproduce the capabilities
of the human brain with greater speed and accuracy.
</template>
</category>
```

Handling similar questions

```
<category>
<pattern>Who are you</pattern>
<template>
<srai>What are you</srai>
</template>
</category>
```

SRAI short for “similar response as in”

Use of wildcards

```
<category>

<pattern> I feel * </pattern>

<template> Why do you feel this way? </template>

</category>
```

Use of wildcards

- The * matches one or more words in the input pattern
- The ^ matches zero or more words
- We can use the matched information in our answer

Use of wildcards

- The * matches one or more words in the input pattern
- The ^ matches zero or more words
- We can use the matched information in our answer

```
<category>
<pattern> I feel * </pattern>
<template> Why do you feel this way? </template>
</category>
```

Use of wildcards

- The * matches one or more words in the input pattern
- The ^ matches zero or more words
- We can use the matched information in our answer

```
<category>
<pattern> I feel * </pattern>
<template> Why do you feel <star/>? </template>
</category>
```

Use of wildcards

- The * matches one or more words in the input pattern
- The ^ matches zero or more words
- We can use the matched information in our answer

```
<category>
<pattern> I feel * when I * </pattern>
<template> Why do you feel <star/> when you <star index = “2” /> </template>
</category>
```

Variables

- Store information in a variable
- Use this information later in the conversation!

```
<category>
<pattern> My name is * </pattern>
<template> Nice to meet you,
<set name = "name" <star/> </set> </template>
</category>
```

Variables

- Store information in a variable
- Use this information later in the conversation!

```
<category>
<pattern> I feel * </pattern>
<template> Why do you feel <star/>, <get name = “name”/>?</template>
</category>
```

Sets

- Use sets to avoid repetitive categories
- For example, use a list of colors so a single template suffices
- You have to specifically define the set!

```
<category>
<pattern> I like <set>colour</set> </pattern>
<template> Yes, that’s a beautiful colour indeed! </template>
</category>
```

Maps

- Specify association between two sets
- Example: countries and capitals

Country	**Capital**
Australia	
Ecuador	
Senegal	
Kosovo	
Brunei	

Maps

- Specify association between two sets
- Example: countries and capitals

Country	**Capital**
Australia	Canberra
Ecuador	Quito
Senegal	Dakar
Kosovo	Pristina
Brunei	Bandar Seri Begawan

Maps

- Specify association between two sets
- Example: countries and capitals (country2capital)

```
<category>
<pattern> What is the capital of <set>country</set></pattern>
<template>
<map name="country2capital"><star/></map>
</template>
</category>
```

Using context

- The <that> tag remembers the last sentence
- Very useful when you want the bot to ask yes/no questions
- Otherwise you easily lose track of the conversation

```
<category>
   <pattern>What about movies</pattern>
   <template>Do you like comedy movies?</template>
 </category>
```

Using context

- The <that> tag remembers the last sentence
- Very useful when you want the bot to ask yes/no questions
- Otherwise you easily lose track of the conversation

```
<category>
    <pattern>NO</pattern>
    <that>Do you like comedy movies</that>
    <template>You don’t have a sense of humor?</template>
  </category>
```

Using context

- The <that> tag remembers the last sentence
- Very useful when you want the bot to ask yes/no questions
- Otherwise you easily lose track of the conversation

```
<category>
    <pattern>YES</pattern>
    <that>Do you like comedy movies</that>
    <template>Nice, I like comedy movies too.</template>
 </category>
```

Using context: topics

- Assigning categories (rules) to topics
- “topic” is a variable in AIML
- Hence the topic is set in a template with the set tag

This allows you to organize your categories so that they are only considered when the topic is being discussed!

The <topic> tag

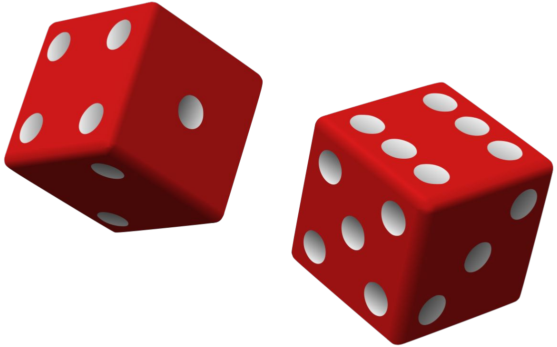
```
<category>
<pattern>I want to discuss movies</pattern>
<template>
Yes <set name = "topic">movies</set>
</template>
</category>
```

The <topic> tag

```
<topic name = "movies">
<category>
<pattern>* like comedy *</pattern>
<template>I like comedy movies too.</template>
</category>

<category>
<pattern> * </pattern>
<template>
Watching good movie refreshes our minds.</template>
</category>
</topic>
```

Randomness

- You often do not want to always respond in the exact same way
- For example, when greeting the user
- Use the <random> tag
- Use <li> and </li> (list items)

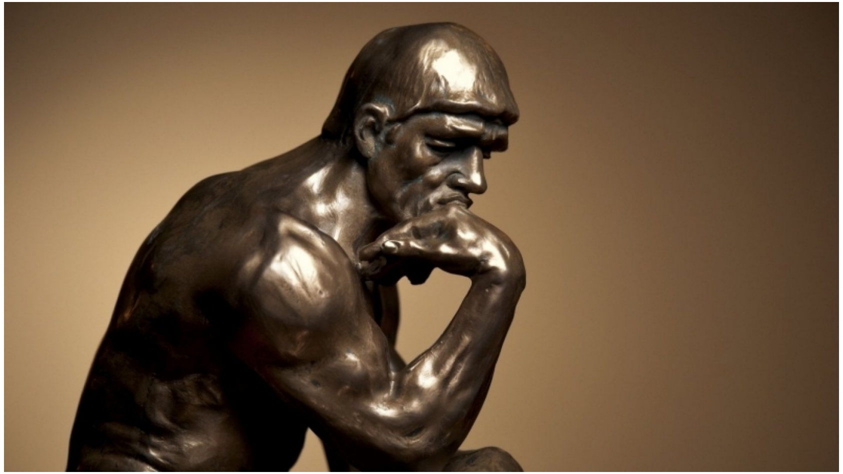


Randomness

```
<category>
<pattern> Hi </pattern>
<template>
<random>
<li> Hello! </li>
<li> Hi! Nice to meet you! </li>
<li> Good morning! </li>
</random>
</template>
</category>
```

Storing information for later

- Setting a variable but not using it in a response
- Use it for later!
- Use the **<think>** tag
- Necessary for longer interactions



Storing information for later

```
<category>
<pattern>My name is *</pattern>
<template>
Hello!<think><set name = "username"> <star/></set></think>
</template>  </category>

<category>
<pattern>Byeee</pattern>
<template>
Hi <get name = "username"/> Thanks for the conversation!
</template>  </category>
```

The <condition> tag

- Simulate a serie of if-else statements, also using <li>

```
<category>
<pattern> How are you feeling? </pattern>
<template>
    <condition> name="mood">
        <li value="good"> Pretty good </li>
        <li value="bad"> Not so good</li>
        <li> I am not sure </li>
    </condition>
</template> </category>
```

The <condition> tag

- Possible to check if a variable was already set

```
<category>
<pattern>What is my name</pattern>
<template>
<condition name="firstname">
  <li value="unknown">You haven't told me your name.</li>
  <li>Your name is <get name="firstname" /></li>
</condition>
</template>
</category>
```

The Ultimate Default Category

If everything else fails:

```
<category>
<pattern>*</pattern>
<template>
I have no answer for that.
</template>
</category>
```

Let’s check out some bots made by students from last year

More AIML

There is more functionality that you can use, check out the documentation

Possible extensions:

- Learning rules from data (Chapter 7.8)
- Convert text into AIML using machine learning
- Using NLP techniques (Chapter 7.8)

AIML summary

- Simple way to make a chatbot
- Full control over the output
- Some of the best bots use AIML
- A lot of manual effort required to create a good bot
- Large set of rules is hard to maintain
- Naming of tags in AIML is terrible

Today

- Quick recap
- History of chatbots
- Chatbots using AIML
    - Build your own chatbot!
- Examples of chatbots

Raise your hand if you have a question!

This course

Week 1	Introduction	Chapter 2, 3, 4
Week 2	Input and Output	Chapter 5, 6
Week 3	Chatbots	Chapter 7
Week 4	Spoken Language Understanding	Chapter 8
Week 5	Dialogue Management	Chapter 10, 11
Week 6A	Response Generation	Chapter 12
Week 6B	Evaluation and Applications	Chapter 17, 18

Assignment 3

- Create your own chatbot using Pandorabots
- Show your creativity!
- You have two weeks

Dutch and English are both OK.

Deadline: December 11th 09:59 AM