



AWS HIGH LEVEL AI SERVICE I

ML UPSKILLING PROGRAM- BASIC LEVEL – SESSION 1

PREPARATION

Set up environment:

1. Install AWS CLI - <https://aws.amazon.com/cli/>
2. AWS Training & Certification <https://www.aws.training> ; Here we can find a lot of free trainings and introductions to AWS. If you have an amazon account, the one for the amazon store, you can use it to login: <https://www.aws.training/Account/LogOn?identityProvider=AmazonNA&returnUrl=%2F> (or you can create a new one clicking on "Create your Amazon account")

Intro:

- [What is Machine Learning \(AWS frameworks and Services\)](#)
- [What is AI \(AWS AI Products\)](#)
- [ML Building Blocks: Services and Terminology](#)

Amazon Polly

- [Intro to Amazon Polly](#)
- <https://aws.amazon.com/blogs/aws/polly-text-to-speech-in-47-voices-and-24-languages/>
- <https://docs.aws.amazon.com/polly/latest/dg/what-is.html>
- <https://docs.aws.amazon.com/polly/latest/dg/how-text-to-speech-works.html>
- (Optional) - https://en.wikipedia.org/wiki/Speech_synthesis

PREPARATION

Amazon Transcribe

- [Intro to Amazon Transcribe](#)
- <https://docs.aws.amazon.com/transcribe/latest/dg/what-is-transcribe.html>
- <https://docs.aws.amazon.com/transcribe/latest/dg/how-it-works.html>

Amazon Lex

- [Intro to Amazon Lex](#)
- <https://docs.aws.amazon.com/lex/latest/dg/what-is.html>
- <https://docs.aws.amazon.com/lex/latest/dg/how-it-works.html>
- Amazon Lex example ([video](#))
- Chatbot design - <https://www.userlike.com/en/blog/chatbot-design>

Amazon Translate

- [Intro to Amazon Translate](#)
- <https://docs.aws.amazon.com/translate/latest/dg/what-is.html>
- <https://docs.aws.amazon.com/translate/latest/dg/how-it-works.html>

PREPARATION

Amazon SageMaker

- [Intro to Amazon SageMaker](#)
- <https://docs.aws.amazon.com/sagemaker/latest/dg/whatis.html>
- [Introduction to Amazon SageMaker Ground Truth](#)
- Data Labeling ([video](#))

CONTENT

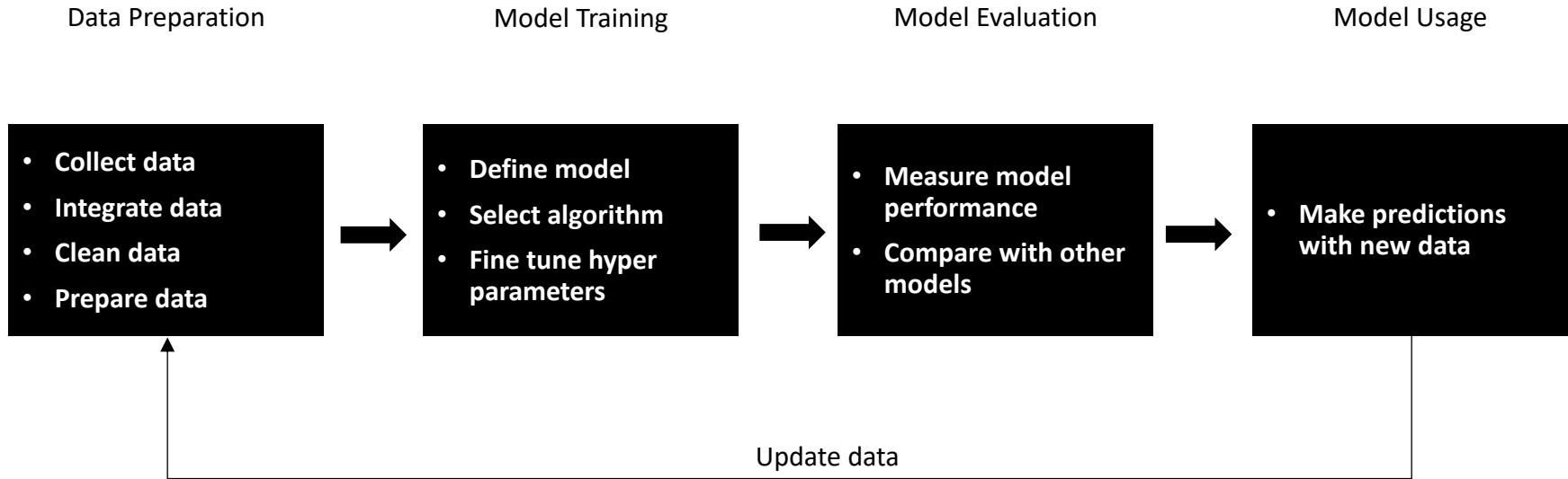
1. INTRODUCTION
2. AMAZON TRANSLATE
3. AMAZON POLLY
4. AMAZON TRANSCRIBE
5. AMAZON LEX
6. AMAZON SAGEMAKER

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INTRODUCTION

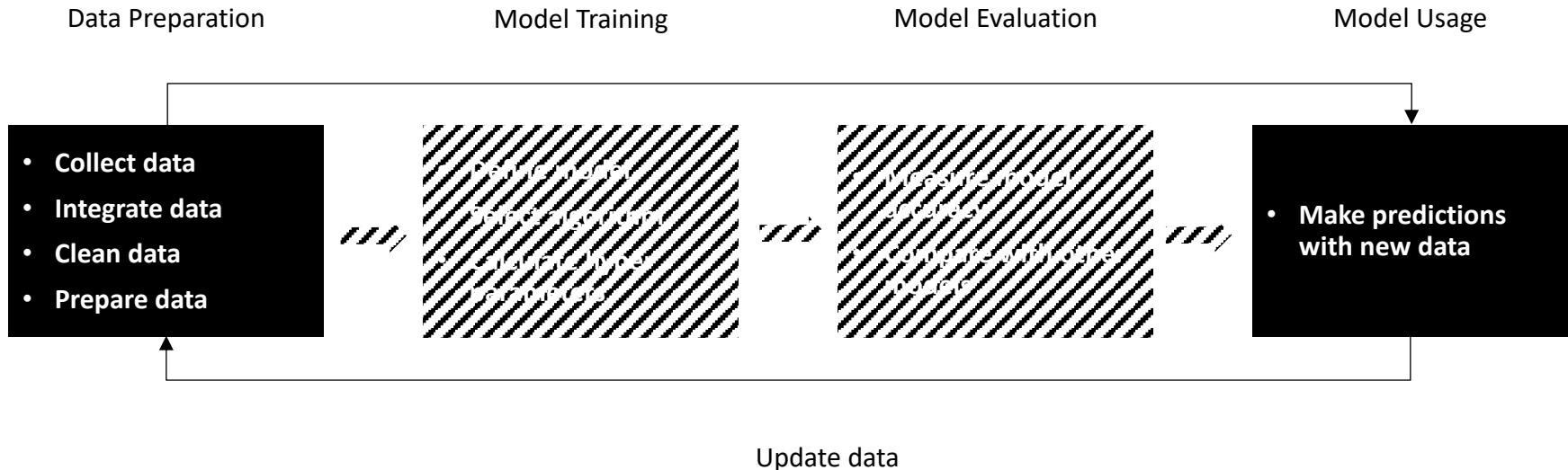
INTRODUCTION

MACHINE LEARNING STAGES



INTRODUCTION

MACHINE LEARNING STAGES



INTRODUCTION

AWS AI/ML SERVICES

Amazon provides several AI/ML services with trained models

Amazon Comprehend	Amazon Elastic Inference	Amazon Forecast	Amazon Lex
Amazon Personalize	Amazon Polly	Amazon Rekognition	Amazon SageMaker
Amazon SageMaker Neo	Amazon Textract	Amazon Transcribe	Amazon Translate

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AMAZON TRANSLATE

AMAZON TRANSLATE

What is Amazon Translate

Amazon Translate is a ***neural machine translation service***.

Neural machine translation is a form of language translation with deep learning models..

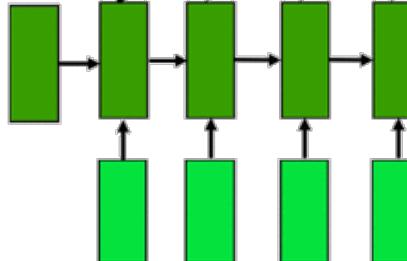
AMAZON TRANSLATE

Decoder



What is Amazon Translate Under the cover

Encoder



das grüne Haus <EOS>

context

Attention

the green house<EOS>

<BOS>the green house



What is Amazon Translate Overview

- Offers translation between 54 different Languages.
- Input and output encoded in UTF-8.
- Custom Terminologies

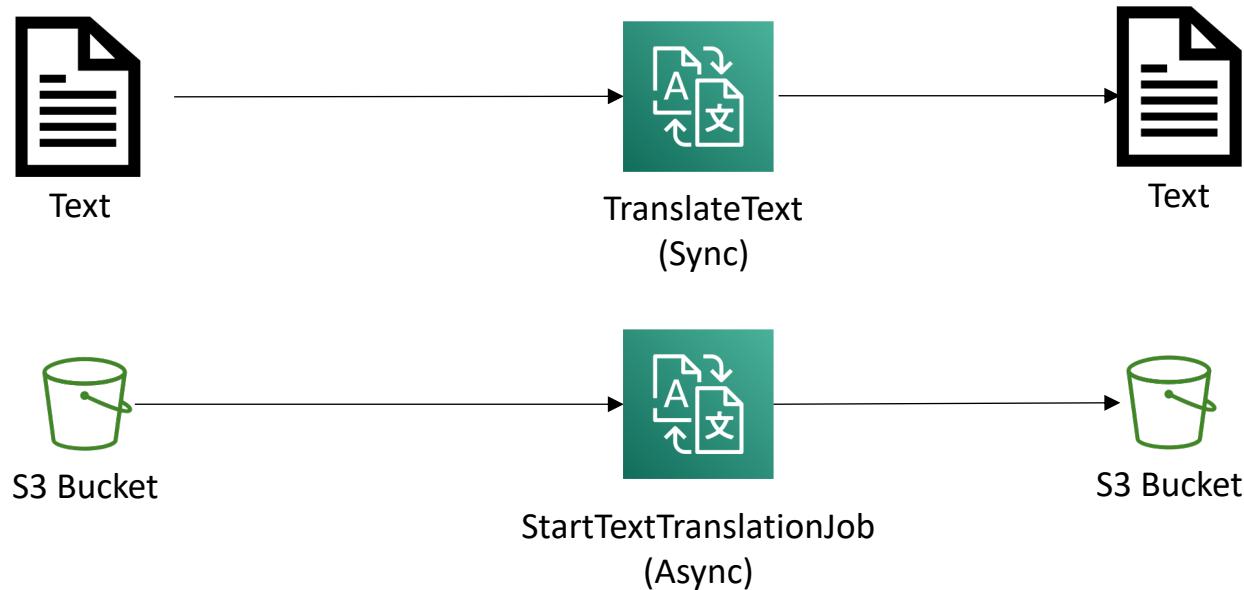


What is Amazon Translate Overview

- Two modes:
 - Single document (sync.) - `TranslateText`
 - Batch (async.) – `StartTextTranslationJob`
 - Html and txt files.
 - 1MB/file
 - 5GB in size for the collection max.

AMAZON TRANSLATE

What is Amazon Translate Data Flow Architecture



AMAZON TRANSLATE

Hands-on exercise

https://aws.amazon.com/getting-started/tutorials/translate-text-between-languages-cloud/?trk=gs_card

Account: adidas-linked-pea

User: **ML_upskilling**

Pass: **adidas_UPSKILLING_initiative_2020**

S3 bucket: <https://s3.console.aws.amazon.com/s3/buckets/pea-upskilling>

Create a folder with your alias. You can use martiano folder as reference

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AMAZON POLLY

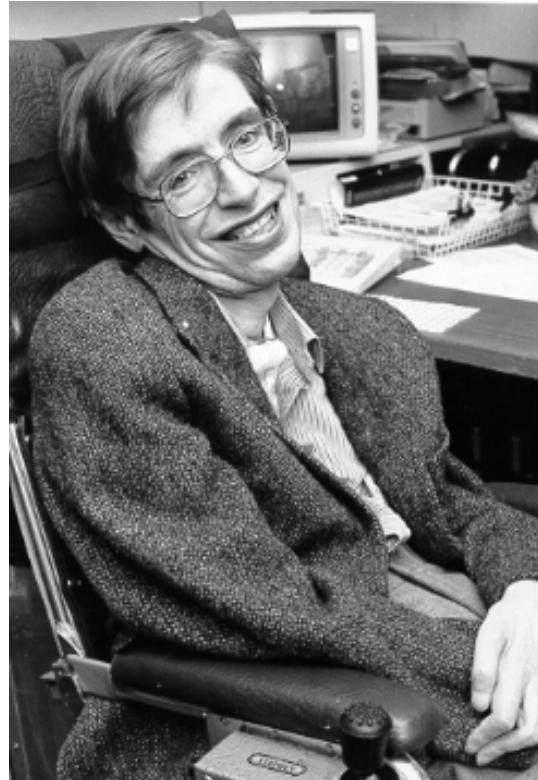
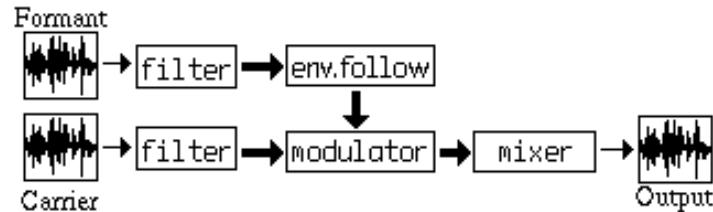
AMAZON POLLY

What is Text To Speech (TTS)

*Text To Speech (also known as **Speech Synthesis**) is the process of artificially producing human speech.*

AMAZON POLLY

What is Text To Speech (TTS) History



AMAZON POLLY

What is Text To Speech (TTS)





Amazon Polly Overview

- Offers 29 different Languages.
<https://docs.aws.amazon.com/polly/latest/dg/voicelist.html>
- Simple High Level REST API
- Two available engines:
 - Standard
 - Neural



Amazon Polly Overview

- Input as:
 - Plain Text
 - Synthesis Markup Language (SSML)



Amazon Polly Overview

- Output in several formats, depending on the target:
 - Audio Stream:
 - mp3
 - ogg_vorbis
 - Pcm
 - Speech Marks:
 - Json

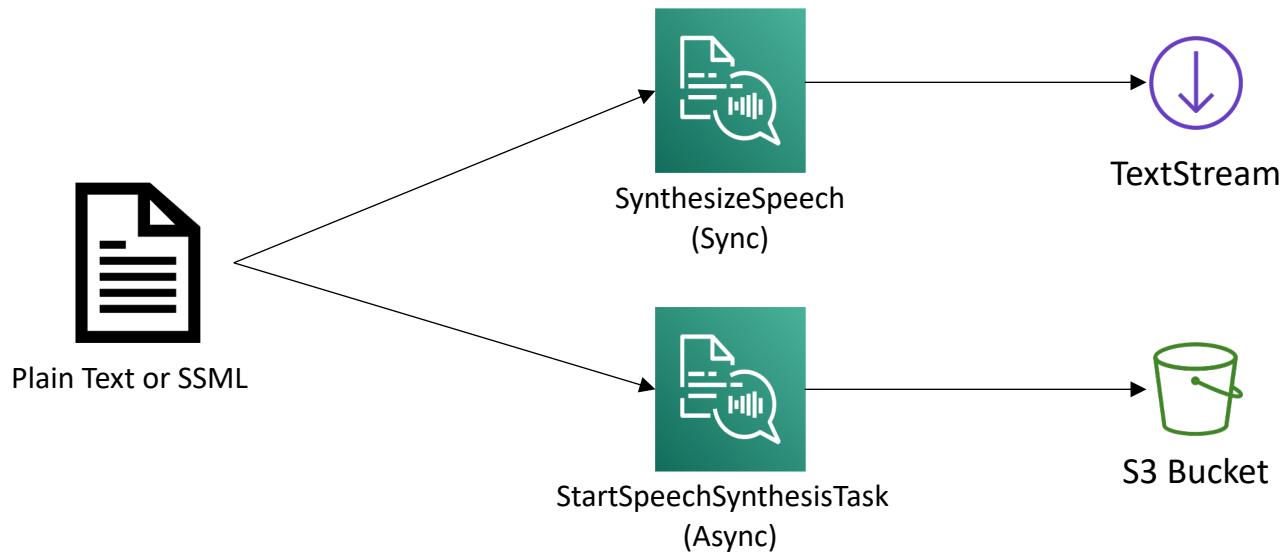


Amazon Polly Overview

- Further customization via:
 - Dictionaries(Lexicons)
- SSML offers the option of introducing speaking styles:
 - Newscaster
 - Conversational

AMAZON POLLY

Amazon Polly Data flow schema



AMAZON POLLY

Hands-on exercises

<https://docs.aws.amazon.com/polly/latest/dg/getting-started-console.html>

<https://docs.aws.amazon.com/polly/latest/dg/ssml-to-speech-console.html>

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AMAZON TRANSCRIBE

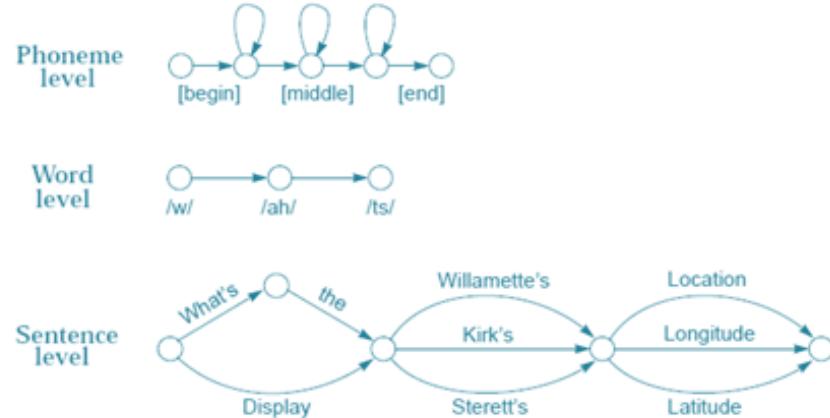
AMAZON TRANSCRIBE

What is speech recognition

*Speech recognition(also known as **Speech To Text**) is the set of methodologies and technologies that enable the recognition and translation of spoken language into text.*

AMAZON TRANSCRIBE

What is speech recognition History



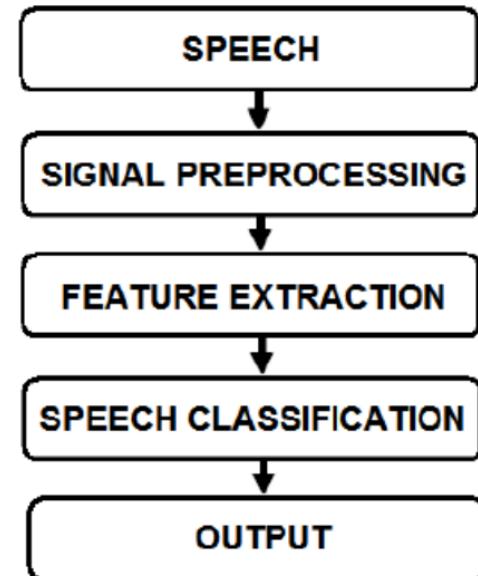
AMAZON TRANSCRIBE

What is speech recognition Neural Networks

- Features extraction → Feature vectors
- Then we pass those Feature vectors to Speech decoders.

Or

- Features extraction → Phoneme recognition





Amazon Transcribe Overview

- High level REST API
- Real-time transcription: 6 voices (En(3), Fr(2) and Es-US)
- Async transcription jobs: 31 voices
 - Channel or Speaker identification
 - Transcription timestamps
 - Vocabulary filtering
 - Custom Vocabulary

AMAZON TRANSCRIBE

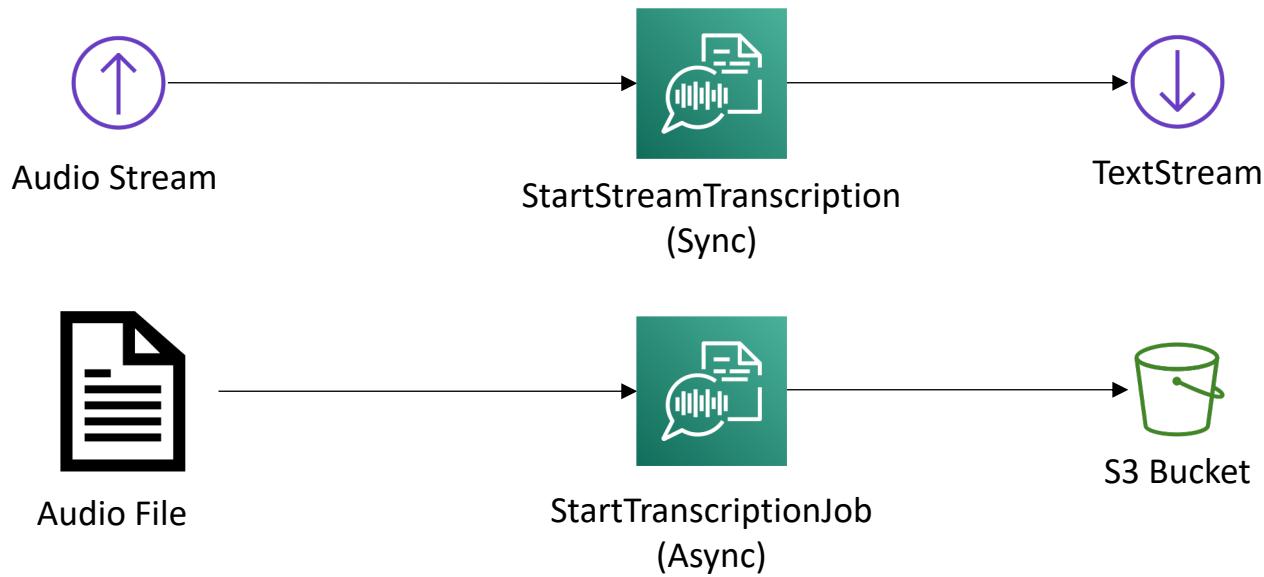


Amazon Transcribe Input & Output

- Input
 - Sampling rate: 16Khz and 8Khz
 - Streaming: 16-bit Linear PCM
 - Async: WAV, MP3, MP4 and FLAC
- Outputs
 - Streaming: Real-time text stream
 - Async: JSON file in a specified bucket, or AWS managed.

AMAZON TRANSCRIBE

Amazon Transcribe Data Flow Architecture



AMAZON POLLY

Hands-on exercises

https://aws.amazon.com/getting-started/tutorials/create-audio-transcript-transcribe/?trk=gs_card – Jump to Section 2

<https://docs.aws.amazon.com/transcribe/latest/dg/getting-started-asc-console.html>

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AMAZON LEX

What is a ChatBot

A **ChatBot** is a piece of software that can conduct a conversation by providing automatic responses to user inputs. They are often designed to simulate the behavior that a human would show, but they are still not able to pass the Turing Test.

AMAZON LEX

What is a ChatBot History and limitations

- Limitations
 - Unsaved queries.
 - They highly depend on NLP correctness.
 - Only one question at a time
 - Social barriers
- Notorious cases:
 - Tay by Microsoft
 - FAIR bots Alice and Bob

```
EEEEEEEEE L I II III III ZZZZZZZZ A A
E L I Z A A
E L I Z A A
EEEE E L I Z A A
E L I Z A A
EEEEEEEEE LLLL LLLL III III ZZZZZZZZ A A
```

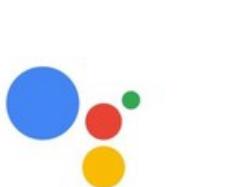
```
ELIZA > (PLEASE TYPE IN ALL CAPS) WHAT'S YOUR NAME DEAR ?
AMIT
ELIZA > HI, I'M ELIZA. WHAT DO YOU WANT TO TALK ABOUT ?
AMIT > CAN I TALK ABOUT MY PROBLEM ?
ELIZA > SURE... !
AMIT > DUE TO ON GOING EXAMS IN COLLEGE, I HAVE A LOT OF STRESS.
ELIZA > PLEASE RELAX A LITTLE. SLEEP WELL.
AMIT > THANKS FOR YOUR ADVICE.
ELIZA > NO MENTION.
AMIT > BYE
ELIZA > BYE AND KEEP IN TOUCH...
```



AMAZON LEX

What is a ChatBot Virtual Assistants

- Most chatbots are accessed through Virtual Assistants



Hi, how can I help?



Hey Cortana



amazon alexa





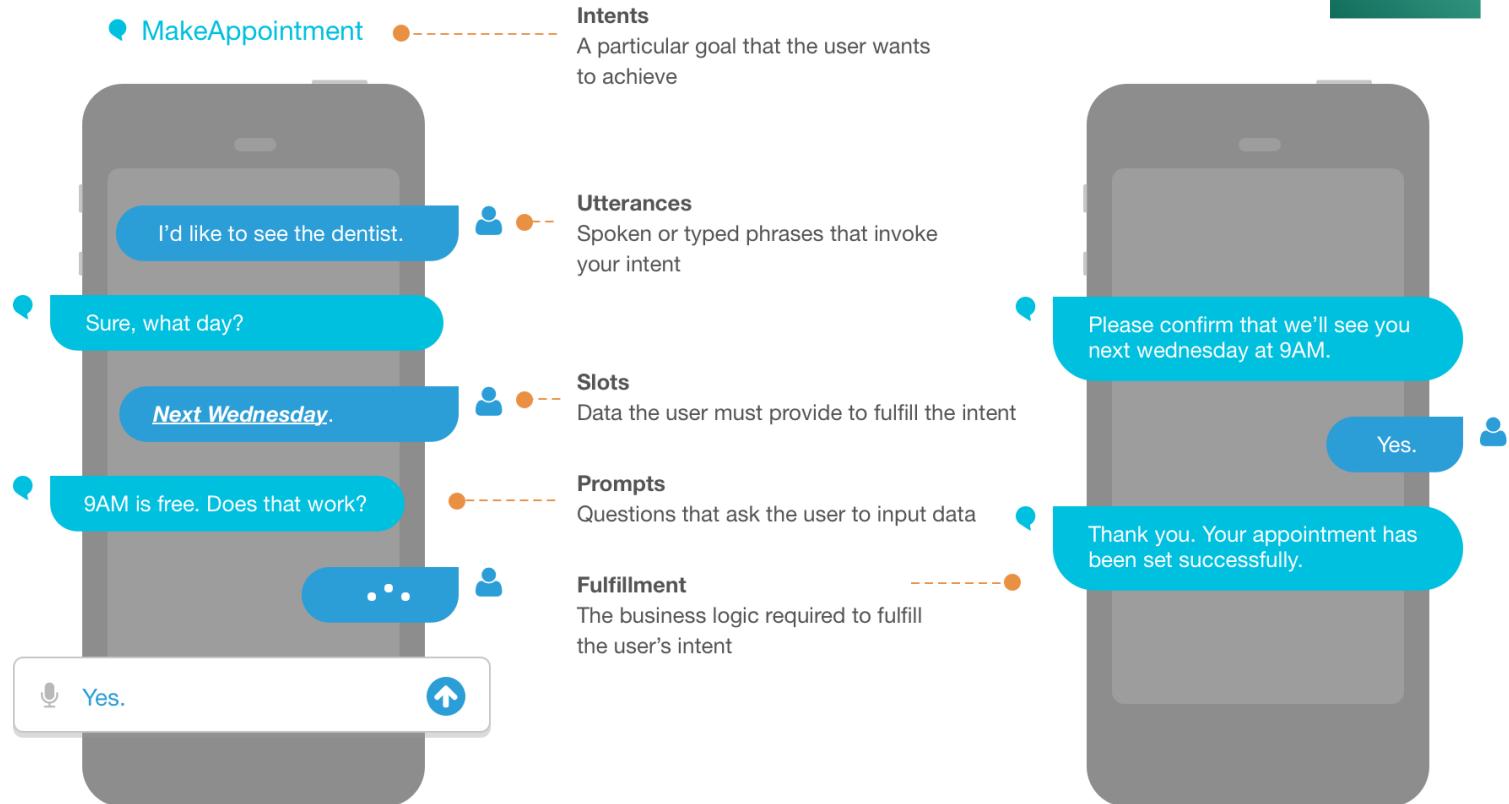
What is Amazon Lex Overview

- High level service for building conversational interfaces for applications using voice and text.
- Powered by ASR (Polly!), NLU (subset of NLP) and TTS.
- Integration with Amazon Comprehend. (Since Nov 2019)
- Serverless
- Auto-scaling, you only pay for requests made.
- Watch out for logging costs!



What is Amazon Lex

Data Flow
Architecture



AMAZON LEX

Hands-on exercise!!

Skip the Lambda part, use Return parameters to client as Fulfillment in both cases.

- <https://docs.aws.amazon.com/lex/latest/dg/gs-bp.html>
- <https://docs.aws.amazon.com/lex/latest/dg/getting-started-ex2.html>

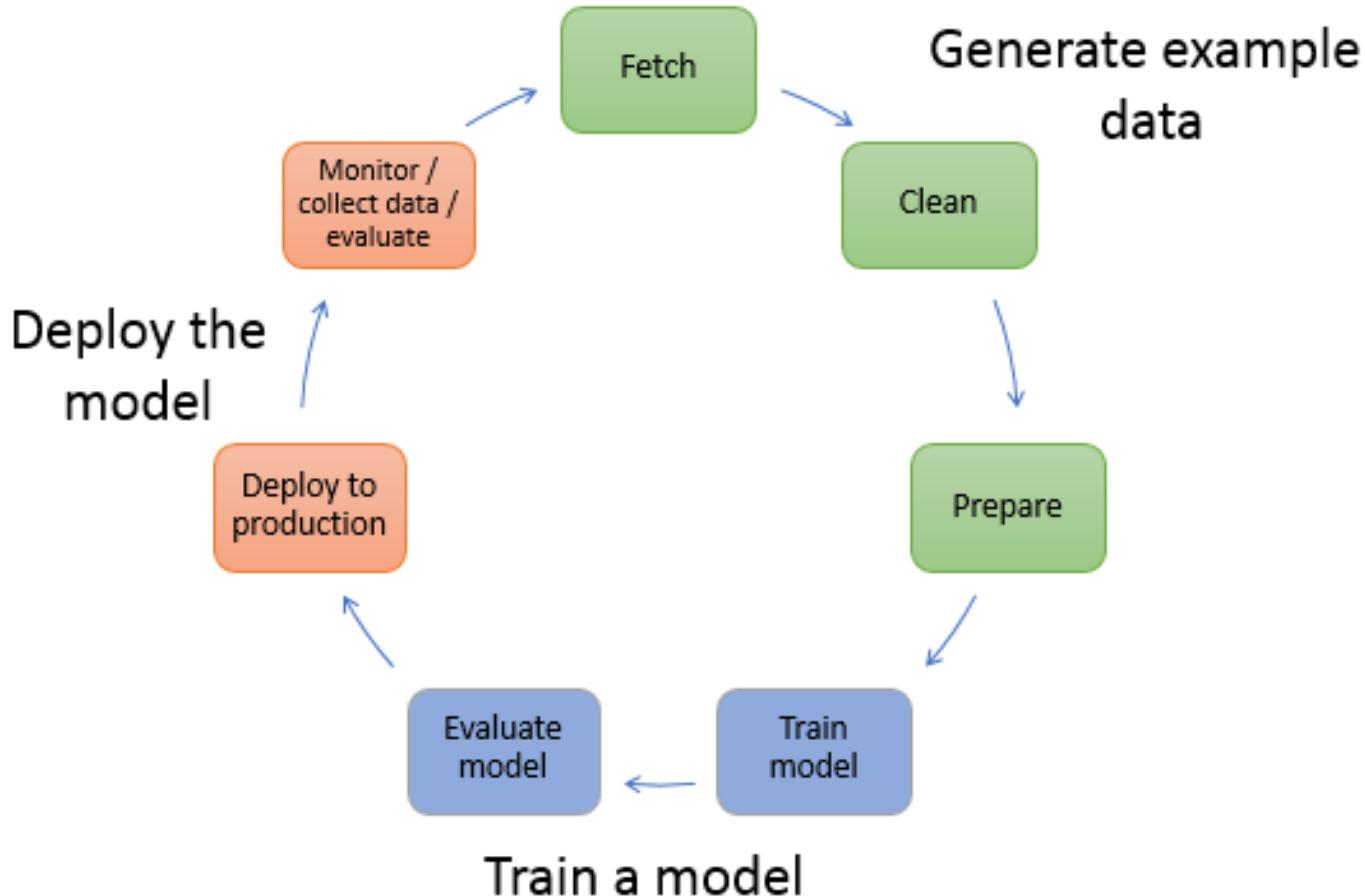
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AMAZON SAGEMAKER

AMAZON SAGEMAKER

Amazon Sagemaker is a **fully managed Machine Learning service**.

It provides all of the components used for machine learning in a single toolset.



AMAZON SAGEMAKER



Label

Build

Train & Tune

Deploy & Manage

Amazon SageMaker Ground Truth

Build and manage training data sets

Amazon SageMaker Studio

Integrated development environment (IDE) for machine learning

Amazon SageMaker Notebooks

One-click notebooks with elastic compute

Amazon SageMaker Autopilot

Automatically build and train models

Amazon SageMaker Model Monitor

Automatically detect concept drift

AWS Marketplace

Pre-built algorithms and models

Amazon SageMaker Experiments

Capture, organize, and search every step

Amazon SageMaker Neo

Train once, deploy anywhere

Amazon SageMaker Debugger

Debug and profile training runs

Amazon Augmented AI

Add human review of model predictions

Automatic Model Tuning

One-click hyperparameter optimization

AMAZON SAGEMAKER GROUNDTRUTH



Showtime

THANKS

EXTRA CONTENT - OPTIONAL

- The Pollexy Project - <https://www.aws.training/Details/Video?id=16493>
- RekogRobot: Build a Robot with AWS AI Services - <https://www.aws.training/Details/Video?id=27228>
- Create streaming video with captions, subtitles, and audio tracks using AWS AI services -
<https://www.aws.training/Details/eLearning?id=44590>
- Alexa for developers - <https://www.aws.training/Details/eLearning?id=34322>
- AWS Well Architected Framework. Complete the free course (1-2 hours): <https://www.aws.training/Details/Curriculum?id=42037><https://aws.amazon.com/architecture/well-architected/>
- Mozilla Common Voice project: [Page](#), [TTS-Github](#)
- [Beyond Dyadic Interactions: Considering Chatbots as Community Members](#)

REFERENCES

- AWS DOCS <https://docs.aws.amazon.com>
- AWS BLOG <https://aws.amazon.com/blogs>
- AWS Training Library <https://www.aws.training/LearningLibrary>
- Sockeye, framework for NMT <https://arxiv.org/abs/1712.05690> & <https://aws.amazon.com/blogs/machine-learning/train-neural-machine-translation-models-with-sockeye/>
- AWS samples <https://github.com/aws-samples>