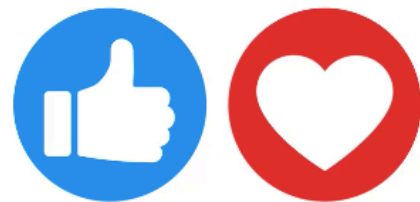


Udemy - 3 - Modeling - AI Services

Amazon Comprehend

Amazon Comprehend

- Natural Language Processing and Text Analytics
- Input social media, emails, web pages, documents, transcripts, medical records (Comprehend Medical)
- Extract key phrases, entities, sentiment, language, syntax, topics, and document classifications
- Can train on your own data



Entities

Entities	Key phrases	Language	Sentiment	Syntax
Analyzed text				
Amazon.com, Inc. is located in Seattle, WA and was founded July 5th, 1994 by Jeff Bezos, allowing customers to buy everything from books to blenders. Seattle is north of Portland and south of Vancouver, BC. Other notable Seattle - based companies are Starbucks and Boeing.				
▼ Results				
<input type="text" value="Search"/>				
<div>< 1 > ⚙</div>				
Entity	Category	Confidence		
Amazon.com, Inc.	Organization	0.90		
Seattle, WA	Location	0.89		
July 5th, 1994	Date	0.99+		
Jeff Bezos	Person	0.99+		
Seattle	Location	0.97		

Key Phrases

Entities	Key phrases	Language	Sentiment	Syntax
Analyzed text				
Amazon.com, Inc. is located in <u>Seattle, WA</u> and was founded <u>July 5th, 1994</u> by <u>Jeff Bezos</u> , allowing customers to buy everything from <u>books to blenders</u> . <u>Seattle</u> is north of <u>Portland</u> and south of <u>Vancouver, BC</u> . Other notable <u>Seattle - based companies</u> are <u>Starbucks</u> and <u>Boeing</u> .				
▼ Results				
<input type="text" value="Search"/> < 1 2 > ⌕				
Key phrases		Confidence		
Amazon.com		0.86		
Seattle, WA		0.95		
July 5th, 1994		0.91		
Jeff Bezos		0.99+		
customers		0.99+		
books		0.99+		
blenders		n.a.		

Language

Insights info				
Entities	Key phrases	Language	Sentiment	Syntax
Analyzed text				
Amazon.com, Inc. is located in Seattle, WA and was founded July 5th, 1994 by Jeff Bezos, allowing customers to buy everything from books to blenders. Seattle is north of Portland and south of Vancouver, BC. Other notable Seattle - based companies are Starbucks and Boeing.				
▼ Results				
Language				
English, en				
0.99 confidence				
► Application integration				

Sentiment

[Entities](#) | [Key phrases](#) | [Language](#) | **[Sentiment](#)** | [Syntax](#)

Analyzed text

Amazon.com, Inc. is located in Seattle, WA and was founded July 5th, 1994 by Jeff Bezos, allowing customers to buy everything from books to blenders. Seattle is north of Portland and south of Vancouver, BC. Other notable Seattle - based companies are Starbucks and Boeing.

▼ Results

Sentiment

Neutral
0.99 confidence

Positive
0.00 confidence

Negative
0.00 confidence

Mixed
0.00 confidence

► Application integration

Syntax

Amazon.com, Inc. is located in Seattle, WA and was founded July 5th, 1994 by Jeff Bezos, allowing customers to buy everything from books to blenders. Seattle is north of Portland and south of Vancouver, BC. Other notable Seattle - based companies are Starbucks and Boeing.

▼ Results

< 1 2 3 4 5 6 > ⓘ

Word	Part of speech	Confidence
Amazon.com	Proper noun	0.94
,	Punctuation	0.99+
Inc.	Proper noun	0.99+
is	Auxiliary verb	0.98
located	Verb	0.99+
in	Adposition	0.99+
Seattle	Proper noun	0.99+
,	Punctuation	0.99+

Amazon Translate

Amazon Translate

- Uses deep learning for translation
- Supports custom terminology
 - In CSV or TMX format
 - Appropriate for proper names, brand names, etc.



Amazon Translate

Translation

Source language

Auto (auto)

Target language

French (fr)

Amazon Translate uses deep learning for machine translation.

Amazon Translate utilise l'apprentissage approfondi pour la traduction automatique.

60 characters, 90 of 5000 bytes used. [Info](#)

Detected language: English (en)

Is this translation what you expected? Please leave us [feedback](#).

Additional settings

Application integration

Learn more about working with the Translate service using APIs for automation and larger volumes of text. [Info](#)

JSON request

```
{  "text": "Amazon Translate uses deep learning for machine translation.",  "sourceLanguageCode": "auto",  "targetLanguageCode": "fr"}  
```

Select

JSON response

```
{  "translatedText": "Amazon Translate utilise l'apprentissage approfondi pour la traduction automatique.",  "sourceLanguageCode": "en",  "targetLanguageCode": "fr"}  
```

Select

Amazon Transcribe

Amazon Transcribe

- Speech to text
 - Input in FLAC, MP3, MP4, or WAV, in a specified language
 - Streaming audio supported (HTTP/2 or WebSocket)
 - French, English, Spanish only
- Speaker Identification
 - Specify number of speakers
- Channel Identification
 - i.e., two callers could be transcribed separately
 - Merging based on timing of “utterances”
- Custom Vocabularies
 - Vocabulary Lists (just a list of special words – names, acronyms)
 - Vocabulary Tables (can include “SoundsLike”, “IPA”, and “DisplayAs”)

The screenshot shows the AWS Management Console for Amazon Transcribe. The left sidebar has a search bar and a list of services, with 'Amazon Transcribe' selected. Under the 'Amazon Transcribe' section, 'Real-time transcription' is highlighted. The main content area is titled 'Real-time transcription' with an 'info' link. Below the title, it says 'See how Amazon Transcribe creates a text copy of speech in real time. Choose **Start streaming** and talk.' There are two buttons: 'Download full transcript' and 'Stop streaming'. The 'Transcription' section shows a 'Language' dropdown set to 'English (us)'. Below this is a text area displaying a transcription of a speech stream. The transcription text is: 'What should I say? Here I'm drawing a blank. Let's see if it actually works. Wow, it's actually working in real time. That's actually really cool, and it's fast enough that I could actually envision this working for reality. I'm closed captions even. Uh, well, it did an okay job there. But still, it's a lot better than most transcription systems that I've seen. It's not 100% accurate yet. You know if you do need, Two Now I'm just like not even talking straight here. This is a good test, though. All right. I think that's enough anyway be I mean the bottom line.' Below the text area, it says '00:41 of 15:00 audio stream'. At the bottom, there are two expandable sections: 'Additional settings' and 'Application integration'.

Amazon Polly

Amazon Polly

- Neural Text-To-Speech, many voices & languages
- Lexicons
 - Customize pronunciation of specific words & phrases
 - Example: "World Wide Web Consortium" instead of "W3C"
- SSML
 - Alternative to plain text
 - Speech Synthesis Markup Language
 - Gives control over emphasis, pronunciation, breathing, whispering, speech rate, pitch, pauses.
- Speech Marks
 - Can encode when sentence / word starts and ends in the audio stream
 - Useful for lip-synching animation



Example of Lexicon

```
<?xml version="1.0" encoding="UTF-8"?>
<lexicon version="1.0"
  xmlns="http://www.w3.org/2005/01/pronunciation-lexicon"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.w3.org/2005/01/pronunciation-lexicon
    http://www.w3.org/TR/2007/CR-pronunciation-lexicon-20071212/pls.xsd"
  alphabet="ipa"
  xml:lang="en-US">
  <lexeme>
    <grapheme>pecan</grapheme>
    <phoneme>pɪˈkɑːn</phoneme>
  </lexeme>
</lexicon>
```

Other example:

```
<lexeme>
  <grapheme>W3C</grapheme>
  <alias>World Wide Web Consortium</alias>
</lexeme>
<lexeme>
  <grapheme>W3C</grapheme>
  <alias>WWW Consortium</alias>
</lexeme>
<lexeme>
  <grapheme>Consortium</grapheme>
  <alias>Community</alias>
</lexeme>
```

Example of SSML to add a pause

For example:

```
<speak>
  Mary had a little lamb <break time="3s"/>Whose fleece was white as snow.
</speak>
```

Or emphasize a word

```
<speak>
  I already told you I <emphasis level="strong">really like</emphasis> that person.
</speak>
```

Amazon Polly

Text-to-Speech

Listen, customize, and download speech. Integrate when you're ready.

Type or paste your text in the window, choose your language and region, choose a voice, choose Listen to speech, and then integrate it into your applications and services.

With up to 3000 characters you can listen, download, or save immediately. For up to 100,000 characters, your task must be saved to an S3 bucket.

Plain text

SSML

Hi! My name is Joanna. I will read any text you type here.

58 characters used

Show default text

Clear text

Engine

Standard

Neural

Language and Region

English, US

Voice

Salli, Female

Joanna, Female

Ivy, Female

Kendra, Female

Kimberly, Female

Matthew, Male

Justin, Male

Joey, Male

Listen to speech

Download MP3

Sample rate: 22,050 Hz

Change file format

Synthesize to S3

Change S3 task settings

Customize pronunciation

You can modify speech by uploading and applying lexicons, which provide a mapping between words, their written representations, and their pronunciations suitable for use in speech synthesis. You can apply up to five lexicons per language in the console. These lexicons are applied in a top-down order, where the first entry in the list has precedence over all other entries.

Learn more

Apply lexicon

Upload lexicon

Amazon Rekognition

Rekognition

- Computer vision
- Object and scene detection
 - Can use your own face collection
- Image moderation
- Facial analysis
- Celebrity recognition
- Face comparison
- Text in image
- Video analysis
 - Objects / people / celebrities marked on timeline
 - People Pathing

Choose a sample image

Use your own image

Done with the demo?

Learn more

Results

looks like a face

99.9 %

appears to be female

99.9 %

age range

17 - 29 years old

smiling

91.7 %

appears to be happy

99.5 %

wearing glasses


99.8 %

Rekognition: The Nitty Gritty

- Images come from S3, or provide image bytes as part of request
 - S3 will be faster if the image is already there
- Facial recognition depends on good lighting, angle, visibility of eyes, resolution
- Video must come from Kinesis Video Streams
 - H.264 encoded
 - 5-30 FPS
 - Favor resolution over framerate
- Can use with Lambda to trigger image analysis upon upload

Rekognition

Object and scene detection
Rekognition automatically labels objects, concepts and scenes in your images, and provides a confidence score.



Done with the demo?
[Learn more](#)

▼ Results

Car	98.8 %
Vehicle	98.8 %
Automobile	98.8 %
Transportation	98.8 %
Human	98.3 %
Person	98.3 %

[Show more](#)

► Request

► Response

Choose a sample image

Use your own image
Image must be jpeg or png format and no larger than 5MB. Your image isn't stored.

New in 2020: Rekognition Custom Labels

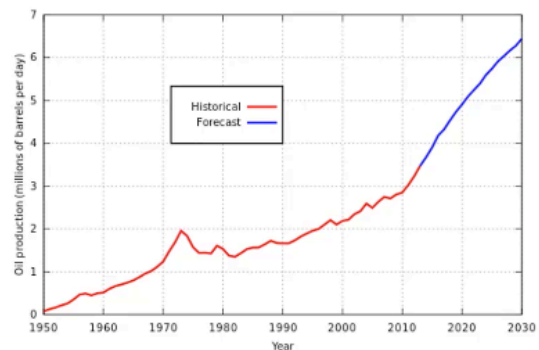
- Train with a small set of labeled images
- Use your own labels for unique items
- Example: the NFL (National Football League in the US) uses custom labels to identify team logos, pylons, and foam fingers in images.



Amazon Forecast

Amazon Forecast

- Fully-managed service to deliver highly accurate forecasts with ML
- "AutoML" chooses best model for your time series data
 - ARIMA, DeepAR, ETS, NPTS, Prophet
- Works with any time series
 - Price, promotions, economic performance, etc.
 - Can combine with associated data to find relationships
- Inventory planning, financial planning, resource planning
- Based on "dataset groups," "predictors," and "forecasts."

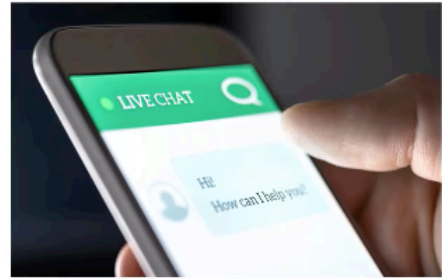


AirB2, using modified code by David "RockyMtnGuy" Moe [CC BY-SA 3.0] (<https://creativecommons.org/licenses/by-sa/3.0/>)

Amazon Lex

Amazon Lex

- Billed as the inner workings of Alexa
- Natural-language chatbot engine
- A Bot is built around Intents
 - Utterances invoke intents ("I want to order a pizza")
 - Lambda functions are invoked to fulfill the intent
 - Slots specify extra information needed by the intent
 - Pizza size, toppings, crust type, when to deliver, etc.
- Can deploy to AWS Mobile SDK, Facebook Messenger, Slack, and Twilio



Utterance (phrase) ==> Invoke ==> **Intent** ==> Invoke ==> Lambda
The **Slots** provides more info for the Intent

Other ML Services

The Best of the Rest

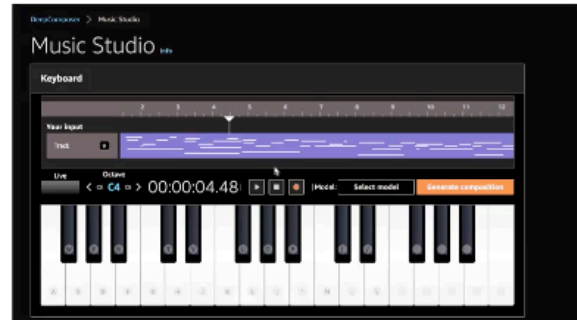
- Amazon Personalize
 - Recommender system
- Amazon Textract
 - OCR with forms, fields, tables support
- AWS DeepRacer
 - Reinforcement learning powered 1/18-scale race car
- DeepLens
 - Deep learning-enabled video camera
 - Integrated with Rekognition, SageMaker, Polly, Tensorflow, MXNet, Caffe



New ML Services for 2020

AWS DeepComposer

- AI-powered keyboard
- Composes a melody into an entire song
- For educational purposes



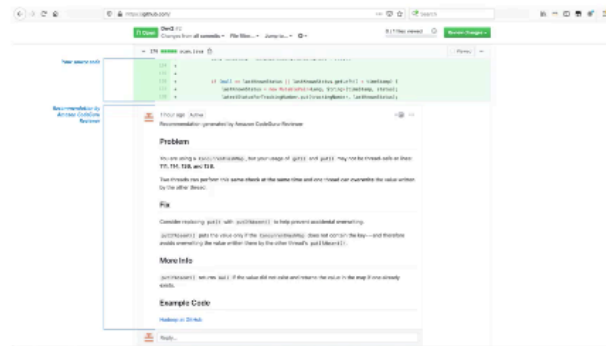
Amazon Fraud Detector

- Upload your own historical fraud data
- Builds custom models from a template you choose
- Exposes an API for your online application
- Assess risk from:
 - New accounts
 - Guest checkout
 - "Try before you buy" abuse
 - Online payments



Amazon CodeGuru

- Automated code reviews!
- Finds lines of code that hurt performance
- Resource leaks, race conditions
- Offers specific recommendations
- Powered by ML
- Currently Java-only (more coming soon)



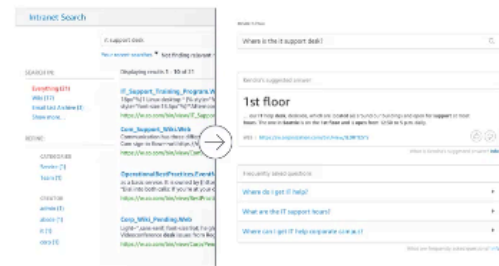
Contact Lens for Amazon Connect

- For customer support call centers
- Ingests audio data from recorded calls
- Allows search on calls / chats
- Sentiment analysis
- Find “utterances” that correlate with successful calls
- Categorize calls automatically
- Measure talk speed and interruptions
- Theme detection: discovers emerging issues



Amazon Kendra

- Enterprise search with natural language
- For example, "Where is the IT support desk?" "How do I connect to my VPN?"
- Combines data from file systems, SharePoint, intranet, sharing services (JDBC, S3) into one searchable repository
- ML-powered (of course) – uses thumbs up / down feedback
- Relevance tuning – boost strength of document freshness, view counts, etc.
- Alexa's sister? I don't know, but that's one way to remember it ☺



Amazon Augmented AI (A2I)

- Human review of ML predictions
- Builds workflows for reviewing low-confidence predictions
- Access the Mechanical Turk workforce or vendors
- Integrated into Amazon Textract and Rekognition
- Integrates with SageMaker
- Very similar to Ground Truth

Putting these Services together

Putting the blocks together

- Build your own Alexa!
 - Transcribe -> Lex -> Polly
- Make a universal translator!
 - Transcribe -> Translate -> Polly
- Build a Jeff Bezos detector!
 - DeepLens -> Rekognition
- Are people on the phone happy?
 - Transcribe -> Comprehend



Quiz

Question 1:

Your deep neural network seems to converge on different solutions with different accuracy each time you train it. What's a likely explanation?

☐ The learning rate is too small.

☐ The batch size is too small

☒ The batch size is too large

Large batch sizes tend to get stuck, at random, inside "local minima" instead of the correct solution.

Question 2:

Your neural network's accuracy on its training data is increasing beyond the accuracy on test or validation data. What might be a valid thing to try to prevent this overfitting?

☒ Use dropout

☐ Add more layers to the model

☐ Implement gradient checking

Dropout layers force the network to spread out its learning throughout the network, and can prevent overfitting resulting from learning concentrating in one spot. Early stopping would be another valid answer.

Question 3:

You're implementing a machine learning model for fraud detection, where most of your training data does not indicate fraud. The cost of a incorrectly identifying an actual fraudulent transaction is much higher than the cost of incorrectly identifying a non-fraudulent transaction. Which metric should you focus on for your model?

☐ Precision

☒ Recall

☐ RMSE

Recall is appropriate when you care most about false negatives, which in this case is incorrectly identifying fraudulent transactions as non-fraudulent.

Question 4:

Where does the training code used by SageMaker come from?

☐ Jupyter notebooks

☒ A Docker image registered with ECR

☐ A GitHub repository

Whether it's your own code, a built-in algorithm from SageMaker, or a model you've purchased in the marketplace - all training code deployed to SageMaker training instances come from ECR.

Question 5:

Which SageMaker algorithm would be best suited for identifying topics in text documents in an unsupervised setting?

☐ BlazingText can predict labels for sentences, but only if you've trained it in a supervised setting. It's not appropriate for working with entire documents.

☐ Object2Vec

☒ LDA

Latent Dirichlet Allocation is a topic modeling technique. Neural Topic Model would also be a correct answer.