

AWS AI/ML Services

Pre-Trained ML services



Amazon
Rekognition



Amazon
Comprehend



Amazon
Translate



Amazon
Textract



Amazon
Lex



Amazon
Polly



Amazon
Transcribe



Amazon
Personalize



Amazon
Forecast



Amazon
Kendra



Amazon
DevOps Guru



Amazon
Code Guru



Amazon
Fraud Detector

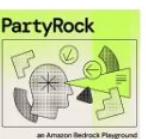


AWS
DeepRacer

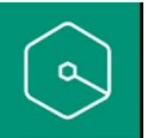
GenAI Services



Amazon
Bedrock



Amazon
PartyRock



Amazon Q

ML Platform



Amazon
SageMaker



Deep
Learning AMI



AWS Deep
Learning
Containers

Infra Service for ML



Amazon
EC2 for ML



Amazon
Elastic
Inference



AWS
Inferentia

Healthcare AI Services



Amazon
HealthLake



Comprehend
Medical



Transcribe
Medical

AWS AI/ML Services Summary

Service Name	Use Case / Purpose
Amazon Rekognition	Image and video analysis.
Amazon Comprehend	Natural language processing to uncover insights from text.
Amazon Polly	Text-to-speech conversion.
Amazon Transcribe	Automatic speech recognition.
Amazon Translate	Language translation.
Amazon Lex	Building conversational interfaces using voice and text.
Amazon Textract	Extracting text and data from scanned documents.
Amazon Personalize	Real-time personalization and recommendation.
Amazon Forecast	Time-series forecasting.
Amazon Fraud Detector	Detecting online fraud.
Amazon CodeGuru	Automated code reviews and application performance recommendations.
Amazon DevOps Guru	Improving application operational performance using ML.
Amazon Kendra	Intelligent enterprise search.
Amazon SageMaker	Building, training, and deploying machine learning models.
AWS Deep Learning AMIs	Preconfigured environments for deep learning applications.
AWS Deep Learning Containers	Optimized container images for deep learning.
Amazon EC2 Instances for ML	High-performance instances optimized for ML workloads.
Amazon Elastic Inference	Cost-effective deep learning inference.
AWS Inferentia	High-performance and cost-effective inference.
Amazon Bedrock	Building and scaling generative AI applications.
Amazon Q	Generative AI-powered assistant for various business needs.
Amazon HealthLake	Managing and analyzing patient health data.
Amazon Transcribe Medical	Transcribing medical conversations and dictations.
Amazon Comprehend Medical	Extracting medical information from unstructured text.

Amazon Comprehend

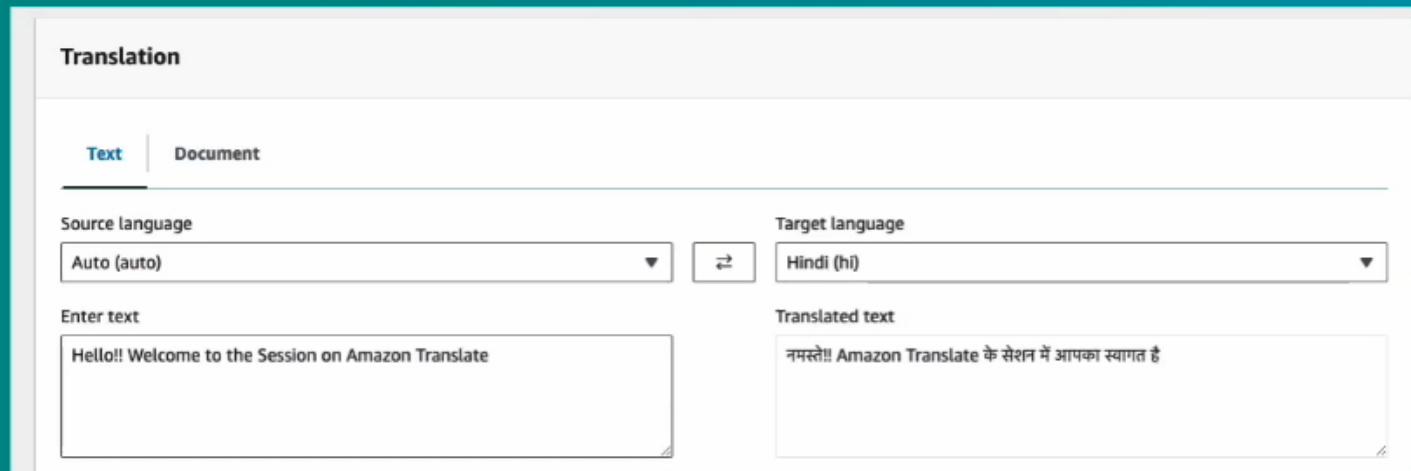
- Natural Language Processing (NLP) service.
- Uncover valuable insights and relationships in text.
- Amazon Comprehend can analyze documents to extract:
 - Entities
 - Key phrases, places, people, brands or events
 - Sentiments
- Amazon Comprehend Use Cases:
 - Customer feedback Analysis
 - Content Organization
 - Social Media Monitoring
 - Legal Document Processing

Amazon Comprehend Capabilities

- Entity Recognition:
 - Identify and categorize names, dates and locations
 - Extract structured information from unstructured data.
- Key Phrase extraction:
 - Identify main topics and themes.
- Sentiment Analysis:
 - Determines positive, negative, neutral or mixed sentiments.
 - Useful for analyzing customer feedback and social media posts.
- Language Detection:
 - Identifies the dominant language in a document.
- Custom Classification:
 - Detect custom classifications based on business needs.
- Custom Entity Recognition:
 - Create custom model to recognize custom entities like product code or industry-specific terminologies .

Amazon Translate

- Neural Machine Translation Service.
- Deliver fast, high-quality, and affordable language translation.



- **Amazon Translate Pricing**

Translation Type	Pricing	Free Tier
Standard Text Translation	\$15.00 per million of characters	2 million characters per month for 12 months
Batch Document Translation	\$15.00 per million of characters	

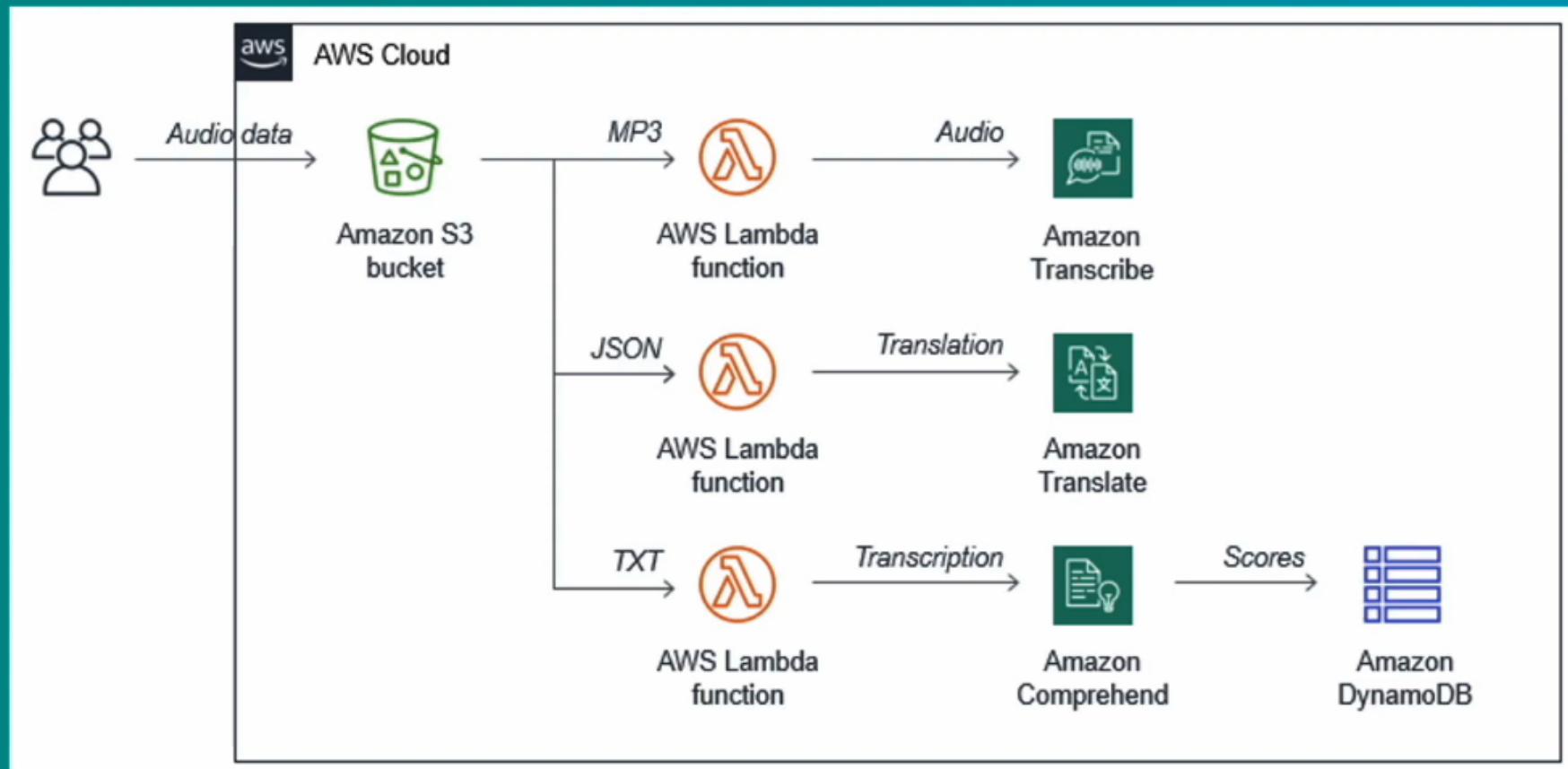
Amazon Translate – Key Features

- Real-time Translation:
 - Real-time or instant translation of text.
 - Option to control Brevity, Formality and Profanity Masking
- Batch Translation:
 - Idea for translating documents, large volume of text in batch mode.
- Custom Terminology:
 - Customize the translation of specific terms and phrases.
 - Maintain consistency with your brand or industry-specific language.
- Language Auto-Detection:
 - Automatically detect the source language.
- Integration with other AWS Services:
 - In-built integration with Amazon S3, Amazon Comprehend, Amazon Polly, etc.
 - Creates comprehensive language processing workflows.

Amazon Translate – Use Cases

- Multilingual Customer Support.
- E-commerce
- Content Localization
- Multilingual Communication

Call Center Handling Multiple Languages



Amazon Rekognition – Feature Deep Dive

- *Image and video analysis service.*
- *Uses Deep Learning to identify objects, people, text, scenes, and activities.*
- **Object and Scene Detection**
 - *Identify objects and scenes in image and videos.*
 - *Example: Common Objects → Car, Furniture, Animals*
 - *Complex Objects → Cityscapes, Natural Landscapes*
- **Facial Analysis**
 - *Detect human faces in images and videos.*
 - *Analyze facial attributes → Age range, gender, emotions, facial landmarks*
- **Celebrity Recognition**
 - *Recognize celebrities in images and videos.*
 - *Useful for medial and entertainment application*
 - *Recognize custom celebrity*

Amazon Rekognition – Feature Deep Dive

- **Text in Image**
 - Detect and extract text from images.
 - Use Cases → Vehicle license plate recognition
- **Video Analysis**
 - Detect activities, track people, recognize objects.
 - Provides features like shot detection, object tracking, and activity detection.
- **Content Moderation**
 - Detect inappropriate content in images and videos
 - Use Cases → Video censoring
- **Face Comparison**
 - Compares faces in images
 - Use Cases → Identity Verification

Amazon Rekognition – Use Cases

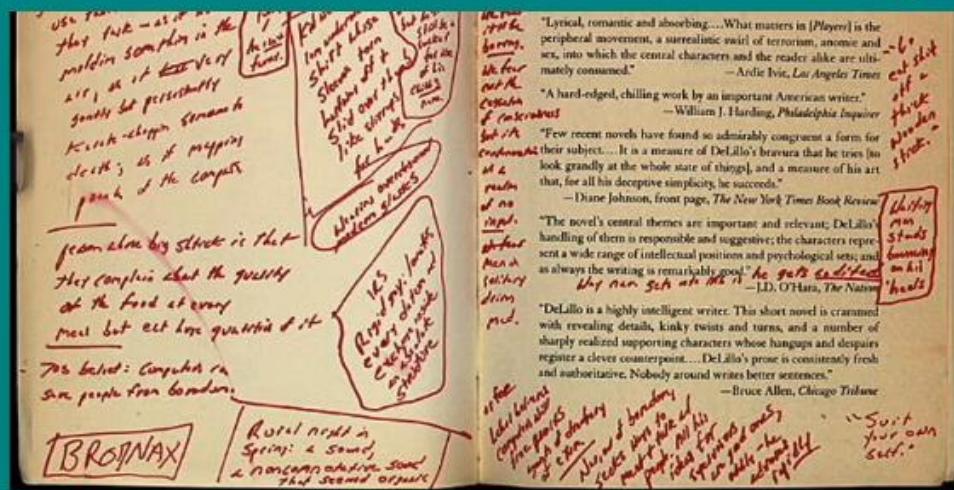
- Security and Surveillance:
 - Detecting and recognizing faces and objects in real-time.
 - Monitor public spaces or country border for suspicious activity.
 - Find missing persons or identify suspects.
 - Monitor public events for security threats.
- Media and Entertainment:
 - Automate content moderation.
 - Recognize celebrities in media content.
 - Analyze video content to detect scenes and activities.
- Healthcare:
 - Medical Imaging to detect specific patterns and anomalies.
 - Facial analysis for patient monitoring and emotion detection.

Amazon Rekognition – Use Cases

- Automotive:
 - Self-driving cars → vehicle and pedestrian detection.
 - Enhance driver safety → attention or drowsiness detection.
 - Traffic monitoring
- Retails and E-commerce:
 - Analyze Product Images and detecting logos.
 - Personalized shopping experience.
 - Theft prevention and store surveillance

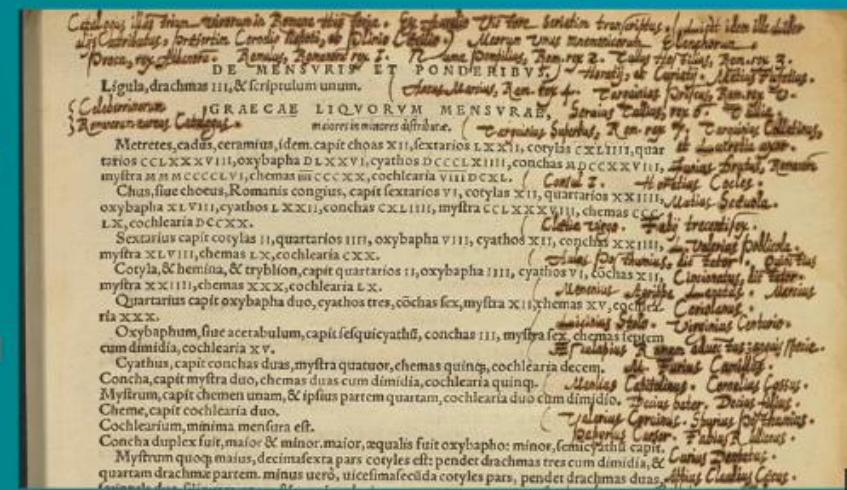
Amazon Textract – Feature Deep Dive

- Can extract text, handwriting, data from scanned documents.
- Identify, understand, and extract data from forms and tables.
- **Text Extraction**
 - Can extract printed and handwritten text from documents.
 - **Use Case:** Digitize and process large volume of paper documents
- **Handwritten Recognition**
 - Read and process handwritten documents.
 - **Use Case:** Convert Manuscripts, document with annotations or marginalia



Annotations

Marginalia



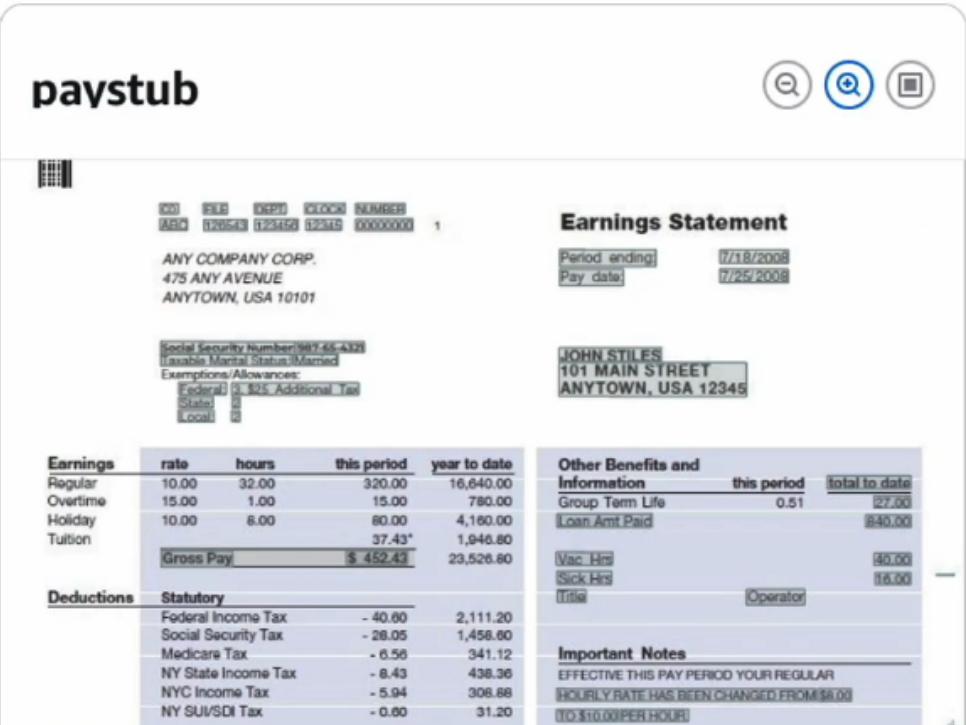
Amazon Textract – Feature Deep Dive

- **Table Extraction**
 - *Preserve the composition of data stored in tables during extraction.*

Analyze Document [Info](#)

Choose a sample document, or upload your own, to view the result from the Analyze Document API.

paystub



Earnings Statement

Period ending	7/18/2008
Pay date	7/25/2008
JOHN STILES	101 MAIN STREET
ANYTOWN, USA 12345	

Other Benefits and Information

Information	this period	total to date
Group Term Life	0.51	27.00
Loan Amt Paid		840.00
Vac. Hrs		50.00
Sick Hrs		16.00
Title	Operator	

Deductions

Statutory		
Federal Income Tax	- 40.60	2,111.20
Social Security Tax	- 28.05	1,458.60
Medicare Tax	- 6.56	341.12
NY State Income Tax	- 8.43	438.36
NYC Income Tax	- 5.94	308.68
NY SUI/SDI Tax	- 0.60	31.20

Important Notes

EFFECTIVE THIS PAY PERIOD YOUR REGULAR
HOURLY RATE HAS BEEN CHANGED FROM \$8.00
TO \$10.00 PER HOUR

Results

Merged Cells

Search

Currently viewing table: 1 2 3 4 5 6 7

CO.	FILE	DEPT.	CLOCK	NUMBER
ABC	126543	123456	12345	00000000

Visualize table data [Info](#)

[Download results](#) [Reset demo](#)

Amazon Textract – Feature Deep Dive

- **Signature Detection**
 - Detect Signature on Documents.
 - Example: Process checks and/or loan applications.

The image shows a comparison between a physical document and its digital representation in the Amazon Textract interface.

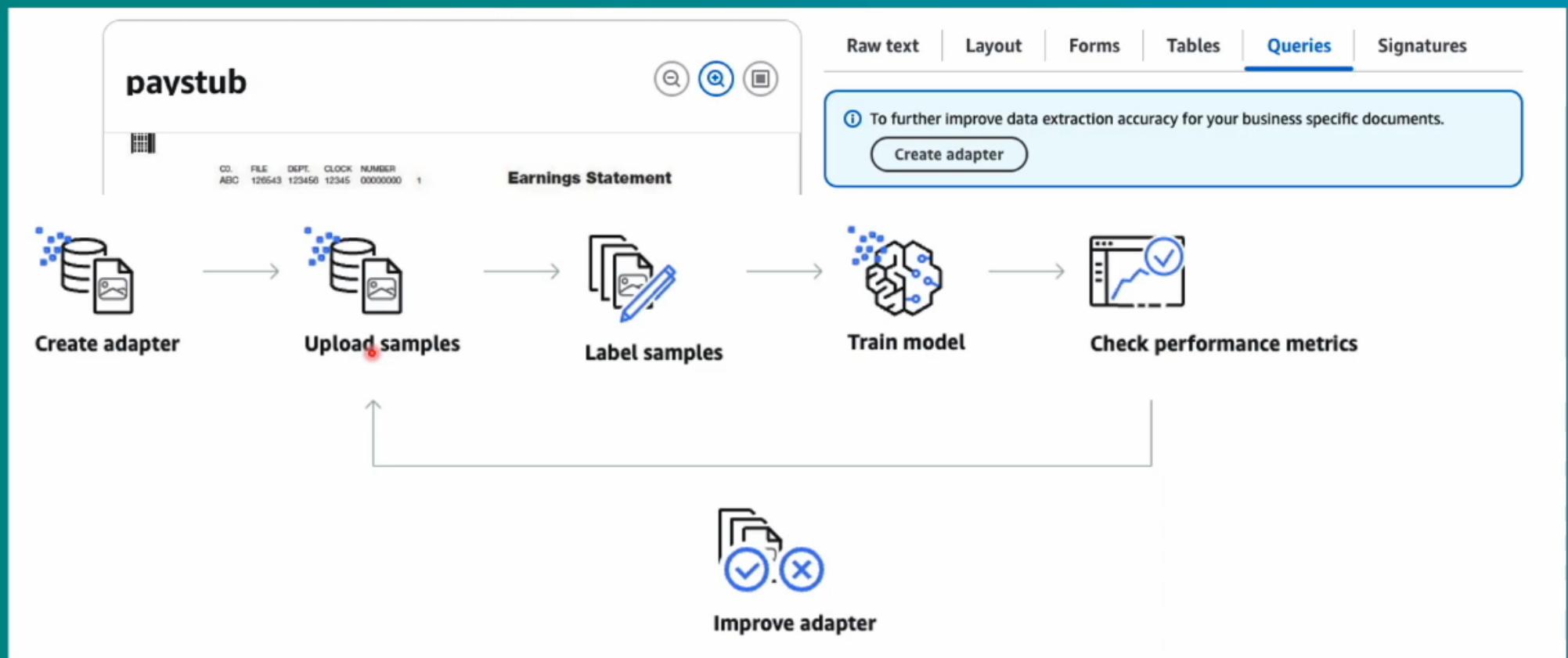
Left Side (Physical Document): A sample check from "ANY COMPANY CORP." to "JOHN STILES" for \$291.00. The check includes fields like Payroll check number (0000000000), Pay date (7/25/2008), and Social Security No. (987-65-4321). A handwritten signature is present over the amount field, which is highlighted with a red box. Below the signature, there is a blue rectangular stamp that reads "AUTHORIZED SIGNATURE" and "VOID AFTER 90 DAYS".

Right Side (Amazon Textract Interface):

- Signature summary:** A table showing the number of pages (1) and total signatures detected (1).
- Signatures detected (1/1):** A table listing the detected signature. It includes columns for Signature, Page number, and Confidence score. The first row shows "Signature 1" on page 1 with a confidence score of 81%.

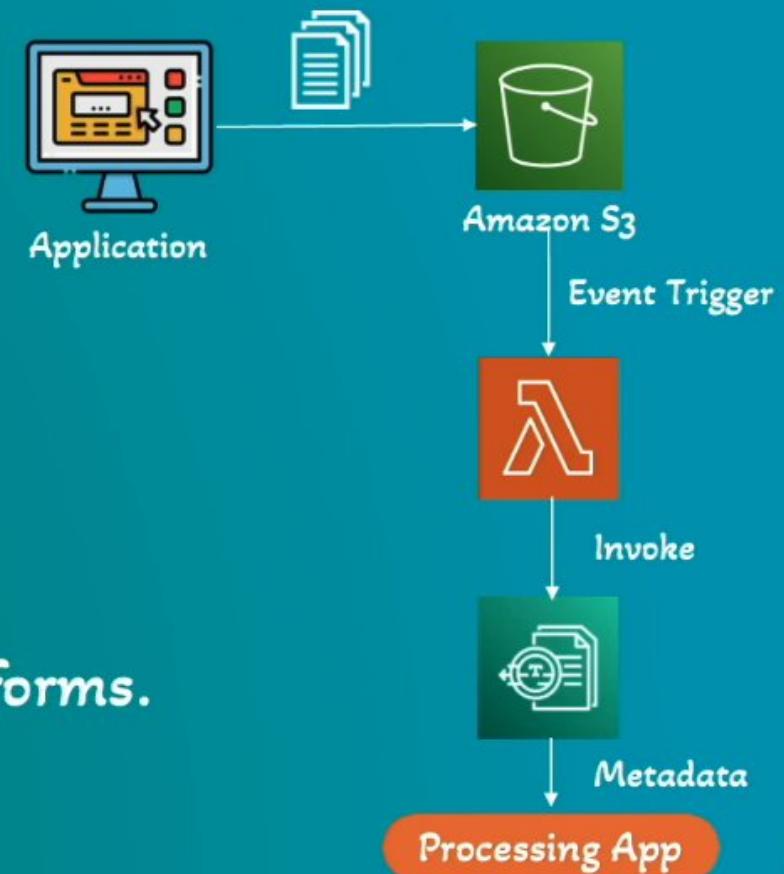
Amazon Textract – Feature Deep Dive

- **Custom Queries**
 - *Customize the pretrained Queries to improve extraction accuracy.*



Amazon Textract – Use Cases

- Financial Services:
 - Extract Critical Business data to process loan and mortgage application
 - Mortgage Rate.
 - Applicant Names.
 - Invoice Totals.
- Healthcare:
 - Extract important patient data from:
 - Health intake forms.
 - Insurance claims
 - Pre-authorization forms
- Public Sector:
 - Extract and process government-related forms.
 - Small Business Loans
 - Federal Tax Forms.

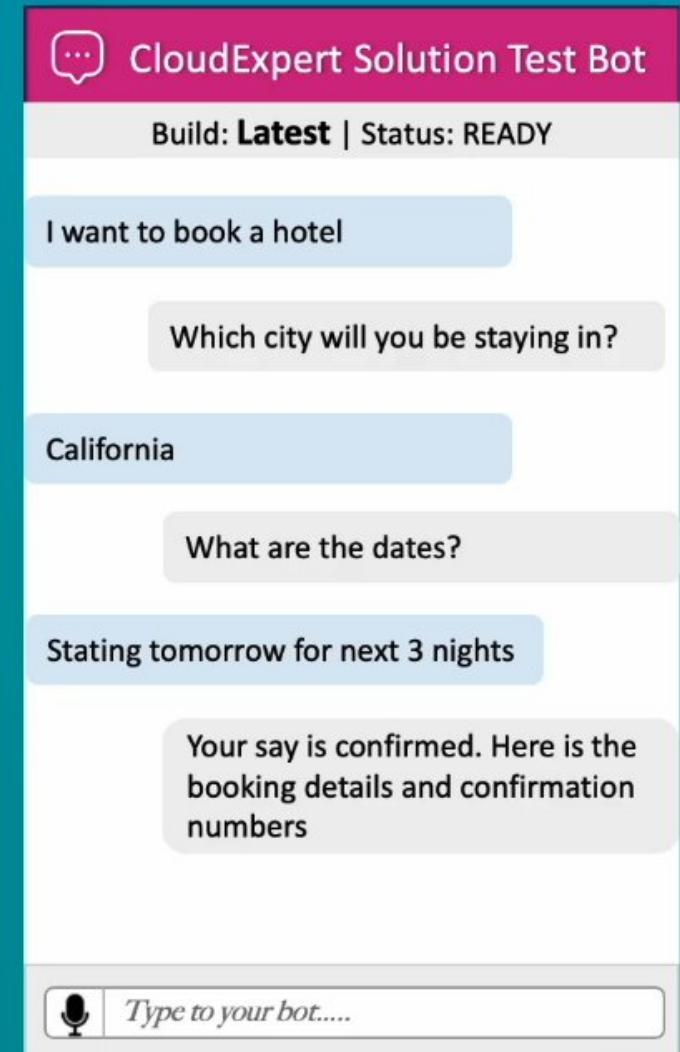


Amazon Lex – Feature Deep Dive

- Fully managed AI service with advance Natural Language models.
- Lex is used to design, build, test and deploy voice and conversational bots.
- **Amazon lex Key Features:**
 - Natural Language Understanding (NLU)
 - Automatic Speech Recognition
 - Multi-turn Dialogs
 - Integration with AWS Service (AWS Lambda, Amazon Connect, Amazon Polly)
 - Generative AI and Large Language Models (LLMs)

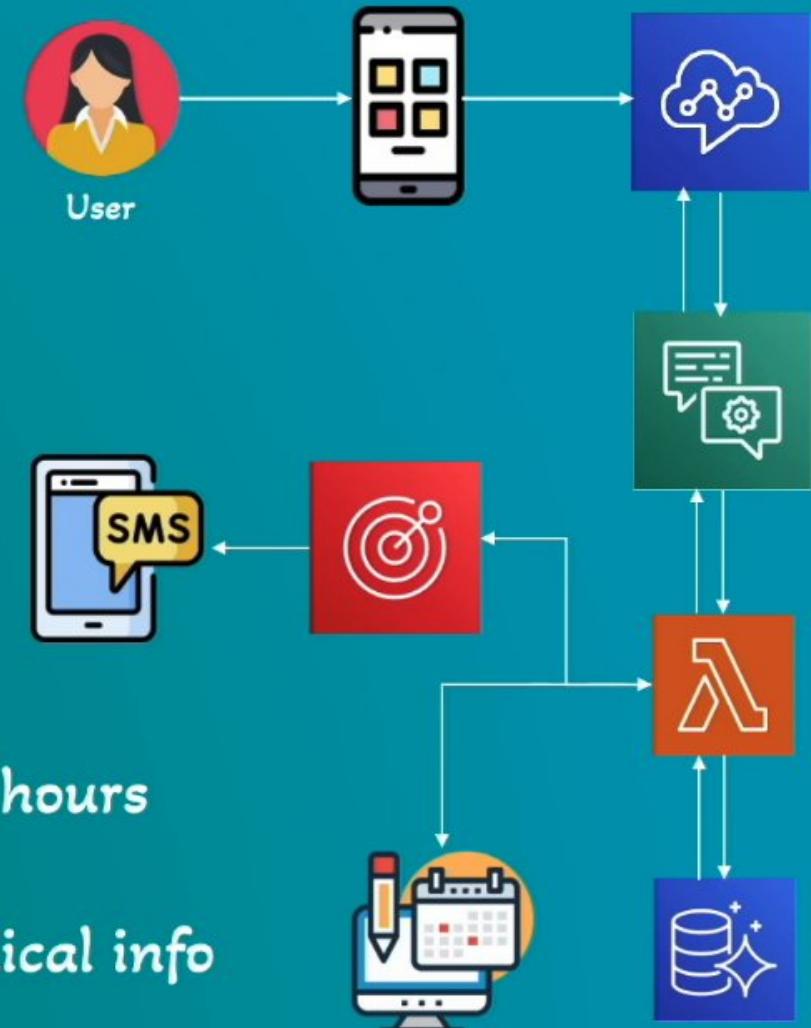
Amazon Lex Key Components

- **Intents:**
 - Represent an action that user wants to perform
 - Example: Book a hotel, book a flight
- **Utterance:**
 - Phrases users might say to express an intent
 - Example: “I want to book a hotel”, “Book a hotel for me”
- **Prompts:**
 - Questions the bot asks
 - Example: “Which city will you be staying in?”
- **Slots:**
 - Parameters or Variables
 - Example: “Date, time, destination for the booking?”
- **Fulfillment:**
 - Bot’s reaction or action on the gathered input
 - Example: Trigger AWS Lambda for backend processing



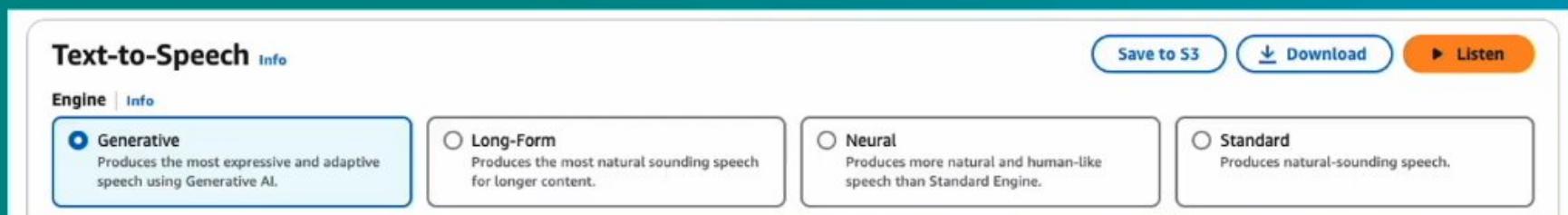
Amazon Lex – Use Cases

- Customer Support:
 - Automate customer service interaction
 - Reduce workload on human agents.
- E-Commerce:
 - Personalized shopping experience
 - Handle multi-lingual customer enquiry
- Education:
 - Create virtual tutors to assist students
 - Assist student with program info, office hours
- Healthcare:
 - Virtual health assistants to provide medical info
 - Appointment scheduling



Amazon Polly

- Fully managed AI service to convert text into lifelike speech.
- Polly uses advance deep learning techniques to synthesize speech.
- Amazon Polly Key Features:
 - Lifelike voices in multiple languages and many voice options.



- High pronunciation accuracy (including abbreviation, acronyms, date/time interpretations, and homograph disambiguation).
- Ideal for low-latency use cases.
- Customize speech output by adjusting volume, pitch and speech rate.

Amazon Polly

- Natural Text-to-Speech generates natural and human-like voice.
- SSML to control pronunciation, intonation, and pauses.
- SSML tags to add emphasis, change the speaking rate, insert breaks.
- You can use Lexicons to customize pronunciation of specific words.
- Lexicon ensures technical terms, brand names pronounced correctly.

```
<speak>Hello, world! <break time="1s"/> How are you today?</speak>
```

```
<lexeme>
  <grapheme>AWS</grapheme>
  <alias>Amazon Web Services</alias>
</lexeme>
```

Combine SAML and Lexicon

```
<speak>
    Welcome to <emphasis level="strong">Amazon</emphasis> Polly!
    <break time="500ms"/>
    We provide <prosody rate="fast" pitch="high">lifelike</prosody> speech
    synthesis.
    <break time="1s"/>
    Let's pronounce some words correctly using our lexicon.
    <phoneme alphabet="ipa" ph="ˈæməzən">Amazon</phoneme> and <phoneme
        alphabet="ipa" ph="ˈpa:li">Polly</phoneme>.
</speak>
```

Amazon Lex – Use Cases

- Media and Entertainment:
 - Create voiceovers for animations, games, and videos.
 - Convert new articles or blogs into audio, allowing readers to listen.
- Customer Service:
 - Enhance IVR systems with human-like voices.
- Education:
 - Speech synthesis to engage students
- Accessibility:
 - Audio version of text content for visually impaired users.

Amazon Transcribe

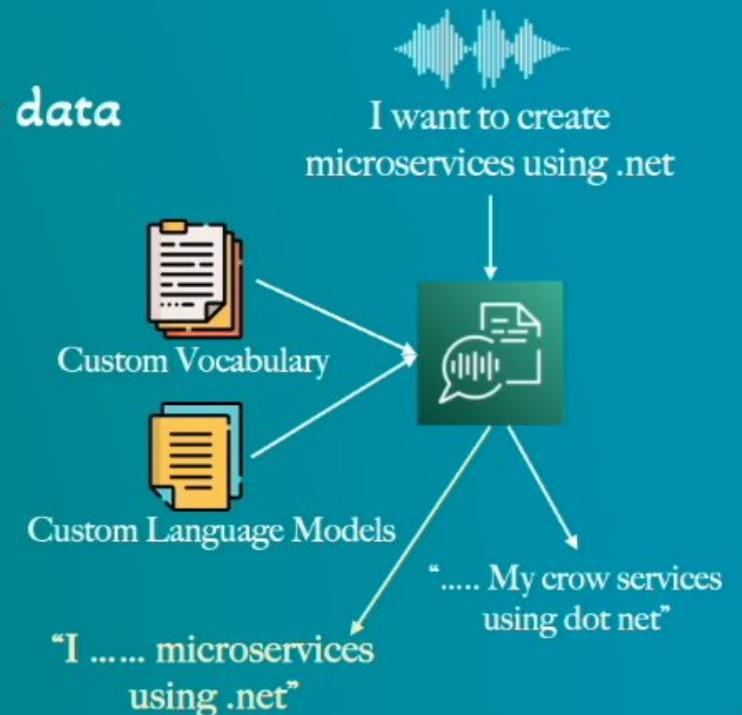


- Fully managed AI service to convert Speech to text.
- Deliver high accuracy transcription for both streaming and recorded audio.
- Can transcribe real-time media or pre-recorded audio files
- Custom vocabularies for domain-specific terms
- Can identify and label different speakers in an audio file.
- Automatically detect language in an audio file.
- Can redact sensitive information, PII data, credit card numbers.
- Call Analytics feature analyzes sentiment, detects call categories.

Custom Vocabularies and Custom Language Models



- **Custom Vocabularies (for domain-specific words).**
 - Transcribe domain-specific words, phrases, or specific terms.
 - Ideal for brand names, acronyms, technical terms.
 - Optionally provides pronunciation hints / Sounds Like to increase recognition.
- **Custom Language Models (for Context).**
 - Train Amazon Transcribe with domain-specific text data
 - Learn the context associated with a given word
- **Custom Vocabularies + Custom Language Models significantly improve the accuracy of transcription for domain-specific content**



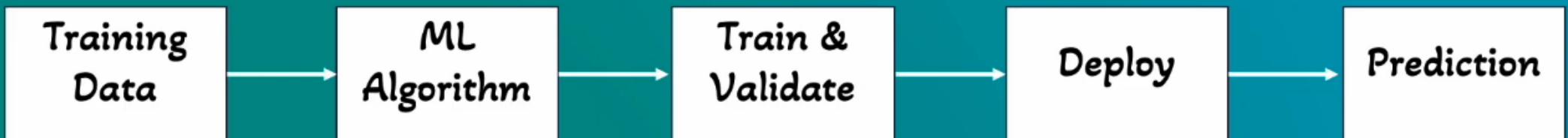
Amazon Transcribe Use Cases

- **Customer Service:**
 - Customer's call transcript to improve service quality
 - Transcribe to convert news interviews and reports.
- **Media and Entertainment:**
 - Generate subtitles for video and transcribe interviews
 - Netflix generates subtitle using Amazon Transcribe
- **Healthcare:**
 - Transcribe medical consultations and patient notes
- **Education:**
 - Transcribe lectures and seminars for easy review

Amazon Personalize



Traditional Machine Learning Lifecycle



Amazon Personalize



Amazon Personalize



- Fully managed ML service to build recommendation system.
- Allows you to train, build, and deploy recommendation models without extensive AI/ML experiences.
- Offers real-time and batch recommendations
- Example: Amazon.com product recommendations
- Domino's uses Amazon Personalize to recommend pizzas and sides.
- Implement in days, not in months.
- This tailored approach makes the ordering process more efficient.

Amazon Personalize

- Real-time Personalization based on user interaction.
- Customizable Recommendations to suit specific business needs.
- User Personalization to tailor recommendations to individual users.
- Personalized Ranking in category or search response
- Can recommend related or similar items
- Seamlessly integrate with other AWS services to build comprehensive solutions.



Amazon Personalize Use Cases

- **E-commerce:**
 - Personalize product recommendations
 - Example: Amazon.com.
- **Media and Entertainment:**
 - Recommend movies, TV shows, or music
 - Example: Amazon Prime Video
- **Marketing:**
 - Create personalized marketing campaign
- **Customer Support:**
 - Recommend relevant articles or solutions based on user queries.
- **Hospitality and Tourism:**
 - Provide personalized wedding registry recommendations.

Amazon Personalize Recipes

- Algorithms that are prepared for specific use cases
- Amazon Personalize provides recipes based on common use cases.
- Example Recipes:
 - Recommending items for user → User-Personalization-v2 recipes
 - Recommending Similar Items → Similar-Items recipes
 - Recommending trending or popular items → Trending-Now, Popularity-Count
 - Ranking items for a user → Personalized-Ranking-v2
 - Getting user segments → Item-Affinity



Exam Summary:

- Amazon Personalize is for recommendations not for Forecast
- Recipes are predefined algorithm for common recommendation use cases
- Recommendations based on real-time data & historical data



Amazon Forecast = Predictive Analytics



ML model can generate the forecast based on the historical time-series data.

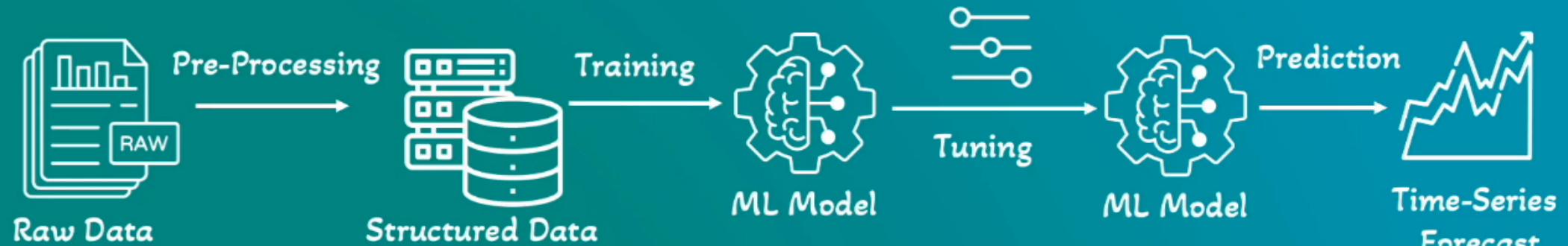
Johnson & Johnson Uses Amazon Forecast to predict demand for medical products

SONY Utilizes Amazon Forecast to optimize supply chain operations

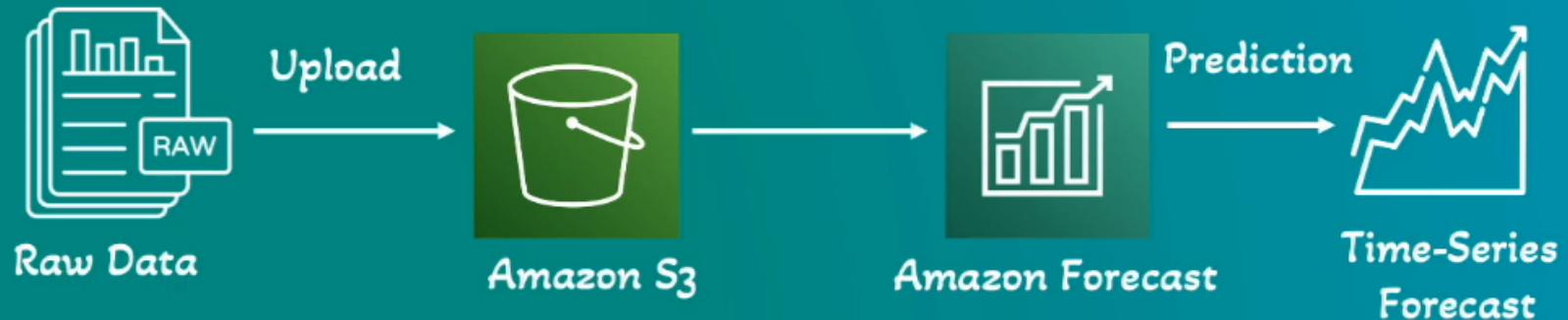
Amazon Forecast



Traditional Way



Requires deep ML expertise to create accurate forecast



Amazon Forecast - AutoML



- Fully managed uses machine learning to deliver highly accurate forecasts.
- Amazon Forecast automates the entire ML process of generating forecast
- Users don't need deep ML expertise to create accurate forecasts
- Customize forecast using additional features such as Holidays, Promotions, Weather Condition.
- Mean Absolute Percentage Error (MAPE) and Weighted Quantile Loss (wQL) metrics to evaluate performance
- Explainability feature to provide insight into the model's decision-making process

Amazon Forecast Use Cases

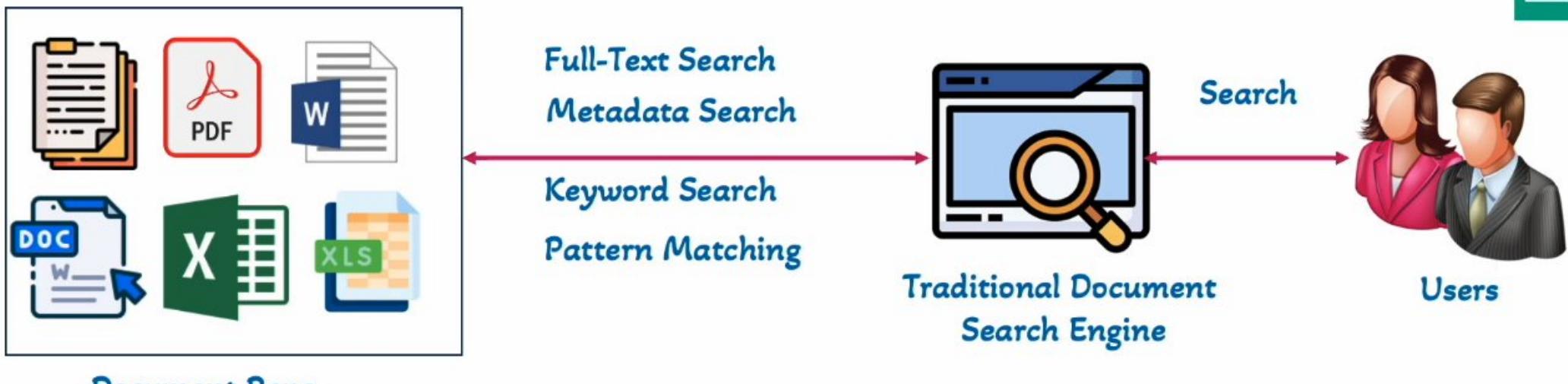


- Retail Industry – Predict Product Demand
- Forecast Demand to improve Supply Chain efficiency .
- Financial Planning – Predict Revenue and expenses.
- Workforce Planning – Forecast staffing needs

Exam Tips – If you find any question with “Forecasting” then think of Amazon Forecast. As this could be the potential answer.



Amazon Kendra = ML Powered Intelligent Search



Document Repo

- Full-Text Search** → Containing the word/phrase “CloudExpert Solution”
- Metadata Search** → Document authored by “CloudExpert Solution”
- Keyword Search** → Returns Document contains the keyword “Certification”
- Pattern Matching** → Finds Document using pattern or regular expression



Amazon Kendra = ML Powered Intelligent Search



- o Added support for direct control of WIA drivers in EnumDWT DeviceType.
Optimized Android Service for document scanning from Android devices
- o The Android service is available on Google Play Store.
« Expanded the capabilities of the Android platform. See the APIs supported on
Android service.

Remote Scan

« The Remote Scan solution powered by Dynamic Web TWAIN is now officially available. Using Remote Scan, you can turn any of your traditional document scanners into a network accessible scanner and allow your end users to use it without any client side installs. Read this documentation to learn how the Remote Scan solution works.

Improvements

Image Viewer

- o The Viewer component has been migrated to a dedicated resource file. This will allow for viewerless implementations of Dynamic Web TWAIN, as well as reducing the load on the browser by removing the necessity of loading the

Document with “Full-Text Search”

- Returns the document path /reference/location
- Can't answer question

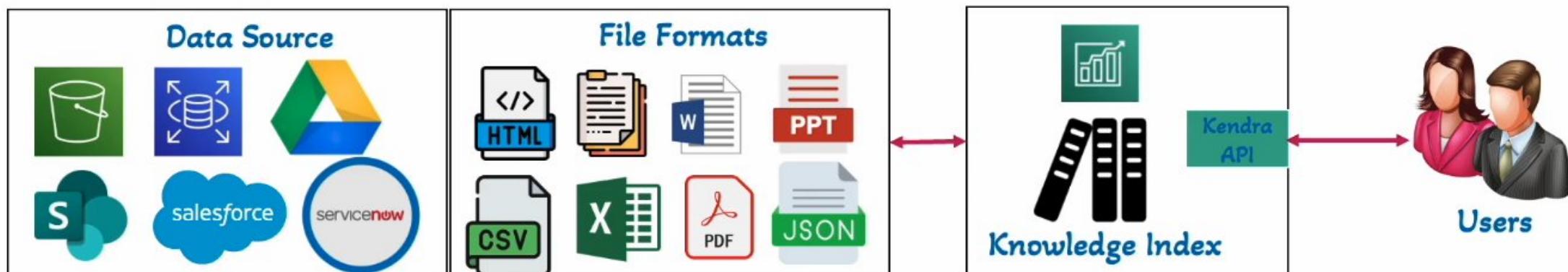
I searched for “Covid-19 Test Centers”

- Either returns the document which has the word or the phrase.
- Can't return the answer embedded in the document or the test center location.

Amazon Kendra



- Fully managed uses ML Powered Intelligent Search service.
- Delivers highly accurate search result.
- Search quickly and efficiently, even when documents scattered across multiple locations and content repo.
- Supports NLP, allows users to ask questions in plain language.
- Can match questions to the most relevant answers from a curated FAQ list.
- Can index documents (not limited to PDFs, words, PPT, Excel, HTML pages).
- Can fine-tune search results based on content attributes.



Amazon Kendra Use Cases



- Enterprise Search – Enhance Employee Productivity
- Improve Customer Service by quickly finding relevant answers.
- Knowledge Management – Organize and retrieve information
- Research & Development – Accelerate research capability



improves search capabilities across its vast repository of technical documents



provides accurate and timely information to its consultants

Exam Tips – If you find any question with “Document Search Service” then think of Amazon Kendra.



Amazon Kendra vs Amazon Elasticsearch



Amazon Kendra



Amazon Elastic Search



Use Cases

Enterprise search, NLP Search, Knowledge management

Best For

Natural language queries, FAQ matching, intelligent search.

Features

Machine learning-based search, NLP, relevance tuning, integration with AWS services.

Log and event data analysis, full-text search, real-time application monitoring

Large-scale data indexing, real-time search and analytics.

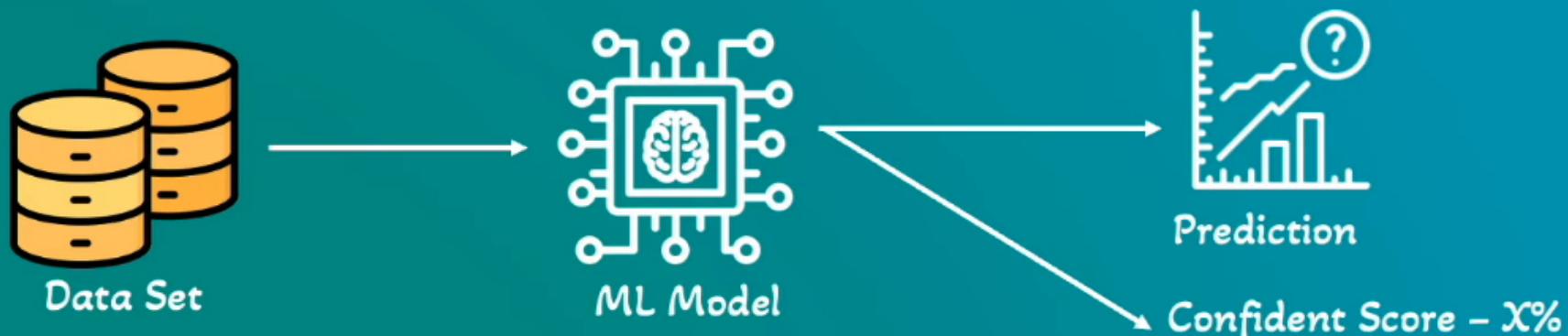
Distributed search and analytics engine, Kibana integration, real-time data processing.

Differentiator

Focuses on intelligent search and natural language processing.

Optimized for large-scale data indexing and real-time analytics.

ML Model Predictions



- Most advance models can produce errors or uncertain results
- Human review complements ML by adding a layer of verification
- Human review is essentials for:
 - Accuracy and Quality Assurance
 - Handling Edge Cases
 - Ethical and Sensitive Decisions
 - Continuous Improvements

[Option+5]

X ▲ ? ⚙ N. Virginia ▾ CloudExpert Solution ▾



Choose a sample image



Use your own image

Upload or drag and drop

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

Use image URL

Use image URL

Go

▼ Results

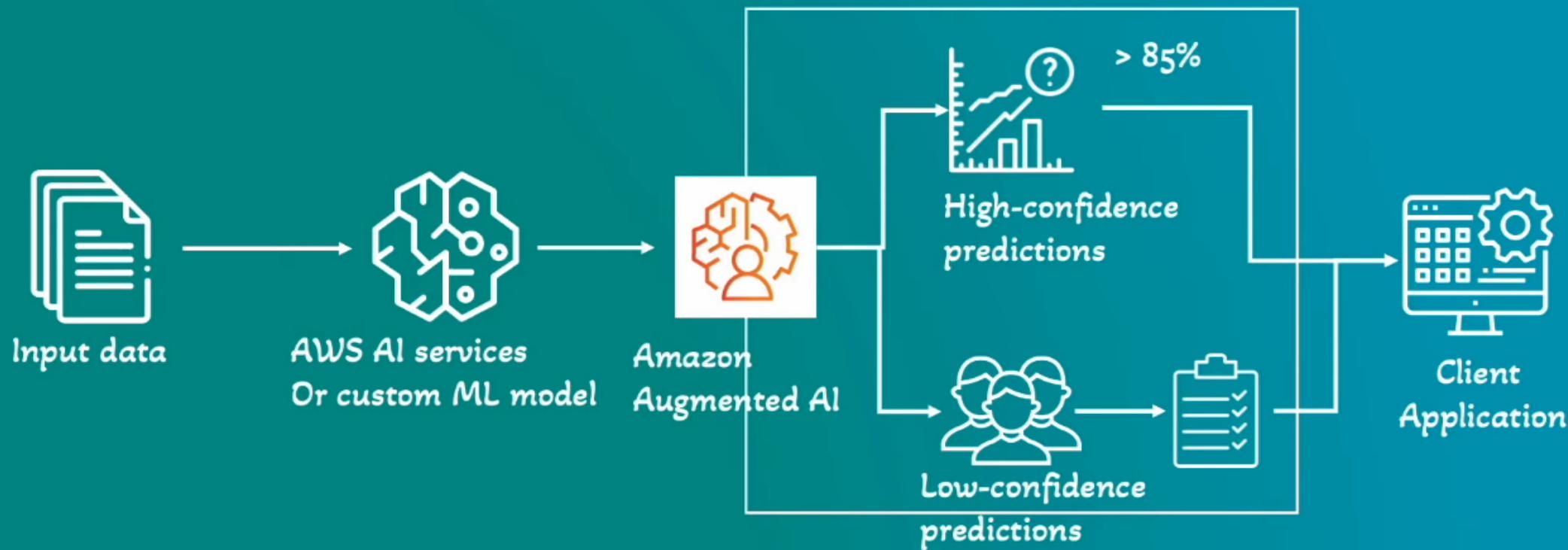
Neighborhood	99.9 %
City	99.9 %
Road	99.9 %
Street	99.9 %
Urban	99.9 %
Person	98.7 %
Car	98.1 %
Transportation	98.1 %
Vehicle	98.1 %
Metropolis	96.2 %
Clothing	95.3 %
Footwear	95.3 %
Shoe	95.3 %
Machine	94.2 %
Wheel	94.2 %
Architecture	92.2 %
Building	92.2 %
Skateboard	80.9 %





Amazon Augmented AI (A2I)

- Fully managed service to add human review to ML workflows.
- Ensure high accuracy for tasks, require human judgement.



Amazon Augmented AI (A2I)



- Seamlessly integrate with other AWS AI/ML Services, and also with custom models built with Amazon SageMaker.
- Flexibility with Reviewers:
 - Own team of reviewers
 - On-demand workforce with Amazon Mechanical Turk
 - Third-party vendors from AWS Marketplace
- Option to provide clear and detailed instructions to reviewer.
- Built-in workflows to route predictions to reviewers.
- Pre-screened vendors for confidentiality requirements.

Amazon Augmented AI (A2I) Use Cases



- Document Processing – Amazon Textract + Amazon Augmented AI to review extracted text from documents.
- Content Moderation - Amazon Recognition + Amazon Augmented AI to review flagged content
- Healthcare – Review sensitive healthcare documents to ensure accuracy.
- Financial Services – Process and review financial documents