Sentiment Analysis using Amazon Aurora Machine learning integration
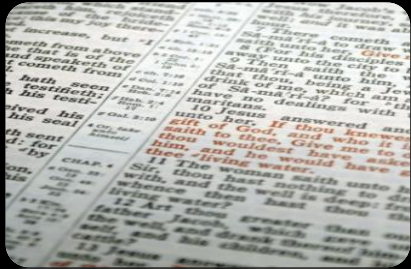
Roneel Kumar

Senior Relational Databases Specialist Solutions Architect
AWS

Machine Learning almost everywhere

WHAT DATA DOES MACHINE LEARNING USUALLY RUN ON ?

Text

Images

Video

Tabular Data

Machine Learning almost everywhere

WHAT DATA DOES MACHINE LEARNING USUALLY RUN ON ?

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and many more …

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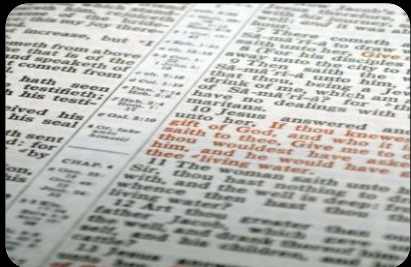Today, we will focus on
"Data which are located in Relational Database"

How can your application use it to make prediction?

Adding **ML** to an application is **challenging**

Typical steps require ML expertise & manual work

1 Select and train the ML model

2 Write application code to read data from the database

3 Format the data for the ML model

4 Call an ML service to run the ML model on the formatted data

5 Format the output for the application

6 Load the results to the application
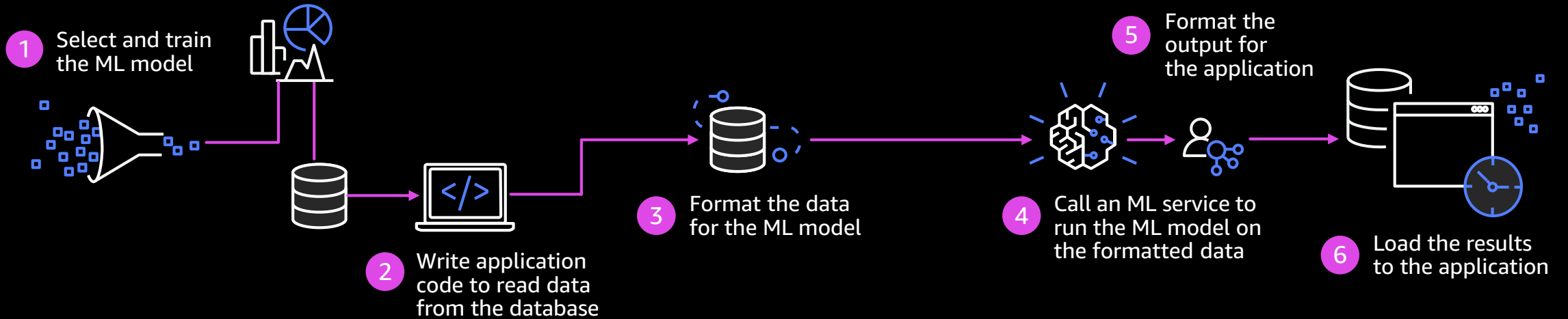
The result: Most ML is done offline

ML
Services

Database

Desktop
tools

Application
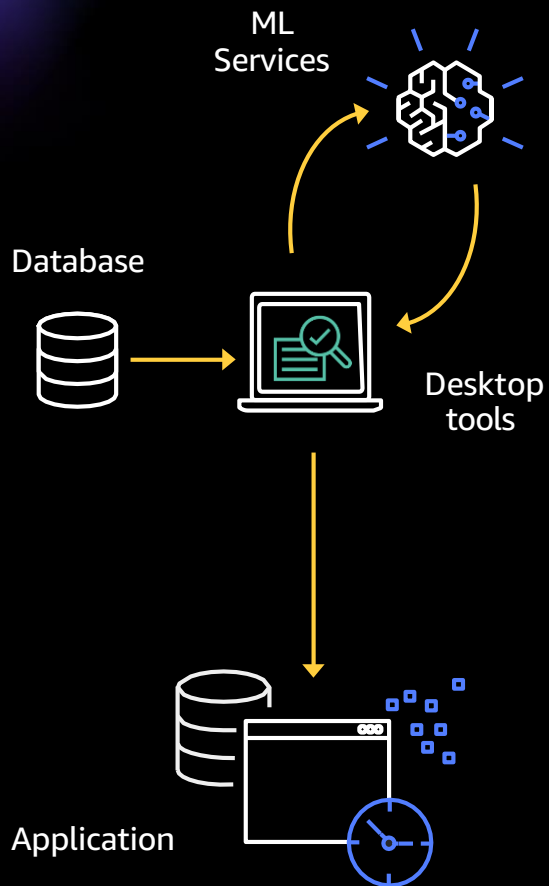
- Data scientist curates and downloads the data manually
- Data preparation, formatting, training, and inference is done using notebooks and custom scripts
- Results in performance problems, high resource usage, and delays
- Less often, there are scheduled or on-demand ML jobs

Single data source

Database

Desktop tools

It would be bad enough even if we had a single data source . . .

- Customer service database
- Order management system
- Financial system
- IT management data

Multiple Amazon Aurora data sources

Database A

Database B

Database C

Database D

Desktop tools
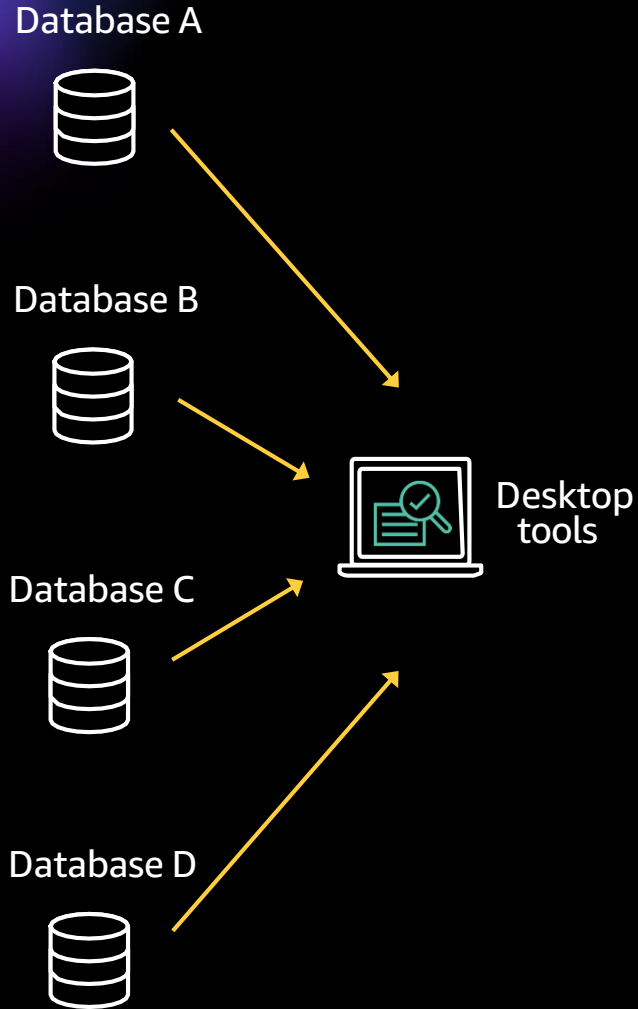
. . . but it's even worse if there are multiple data sources, like:

- Identity management and authentication
- Transactions
- Customer service

Each source may need a different algorithm, e.g., linear regression for supervised learning
or anomaly detection for unsupervised learning

Then we want to reconcile them

Amazon Aurora ML

SIMPLE, OPTIMIZED, AND SECURE AURORA, AMAZON SAGEMAKER, AND AMAZON COMPREHEND INTEGRATION

ML predictions
on relational data

Integration with
Amazon SageMaker
& Amazon
Comprehend

Familiar SQL
language,
no ML expertise

Low-latency,
immediate

Security &
governance

aws

Before: 6 steps

From 6 steps

1 Select and train the ML model

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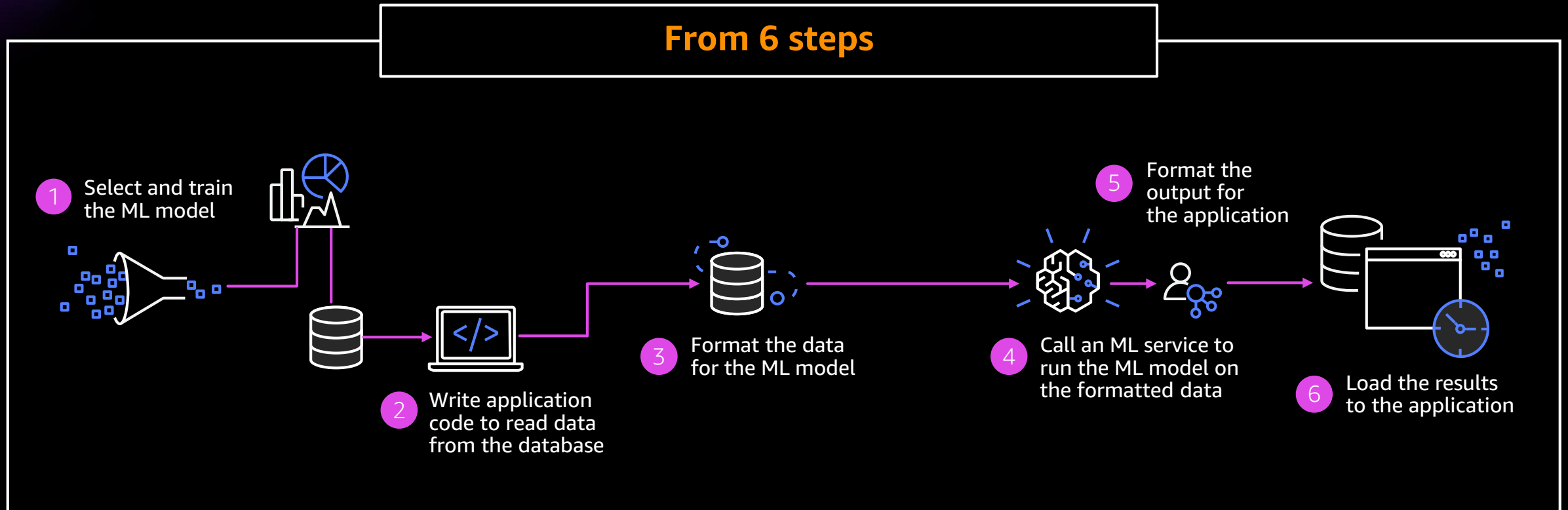
Don't forget the security integration

Now: 3 steps

To 3 steps

1 (Optional) Select and configure the ML model with Amazon SageMaker Autopilot

2 Run a SQL query to invoke the ML service

3 Use the results in the application
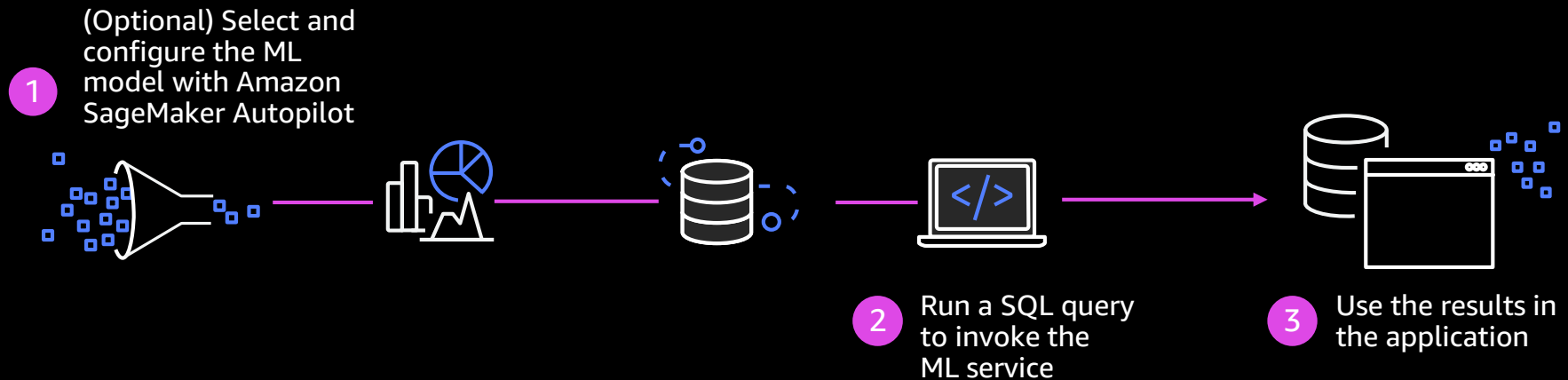
Use the familiar SQL language for training & prediction

Amazon Aurora

Amazon Aurora

Delivered as a managed service

Drop-in compatibility with MySQL and PostgreSQL

Simplicity and cost-effectiveness of open-source databases

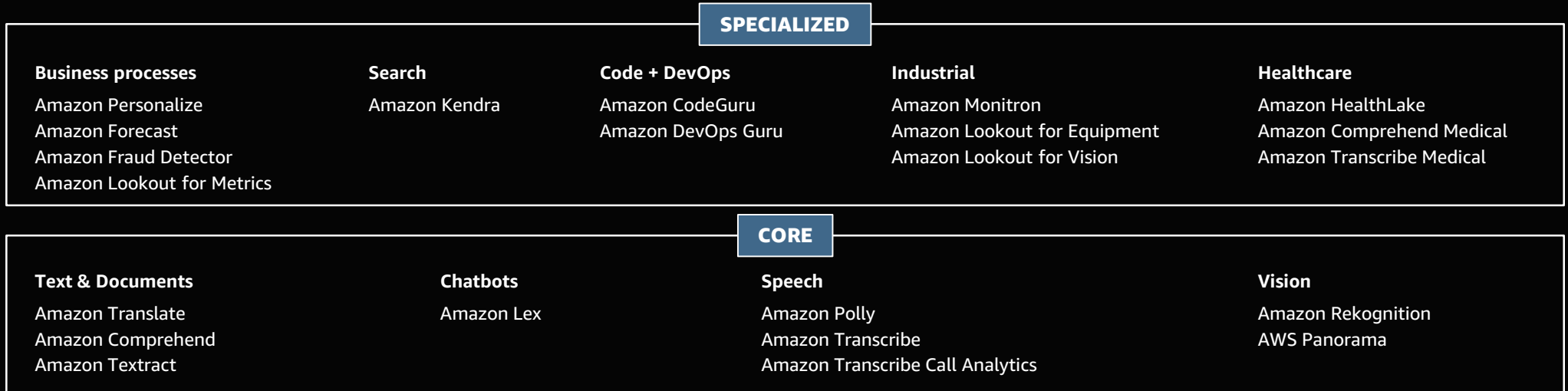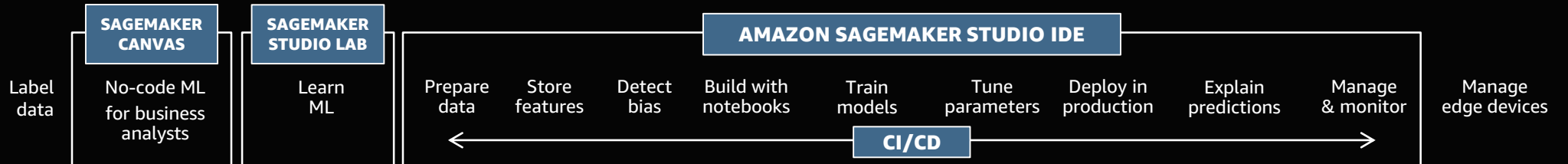Throughput and availability of commercial databases

Simple pay-as-you-go pricing

aws

The AWS ML Stack

BROADEST AND MOST COMPLETE SET OF MACHINE LEARNING CAPABILITIES

AI SERVICES

SPECIALIZED

Business processes	Search	Code + DevOps	Industrial	Healthcare
Amazon Personalize	Amazon Kendra	Amazon CodeGuru	Amazon Monitron	Amazon HealthLake
Amazon Forecast		Amazon DevOps Guru	Amazon Lookout for Equipment	Amazon Comprehend Medical
Amazon Fraud Detector			Amazon Lookout for Vision	Amazon Transcribe Medical
Amazon Lookout for Metrics				

CORE

Text & Documents	Chatbots	Speech	Vision
Amazon Translate	Amazon Lex	Amazon Polly	Amazon Rekognition
Amazon Comprehend		Amazon Transcribe	AWS Panorama
Amazon Textract		Amazon Transcribe Call Analytics	

ML SERVICES

SAGEMAKER CANVAS

SAGEMAKER STUDIO LAB

AMAZON SAGEMAKER STUDIO IDE

Label data	No-code ML for business analysts	Learn ML	Prepare data	Store features	Detect bias	Build with notebooks	Train models	Tune parameters	Deploy in production	Explain predictions	Manage & monitor	Manage edge devices

CI/CD

ML FRAMEWORKS & INFRASTRUCTURE

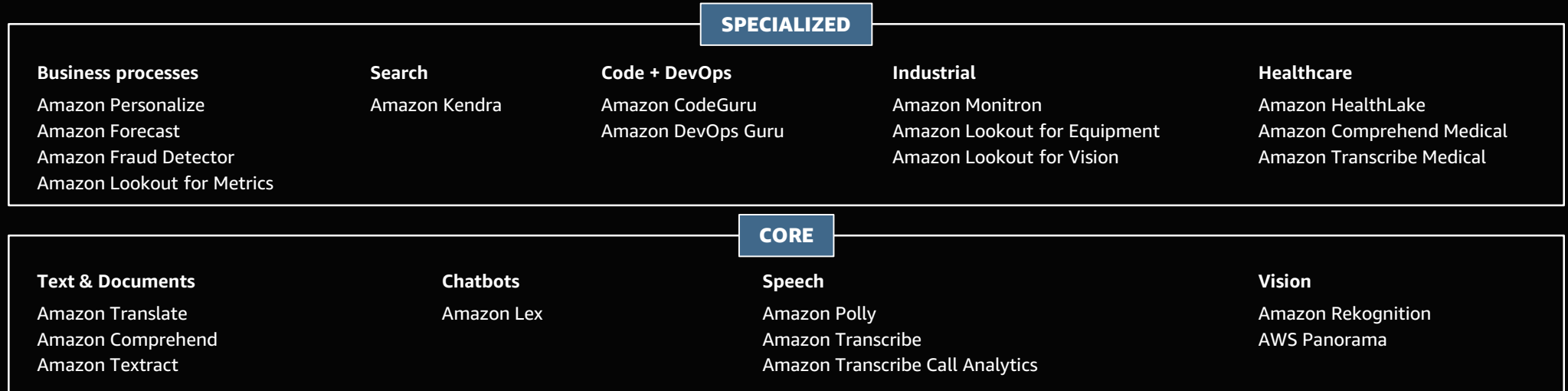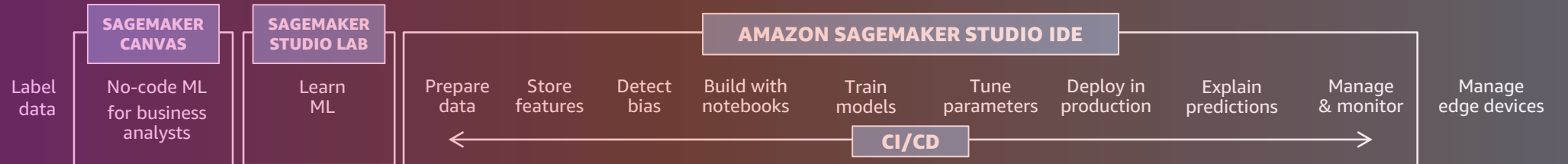| PyTorch, Apache MXNet, TensorFlow	Amazon EC2	CPUs	GPUs	AWS Inferentia	AWS Trainium	Habana Gaudi	FPGA	Elastic inference

aws

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Amazon Lookout for Metrics				

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ML SERVICES

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CI/CD

ML FRAMEWORKS & INFRASTRUCTURE

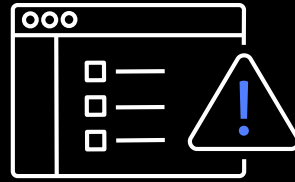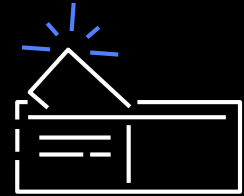| PyTorch, Apache MXNet, TensorFlow	Amazon EC2	CPUs	GPUs	AWS Inferentia	AWS Trainium	Habana Gaudi	FPGA	Elastic inference

aws

Calling ML models from Amazon Aurora

Find suspected fraudulent transactions

Flag comments with negative sentiment

Sort customers by predicted future spend

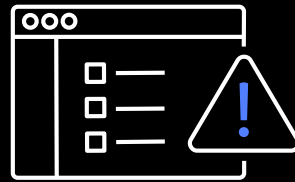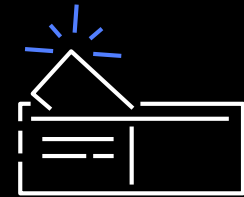# ML driven insights using SQL

Find suspected
fraudulent transactions

Flag comments with
negative sentiment
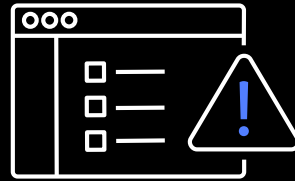
Sort customers by predicted
future spend

```
CREATE TRIGGER insert_check
BEFORE INSERT ON sales
  FOR EACH ROW
  BEGIN
    IF is_transaction_fraudulent(column1,
      column2, column3 …) = 'True' THEN
      rollback; END IF;
  END;
```
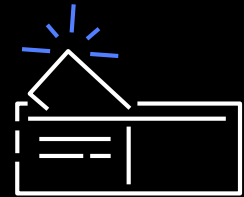
aws

ML driven insights using SQL

Find suspected
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Flag comments with
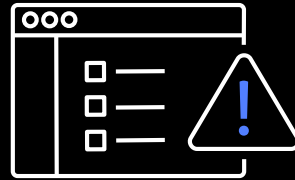negative sentiment

Sort customers by predicted
future spend


```
SELECT * FROM product_reviews
    WHERE aws_comprehend_detect_sentiment(review_text, 'en') = 'NEGATIVE';
```
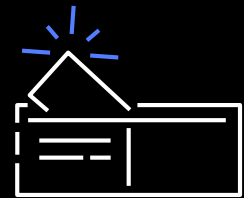
ML driven insights using SQL

Find suspected fraudulent transactions

Flag comments with negative sentiment

Sort customers by predicted future spend

```
SELECT * FROM customers
 ORDER BY predicted_future_spend (column1, column2, ...)
```

Demo

- Sentiment analysis using Amazon Aurora ML integration
- Customer churn analysis with Amazon SageMaker

aws

Visit the AI & Machine Learning resource hub for more resources

Dive deeper into these resources, get inspired and learn how you can use AI and machine learning to accelerate your business outcomes.

- The machine learning journey e-book
- 7 leading machine learning use cases e-book
- A strategic playbook for data, analytics, and machine learning e-book
  Accelerate machine learning innovation with the right cloud services & infrastructure e-book
- Choosing the right compute infrastructure for machine learning e-book
- Improving service and reducing costs in contact centers e-book
- Why ML is essential in your fight against online fraud e-book
- … and more!

https://bit.ly/3mwi59V

Visit resource hub

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Validate your expertise

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aws

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Thank you!

Roneel **Kumar**