DEV05

AI & ML using Microsoft cloud services

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@francedit

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Agenda

- AI/ML everywhere?
- The perspective for the data architect
- The perspective for the developer
- Demo pills

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Imagine you need to design a new cloud data platform for a customer…

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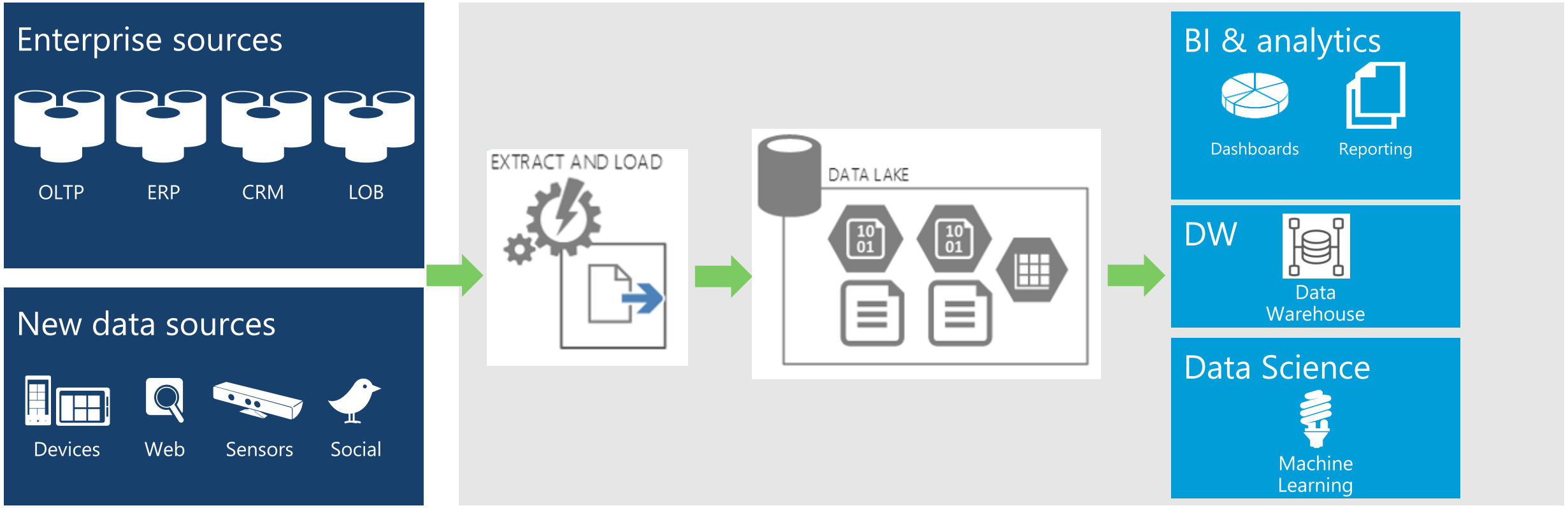
The importance of a data lake in modern solutions

New approaches using ELT

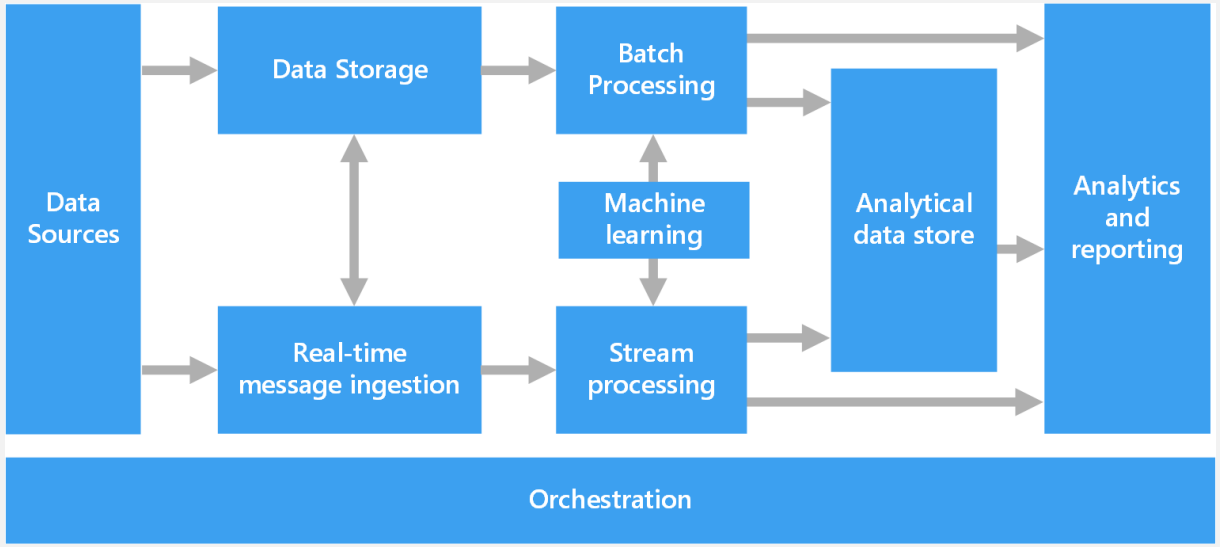


- All data sources can be considered
- Native formats, streaming data, big data

- Extract and load, with minimal transform
- Commodity hardware
- Transform can be applied later
- Easy to plug additional services

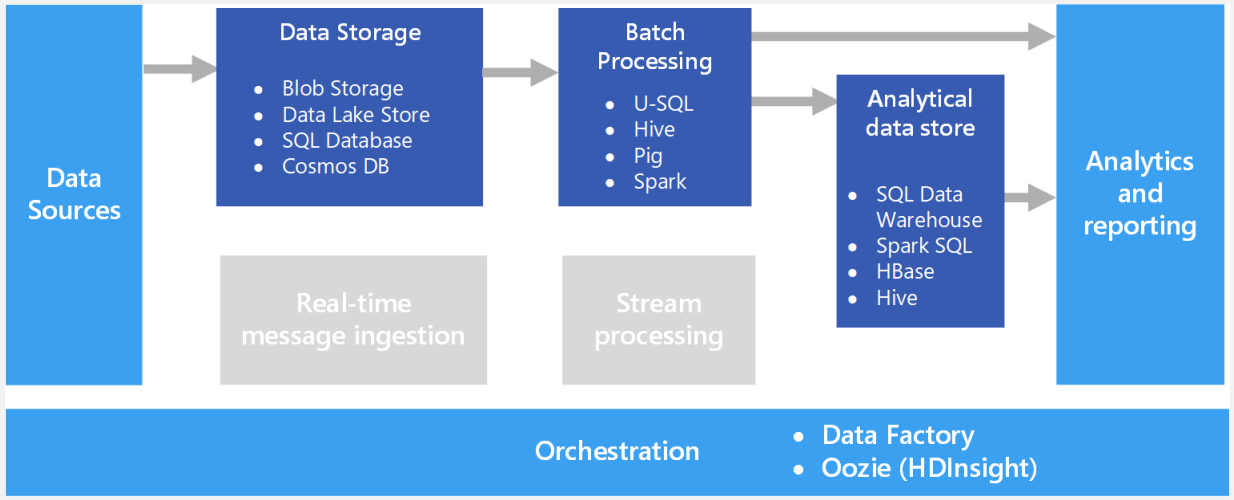
- Data warehouse
- Presentation layer
- Enrich information

Lambda architecture approach

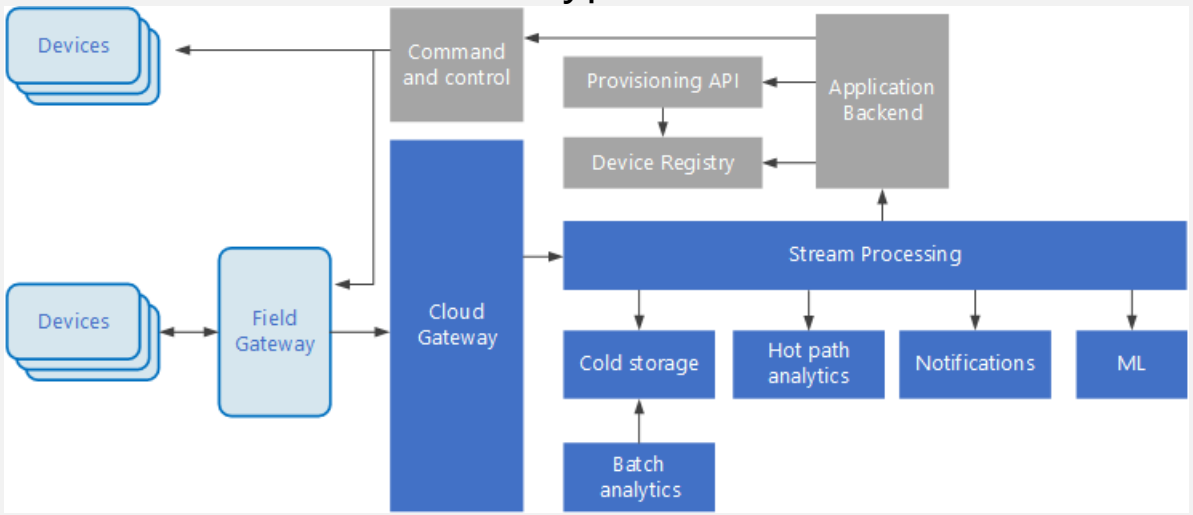


- Batch processing
- Stream processing

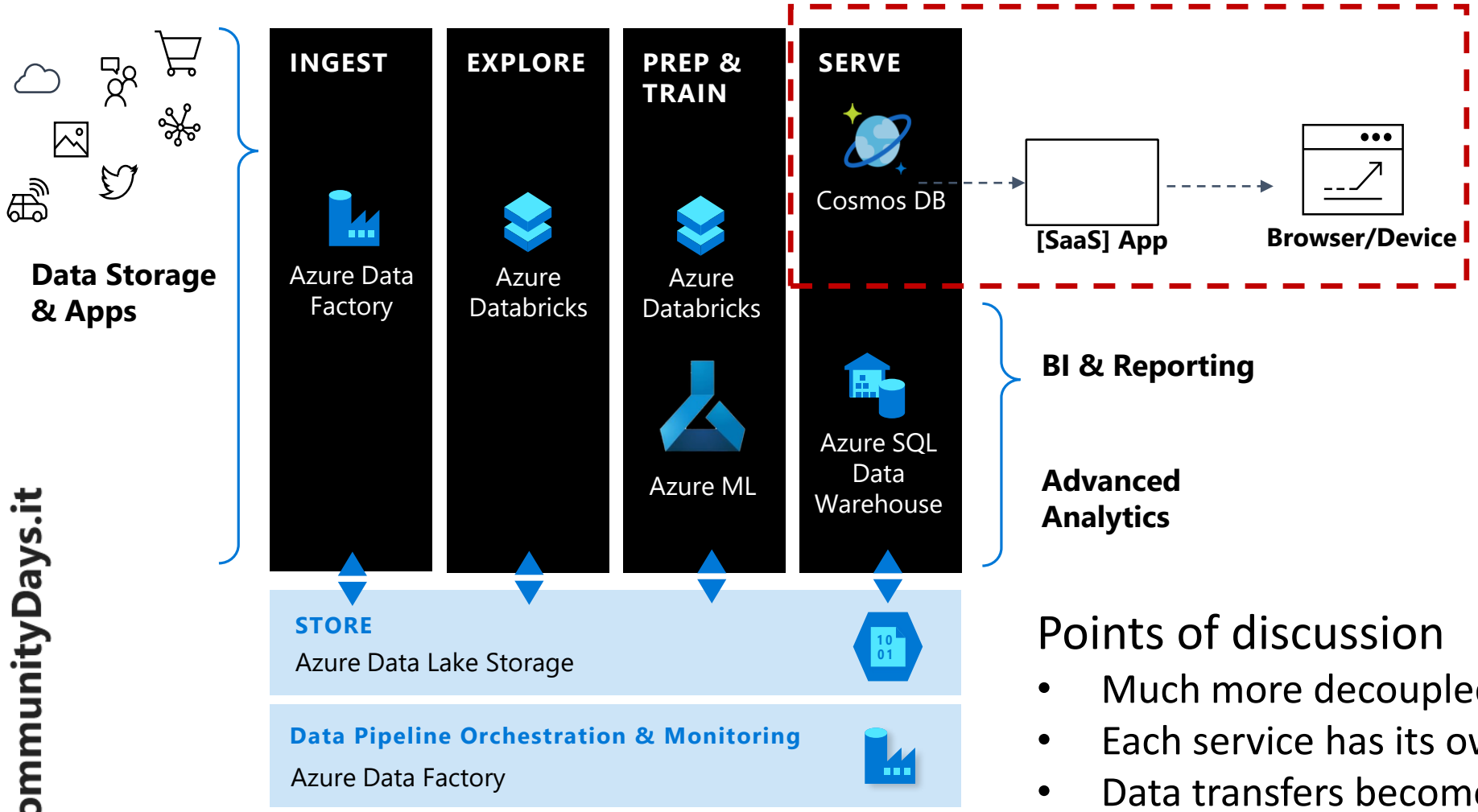
Batch processing of information



Event drive architecture (typical for IoT)



Azure Services for Modern Data Platforms…



Points of discussion

- Much more decoupled services than on-prem
- Each service has its own characteristics
- Data transfers become important
- Excellent architectural design is a must have
- Orchestration of information changes

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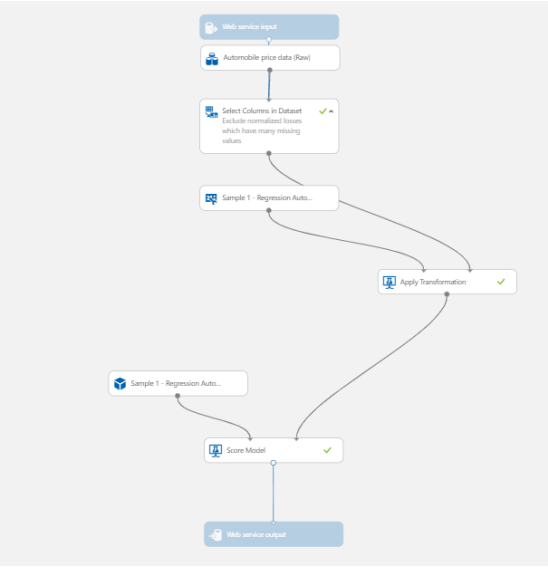
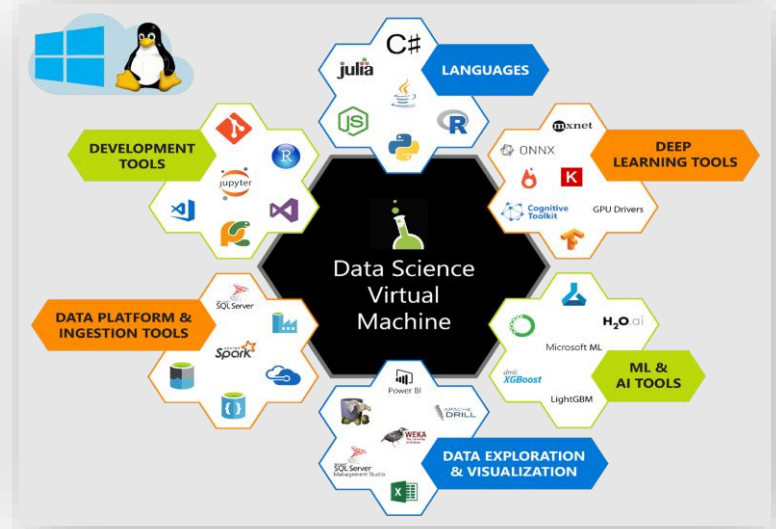
Machine Learning – modeling and authoring

Empower data science and development teams





Integrated data science & data engineering teams

Desktop solutions not adequate

Need a unified big data & machine learning solution

Azure Databricks + Azure Machine Learning service

Individual data scientists

Desktop solutions adequate

Need cloud for sporadic compute needs

Machine Learning VMs

NOTE: *This workspace (AML service) is different from and not compatible with the Machine Learning Studio Workspace, which offers users a serverless, drag-n-drop environment.*

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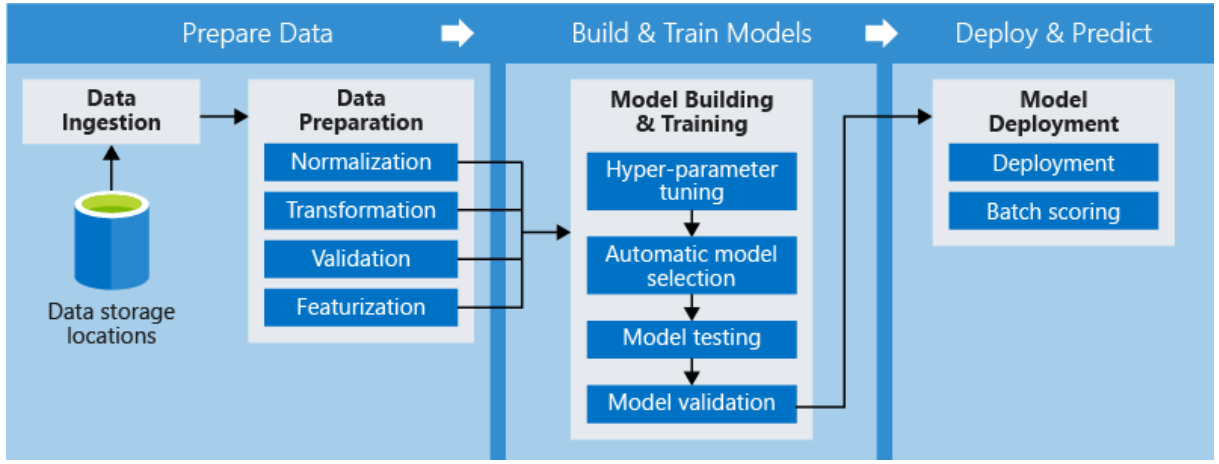

Demo

Azure Machine Learning service

Azure Databricks

```
val configs = Map(
  "dfs.adls.oauth2.access.token.provider.type" -> "ClientCredent
  "dfs.adls.oauth2.client.id" -> "<aaaaaaaa-bbbb-cccc-dddd-eeeee
  "dfs.adls.oauth2.credential" -> "<NzQzY2QzYTAtM2I3Zi00NzFmLWI3
  "dfs.adls.oauth2.refresh.url" -> "https://login.microsoftonlin

dbutils.fs.mount(
  source = "adl://kpadls.azuredatalakestore.net/",
  mountPoint = "/mnt/kp-adls",
  extraConfigs = configs)
```

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As a developer,
why should you care about AI and ML?

Some problems are difficult to solve using traditional algorithms and procedural programming.

Examples

- Classify if a customer is a retention risk
- Identify objects in images and videos
- Detect defects in an industrial process

These examples are good candidates for *machine learning*.

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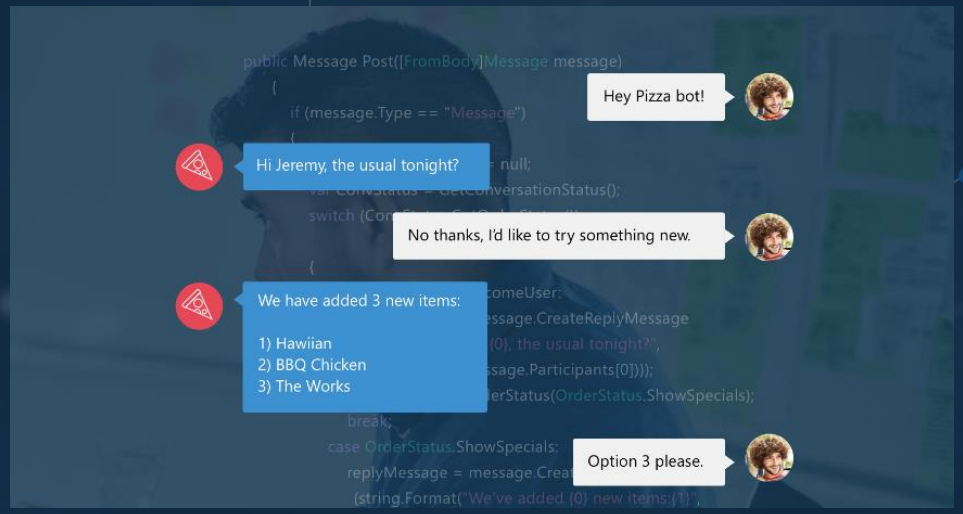
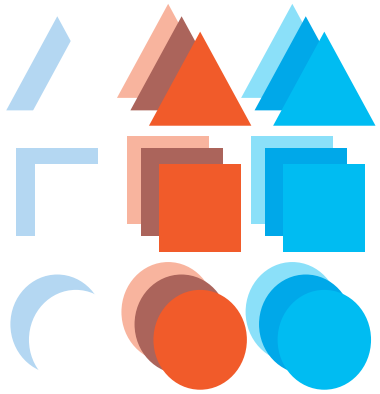
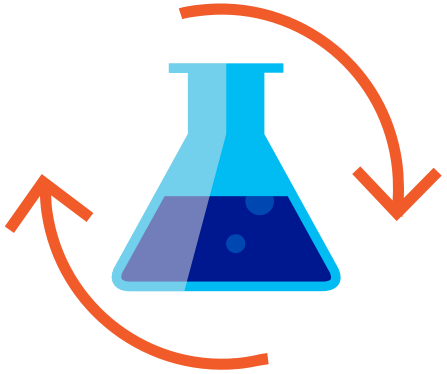
How can you get started with AI and ML?



Machine Learning Landscape





Prepare Your Data

Quickly launch and scale Spark on demand
Rich interactive workspace and notebooks
Seamless integration with all Azure data services

Build and Train

Broad frameworks and tools support
TensorFlow, Cognitive Toolkit, Caffe2, Keras, MxNET, PyTorch

Deploy

Docker containers
Windows AI Platform
Azure Machine Learning

Azure Cognitive Services

The most comprehensive pre-trained AI

Decision

Personalizer

Anomaly Detector

Content Moderator

Vision

Ink Recognizer

Computer Vision

Face

Video Indexer

Custom Vision

Form Recognizer

Language

Text Analytics

Translator Text

Bing Spell Check

Language Understanding

Content Moderator

QnA Maker

Speech

Conversation transcription capability

Custom Speech

Speech transcription

Text-to-Speech

Neural Text-to-Speech

Web search

Bing Custom Search

Bing Video Search

Bing Entity Search

Bing News Search

Bing Local Business Search

Bing Web Search

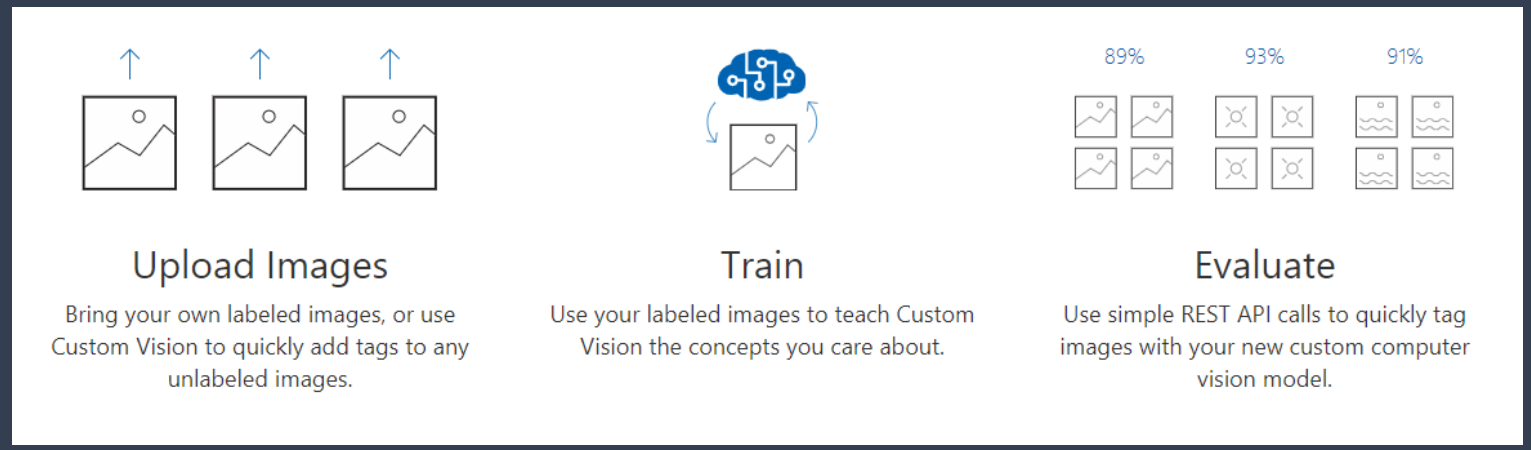
Bing Image Search

Bing Autosuggest

Bing Visual Search

Ink Recognizer

Custom Vision



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Machine Learning for Developers

Azure Cognitive Services

Ink Recognizer

Windows AI platform

Sentiment Analysis

ML.NET

Price prediction

Enable Multi-Input

Increase Functionality

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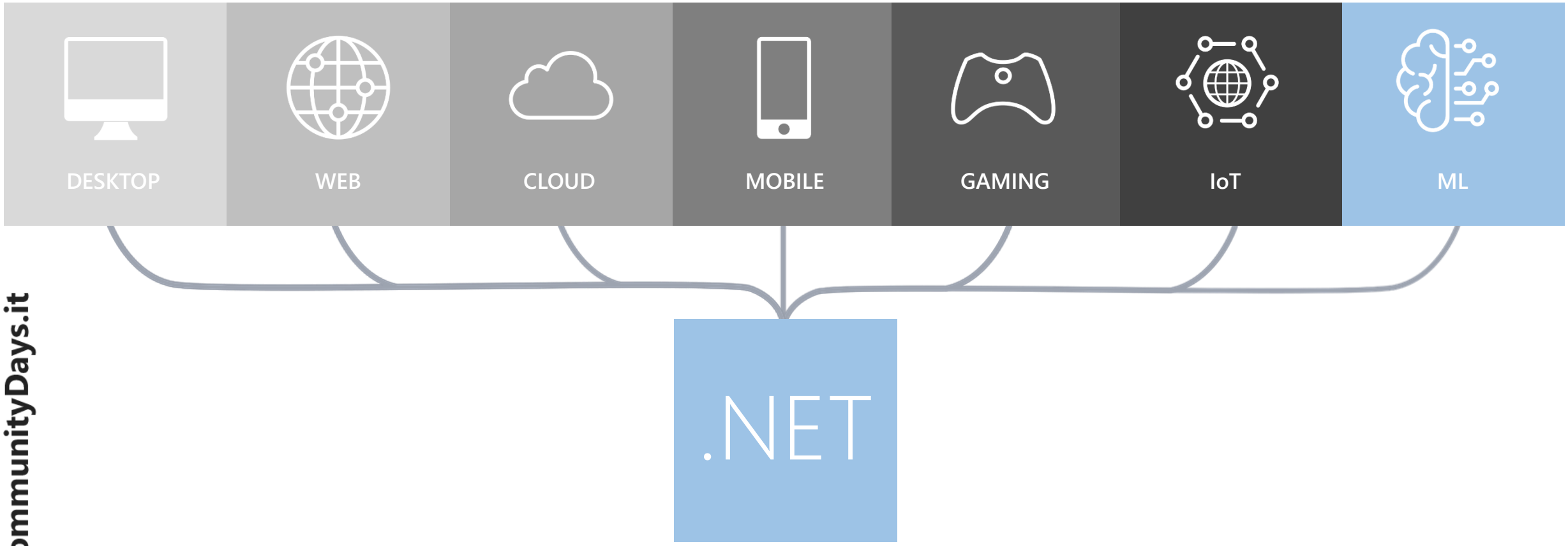
Your platform for building **anything**



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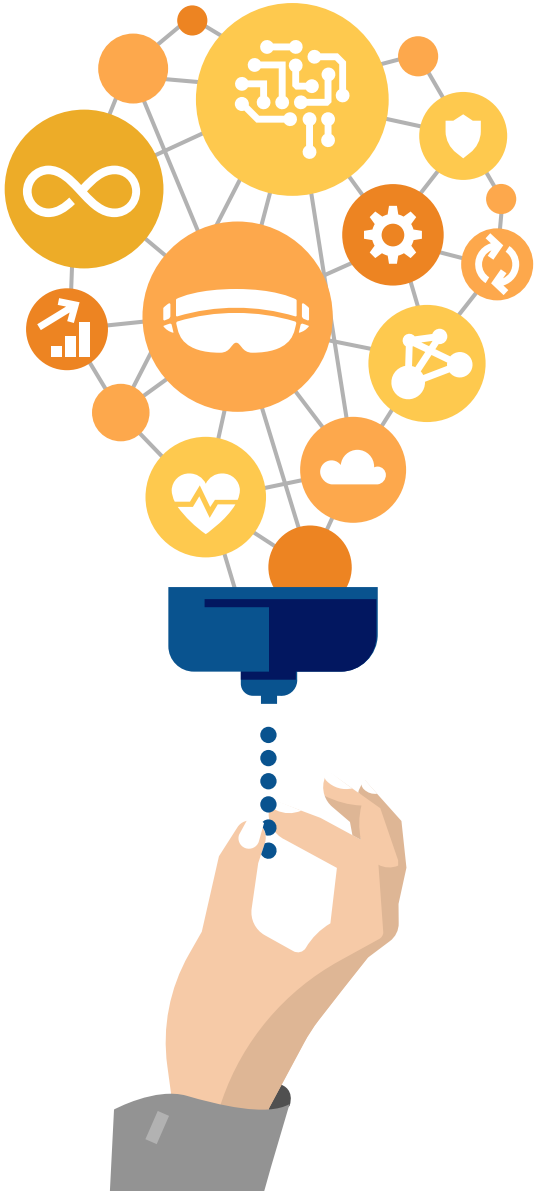
ML.NET



- *Machine Learning framework for building custom ML Models*
- **Proven at scale**
  - Azure, Office, Windows

Extensible

TensorFlow, ONNX and Infer.NET

Cross-platform and open-source

Runs everywhere

Easy to use tools

CLI + UI-based tool for building models

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ML.NET Tooling

ML.NET CLI global tool accelerates productivity

AutoML

Model Builder

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AutoML with ML.NET

ML.NET CLI global tool accelerates productivity

How much is the taxi fare for 1 passenger going from Cape Town to Johannesburg?

DEMO

ML.NET

```
# STEP 1: Load data
IDataView trainingDataView = mlContext.Data.LoadFromTextFile<TaxiTrip>( ... )
IDataView testDataView = mlContext.Data.LoadFromTextFile<TaxiTrip>( ... )
        # Display first few rows of the training data
ConsoleHelper.ShowDataViewInConsole(mlContext, trainingDataView)

# STEP 2: Initialize user-defined progress handler that AutoML
will invoke after each model
var progressHandler = new RegressionExperimentProgressHandler()

# STEP 3: Run AutoML regression experiment
ExperimentResult<RegressionMetrics> experimentResult = mlContext.Auto()
        .CreateRegressionExperiment(ExperimentTime)
        .Execute(trainingDataView, LabelColumnName, progressHandler:
progressHandler)
        # Print top models found by AutoML
PrintTopModels(experimentResult)

# STEP 4: Evaluate the model on test data
RunDetail<RegressionMetrics> best = experimentResult.BestRun
ITransformer trainedModel = best.Model
        # Run best model on test data
IDataView predictions = trainedModel.Transform(testDataView)

# STEP 5: Save trained model to a .ZIP file
mlContext.Model.Save(trainedModel, trainingDataView.Schema, ModelPath)
```

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Knowledge mining

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Azure AI

AI apps & agents

Azure Bot Service
Azure Cognitive Services

Machine learning

Azure Databricks
Azure Machine Learning
Azure AI infrastructure

Knowledge mining

Azure Cognitive Search

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Knowledge Mining is the process of discovering actionable information from large sets of unstructured data, like text or images.

It uses Artificial Intelligence to detect hidden patterns and information. It can be used to guarantee compliance, enrich search, automate processes, among other business processes.

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Cognitive Search is the Microsoft solution for Knowledge Mining.

AI approach for content understanding. Ingests unstructured content to create rich metadata into an Azure Search index, with the power of Cognitive Services.

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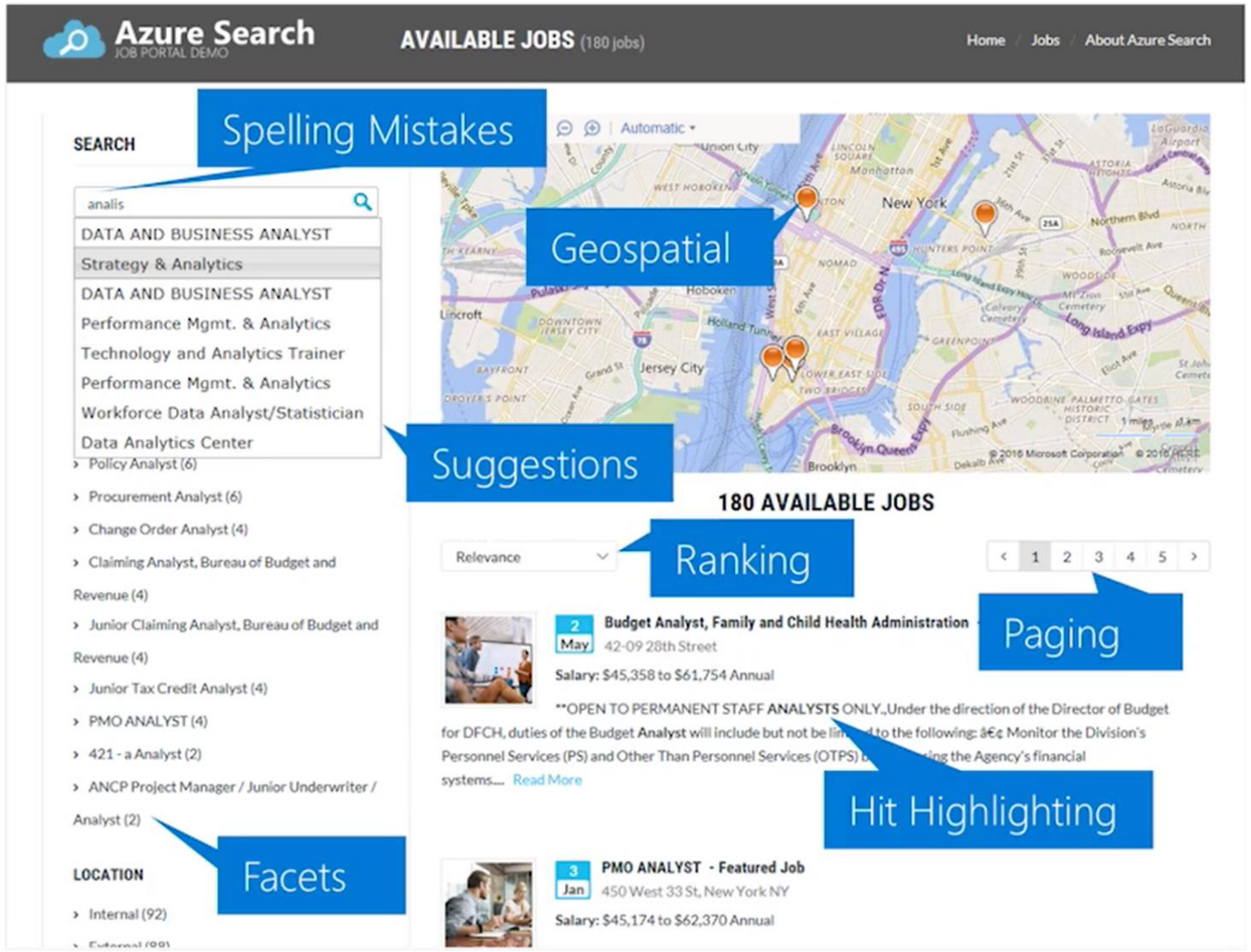
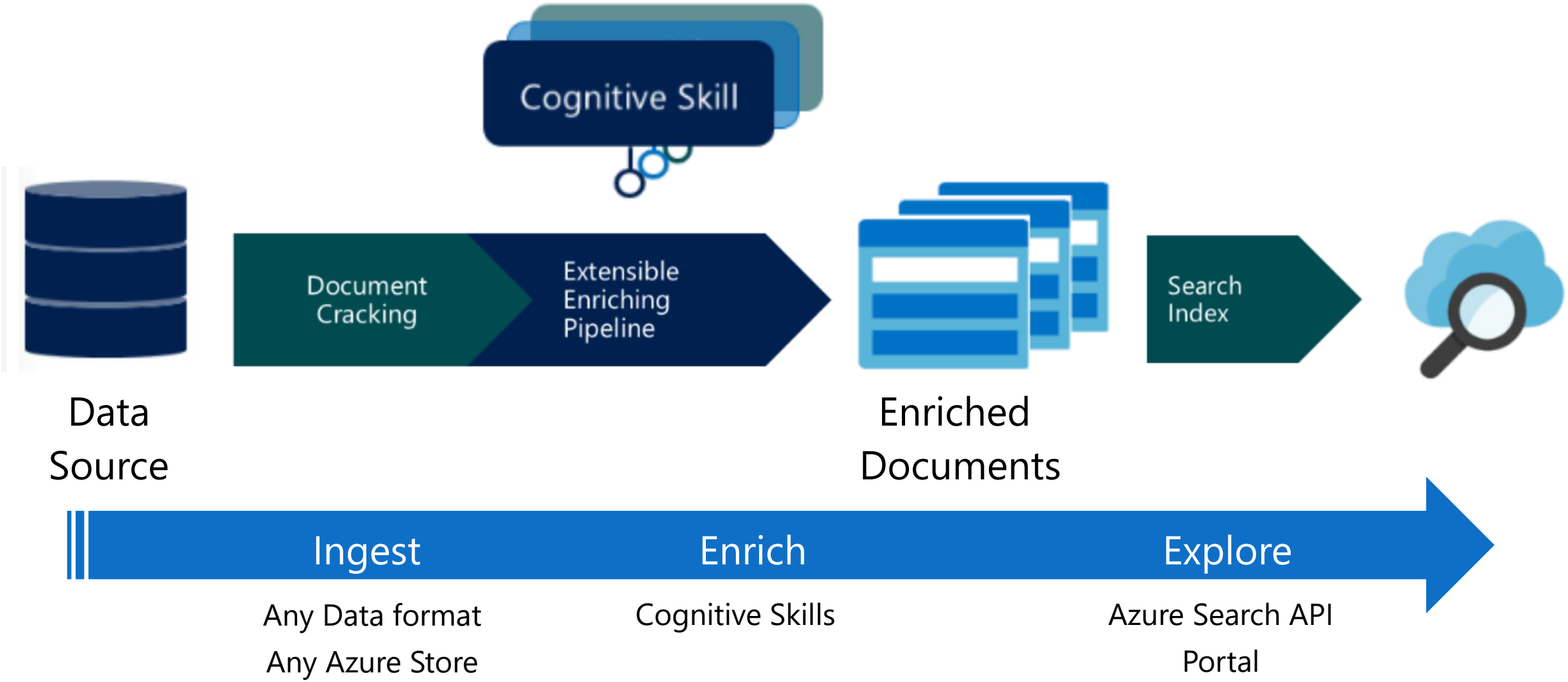
What Azure Search is

- AI-Powered cloud search service for web and mobile app development
- Enterprise Search as a Service – Azure PaaS product
- Enrich and extract insights through cognitive skills (Cognitive Search)
- Easily scale up and down
- Natural Language Processing for web search grade experience
- Connect search results to business goals with great control over search ranking
- 99.9% SLA, GDPR, Standard Azure OST (Online Service Terms)
- Creates indexed metadata about your data

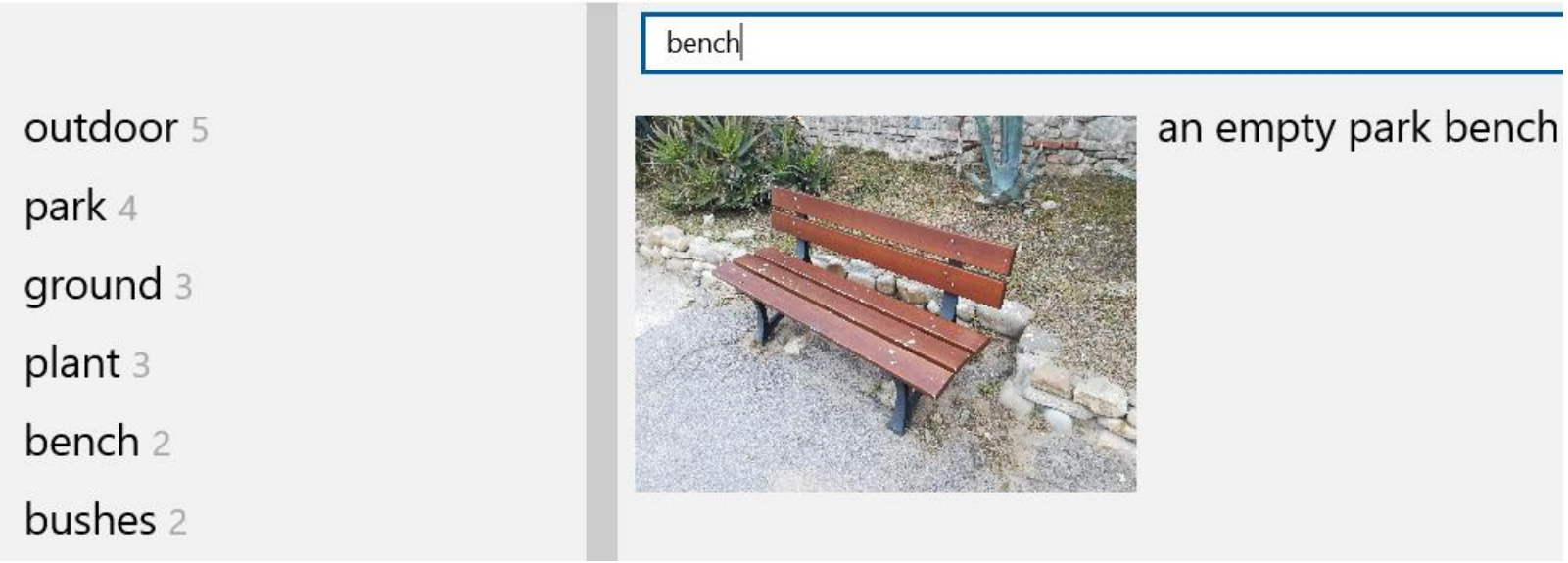


Azure Cognitive Search Pipeline



Demo – Cognitive Search

Search42 - You ask, I have THE answer https://github.com/DotNetToscana/CognitiveSearch



JFK Files
https://jfk-demo.azurewebsites.net/

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Links to demos

- ML.NET: https://github.com/microsoft/InsiderDevTourDemos19/tree/master/Sessions/ml/ML.NET%20Demo
- Custom Vision: https://github.com/DotNetToscana/CustomVisionCompanion
- Cognitive Search: https://github.com/DotNetToscana/CognitiveSearch