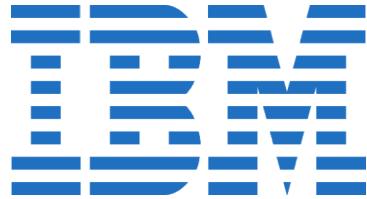


# Applying AI and Analytics to COVID-19

June 24, 2020

The session starts at 9:00am.

# Applying AI and Analytics to COVID-19



Power of data. Simplicity of  
design. Speed of innovation.

**Asad Mahmood**

**Bernie Beekman**

**Lee Angelelli**

**Michael Cronk**

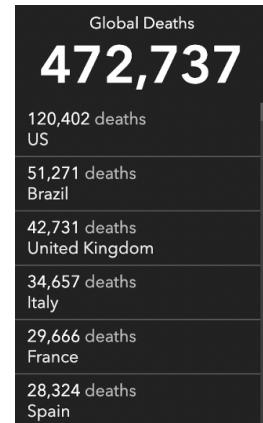
**Vishesh Javangula**

# Agenda

Time	Description
9:00am – 10:00am	Introduction to IBM Cloud, Watson Services, Watson Studio, and Decision Optimization
10:00am – 11:30am	Lab 1 – Develop pandemic and socioeconomic annotators to extract domain-specific information
11:30am – 12:00pm	Lab 2 – Create a knowledge management system (KMS), ingest data, train the KMS to generate knowledge, and analyze information to create a COVID-19 stability index
12:00pm – 12:30pm	Lunch
12:30pm – 1:00pm	Lab 2 – Create a KMS (continued)
1:00pm – 2:00pm	Lab 3 – Develop a COVID-19 Chatbot Assistant
2:00pm – 3:30pm	Lab 4 – Forecast COVID-19 outbreaks – find optimal ways to relocate sick people among areas
3:30pm – 5:00pm	Lab 5 – Develop dashboards that display COVID-19 statistics
5:00pm – 5:15pm	Wrap up – Q&A

# Introduction - Applying AI and Analytics to CoVID-19

- **Situation:** COVID-19 virus is causing global deaths and socioeconomic instability
- **Problem:** People scared about their livelihood; disengaged in economies and society
  - Leaders unable to collect/analyze information about COVID-19 virus, assess impacts, @speed/scale
- **Impacts:** Lack of insight into current/future situation and non-optimal decisions/responses
  - Minimal insight into coronavirus spread, inaccurate demographic info about infections/symptoms
  - Peoples fears/needs, inventory of essential products, supply-chains, necessary financial response
  - Shutdown of economies, community unrest, uncontrolled deficits expanding, etc.
- **Need:** Data-Driven environment supported by intelligent systems and processes that can:
  - Collect structured/unstructured data, create perception, understand, reason, and learn
  - Understanding current/future (predicted) COVID-19 surges/resurges
  - Identify current/future problems, obstacles, and impacts on societies, economies, etc.
  - Generate optimized decisions and response localized to areas



## Training Session Goals

- **Teach attendees how to apply Artificial Intelligence (AI), Machine Learning (ML), and optimization to COVID-19 use cases**
- **Through a series of labs – attendees will develop capabilities that can:**
  - Ingest/extract information from text to create knowledge
  - Understand human language, concepts, tones, needs, etc. to inform planners
  - Analyze the information to create social health indexes
  - Create 'chat-bots' that act on this knowledge to answer peoples' questions
  - Analyze current drivers to forecast future conditions
  - Create decision optimization models based on current/future conditions
- **The above capabilities will enable planners to respond with speed at scale**

# Outline

- **IBM Cloud Overview**
- **Watson Services Overview**
- **Watson Studio Overview**
- **Labs**



# What is IBM Cloud?

The IBM Cloud is an **open-standards**, cloud-based innovation platform for *building, managing, and running* applications **of all types** (web, mobile, big data, smart devices, and more).



## Instant Environments

The developer can choose any language runtime or bring your own. Zero to production in one command.

## DevOps

Development, monitoring, deployment, and logging tools allow the developer to run the entire application.

## APIs and Services

A catalog of 125+ IBM, third party, and open source API services allow the developer to stitch an application together in minutes.

## Build your apps, your way

Use the most prominent compute technologies to power your app: Cloud Foundry, Docker, Kubernetes.

## On-Prem Integration

Build hybrid environments. Connect to on-premise assets plus other public and private clouds.

## Flexible Pricing

Sign up in minutes. Pay as you go and subscription models offer choice and flexibility.

# How Does IBM Cloud Work?

## BUILD

DevOps  
Tooling

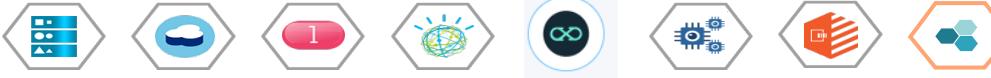


Your Own Hosted Apps / Services



Catalog of Services that Extend Apps' Functionality

## ENRICH



## EXPLORE

Flexible Compute Options to Run Apps / Services

## DEPLOY

Functions



Instant Runtimes



Containers



Platform Deployment Options that Meet Your Workload Requirements

Cloud  
Public



Cloud  
Dedicated



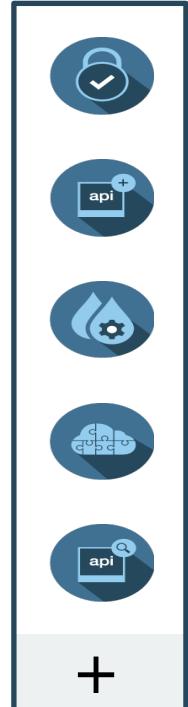
Cloud Local &  
IBM Cloud  
Private



Powered by IBM Cloud Infrastructure

In Your Data Center

Integration and API  
Mgmt



# IBM Cloud DevOps Capabilities

# Cloud.net/devops

**Deliver to market with speed, control, confidence and compliance**

# Cognitive DevOps Insights

# Continuous Delivery

## *Speed with control*

## Continuous Availability

*Always on  
Automated ops*

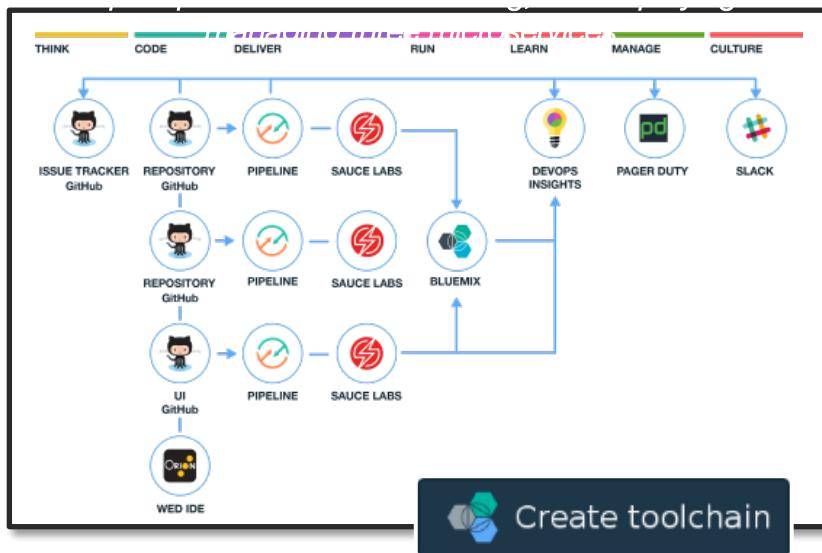
# Continuous Security

# *Protect & defend*

# Open Toolchain



# Built on the Open Toolchain foundation



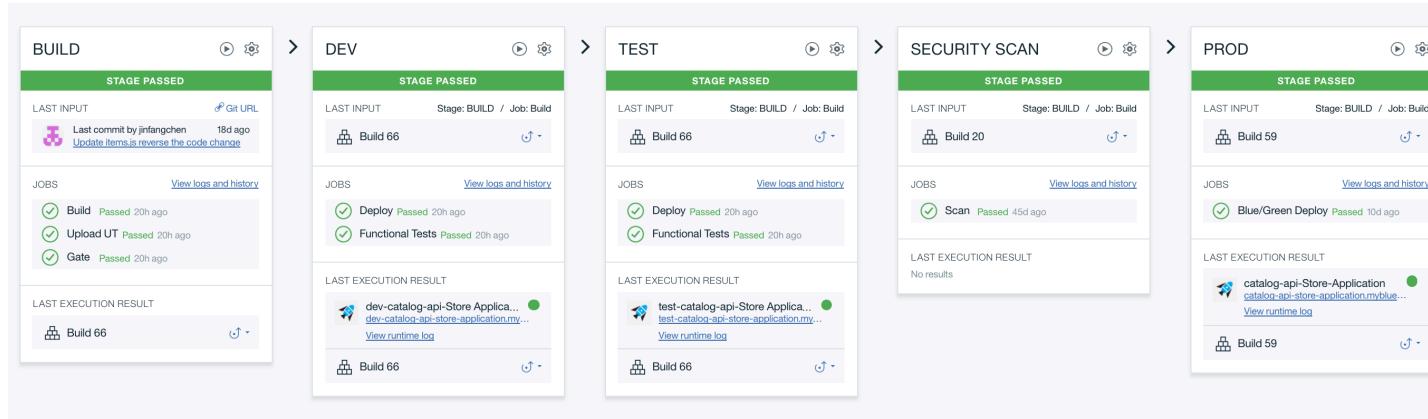
Toolchains provide an integrated set of tools that support the best practices to build, deploy and manage your apps

You can create toolchains that include Cloud services, open source tools, and third-party tools that make development and operations repeatable and easier to manage

Rapidly instantiate new toolchains from templates to on-board new teams quickly



# Deliver Continuously using an Integrated Pipeline



## Import Code

Import, build, and deploy an application from a GitHub repository in a few clicks

## Continuous Integration

Automate builds and deployments for many types of code, running builds automatically when code changes

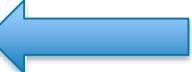
## Continuous Testing

Drive automated unit tests, function tests, security scans, and more; with quality gates

## Deliver to Multiple Platforms

Deploy applications to Cloud Foundry, Cloud, IBM Containers, other clouds, or on-premises systems

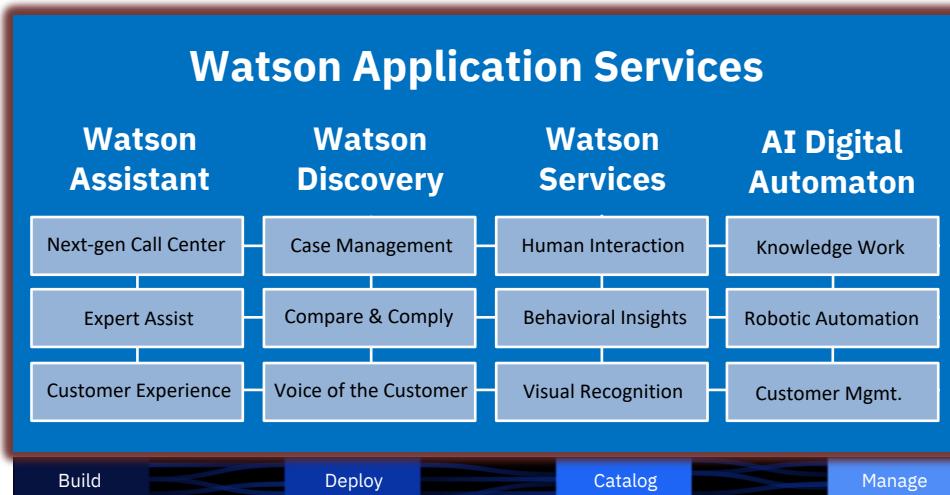
# Outline

- IBM Cloud Overview
- Watson Services Overview 
- Watson Studio Overview
- Labs

# IBM Watson AI Services

Use IBM AI capabilities to create cognitive systems that can:

- **Understand** – understand human language
- **Reason** - understand underlying concepts, forms hypothesis, and can infer based on present data
- **Learn** - value increases over time as AI improve with each new piece of information and with each new interaction
- **Interact** – the ability to talk, hear, and interact with humans in a natural way



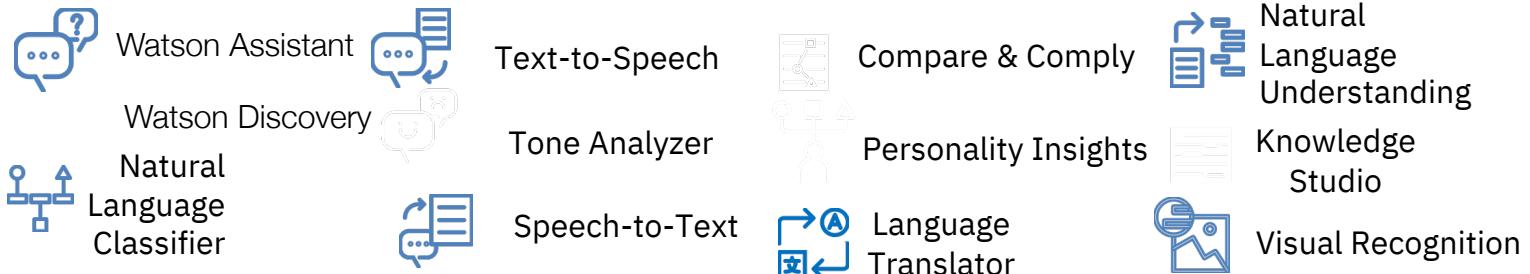
Predict and shape future outcomes

Optimize labor to higher value work

Automate decision, processes & experiences

Reimagine new business models

## Watson Services



<https://cloud.ibm.com/catalog?category=ai>

# Watson Knowledge Studio

- Create a machine learning model
  - Understands the linguistic nuances, meaning, and relationships specific to an industry
- Create a rule-based model
  - Finds entities in documents based on rules that you define
- Build models without requiring deep technical skills or coding
- Apply curated model to multiple applications including Discovery and Assistant

Watson Knowledge Studio

Completed  Close

Relation Type

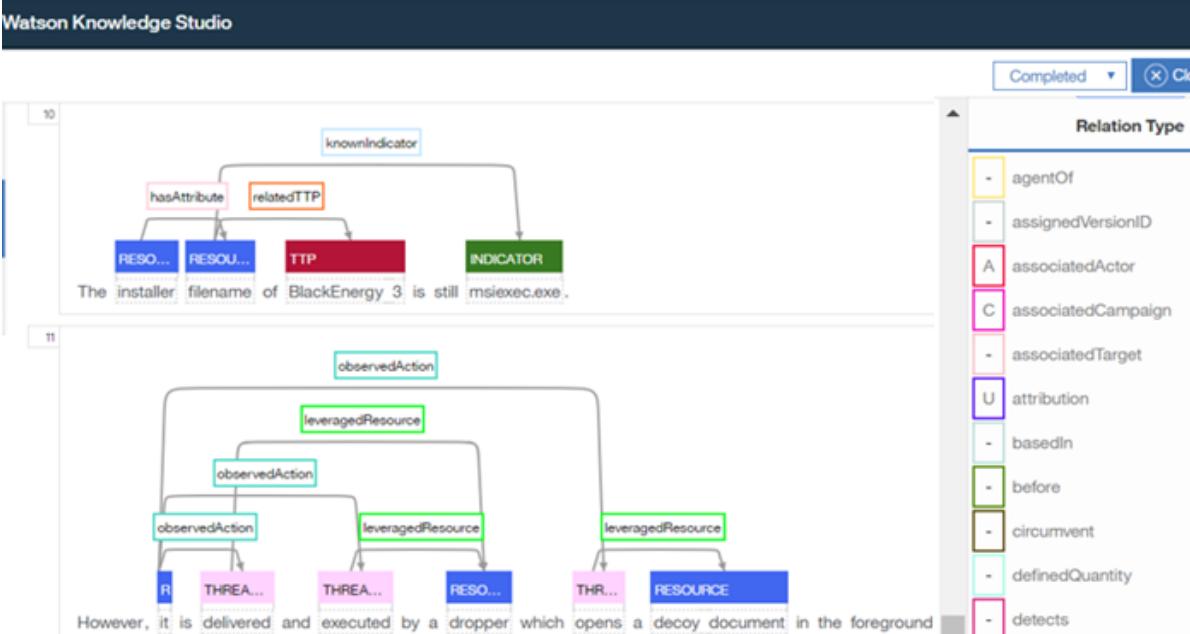
- agentOf
- assignedVersionID
- A associatedActor
- C associatedCampaign
- associatedTarget
- U attribution
- basedIn
- before
- circumvent
- definedQuantity
- detects

The installer filename of BlackEnergy 3 is still msieexec.exe.

Discovery

However, it is delivered and executed by a dropper which opens a decoy document in the foreground

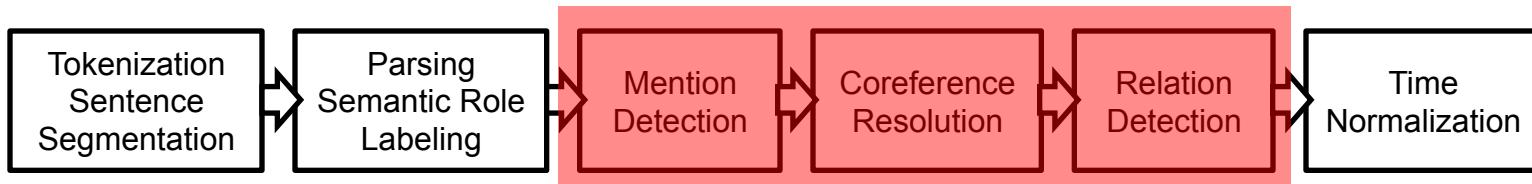
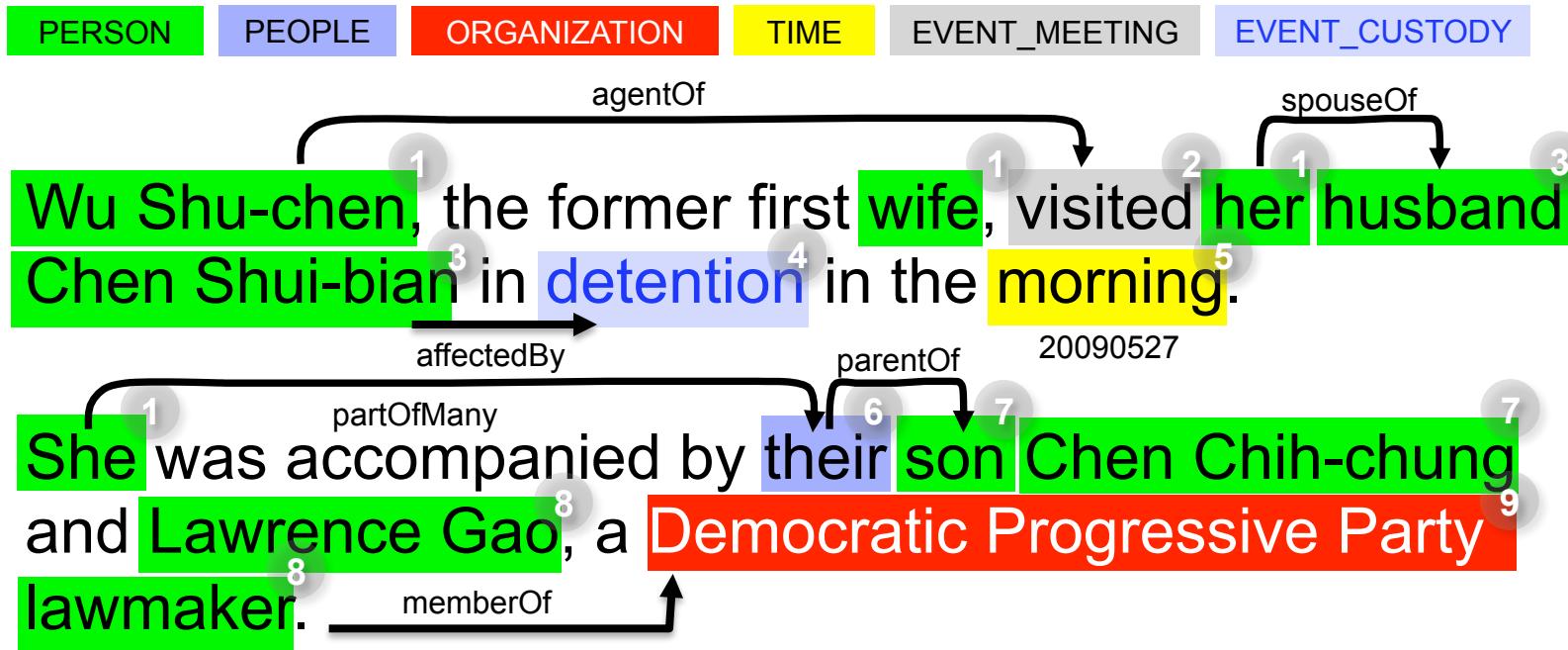
Natural Language Understanding



This figure illustrates the Watson Knowledge Studio interface, showing two examples of knowledge graphs extracted from text. On the left, a graph for 'Discovery' shows entities like 'RESO...', 'RESOU...', 'TTP', and 'INDICATOR' connected by relations such as 'hasAttribute' and 'relatedTTP'. A legend on the right lists various relation types. On the right, a graph for 'Natural Language Understanding' shows entities like 'R', 'THREA...', 'RESO...', 'THR...', and 'RESOURCE' connected by 'leveragedResource' and 'observedAction' relations. Arrows point from each graph to its respective application icon.

# WKS Annotation Example

- Uses mention/relation detection and coreference to understand human language



# Watson Discovery Service

Rapidly add a cognitive search and content analytics engine to applications to identify patterns, trends and actionable insights that drive better decision-making



- **Automate Data Ingestion** using the APIs, web upload or data crawler and feed through Document Conversion to deal with multiple file types
- **Apply enrichments** to make the raw data ‘smarter’ with easy Natural Language Processing and custom models to extract entities, relations, keywords, sentiment, etc.
- **Combine Diverse Content Sources** to create one-of-a-kind applications that leverage data from pre-enriched sources and private content from across the enterprise
- **Extract Insights** with simple but powerful queries that support multiple query types including boolean, filter, and aggregation queries to discover patterns, trends and answers
- **Extend conversation apps** to find answers without modeling intents

## | Data

Private data



## | Ingestion

Convert and enrich by leveraging Watson APIs to add NLP meta data to your content, making it easier to explore and discover insights

Clean and normalize through an automated processing of NLP results, improving data quality

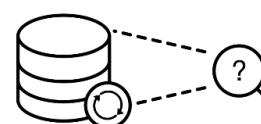
## | Storage

Normalized data is indexed into a collection as part of your environment in the cloud



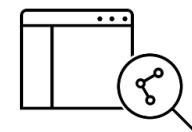
## | Query

Understand data faster, create better hypothesis and deliver better outcomes



## | Output

Actionable insights into your app



# Watson Assistant

## Solution

- Enables callers to converse in natural language to address questions or complete tasks in real-time via phone
- Leverages Watson Assistant, Watson Speech, and IBM Voice Agent with Watson

## Assistant / Skills

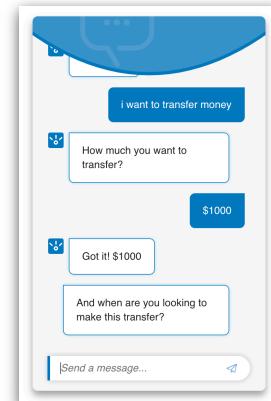
- Assistant maintains session context and can connect to a number of managed integrations
- Assistant references “skills” which contain reasoning logic and responses
- Preview link integration allows you to quickly share your bot internally before launching

## Benefits

- Reduce cost of resolving customer query (deflection)
- Improve customer satisfaction by answer & resolve calls more quickly

The screenshot shows the Watson Assistant interface. At the top, there are tabs for Home, Skills, and Assistants, with Assistants selected. To the right, it says "Instance Watson Assistant (formerly Conversation)-b4" and "Change". Below the tabs, there's a breadcrumb navigation "[Assistants](#)". The main content area displays the "TW Bank Bot" skill. It has a brief description: "TW bank's banking assistant!". On the right side, there are buttons for "View API Details", "Rename", and "Delete". Below the description, there's a section titled "Skill" containing the skill name "TW Bank Bot" and a "More" button. Underneath, there are sections for "LANGUAGE: English (US)", "TRAINED DATA: 22 Intents | 5 Entities | 53 Dialog Nodes", "DATE CREATED: Wed Dec 05 2018", and "DATE MODIFIED: Wed Dec 05 2018". A "LINKED ASSISTANTS" section lists "grnnejwkgnewjkl, TW Bank Bot". On the far right, there's an "Integrations" section with a sub-section titled "Choose a channel to deploy your Assistant." It includes a "Add integration" button, a "Preview Link" button with a "Copy" icon, and a "More" button.

The screenshot shows the "Add Integration" dialog box. At the top, it says "Add Integration" and "Select a deployment method that is managed for you and can be configured within the tool or learn about other ways to deploy the assistant." Below, there are two main sections: "Managed|Built-in integrations" and "Other integrations". In the "Managed|Built-in integrations" section, there are three items: "Facebook Messenger" (with a Facebook icon), "Preview Link" (with a blue square icon), and "Slack" (with a gear icon). Each item has a brief description below it. In the "Other integrations" section, there are two items: "Custom application" and "WordPress plug-in", each with a "Learn more" link. At the bottom right of the dialog box, there's a "Send a message..." input field with a send icon.



# AutoDesk - Watson Assistant Use Case



For more than 34 years, software giant Autodesk sold its popular 3D design, engineering and entertainment software under perpetual desktop licensing agreements. However, the way customers wanted to buy and access products changed. Recognizing that shifting to a subscription business model requires real-time customer service and support, Autodesk developed a virtual agent to interact with customers and improve their experiences.

## 100 , 000

Supports 100,000 conversations per month, easing the burden on call center staff

## 99%

Improvements in customer response times for Autodesk by implementing Watson

## 5 – 10 min

Resolves cases in five to 10 minutes as opposed to a day and a half. And the only reason it takes five to 10 minutes is because that's how long a customer needs to type in or find specific information, such as matching a serial number to an entitlement or contract

## 14M

Analyzes a total of 14 million sentences for keywords, entities, phrases, clusters, and other speech and language patterns



## 60

Different use cases recognized to quickly resolve easy requests so that agents can focus on helping customer with complex issues

## 5 . 4 min

Drastically reduces resolutions time from 1.5 days to just 5.4 minutes for most inquiries

## Connect

With IBM and Salesforce, you'll have the capability to seamlessly connect real-time insights found in unstructured data to discovery within customer data.

## ↑ 10pt

10-point increase in customer satisfaction levels because customers don't have to wait as long to have their questions answered



Learn more  
[Read the full case study](#)  
Contact Us  
<https://www.ibm.com/watson/partnerships/>

# What is Project Debater?

- A grand challenge IBM Research project which demonstrated:
  - A computer system that successfully participated in a verbal, competitive debate against a human opponent
  - Our advancement and integration of Natural Language Understanding, Natural Language Generation and the emerging field of computational argumentation

- Try Project Debater at  
<https://ui.debater.res.ibm.com/domain/public>



- Project Debater Applications



**Voice of the people** - qualitative and quantitative assessment of the views of customers, constituents, employees etc., as expressed in free text responses to surveys or implicit information in social media, conversation logs, interviews, etc.

Potential users: *Marketeers, Sellers, Executives, HR*



**Corpus-wide mining:** : detect relevant information that can impact your business decision-making process pro-actively and usefully.

Potential users: *financial analysts, intelligence analysts, risk officers, journalists, marketeers*

# Project Debater Capabilities

## Speech writing and delivery

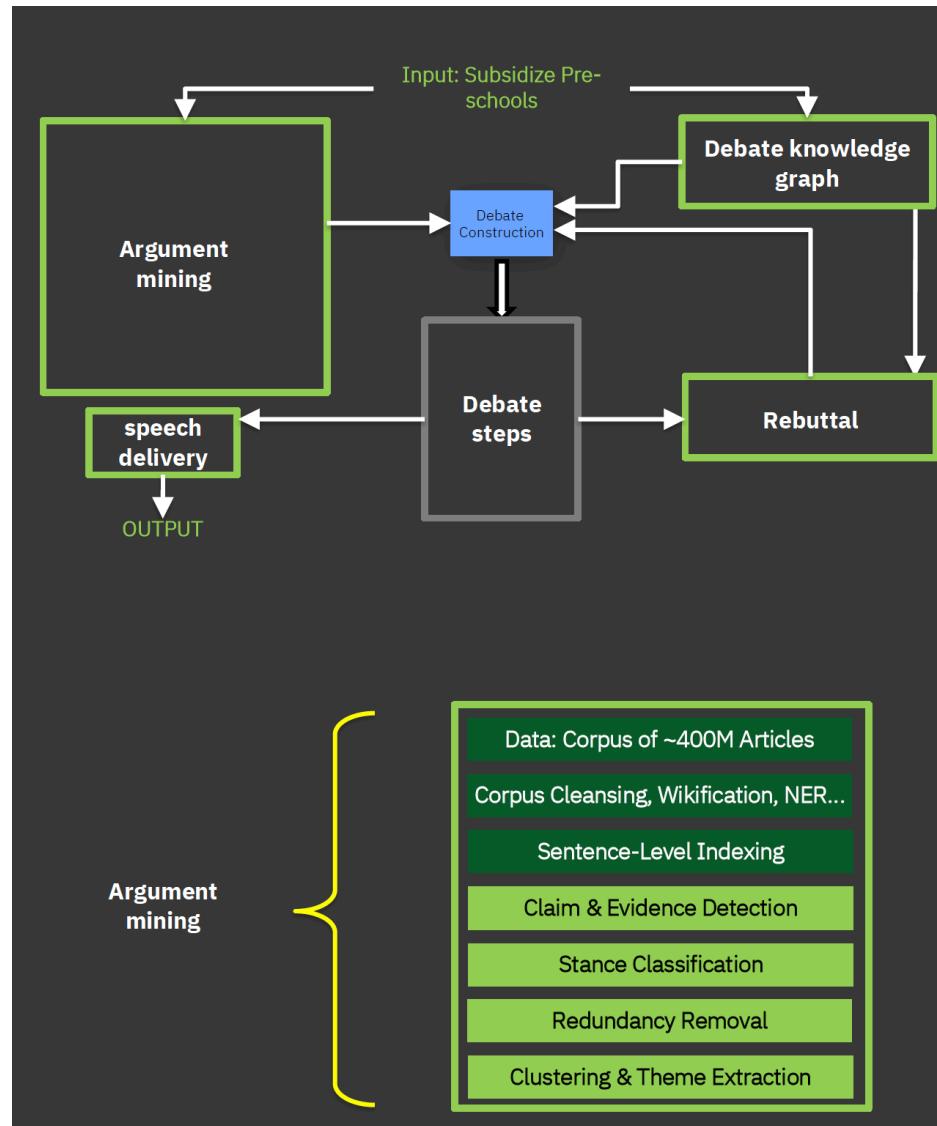
- Digest massive corpora
- Create a well-structured narrative
- Deliver with clarity and purpose

## Listening with Comprehension

- Identify key arguments in long continuous spoken language

## Modeling Human Dilemmas

- Model controversy
- Propose principled arguments

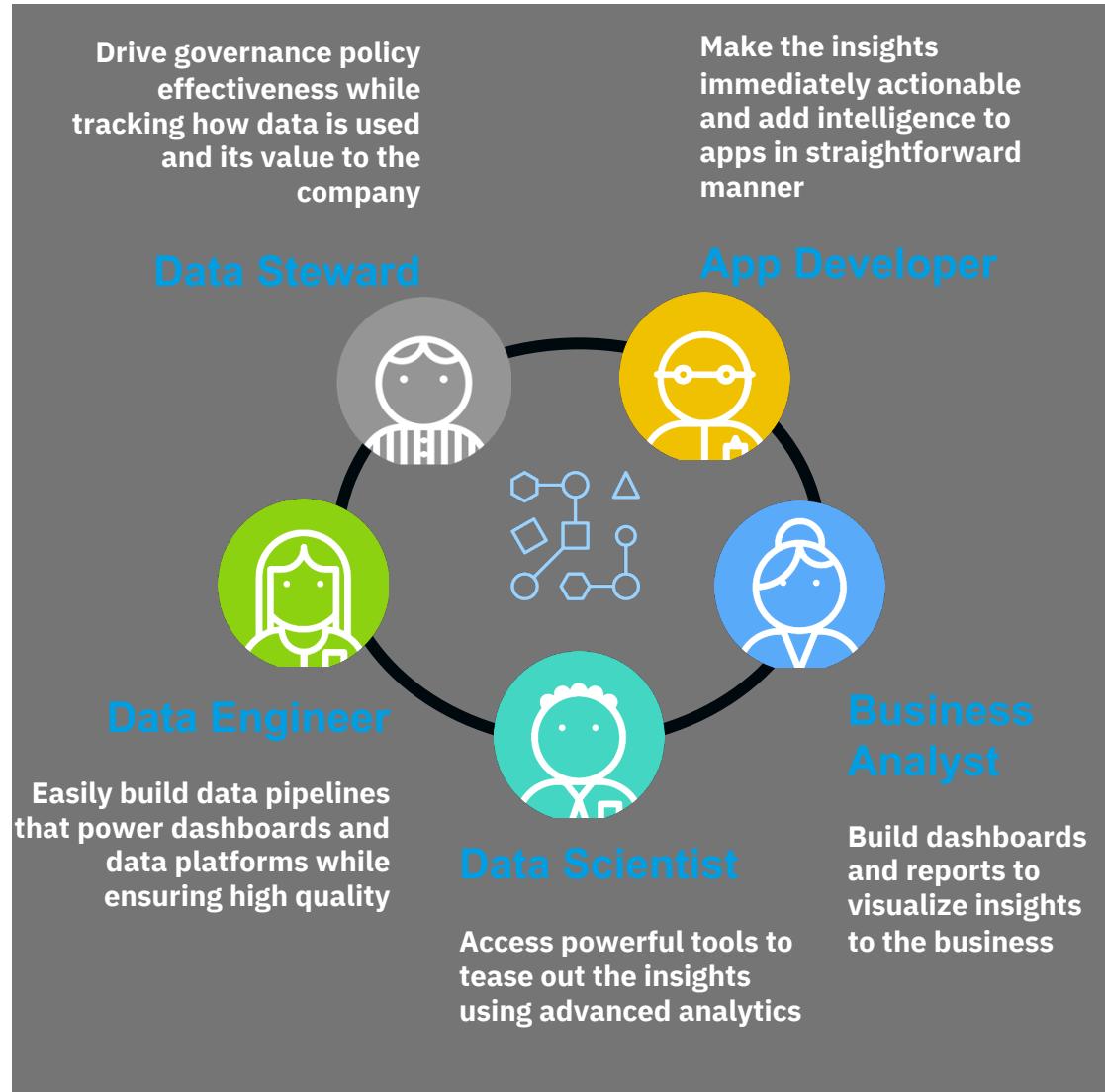


# Outline

- IBM Cloud Overview
- Watson Services Overview
- Watson Studio Overview 
- Labs

# IBM Watson Studio Platform

An integrated platform of tools, services, data, and metadata that help companies or agencies accelerate their shift to be data-driven organizations.

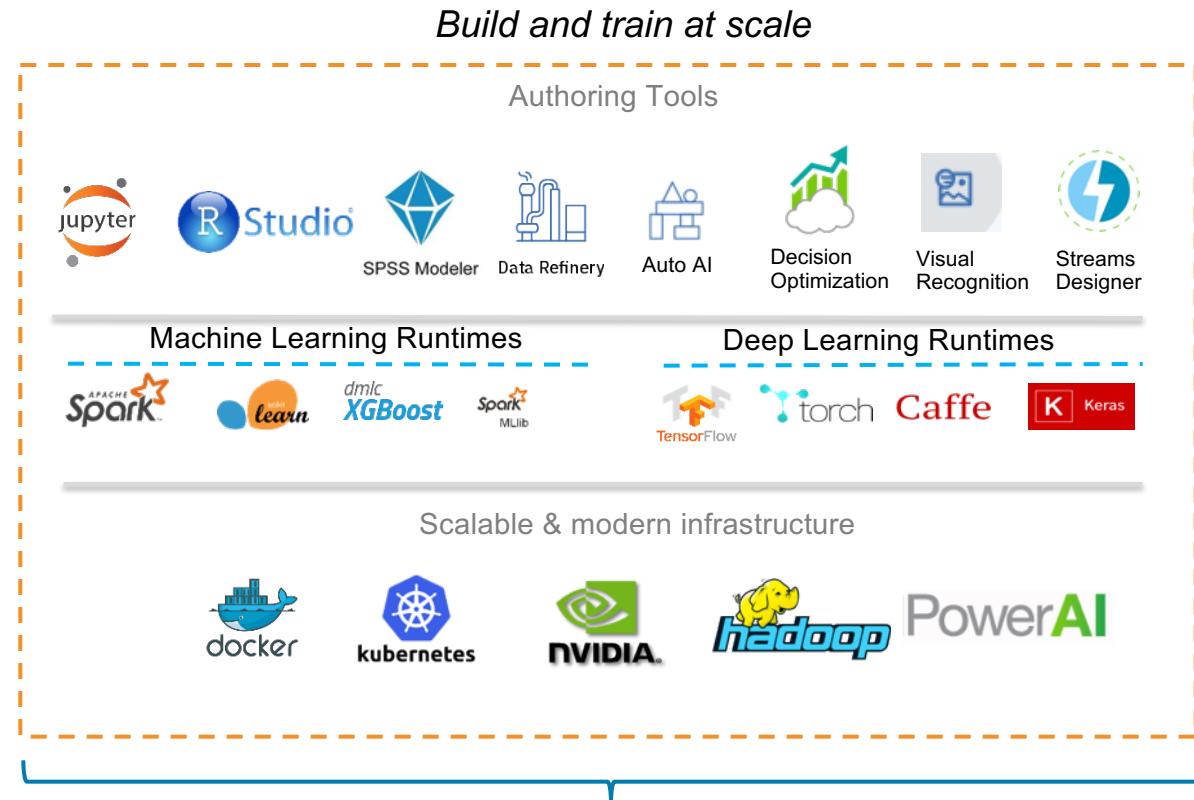


# Watson Studio Deployment Options

- Watson Studio on IBM Cloud
  - Managed offering provided by IBM
- Watson Studio Desktop
- IBM Cloud Private for Data
  - Watson Studio Local

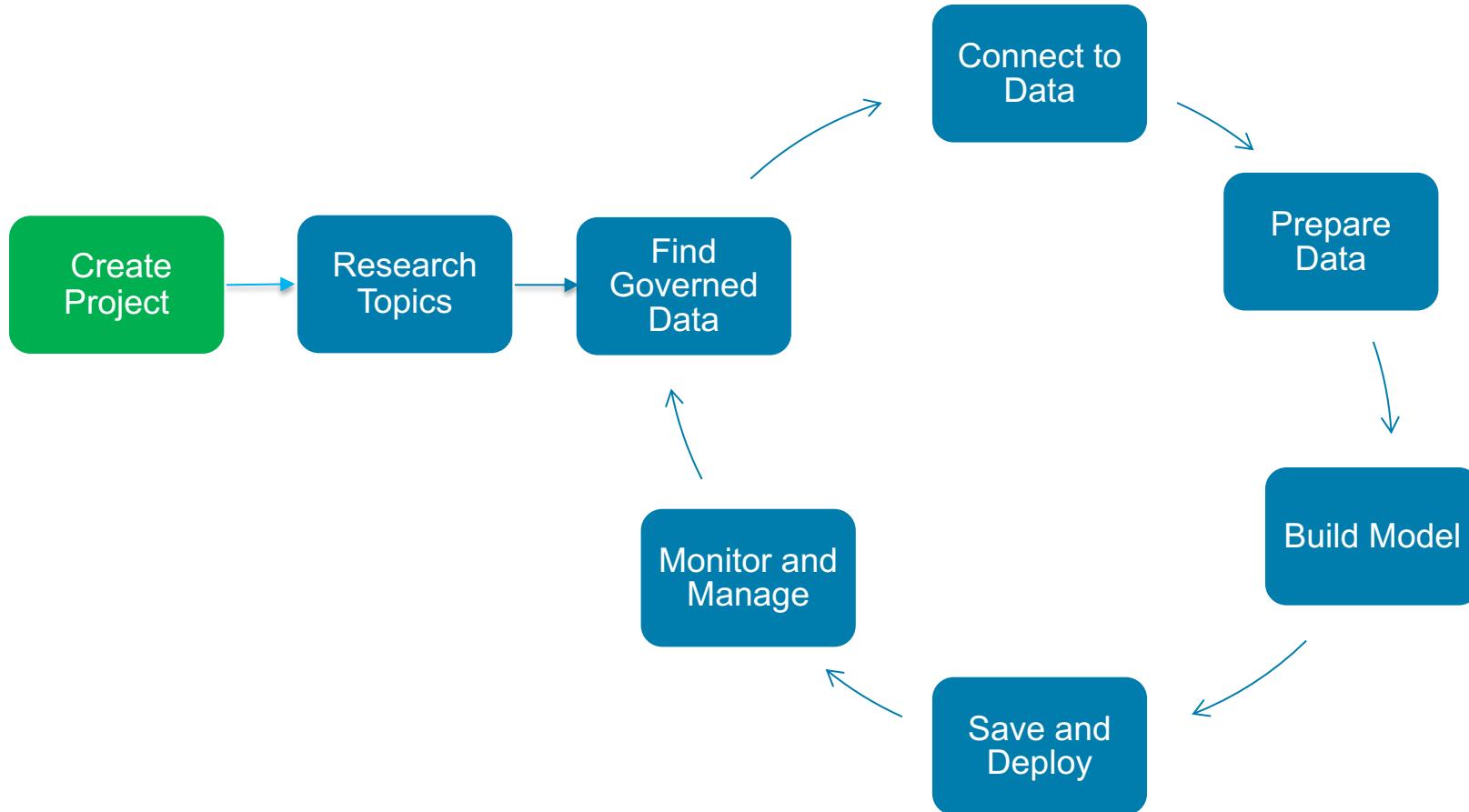
# Watson Studio Tools

- Using best of breed - Open source & IBM tools
- Code (R, Python or Scala) and no-code/visual modeling tools
- Container-based resource management
- Elastic cpu/gpu power
- Run on x86, Power, zLinux
- Integrate with Hadoop/Spark Infrastructure
- Train and deploy where your data lives



# Watson Studio supports the Data Science Lifecycle

*Build, train, deploy, and monitor at scale ML/DL workflows to infuse AI into the enterprise to drive innovation.*



# Watson Studio Project Features

*Making Data Science a Team Sport*

Create  
Project

- Organizes resources to achieve a particular data analysis goal
- Support role-based collaboration (Admin, Editor, Viewer)
- Assets from all IDEs can be included in one Watson Studio project: notebooks, data sources, flows, models, etc.
- Export/Import Projects

# Add to Project

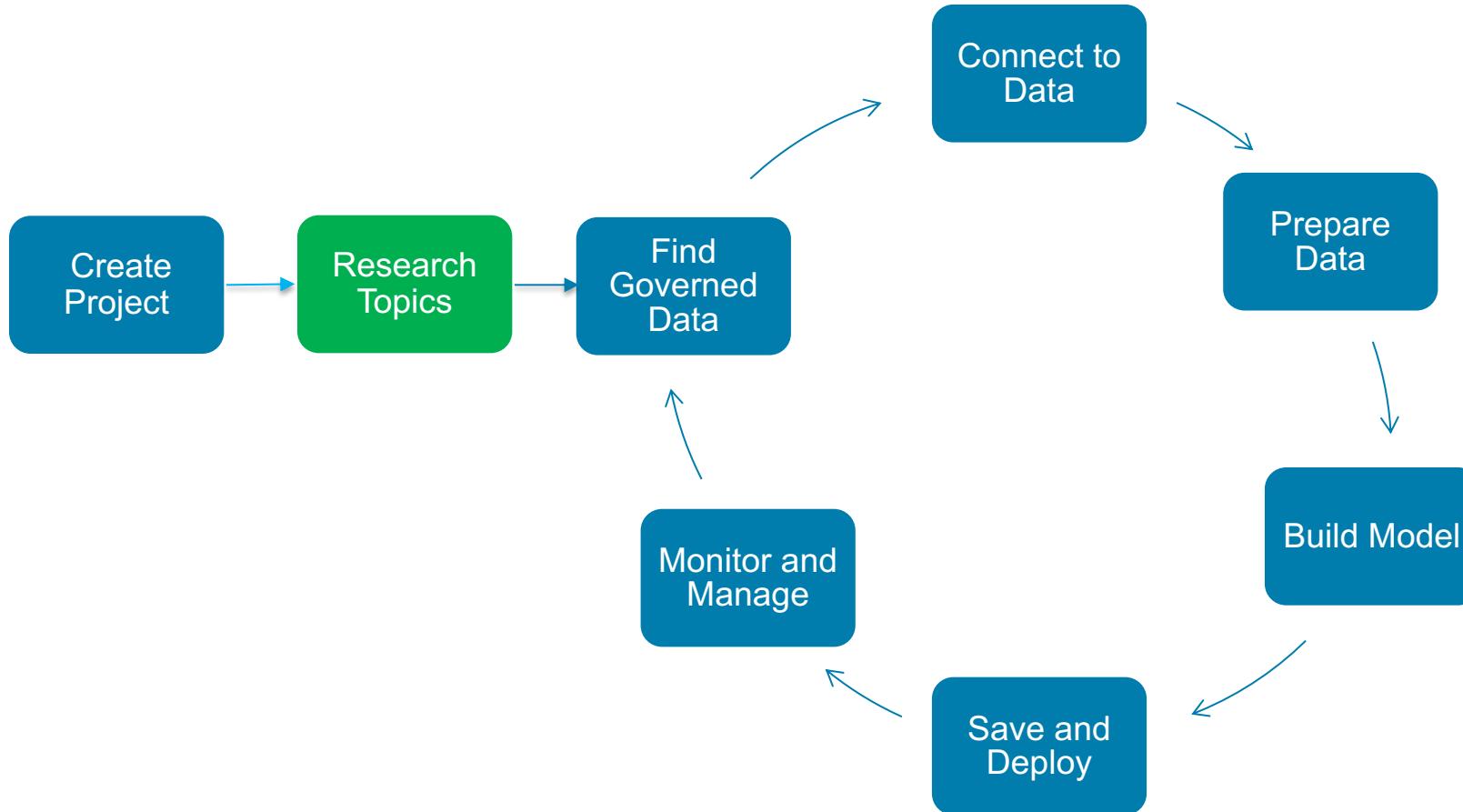
Choose asset type

Available asset types

 Data	 Connection	 Connected data
 AutoAI experiment	 Notebook	 Dashboard
 Visual Recognition ...	 Natural Language Cl...	 Watson Machine Lea...
 Deep learning exper...	 Modeler flow	 Data Refinery flow
 Streams flow	 Decision Optimizatio... <span>NEW</span>	

# Watson Studio supports the Data Science Lifecycle

*Build, train, deploy, and monitor at scale ML/DL workflows to infuse AI into the enterprise to drive innovation.*



# Watson Studio Gallery

*Built-in learning to get started*

Research  
Topics

- The Gallery includes notebooks, and data sets
- Copy notebooks or Data Sets into projects
- Continuously updated in IBM's managed service

# Watson Studio Community

Research Topics



IBM Data Science Community Topic groups Local User Groups Events Participate Data Science Elite

## Watson Studio and Machine Learning

Join the conversation.

[Join / sign up](#)

[Explore Watson Studio](#)



Feed

News

Group resources

Learn

Support

## Welcome!

You are not yet signed up for the IBM Community.

[Join / sign up](#)

## Discussions

[Login to start a discussion](#)

Term / Keyword / Phrase



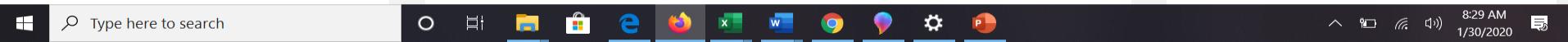
WATSON STUDIO

Ready to build [Trustbit] Using Watson Studio, ML, IBM Blockchain...

## Events

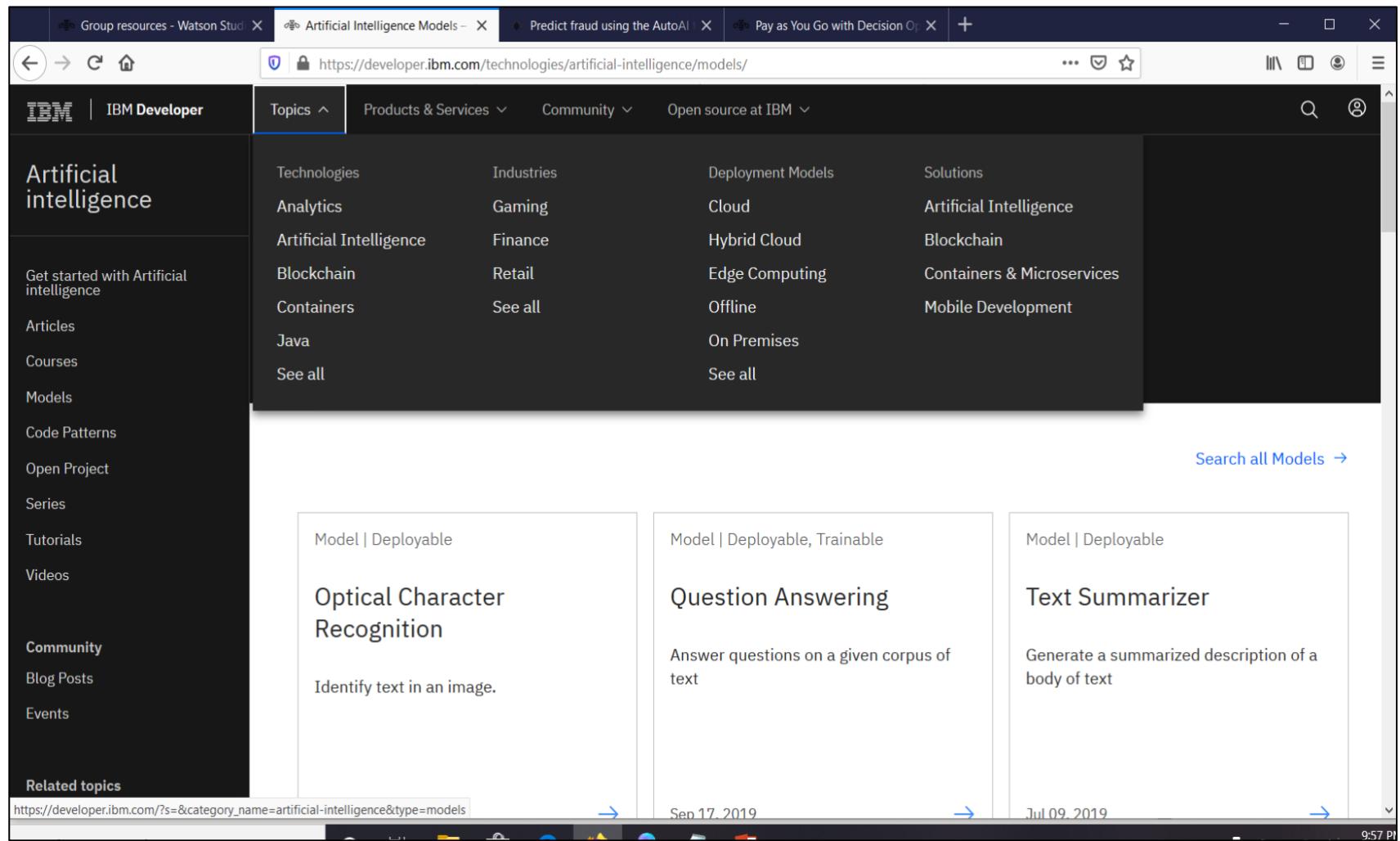
No upcoming events.

[View all events →](#)



# developer.ibm.com

Research Topics



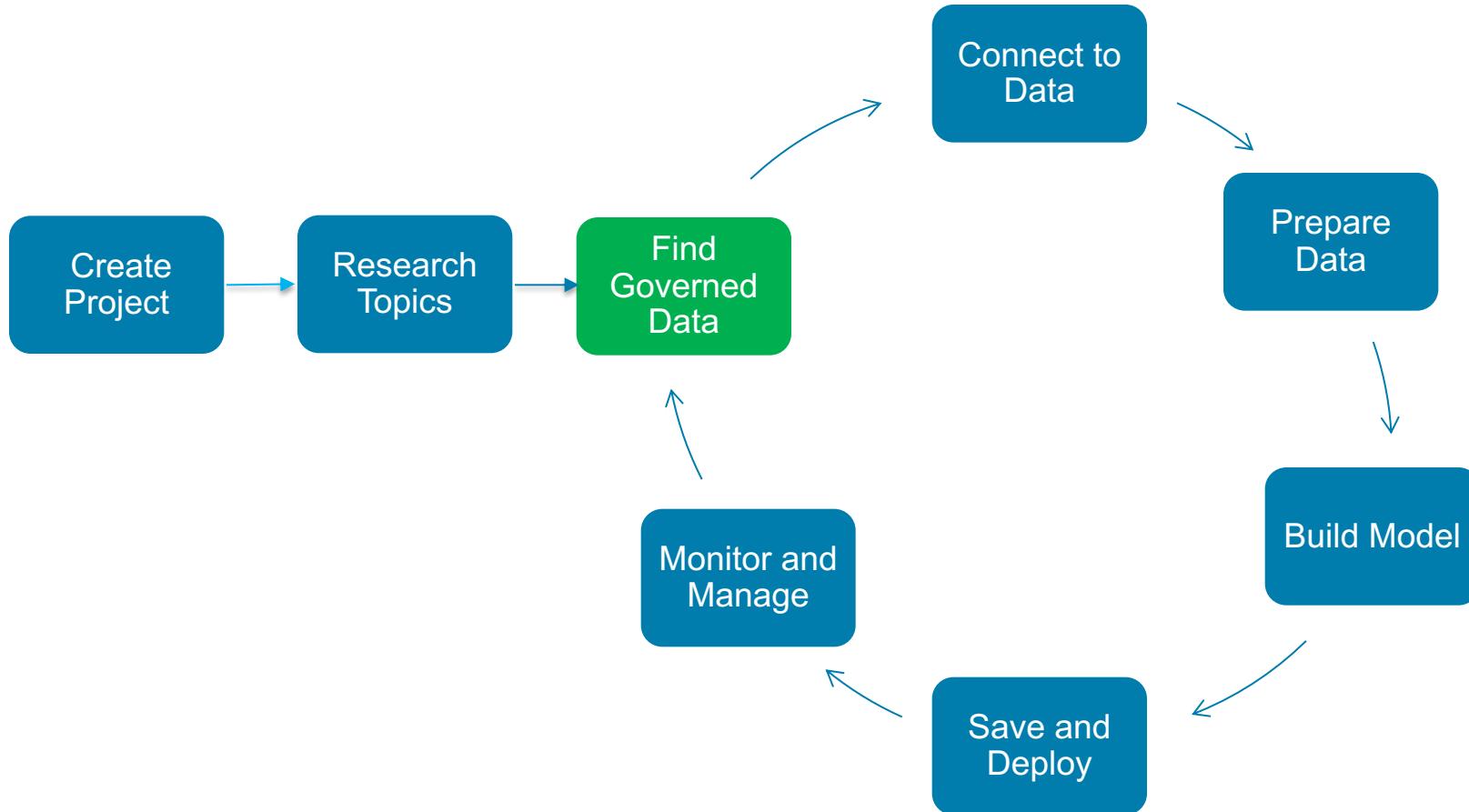
The screenshot shows the IBM Developer website at <https://developer.ibm.com/technologies/artificial-intelligence/models/>. The page is titled "Artificial intelligence". The left sidebar lists categories like "Get started with Artificial intelligence", "Articles", "Courses", "Models", "Code Patterns", "Open Project", "Series", "Tutorials", and "Videos". The main content area displays a grid of AI models:

Model   Deployable	Model   Deployable, Trainable	Model   Deployable
<b>Optical Character Recognition</b> Identify text in an image.	<b>Question Answering</b> Answer questions on a given corpus of text	<b>Text Summarizer</b> Generate a summarized description of a body of text

The URL in the address bar is [https://developer.ibm.com/?s=&category\\_name=artificial-intelligence&type=models](https://developer.ibm.com/?s=&category_name=artificial-intelligence&type=models).

# Watson Studio supports the Data Science Lifecycle

*Build, train, deploy, and monitor at scale ML/DL workflows to infuse AI into the enterprise to drive innovation.*



Find  
Governed  
Data

# Watson Knowledge Catalog Features

*Unlock tribal knowledge and unleash knowledge workers*

- **Find** data (structured, unstructured) and AI assets (e.g., ML/DL models, notebooks, Watson Data Kits) in the **Knowledge Catalog** with intelligent search and giving the right access to the right users.
- Discover assets, profiling, classification
- Policy, rule authoring
- Policy, rule enforcement
- Asset Usage Statistics

# Watson Knowledge Catalog Features

 Data Asset

## female\_human\_trafficking

### Description

There is no description available for this asset.

Added: Jan 31, 2019 10:02 AM

Format: application/octet-stream

Size: 347 KB

### Tags

trafficking | female human trafficking

### Reviews

 0 reviews

### Connection

Source: Watson Studio Labs\_DataCatalog

Source type: Cloud Object Storage

### Classification

Personally Identifiable Information

Personally identifiable information (PII) is defined as any data that could potentially identify a specific individual. Any information that can be used to distinguish one person from another can be considered PII.

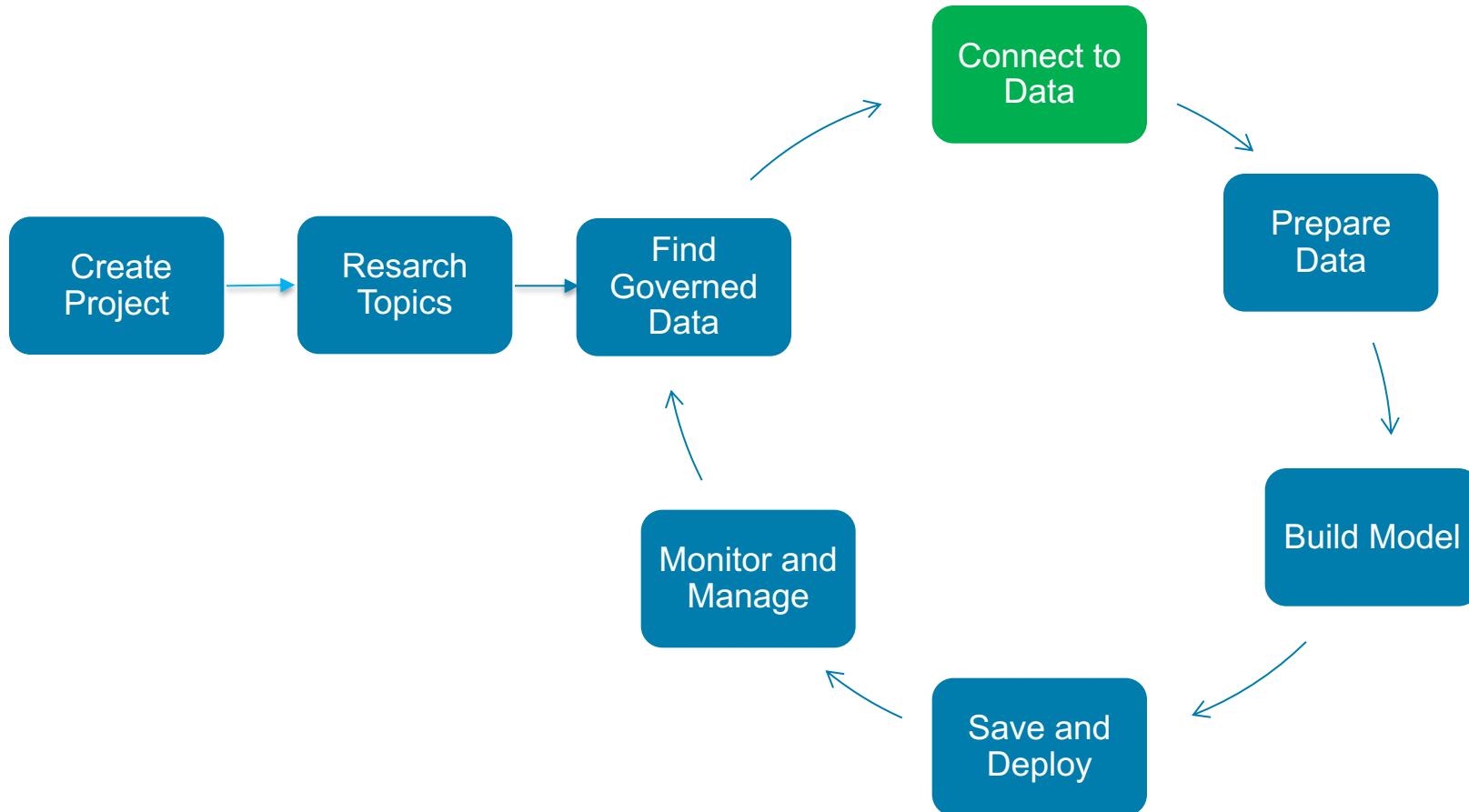
Schema: 26 Columns | 1085 Rows |  2 Columns anonymized 

Preview: 1000 rows | Last refresh: 22 seconds ago |  Refresh

ATE	BIRTH_COUNTRY_CODE	OCCUPATION	ADDRESS	SSN	PASSPORT_NUMBER
15	GH	Engineer, land	824 Kristin Grv, A	afe55d1d355c3:	1c9da91e1e20863dd850
19	GH	Editor, commissi	1148 Wang Fall S	77a0daa42ec7d	12d38855ed107e7cc5dd
16	GH	Merchant navy of	9486 Pratt Wall,	669061087d6d1	c43ed0283a3def7031d8:
17	GH	Paramedic	0890 Johnson Tr	997b59e501b2e	179abee5ba608418154d
18	GH	Surveyor, buildin	2315 Brittany Cr	70329b83b40ct	84524ccc3c5c6590600e!
24	GH	Waste managem	88811 Donald Pa	d2f2236f52407:	a730ae13f5ed96f71e904
23	GH	Doctor, general p	9150 Donald Rp	d2c2d41163d8f:	ced1617be1d70e44421c
02	GH	Forest/woodland	1355 Lopez Villa	62007942c2b0c	8c8debda401b6b6d954b
12	GH	Land/geomatics :	86792 Amy Vlgs,	08f8dd9f9ba89t	a43f1d6c9cacdfa82a1a1
10	GH	Oncologist	108 Erin Via, Nev	f8b871f6e058e2	f289be62078ebbe457c6:
07	GH	Veterinary surge	79572 Schmidt E	f2006c1d30df33	624a9605774a0cf98aa
00	GH				

# Watson Studio supports the Data Science Lifecycle

*Build, train, deploy, and monitor at scale ML/DL workflows to infuse AI into the enterprise to drive innovation.*



# Watson Studio Connection Features

Connect to  
Data

- Upload files
- Connectors to Structured and Unstructured, On-prem and Cloud data sources.
- Wizard based connection definition and code generation

# Connection Options

Connect to Data

New connection

IBM services

 BigInsights HDFS	 Cloud Object Storage	 Cloud Object Storage (infrastructure)	 Cloudant
 Cognos Analytics	 Compose for MySQL	 Compose for PostgreSQL	 Db2
 Db2 Big SQL	 Db2 for i	 Db2 for z/OS	 Db2 Hosted
 Db2 on Cloud	 Db2 Warehouse	 Informix	 Object Storage OpenStack Swift (infrastructure)
 PureData for Analytics	 Watson Analytics		

Third-party services

 Amazon Redshift	 Amazon S3	 Apache Hive	 Cloudera Impala
 Dropbox	 FTP	 Google BigQuery	 Google Cloud Storage
 Hortonworks HDFS	 Looker	 Microsoft Azure Data Lake Store	 Microsoft Azure SQL Database
 Microsoft SQL Server	 MySQL	 Oracle	 Pivotal Greenplum
 PostgreSQL	 Salesforce.com	 Sybase	 Sybase IQ
 Tableau	 Teradata		

[Connect to Data](#)

# Notebook Screenshot

The screenshot shows a Jupyter-style notebook interface with the following elements:

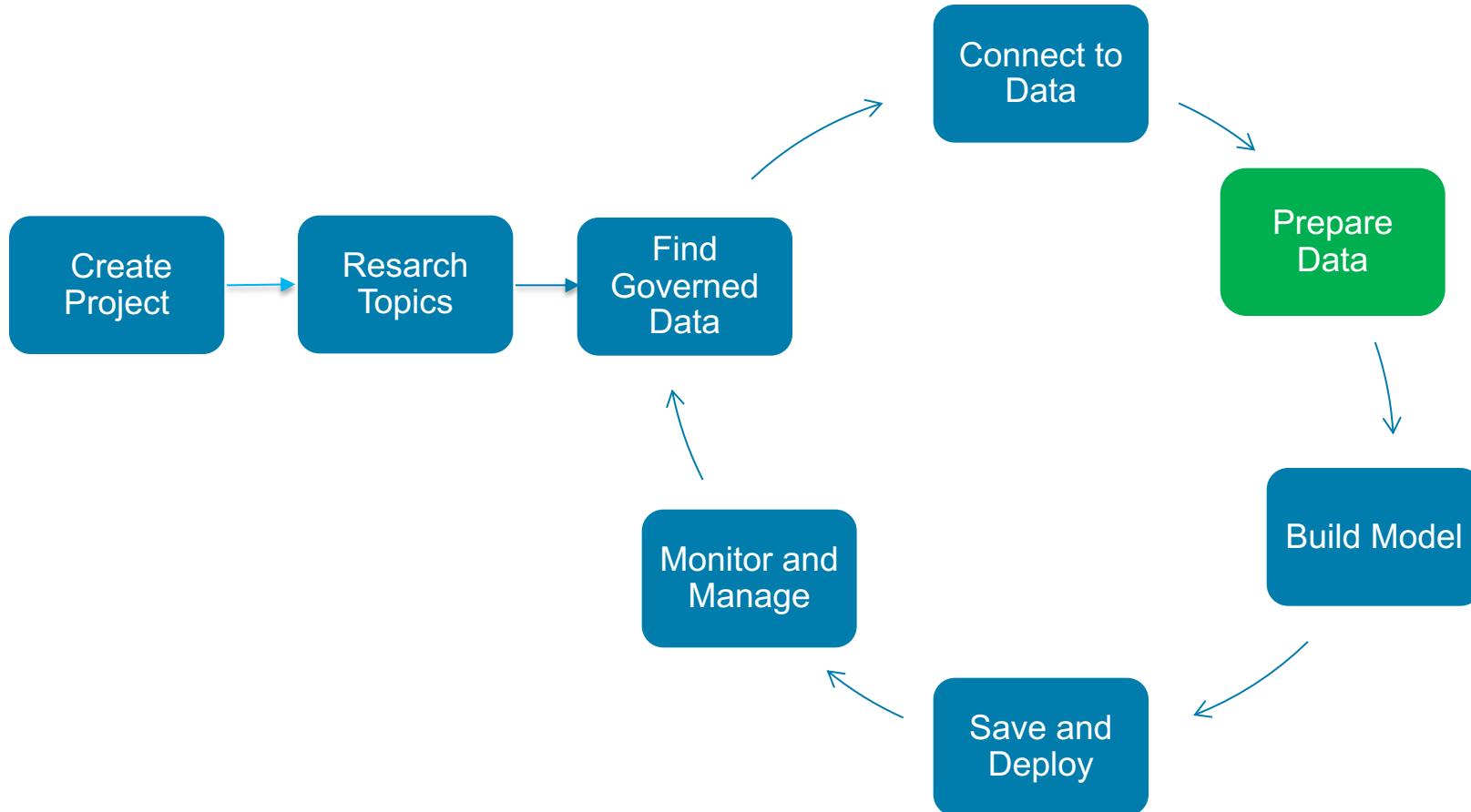
- Top Bar:** File, Edit, View, Insert, Cell, Kernel, Widgets, Help, Trusted, Python3.6, git nbdiff.
- Toolbar:** Standard notebook toolbar icons.
- Code Cell:** Contains SQL schema definitions for a 'CLAIMS' table.

```
-- PROCEDURE_PERCT_RANK: integer (nullable = true)
-- PROCEDURE_RISK_GROUP: string (nullable = true)
-- QUANTITY_INDEX: integer (nullable = true)
-- SERVICE_TYPE: string (nullable = true)
-- SUBMIT_CHG: integer (nullable = true)
-- SUBMITTED_CHG_INDEX: integer (nullable = true)
-- TOTAL_CHARGES_INDEX: integer (nullable = true)
-- TOTAL_CHARGES_PER_PROCEDURE: integer (nullable = true)
-- USER_DEFINED_FLAG_0: string (nullable = true)
-- SUBMITTED_CHARGE_AMOUNT: integer (nullable = true)
-- CLAIM_NUMBER: string (nullable = true)
-- IS_FRAUD: string (nullable = true)
```
- Section Header:** Read in CLAIMS Table
- In [5]:** A code cell containing Python code for loading data from a remote connection using SparkSession.

```
import dsx_core_utils, requests, os, io
from pyspark.sql import SparkSession
# Add asset from remote connection
df7 = None
dataSet = dsx_core_utils.get_remote_data_set_info('CLAIMS')
dataSource = dsx_core_utils.get_data_source_info(dataSet['datasource'])
sparkSession = SparkSession(sc).builder.getOrCreate()
# Load JDBC data to Spark dataframe
dbTableOrQuery = '"' + (dataSet['schema'] + "." if(len(dataSet['schema'].strip()) != 0) else '') + dataSet['table'] + '"'
if (dataSet['query']):
    dbTableOrQuery += dataSet['query']
```
- Right Panel:** Data integration interface with tabs Local, Remote, Other. The Remote tab is selected. It shows sections for PROCEDURES, PATIENTS, and CLAIMS, each with an "Insert to code" button. Below these are buttons for "Insert Pandas DataFrame" and "Insert Spark DataFrame in Python".

# Watson Studio supports the Data Science Lifecycle

*Build, train, deploy, and monitor at scale ML/DL workflows to infuse AI into the enterprise to drive innovation.*



# Watson Studio Data Refinery Features

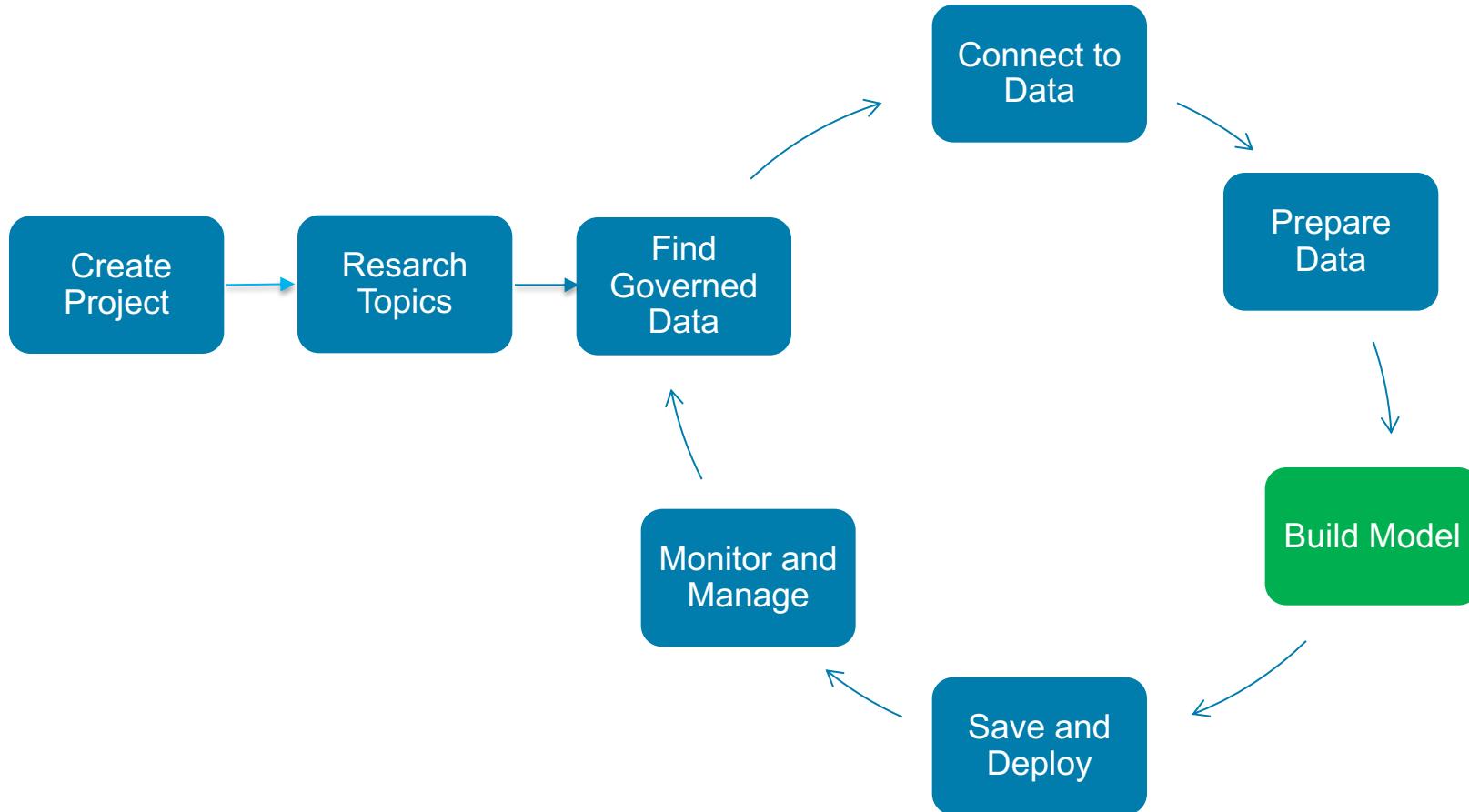
*Making Data fit for use*

Prepare  
Data

- Data Refinery tool to profile, visualize, and shape data.
- Create data preparation pipelines via point and click capability on subset of data
  - ✓ Cleanse the data: fixing or removing data that is incorrect, incomplete, improperly formatted, or duplicated
  - ✓ Shape the data: customize data by filtering, sorting, combining, or removing columns, and performing operations
- Run the pipeline on all the data
  - Manually (on demand)
  - Automated (scheduled)

# Watson Studio supports the Data Science Lifecycle

*Build, train, deploy, and monitor at scale ML/DL workflows to infuse AI into the enterprise to drive innovation.*



# Watson Studio Model Building Features

*The best of open source and IBM Watson tools to create start-of-the-art data products*

[Build Model](#)

## Open Source Tools

- Jupyter Notebooks \*\*
- RStudio and Shiny
- Libraries- scikit-learn, XGBoost, Spark, TensorFlow, Caffe, Keras, PyTorch

## IBM Tools

- AutoAI
- SPSS Modeler
- Neural Network Modeler
- Experiment Builder
- Natural Language Classifier Model
- Visual Recognition Model
- Decision Optimization \*\*

\*\* in hands-on labs

# Jupyter Notebook

[Build Model](#)

My Projects / Watson Studio Labs / Machine Learning with SparkML



File Edit View Insert Cell Kernel Help

Not Trusted | Python 3.6 with Spark 0



## Read Data Asset - female\_human\_trafficking - See Lab Instructions

```
In [ ]: # Insert SparkSession DataFrame code in this cell after the comments.  
# make CERTAIN to rename the default dataframe name (df_data_1 or df_data_2 or df_data_3, etc) to trafficking_df  
# Put cursor on the next line to Insert to code.
```

## Read Data Asset - Occupations - See Lab Instructions

The occupations listed in the female human trafficking file are too numerous to use as input to a machine learning model. We will categorize these occupations into 15 categories by joining with two other files. The Occupation.csv file contains a mapping of the occupations in the female human trafficking table to a category code. The Categories.csv file contains each code followed by the category name. This information needs to be joined to the female human trafficking table.

Follow the same procedure as above to insert a SparkDataFrame for Occupations

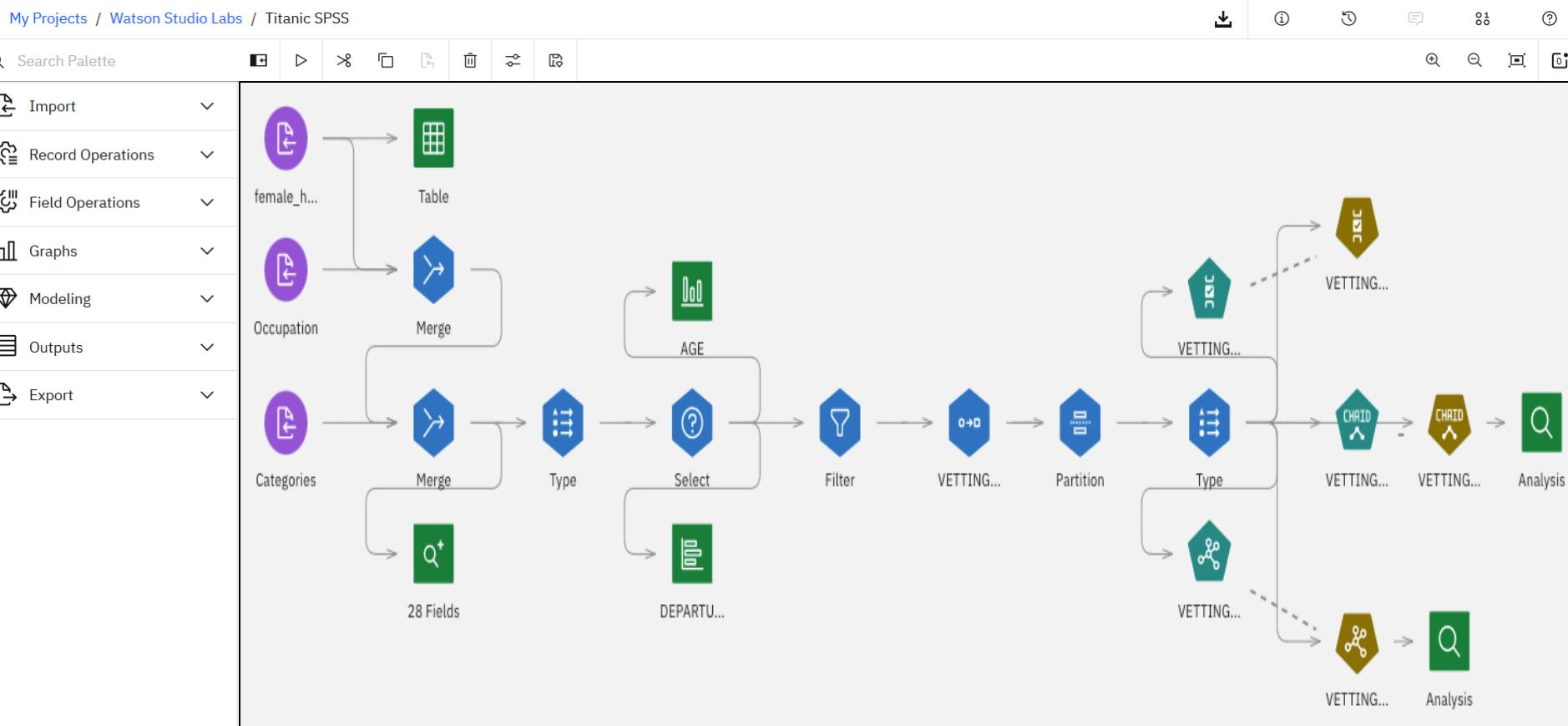
```
In [ ]: # Insert SparkSession DataFrame code in this cell after the comments  
# make CERTAIN to rename the default dataframe name (df_data_1 or df_data_2 or df_data_3,etc) to occupations  
#Put cursor on the next line to Insert to code
```

## Read Data Asset - Categories - See Lab Instructions

Follow the same procedure as above to insert a SparkDataFrame for Categories

```
In [ ]: # Insert SparkSession DataFrame code in this cell after the comments  
# make CERTAIN to rename the default dataframe name (df_data_1 or df_data_2 or df_data_3,etc) to categories  
#Put cursor on the next line to Insert to code
```

# SPSS Modeler

[Build Model](#)

# Neural Network Modeler

[Build Model](#)

An intuitive drag-and-drop, no-code interface for designing neural network structures using the most popular deep learning frameworks. Quickly capture your network design then single click export for experimental optimization.

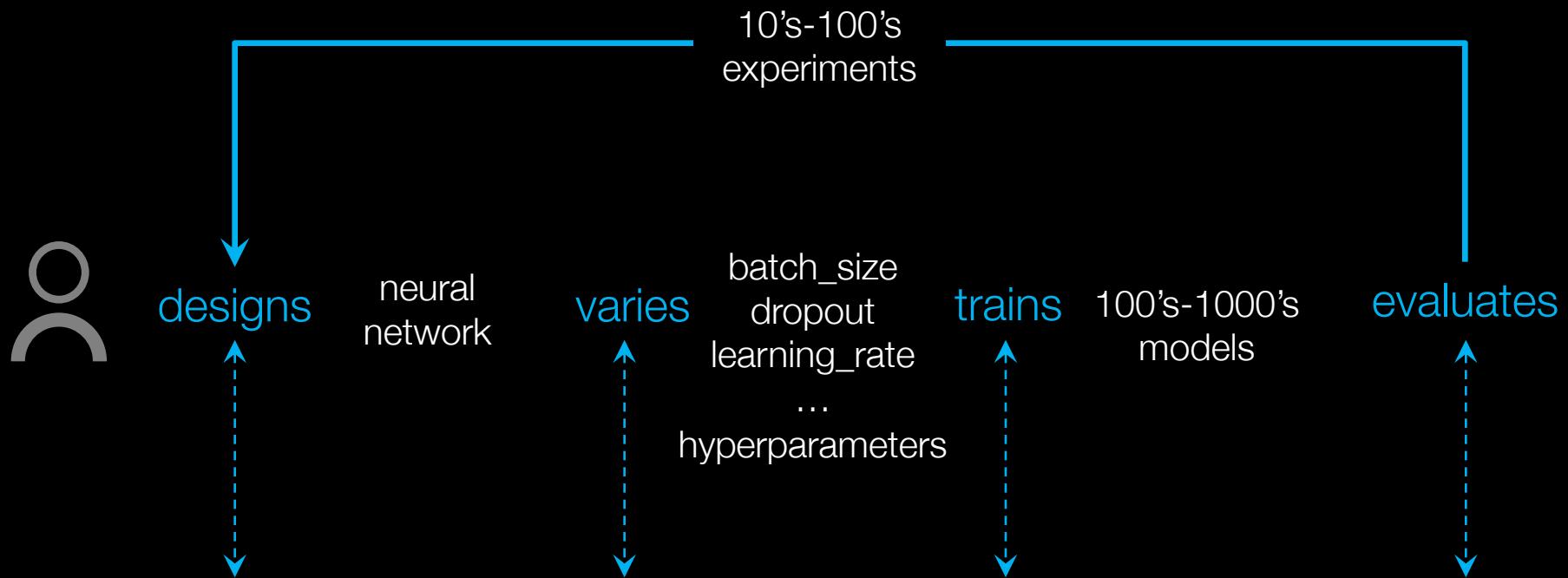


The screenshot displays the Deep Learning Editor interface. On the left, a sidebar lists nodes categorized by type: Input, Activation, Convolution, Core, Metric, and Loss. The main workspace shows a neural network flow starting from 'Image Data' through 'Conv 2d', 'ReLU', and 'Pooling 2d' layers, followed by another path through 'Conv 2d', 'ReLU', and 'Pooling 2d' layers, and finally a path through 'Flatten', 'Dense', and 'Dense' layers, ending with 'Softmax With Loss'. A callout points to this flow with the text 'Real-time validation of network flow'. To the right, a detailed configuration panel for a 'Dense' layer is shown, listing options for Weight Regularizer (L1, L2, L1-L2, null), Weight LR Multiplier (1), Weight Decay Multiplier (1), Bias Constraint (maxnorm, nonneg, unitnorm, null), Bias Regularizer (L1, L2, L1-L2, null), Bias LR Multiplier (1), Bias Decay Multiplier (1), and Activity Regularizer (L1, L2, L1-L2, null). A 'Save' button is highlighted with a red box. Callouts point to this panel with the text 'Define layer configuration' and 'Choose optimizer params'. At the bottom, a list of export options is shown:

- Generate CPU or GPU compatible code
- Save as popular framework code
- Export as a python notebook
- Execute as batch experiment

# Experiment Builder

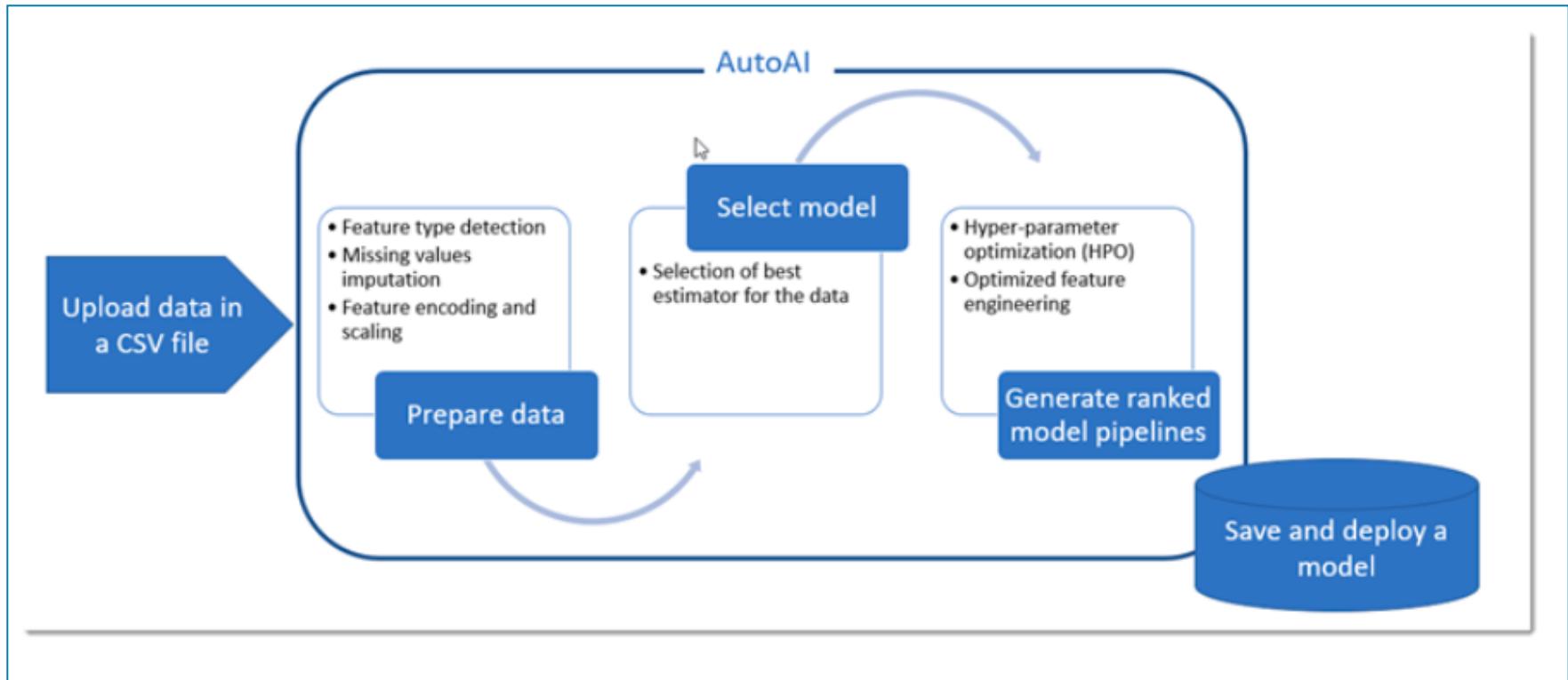
Build Model



**Experiment Builder**  
supports the end-to-end workflow

# AutoAI

Build Model



# AutoAI

[Build Model](#)

## Pipeline leaderboard

[Compare pipelines](#)

Ranking based on:

Accuracy



RANK	ACCURACY	PIPELINE INFORMATION	View details	Save as model
> 1	0.897	P3 - XGB classifier estimator Transformers (8): Preprocessing > Standard scaler > Univariate feature selection > Sine > Univariate feature selection > Tangent > ...	<a href="#">View details</a>	<a href="#">Save as model</a>
> 2	0.884	P1 - XGB classifier estimator Transformers (2): Preprocessing > XGB classifier estimator	<a href="#">View details</a>	<a href="#">Save as model</a>
> 3	0.884	P2 - XGB classifier estimator Transformers (2): Preprocessing > XGB classifier estimator	<a href="#">View details</a>	<a href="#">Save as model</a>

# Decision Optimization

[Build Model](#)

**Decision Optimization (DO)** enables data science teams to capitalize on the power of *prescriptive analytics* and build solutions using a combination of techniques like optimization and machine learning.

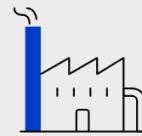
Integrated with Watson Studio, Decision Optimization can combine optimization techniques with coding and non-coding tools, model management and deployment – as well as other data science capabilities.

Decision Optimization evaluates millions of possibilities – balancing trade-offs and business constraints to find the best possible solution.

Insights that drive optimal decisions to complex problems



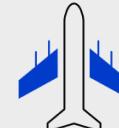
Determine location  
and capacity  
of warehouses



Determine which plant  
should manufacture  
which product



Build financial  
portfolios by balancing  
risks and rewards

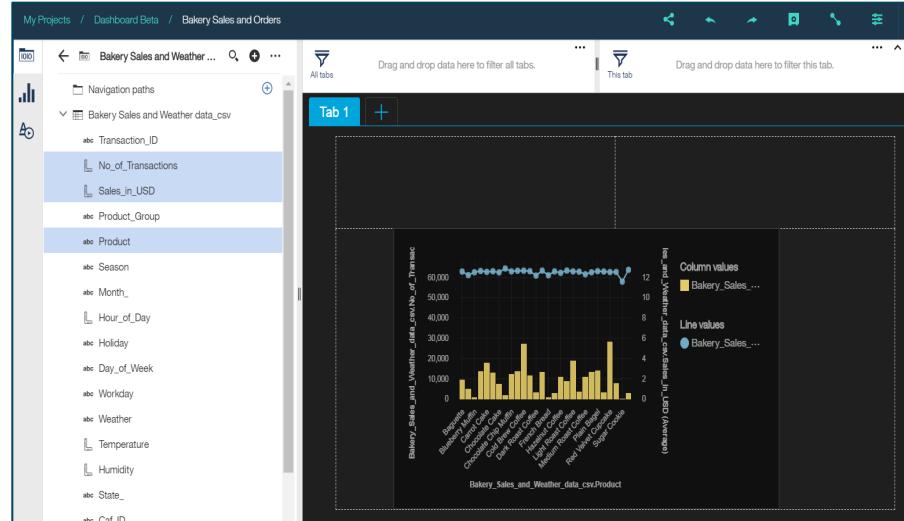
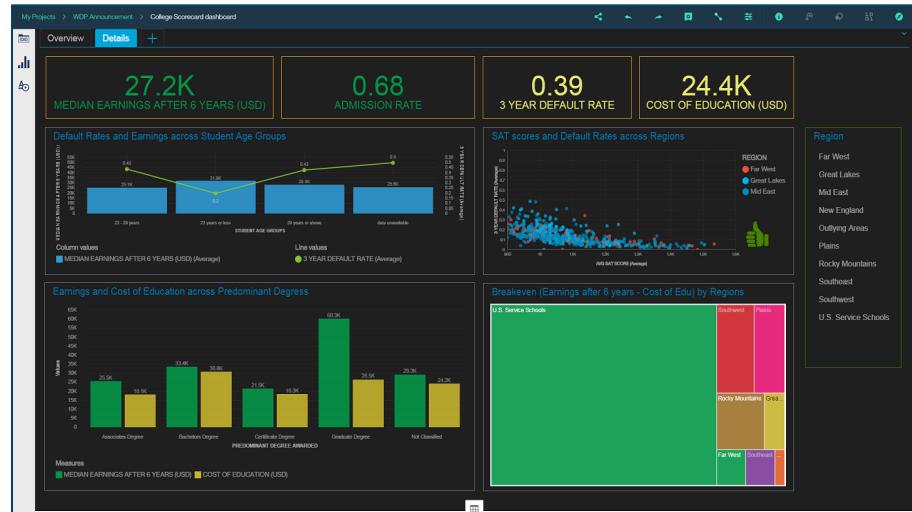


Allocate aircraft  
and crew to flights

# Watson Studio Dynamic Dashboards

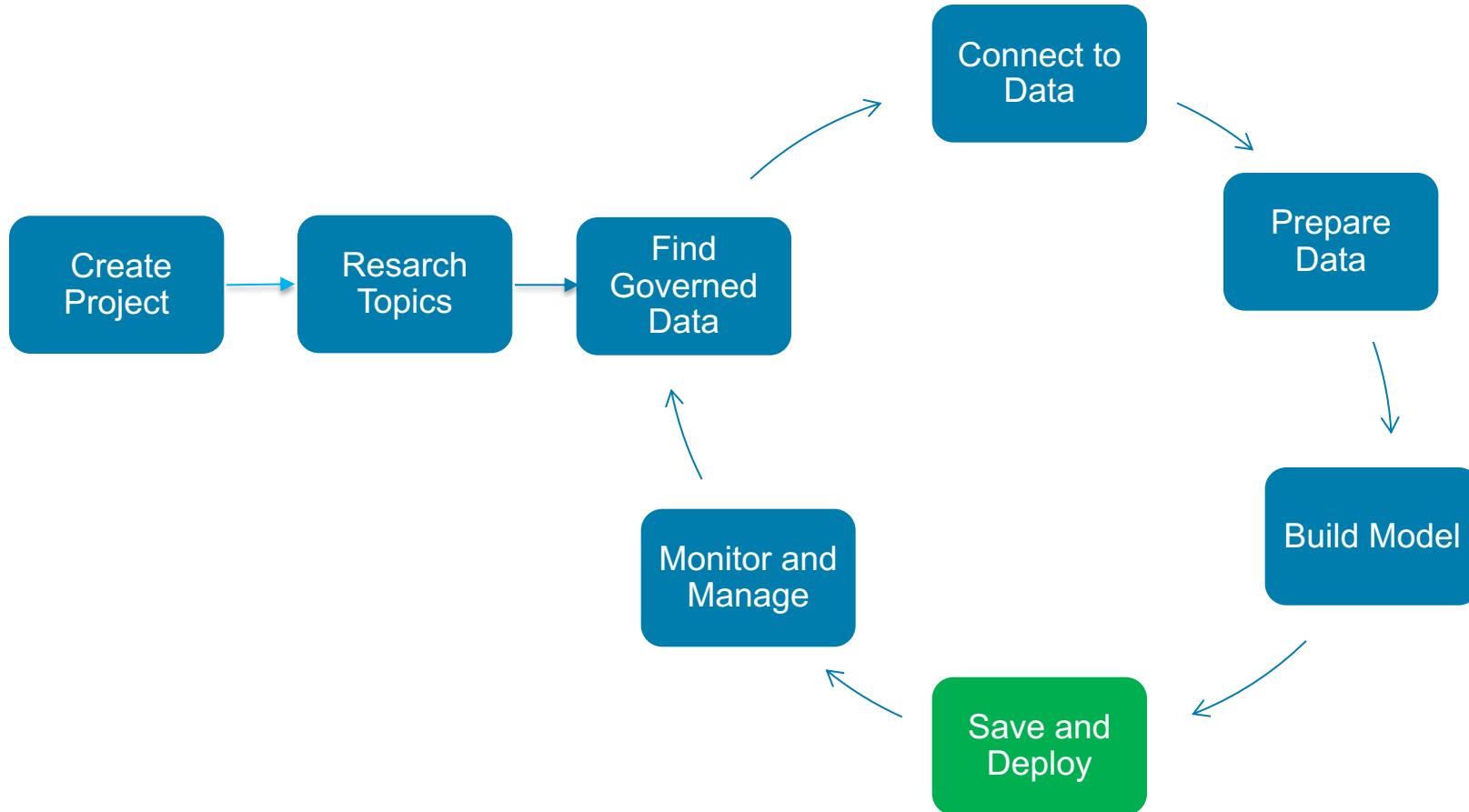
*Making insights available to all*

Build Model

# Watson Studio supports the Data Science Lifecycle

*Build, train, deploy, and monitor at scale ML/DL workflows to infuse AI into the enterprise to drive innovation.*



**Save and Deploy**

# Watson Studio Save and Deploy Models

*Save and Deploy Models with Watson Machine Learning*



IBM Watson Projects Tools Catalog Community Services Manage Support Docs 1449375 - IBM Corpor... B

## Create Deployment

### Define deployment details

Name

Model

### Description

*Deployment description*

300

### Deployment type

- Web service
- Batch prediction
- Realtime streaming prediction

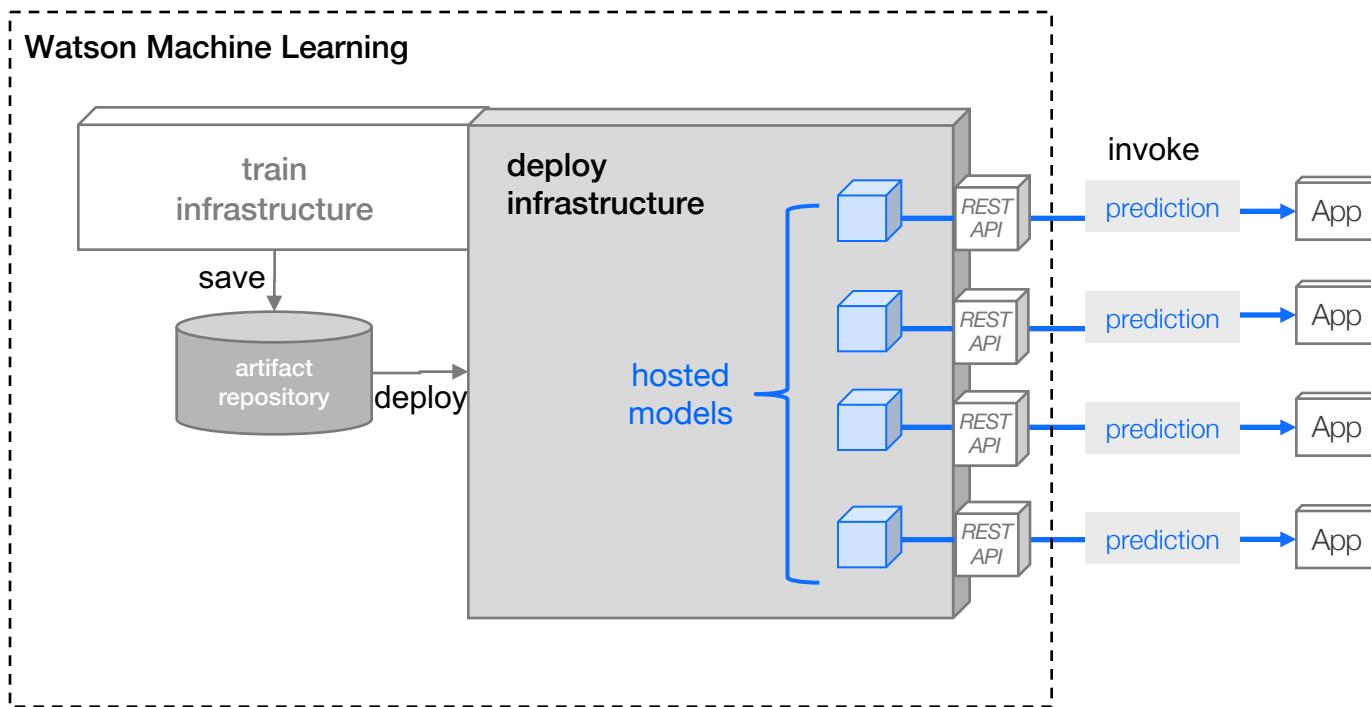
Cancel

Save



# Watson Studio Save and Deploy Trained Models

*Save and Deploy Models with Watson Machine Learning*



# Watson Studio Save and Deploy Features

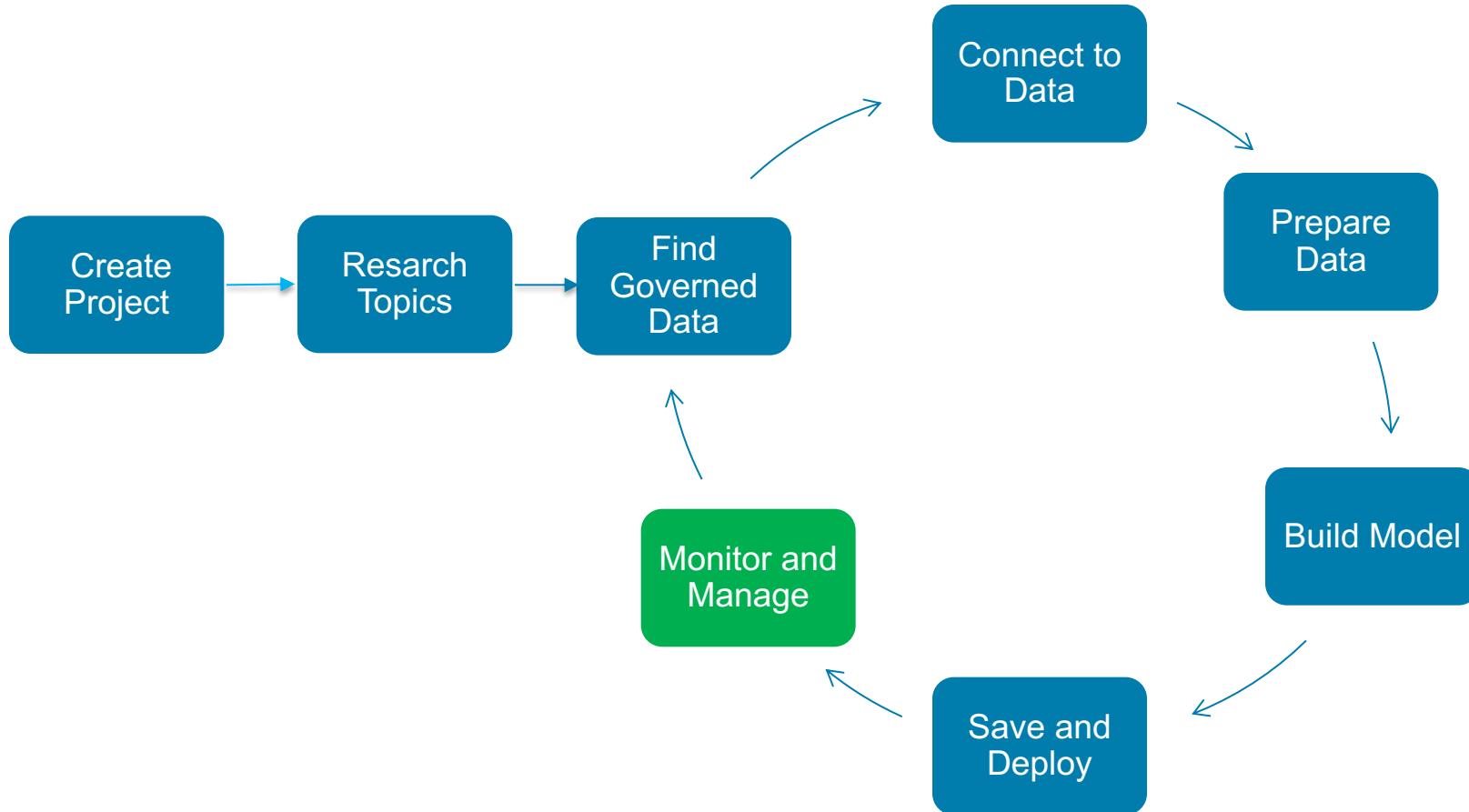
*Save and Deploy Models with Watson Machine Learning*

Save and  
Deploy

- Watson Machine Learning API to save/load models to/from repository
- Watson Machine Learning API to deploy saved models easily and have them scale automatically.
- Watson Machine Learning API to invoke deployed models

# Watson Studio supports the Data Science Lifecycle

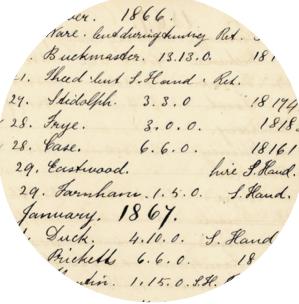
*Build, train, deploy, and monitor at scale ML/DL workflows to infuse AI into the enterprise to drive innovation.*



# Our vision for Trusted AI

*Pillars of trust, woven into the lifecycle of an AI application*

Monitor and Manage



Is it  
accurate?



Is it  
fair?



Is it easy to  
understand  
?



Did anyone  
tamper  
with it?

# Watson OpenScale

Monitor and  
Manage

## Trust and Transparency

- Intelligently delivers bias mitigation help
- Provides traceability & auditability of AI predictions made in production applications
- Tracks AI accuracy in applications
- Explains an outcome in business terms
- Drift Detection

## Automation

- Automatically detects and mitigates bias in model output, without affecting currently deployed model or outcomes

## Open By Design

- Monitor models deployed on third party model server engines
- Deploy behind enterprise firewall or on IaaS provider

# Watson Studio Takeaways

## Integrated Collaboration Environment

- Data Scientists, Subject Matter experts, Business Analysts & Developers all in one environment to accelerate innovation, collaboration and productivity
- Built-in learning to get started or go the distance with advanced tutorials

## Choice of Tools for the full AI lifecycle

- Best in-breed open source and IBM tools that support the end-to-end AI lifecycle
- Choice of code or no-code tools to build and train your own ML/DL models or easily train and customize pre-trained Watson APIs

## Support for all levels of expertise

- Use Watson smarts and recommendations for the best algorithms to use given your data, OR
- Use the rich capabilities and controls to fine tune your models

## Multiple Deployment Options

- Watson Studio on IBM Cloud – Managed offering
- Watson Studio Local – Private Cloud, Public Cloud-(IBM, Azure, AWS)
- Watson Studio Desktop

## Model lifecycle & management

- Deploy models into production then monitor them to evaluate performance.
- Capture new data for continuous learning and retrain models so they continually adapt to changing conditions.

## Integrated with Knowledge Catalog

- Intelligent discovery of data and AI assets that enables reuse & improves productivity
- Seamlessly integrated for productive use with Machine Learning and Data science
- Powerful governance tools to control and protect access to data

# Outline

- IBM Cloud Overview
- Watson Services Overview
- Watson Studio Overview
- Labs 

# Lab-1: Watson Knowledge Studio

## Introduction:

In this lab, you will use Watson Knowledge Studio to develop socioeconomic annotators for COVID-19.

## Objectives:

Upon completing the lab, you will know how to:

- Create and edit a type system
- Create a dictionary for each entity type
- Upload a training corpus
- Perform manual annotation
- Train and create a machine learning (ML) annotator
- Save and deploy the ML annotator to Watson Discovery

# Applying AI and Analytics to COVID-19

Lab 1 in progress. We will return to  
the main room at 11:30 am.

## Lab-2: Watson Discovery

### Introduction:

In this lab, you will use Watson Discovery to develop a knowledge management system (KMS), train the KMS to generate knowledge and analyze information to create a COVID-19 vulnerability index.

### Objectives:

Upon completing the lab, you will know how to:

- Create a collection and upload data
- Add the entity model from Knowledge Studio
- Perform custom entity extraction
- Retrieve the analyzed files using the Discovery API
- Calculate the COVID-19 vulnerability index
- Perform Smart Document Understanding on a COVID-19 publication
- Create and run Natural Language Queries
- Use relevancy training to improve the relevance of results

## Applying AI and Analytics to COVID-19

Lab 2 in progress. We will return to the main room at 12 pm break for lunch.

Continue working lab 2 at 12:30 pm

We will return to the main room at 1 pm

# Watson Assistant

is the **AI**-powered foundation of **smart** customer experiences.

Centralize your customer communication and problem resolution

Get started fast with your existing logs and web content

Go live without needing a developer

Dynamically manage vague questions





# Watson Assistant

Market Differentiation

## Low-code platform

Intuitive building interface that helps you— from coders to the C-suite – to successfully build and deploy an assistant quickly.

## Deploys anywhere

One of the only vendors in the market that allows you to deploy and run a virtual assistant on premises or on *any* public cloud.

## Powered by best in class NLU

Best in class AI powers the underlying language models, so you can build the smartest assistant your business.

## Seamlessly hands off to your agents

Connect to your existing service desk to transfer conversations to human agents

## Connects to any channel

You have channels, applications, and content in place. Make the most of them. We make it possible to connect to (almost) *anything*.

## Scales effortlessly

An enterprise can go from a single user to supporting millions of conversations across its organization with a single product.

# **Watson Assistant**

Driven by intents, not rules

Watson Assistant  
**understands**  
the user's intent

- Handcrafted rules unable to scale and do not benefit from data
- State of the art NLU to derive intent
- Learns over time based on usage

**Intent** Password Reset

- “ I forgot my password... ”
- “ How do I get a new password? ”
- “ Can’t login into your site... ”
- “ My login isn’t working, please help... ”
- “ Can you reset my password? ”

**“ I’m frustrated,  
I haven’t been  
able to login  
into your online  
billing system ,”**

Extract other key information from a question

**Intent**

Password Reset

**“ I’m frustrated,  
I haven’t been  
able to login  
into your online  
billing system ,”**

Extract other key information from a question

**Intent**

Password Reset

**Entities**

Online Billing System

**“ I’m frustrated,  
I haven’t been  
able to login  
into your online  
billing system ,”**

Extract other key information from a question

**Intent**

Password Reset

**Entities**

Online Billing System

**Emotional Tone**

Anger → Leverages Watson Tone Analyzer

**“ I’m frustrated,  
I haven’t been  
able to login  
into your online  
billing system ,”**

Extract other key information from a question

**Intent**

Password Reset

**Entities**

Online Billing System

**Emotional Tone**

Anger → Leverages Watson Tone Analyzer

**Context**

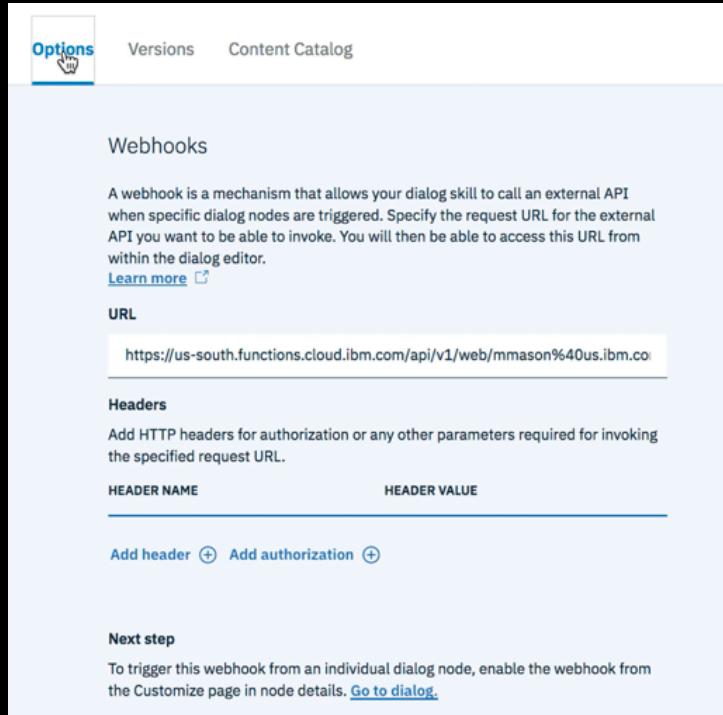
Bill Smith, 47 / Gold Member

**Context**

Mobile

# Webhooks

Webhooks let you pull in user information to personalize answers, post transactions to internal systems, check other systems for answers to questions, you name it—all in-line within your dialog.



The screenshot shows the IBM Watson Assistant Dialog Editor interface. At the top, there are three tabs: 'Options' (which is active and highlighted in blue), 'Versions', and 'Content Catalog'. Below the tabs, the page title is 'Webhooks'. A descriptive text block explains what a webhook is: 'A webhook is a mechanism that allows your dialog skill to call an external API when specific dialog nodes are triggered. Specify the request URL for the external API you want to be able to invoke. You will then be able to access this URL from within the dialog editor.' It includes a 'Learn more' link. The main configuration area has two sections: 'URL' (containing a text input field with the value 'https://us-south.functions.cloud.ibm.com/api/v1/web/mmason%40us.ibm.co') and 'Headers' (containing a table with columns 'HEADER NAME' and 'HEADER VALUE'). Below these sections are buttons for 'Add header' and 'Add authorization'. At the bottom, there is a 'Next step' section with the text: 'To trigger this webhook from an individual dialog node, enable the webhook from the Customize page in node details. [Go to dialog](#)'.

# Lab-3: Watson Assistant – COVID-19 Chatbot

## Introduction:

This lab will build a chatbot to respond to questions about COVID-19. Watson Assistant and Watson Discovery services from IBM will be used to build the chatbot.

## Objectives:

The goal of this lab is to familiarize the user with the Watson Assistant service. Watson Assistant is IBM's AI offering that lets you build, train, and deploy conversation interactions into any application, device, or channel. Watson Assistant can be deployed on any cloud or on-premises environment.

After completing this lab, you will be familiar with these features of Watson Studio.

- Provision an instance of Watson Assistant
- Add a dialog skill to your Watson Assistant instance
- Connect your Watson Assistant with Watson Discovery
- Create Cloud Functions
- Integrate data sources via a Watson Assistant webhook

## Applying AI and Analytics to COVID-19

Lab 3 in progress. We will return to  
the main room at 2 pm.

# IBM Watson Studio

Enterprise Data Science platform that helps your team work together to build models to make better data driven decisions for your business



## Analyze any data, no matter where it lives

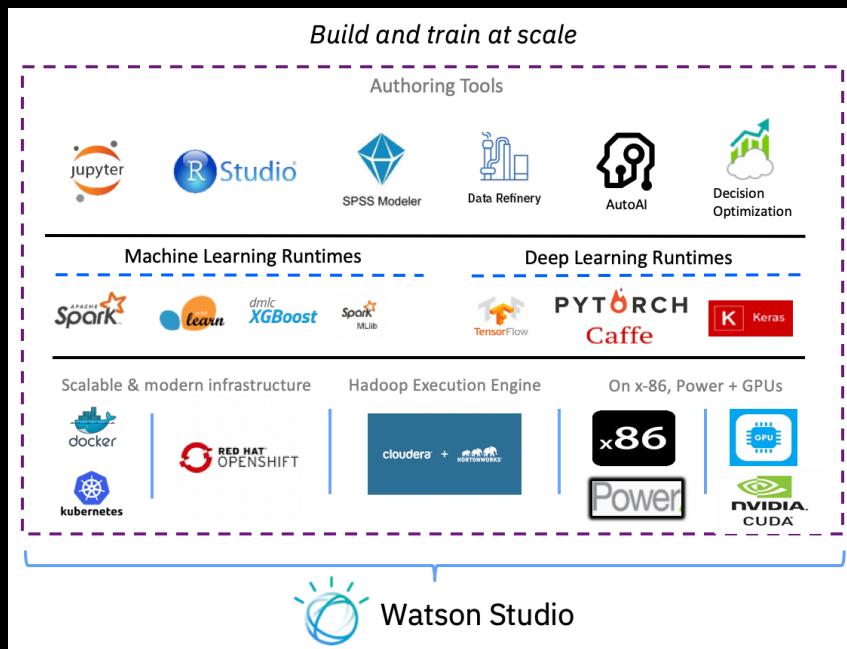
Connect to and analyze your data without moving a single byte through dozens of connectors and multiple deployment options

## Empower your entire organization with notebooks, visual productivity, and automation tools

Leverage your entire organization with a variety of tools in a single integrated platform

## One platform to rule them all from discovery to production

Analyze data, build predictive models, and seamlessly integrate Watson Machine Learning to deploy at scale



# IBM Watson Machine Learning

Embed Machine Learning and Deep Learning  
in your Business

## Deploy and Manage Models

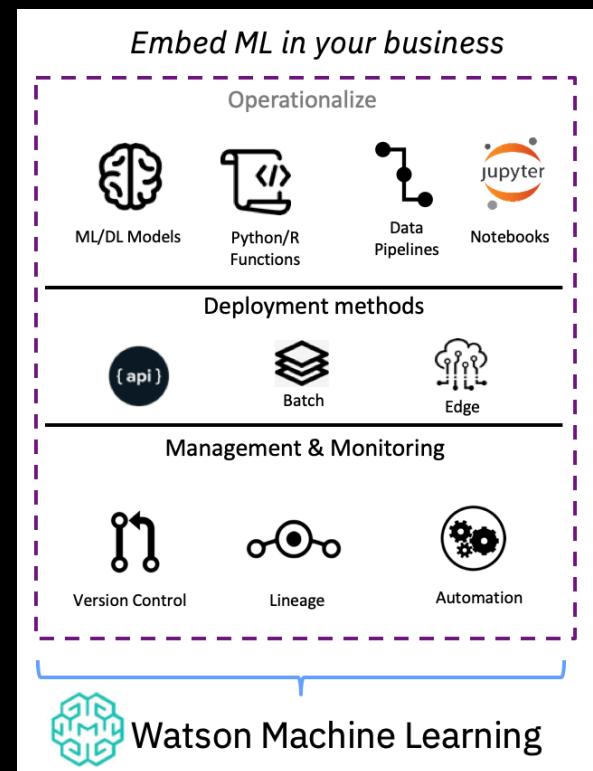
Move models to production, in an easy, secure, and compliant way

## Intelligent Model Operations

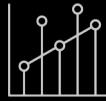
Embed intelligent training services, with feedback loops that constantly learn from new data, regardless where it resides

## Accelerate Compute Intensive Workloads

Distribute your deep learning training and Hadoop/Spark workloads with multi-tenant job scheduling

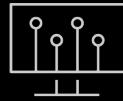


# Machine learning and optimization: better together



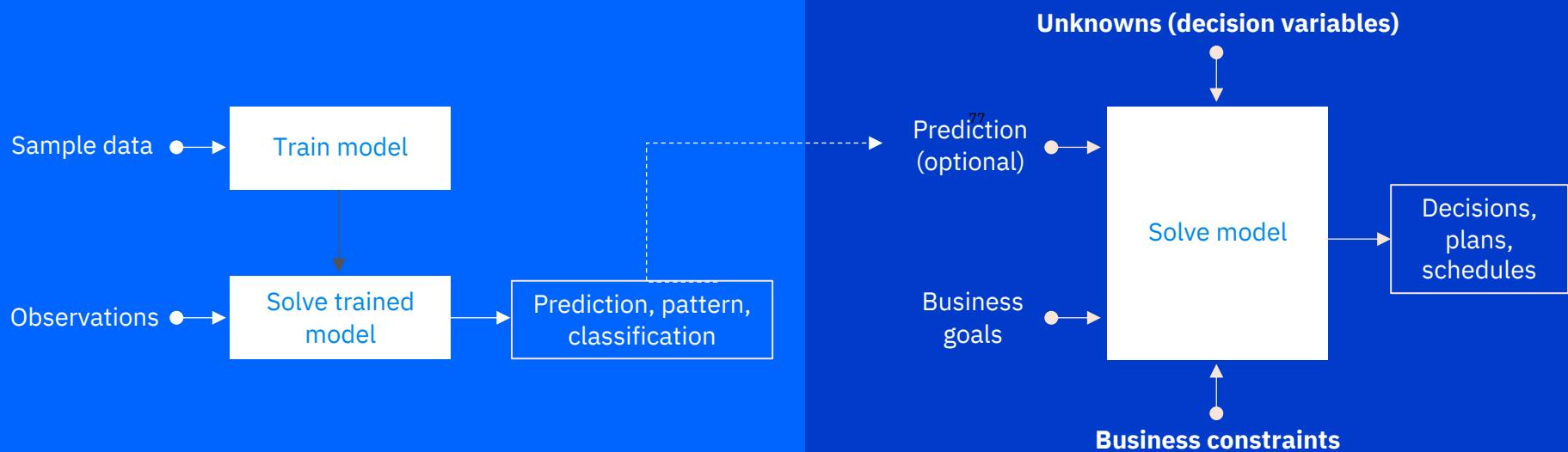
## Predictive analytics

- Basic (supervised): You **know the answer**, and you **train the machine how to find it**.
- Advanced: Unsupervised, reinforcement, deep learning



## Prescriptive analytics

- You **don't know the answer**, and you **provide the machine the logic on what is a good and a bad solution**.
- Advanced: Robust, stochastic, etc



# Capitalize on the power of prescriptive analytics with **Decision Optimization**

## Create innovative solutions

Combine optimization technology with data science techniques such as machine learning

## Improve productivity

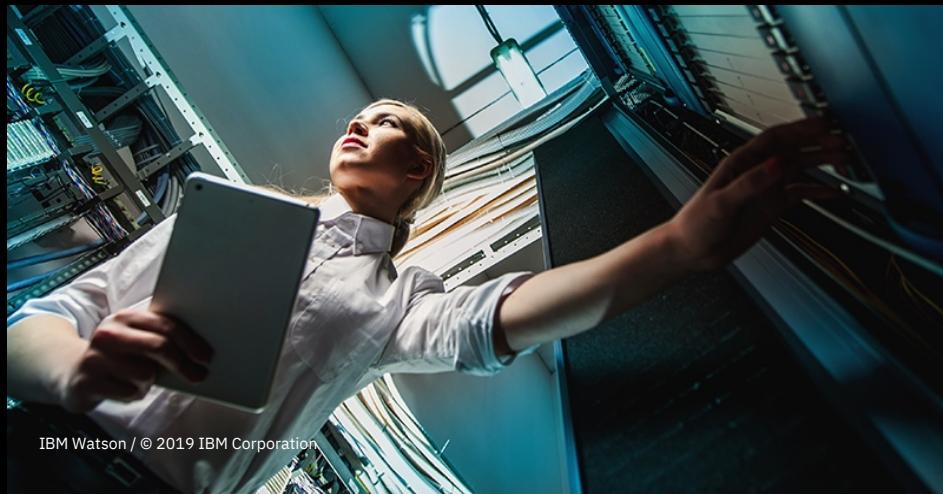
Validate optimization models more quickly and easily using visual dashboards

## Experience fast time to value

Solve optimization models quickly across domains using powerful solvers

## Operationalize your projects

Deploy optimization models in production to drive business impact around real use cases



# Lab-4: Watson Studio – Forecast COVID-19 Outbreaks

## Introduction:

This lab will apply predictive analytics to analyze different factors among people to predict future COVID-19 infection rates in an area. Based on areas predicted to have high COVID-19 infections – this lab will apply optimization techniques to optimize the planning of transferring COVID-19 patients from hospitals located in epidemic areas to hospitals with less COVID-19 patients. Our hope is to educate people how to apply IBM's predictive and optimization technologies to help them improve planning and responding to COVID-19 cases.

## Objectives:

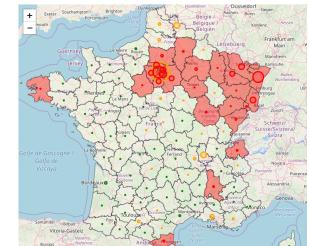
The goal of this lab is to educate user on how to apply IBM predictive analytics and optimization tools to different applications of COVID-19 like (1) predicting future infections and (2) optimizing response for better decision making. We intend students learn these skills.

- Load data form different places to be used for analysis
- Represent the current situation on a map using folium
- Use a LinearRegression to predict new cases to come for each department
- Use Decision Optimization to model and optimize plan transfers
- Use folium to display the optimized future patient transfers plan

# Lab-4 Overview

The Lab contains these parts:

- Upload data into your project
  - Use WS data import function (departements.csv)
- Create/import a notebook ([FranceCovid19.ipynb](#))
- Load the data from different places (departements, current situation, etc)
  - We use data from the French government [data.gouv.fr](#) site in addition to some imported data on the different French administrative “departments” (GPS coordinates)
- Represent the current COVID-19 infection situation on a map
  - Circles show the number of reanimation cases in each department
- Predict new cases to come for each department
  - Illustrative purposes - train a simplistic predictive LinearRegression model (epidemy is not linear)
- Develop a plan transfers optimization model
  - Our hypothesis for the optimization model is that two different types of transfers can be done:
    - long distance transfers (planes, trains) with the number of transfers limited over the whole country, several people can be transferred at a time.
    - Short distance transfers (ambulances) with the number of transfers limited per area, and with just one person at a time
- Display all the transfers from the optimized patient transfer solution



## Applying AI and Analytics to COVID-19

Lab 4 in progress. We will return to  
the main room at 3:30 pm.

# Cognos Analytics

---

*All the answers you need in one place*

Prepare

Automated data preparation and data modeling to easily cleanse and combine your data in minutes

Analyze

Guided exploration infused with augmented intelligence and machine learning to uncover hidden patterns and insights

Create & Share

Interactive dashboards, storytelling and pixel-perfect reporting to collaborate and share across your organization

INFUSE

Technology integration that allows you to infuse analytics into your business process



# IBM Cognos Analytics

# Weather API

## *Tracking Global Progression of COVID-19*

- Data collected from API:
  - Total cases up to May 20<sup>th</sup>
  - New cases added each day
  - Total Deaths up to May 20<sup>th</sup>
  - New deaths added per day
- Sourced from WHO, U.S. state and country government sources
- Bundled into 3 csv files

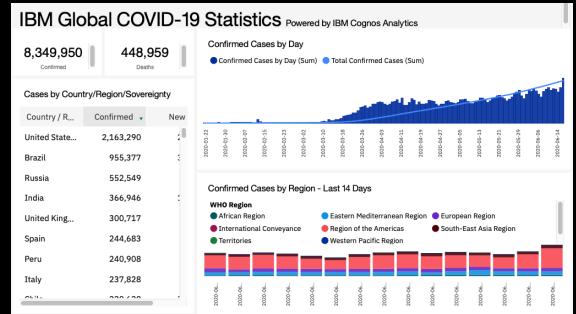


# Lab 5

## *Developing Dashboards with Cognos*

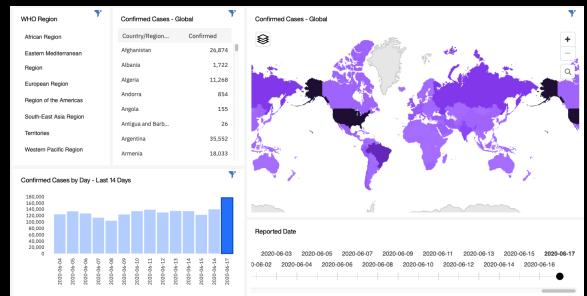
### COVID-19 Cases

Global, country,  
region, and continent  
statistics



### Global Map View

Change of over time on  
a country-by-country  
bases



# Lab-5: Cognos - COVID-19 Statistics/Dashboard

## Introduction:

This lab will build a series of Cognos Dashboards to display COVID-19 data.

## Objectives:

The goal of the lab is to familiarize the user with the use of the Cognos Analytics web-based business intelligence suite. IBM Cognos Analytics contains integrated toolsets for reporting, analytics, and visualization. This lab will focus on the visualization component. We will be creating three tabs similar to those on the IBM & Weather Channel COVID-19 Dashboard. IBM created a data fabric pulled from state and local governments as well as the World Health Organization. Where the public dashboard updates dynamically based on daily data pulls, we will use extracted data tables for the lab to build visualizations for a specific set of dates.

After completing this lab you will be familiar with these features of Cognos Analytics:

- Access the Cognos free trial
- Create a "COVID-19 Cases Dashboard"
- Create a global map view
- Add a webpage tab.

## Applying AI and Analytics to COVID-19

Lab 5 in progress. We will return to  
the main room at 5 pm.