

Intelligent Contracts Workshop Guide

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Intelligent Contracts Workshop Scenario

(top)

In this hands-on end to end workshop will be split into three sections. In each you'll learn:

- how someone like a procurement officer can obtain prescriptive suggestions within a business automation workflow improving the likelihood of contract success.
- how to use IBM Watson Studio, to **analyze**, build, test and deploy a machine learning model used to score contracts and make prescriptive suggestions.
- how to use IBM Watson Discovery, to extract textual concepts coming from many contracts to analyze contracts themselves and provide the machine learning model cognitive attributes to improve prediction accuracy.

AI Ladder & ModelOps

IBM Cloud Pak For Data provides a stack of capabilities broken down into these 4 areas known as the AI Ladder to collect, organize, analyze and infuse machine learning into downstream applications on a platform where Data Engineers, Data Governance Engineers, Data Scientists, Analysts, and Developers all collaborate to deliver insights as a team sport.

The ModelOps workflow is an end to end process for developing and deploying data science assets to production that are monitored for bias developed during the Analyze Phase.



Figure 1 AI Ladder - Collect, Organize, Analyze, and Infuse AI into downstream applications.

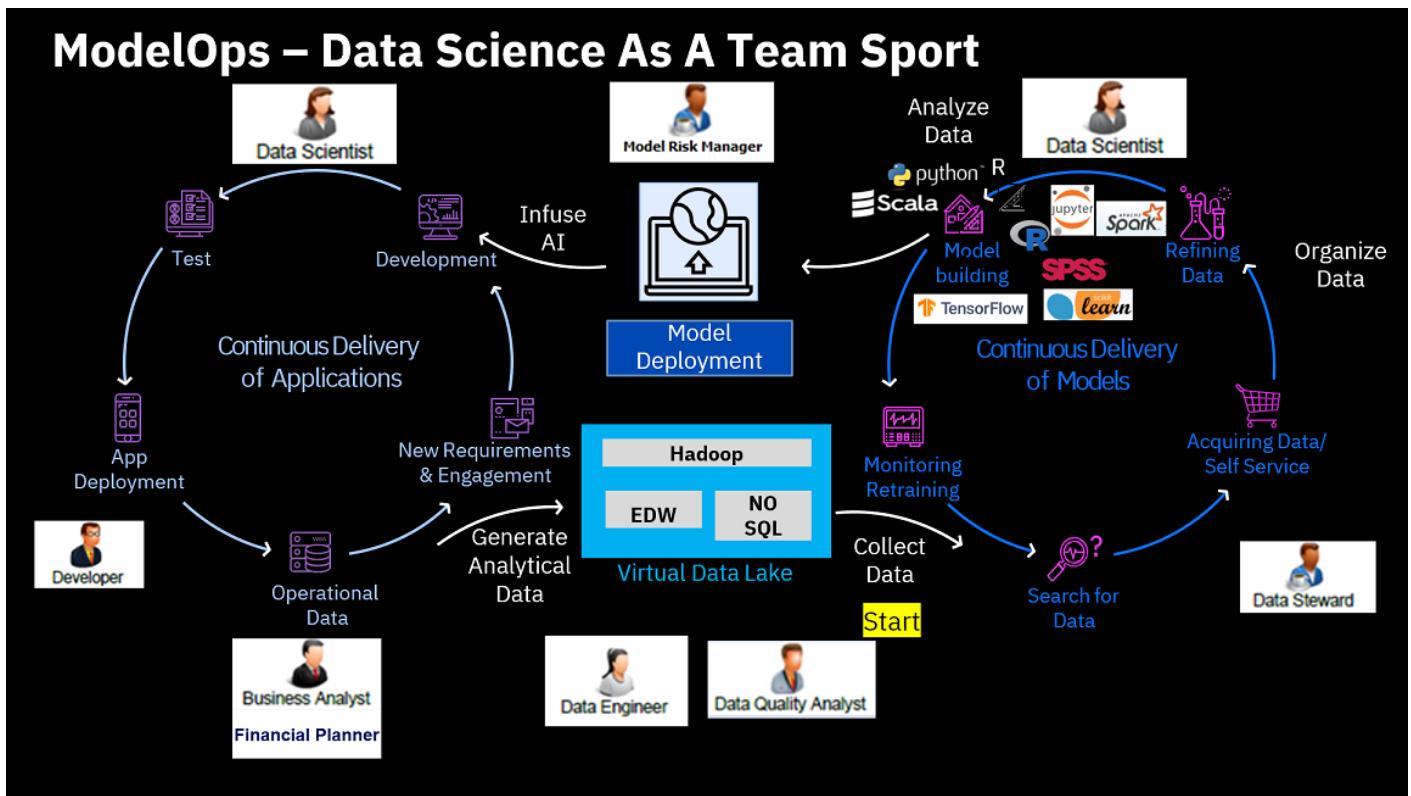
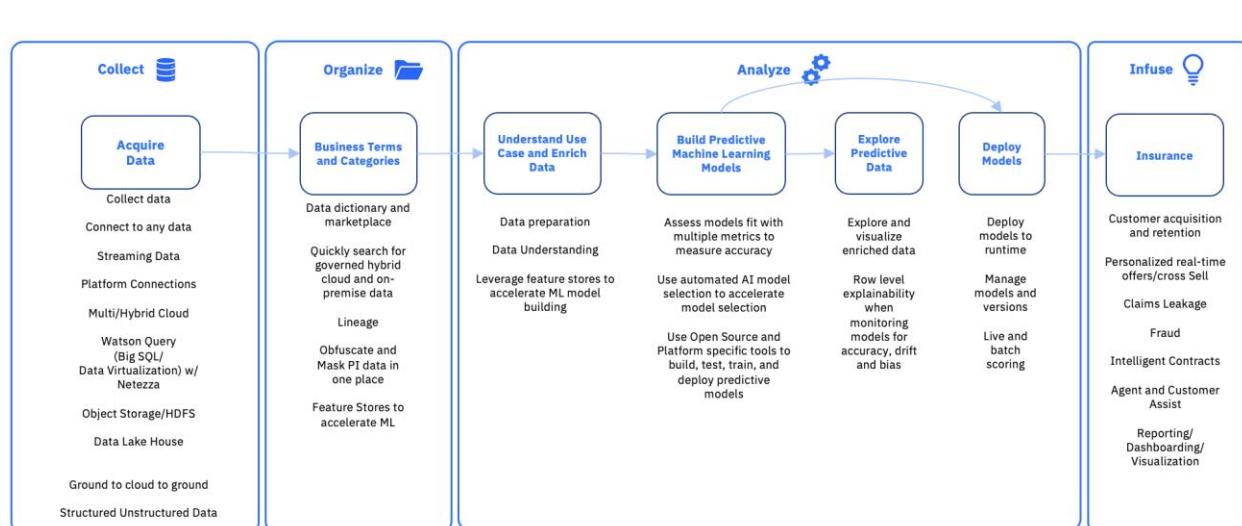


Figure 2 All participants collaborate as a team to deliver end to end model ops infused in downstream applications.

1) Business Automation Workflow Workshop (top)

Introduction

IBM AI has 4 primary capability areas – Collect, Organize, Analyze and Infuse:



The Infuse capability (on the RHS) is all about how other applications can use ML models - how the models are *infused* into these applications. This part of the demonstration illustrates how an application – Business Automation Workflow – can be infused with ML capabilities. This script will show how to install the demonstration on a BAW environment of your choice and then how to run through the demo.

Note that the demonstration is a “vision demo”, there is no actual call into a ML service. This is convenient as it means that the demo assets can be installed on any BAW environment without the need to integrate with some other system. No prior knowledge of IBM BAW is required in order to install or run the demo.

Following the Demo instructions below, there is information on how to install the demo in a BAW environment.

Demo Installation

(top)

The demo workflow is provided in a file with a ‘.twx’ extension and is installed into the Workflow Center component of BAW. The demo was created with BAW v21.0.3 and so will require an environment at this level or later. Any BAW 21.0.3+ environment will be suitable – a local VM, a Skytap environment, BAW on Cloud, CP4BAaaS or a BAW container deployment. It is recommended that a SaaS environment is used, as this requires no software installation but any of the other environments listed here will also work. The following instructions assume that a Cloud Pak for Business Automation as a Service environment is being used.

1. Create a IBM Business Automation Workflow environment in Tech Zone.
 - a. Open the following URL: <https://techzone.ibm.com/collection/ibm-business-automation-traditionaland-on-premise-asset-version-32> . This URL is for a Skytap instance for IBM Business Automation Workflow

IBM Business Automation - Traditional and On-premise - Asset Version 3.2 Updated 05-12-2022

Visibility IBMers, Business Partners

★★★★★ (9) Rate this resource

Business value

IBM Business Automation - Traditional and On-premise - Asset Version 3.2 includes:

- BAW 21.0.3
- IID 21.0.3
- eclipse Process Designer 8.5.7 CF2021.12
- ODM 8.11
- IBM RPA 21.0.2 ifix3.
- Datacap 9.1.9 (Golden Demo Updates)
- Daeja 5.0.10 IF001 to fix the issue with Daeja due to missing libraries
- BAI for a Server 20.0.3 and BAW ML Server (unchanged)
- See for important update information: <https://ibm.box.com/v/IBM-DBA-VM-EXT-V32>

Comments

User ids and passwords as well as other important usage information: <https://ibm.box.com/v/IBM-DBA-VM-EXT-V32>

- b. Select the Environments link on the left-hand side:

Environments

May 24, 2022
IBM Business Automation - Traditional and On-premise. Asset Version V3.2 [Updated 05-12-2022]

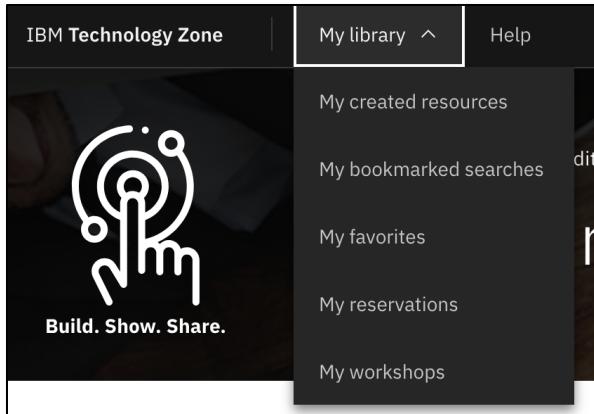
Skytap: APAC-2, EMEA, US-Central

Includes latest BAW, ODM, Datacap, BAI and RPA - all in one VM!

Visibility
IBMers, Business Partners

Reserve

- Click on Reserve. In the screen that follows click on the 'Reserve Now' radio button
- c. Select an appropriate purpose and geography. Click on submit.
- d. When the environment is ready, you will receive an email notification. This should not take more than 10-15 minutes.
- e. After the email is received click on my reservations:



You will see a view like the following:

A screenshot of the 'My reservations' page. The header features the 'Build. Show. Share.' logo and the text 'My reservations'. Below the header is a navigation bar with tabs: 'My resources', 'My bookmarks', 'My favorites', and 'My reservations' (which is highlighted). A search bar with the placeholder 'Filter reservations by name' is present. The main content area displays a reservation for 'IBM Business Automation - Traditional and On-premise. Asset Version V3.2'. It includes a 'Customer Demo' section with the identifier '0063h00000FwsqfAAB' and the name 'Westfield Insurance'. Below this is another section for 'IBM Business Automation - Traditional and On-premise - Asset Version 3.2[US- Central]'. A date range selector shows 'May 1, 2022 5:57 PM' to 'Jun 13, 2022 5:57 PM'. Below the date range are fields for 'Username' (10595759) and 'Password' (6cduxm3a), each with a copy icon. The status is listed as 'Status: Ready' with a monitor icon.

- f. Make a note of the password for your environment and then click on the blue display icon at the foot of the page to go to the Skytap environment:

Desktop

Published services

Purpose Shared Reservation

Notes

Environment

Username: 10595759

Password: 6cduxm3a

[Open your Skytap environment](#)

Click on the blue button to open the Skytap environment. You may need to enter the (previously copied) password. You will then see a screen like this:

IBM Demonstration Portal

Region: US-Central

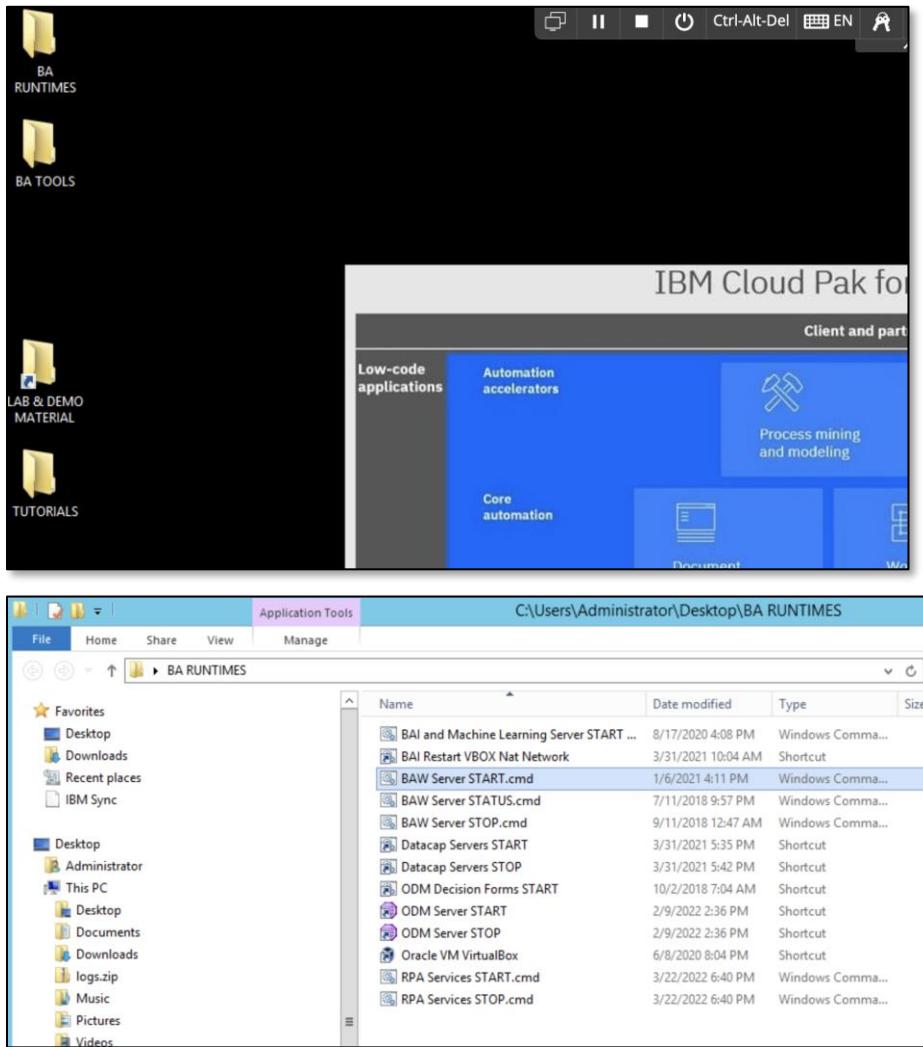
VMs: 1

	Running				Sort by name	↑
<input checked="" type="checkbox"/>	DBA VM 3.2	II	■	Power		
Endpoints: 1 (host-1 - 10.0.0.1)						
						
METERED RAM	STORAGE	LICENSE				
32 GB	250 GB	--				
A1						

- g. If the environment is running, click on the terminal icon. If the environment is not running, click on the start/play button.
- h. Clicking on the terminal icon will open the Windows desktop. There is a control segment for the screen, at the top. These provide several useful capabilities including a copy/paste (4th from right) and fit to window (3rd from right):



2. It is necessary to start BAW before it can be used.
 - a. Click on the BA RUNTIMES folder in the top left of the Windows desktop

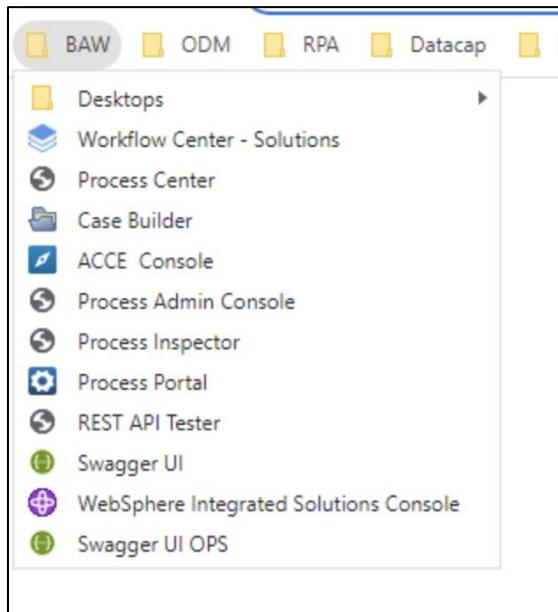


Right click on the ‘BAW Server START.cmd’ file and click on open. This will open a Command window showing the output of the various commands being executed. Actually, there is just a single command:

`CALL BPMConfig.bat -start -profile DmgrProfile -de ProcessCenter`

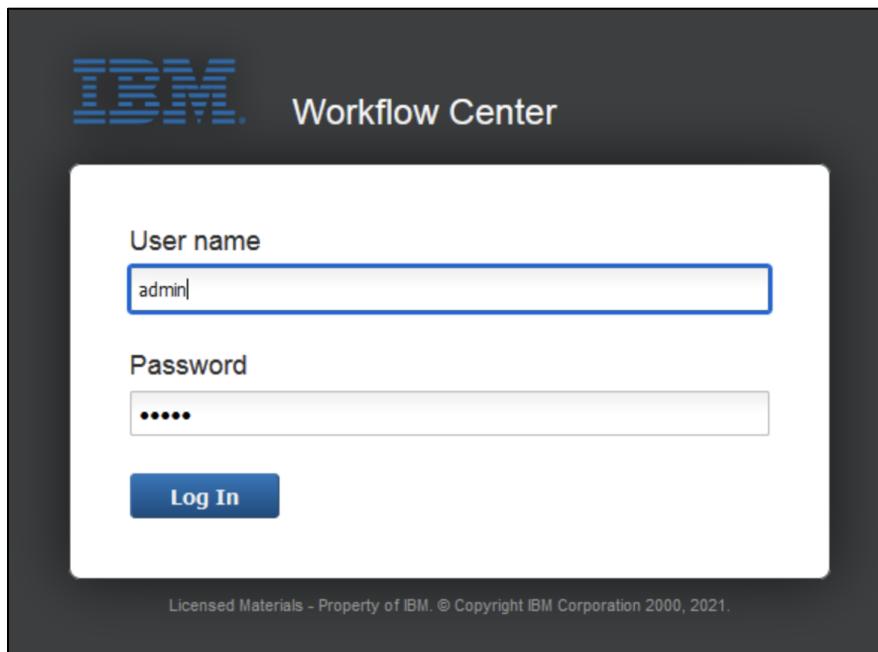
After a few minutes (maybe 5 or 6) the cmd file completes with “Press any Key to continue...”. Dismiss the window.

3. All of the browsers included in the environment are preconfigured with links to the various installed components. Open the browser of your choice and open the

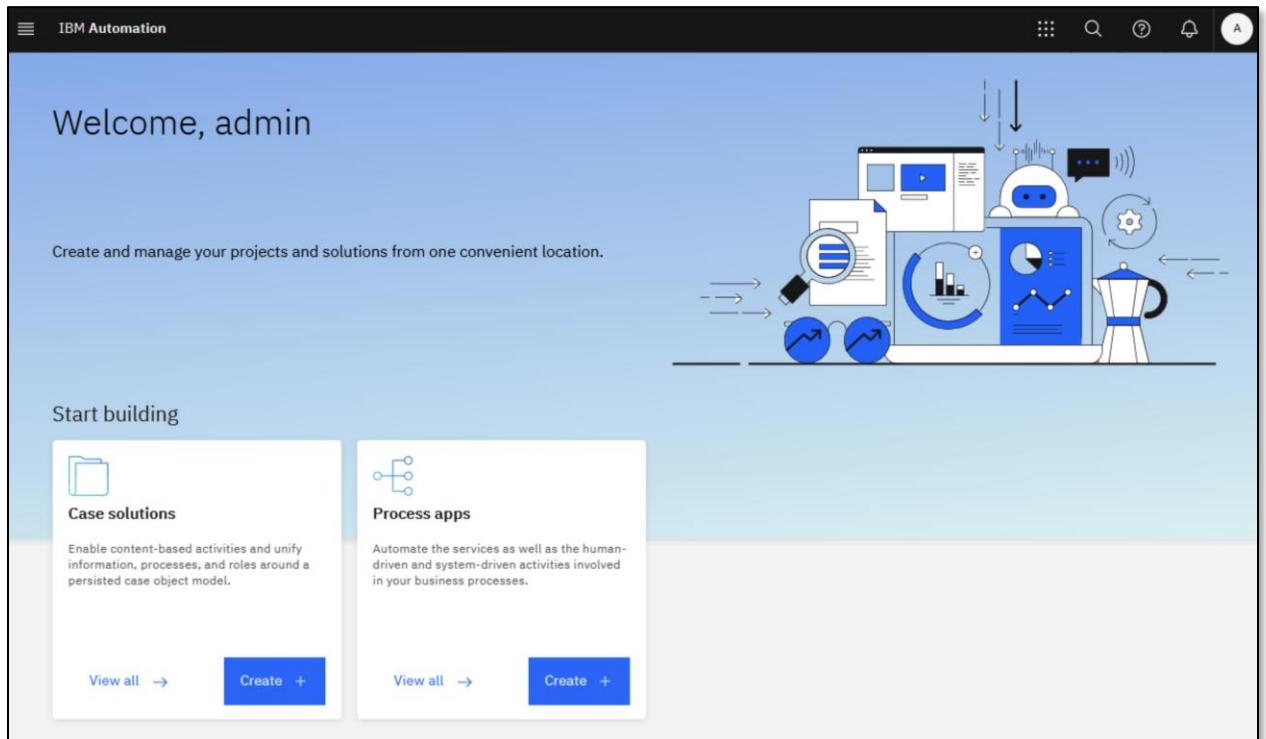


Click on ‘Workflow Center – Solutions’ to open the BAW Workflow Center environment.
(For other BAW environments, look for the URL for the Workflow Center URL, e.g.
<https://host:port/WorkflowCenter/>, <https://ibmbaw:9443/WorkflowCenter/>.

4. Log into the environment with suitable credentials, admin/admin is often available



The following page will be displayed:

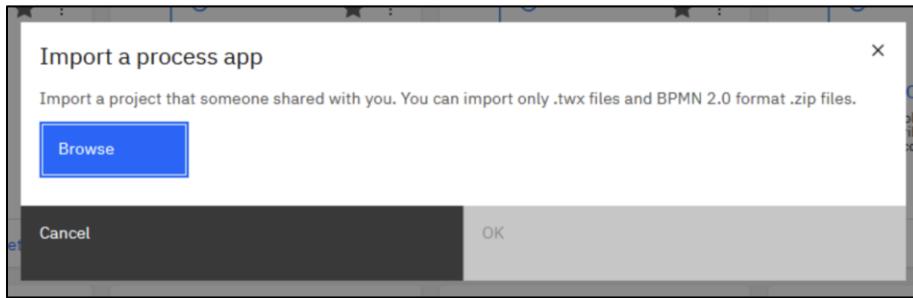


5. Click on the Process apps tile. A page showing all of the available Process Applications is shown. Your page will differ according to the applications installed in your chosen BAW environment:

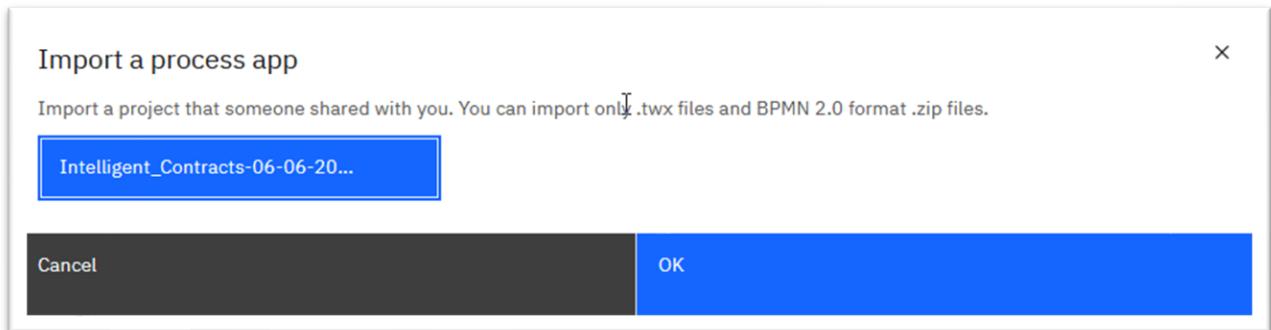
The screenshot shows the "Process apps" page with 10 items listed. The header includes a search bar, sorting options ("Recently updated"), a "Favorites" dropdown, an "Import" button, and a "Create +" button. A message at the top left says "Displaying 10/10 projects". The items are arranged in two rows of five. Each item has a small icon, a name, a star rating, and three dots for more options. Some items also show author information and a "Details" link.

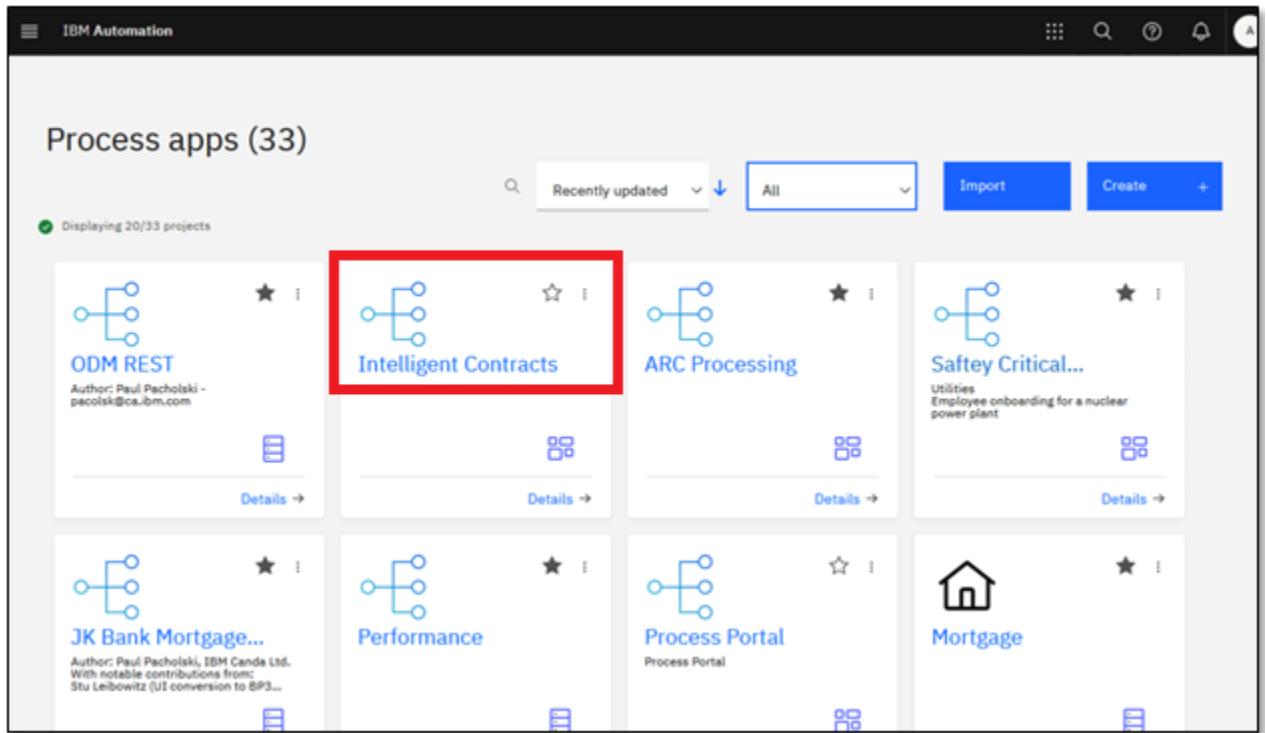
Icon	Name	Rating	Author	Details
ODM REST	ODM REST	★	Author: Paul Pacholski - pacolks@ca.ibm.com	Details →
ARC Processing	ARC Processing	★		Details →
Saftey Critical...	Saftey Critical...	★	Utilities Employee onboarding for a nuclear power plant	Details →
JK Bank Mortgage...	JK Bank Mortgage...	★	Author: Paul Pacholski, IBM Canda Ltd. With notable contributions from: Stu Leibowitz (UI conversion to BP3...)	Details →
Performance	Performance	★		Details →
Mortgage	Mortgage	★		Details →
BAI DemoB	BAI DemoB	★	Paul Pacholski	Details →
Account Opening	Account Opening	★	Author: Jeff Goodhue; evolved from Retail Banking to Account Opening	Details →

6. Open up a web browser and navigate to https://github.com/snyderbrian/Intelligent-Contracts-Workshop/blob/main/Intelligent_Contracts-06-06-2022-1.twx
(You need to copy and paste the URL into the Virtual Machine so it saves the file there, NOT on your actual desktop)
Save to your **Downloads** folder (on the VM) by clicking on **Downloads** first and then selecting **Open**
You'll navigate to the **Downloads** folder (on the VM) in the next step to import it.
7. Note the blue button in the top right labeled Import. Click on this:



- Click on **Browse**, navigate to the **Downloads** folder where Intelligent_Contracts-06-06-2022-1.twx resides and select it for import.
8. Select the file and then click on the blue OK button.
The Process Application will be imported into the Workflow Center, which will be refreshed to show the imported project.





9. Click on the **Intelligent Contracts** tile and the Process Designer tool will open:

A screenshot of the 'Intelligent Contracts' process app settings page. The left sidebar shows navigation options: 'Intelligent Contracts' (selected), 'Processes', 'User interface', 'Exposed Automation Services', 'Services', 'Events', 'Teams', 'Data', and 'Performance'. The main content area has tabs: 'Overview' (selected), 'Environment Variables', 'Servers', and 'UI Conversion'. Under 'Overview', there's a 'Common' section with fields for 'Name' (set to 'Intelligent Contracts') and 'Documentation'. A rich text editor is shown below. A 'Target Environment' section at the bottom contains the note: 'The target installation environment determines the set of features that are supported in the project target environment that corresponds to the environment that this project will be installed on.'.

Click on Processes and the list of processes will appear.

Click on Contract Analysis:

10. There are 6 activities in this process:

- Setup** is for initialization steps. This is currently limited to setting up some date information.
- Load Contracts** is to load a specific file to be analyzed and to enter any necessary comments
- Analyze Contracts** is to call the ML service that analyzes the contract file and returns an opinion on the likely success of the contract plus a set of significant

criteria that are relevant to the opinion.

NOTE: In this demo the call to the ML service is not implemented. Instead, a set of default values is provided. This is OK, as this is a “vision demo” and not a proof of capabilities.

- d. **Review Results** shows the information returned by the ML service call. It shows information on the likelihood of a successful contract. It also shows the contract characteristics that influence contract success (as derived during ML modeling) and the particular characteristics that affected this opinion.
The next steps are an approval step and there is the opportunity to enter more comments for the approver.
 - e. **Approve Contract** is for an approver to ‘accept’ the contract or return it to be re-worked.
 - f. **Update Systems of Record** is a no-op step included to represent a next step after a contract approval.
11. The 3 user activities are contained within 2 swim lanes named **Procurement Analyst** and **Procurement Reviewer**. Each swim lane has a set of authorized users in a Team. The **Contract Analysis** Team is associated with the **Procurement Analyst** swim lane and the **Contract Mgmt** team is associated with the **Procurement Reviewer** swim lane. You may associate any set of users/groups with each team. The simplest way to run the demo is to ensure that there is a user common to both teams so that all 3 activities can be run by the same user.
- a. On the left side of the Process Designer page, click on Teams and select Contract Analysis from the list:

The screenshot shows the IBM Automation interface. At the top, there's a navigation bar with three horizontal lines and the text "IBM Automation". Below it, a breadcrumb trail says "Process apps / Intelligent Contracts". A sub-header "Contract Analysis" with a close button (X) is visible. On the left, a sidebar lists several categories: "Intelligent Contracts" (selected), "Processes", "User interface", "Exposed Automation Services", "Services", "Events", "Teams" (highlighted in blue), and "Data". Each category has a plus sign icon next to it. To the right of the sidebar, a search bar with a magnifying glass icon and a dropdown menu labeled "Type" are shown. Under "Team", there are two entries: "Contract Analysis" and "Contract Mgmt", each preceded by a user icon.

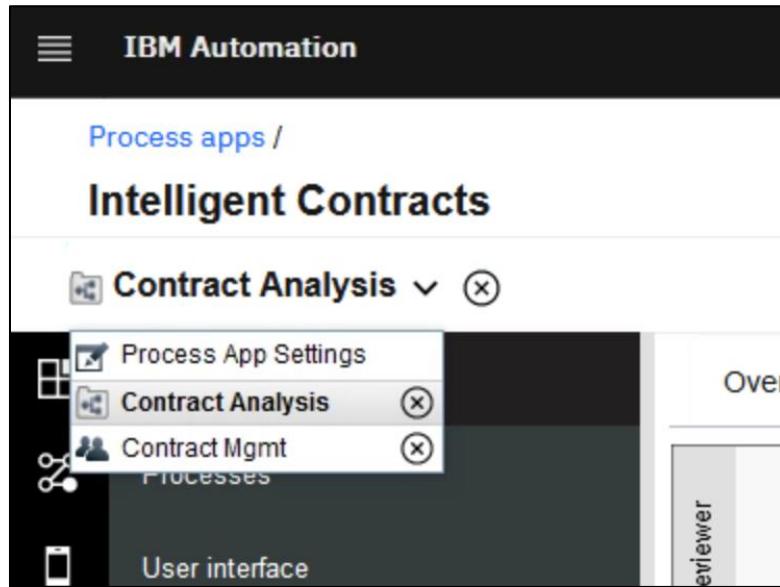
- b. The members of the team are shown on the right side of the page:

This screenshot shows the "Behavior" configuration screen. At the top, there's a header with two "K" icons and the word "Behavior". Below it, a note says "Specify members by using:" followed by two radio buttons: "Users or groups" (selected) and "A service". A "Members" section is expanded, showing a list of users under "Users": jkOfficer1, jkOfficer2, jkUnder1, jkUnder2, and admin. There's also a "User Groups" section with a plus sign icon. On the far right, there are "X" and "+" icons.

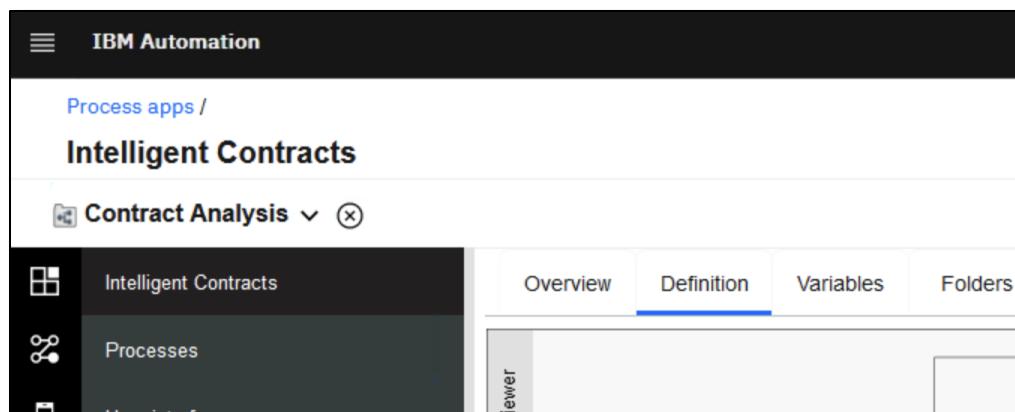
There are 5 users and no groups shown above. You can use any user that is

available to your system. With the exception of SaaS (where your SaaS user is the best option), admin is the most commonly available/simplest user to use. If your preferred user is not present click on the plus “+” to the right of users and add the appropriate user.

- c. Repeat the above steps for the **Contract Mgmt** team.
12. Lastly, ensure that any user can start an instance of the **Contract Analysis** process.
- a. Navigate back to the **Contract Analysis** process definition:



- b. Select the Overview tab:



- c. Under the Exposing section on the RHS, ensure that 'Expose to start' is set to All Users:

Details

Instance name: + tw.system.process.instanceId

Enable due date:

Due in: Hours

Enable at risk calculations:

Enable tracking groups:

Allow projected path management:

Work Schedule

Time schedule:

Time zone:

Holiday schedule:

Exposing

Expose to start: All Users System Data

Expose business data:

This ensures that any user can start an instance of the **Contract Analysis** process.

Note that there are just 3 user activities in this process, those colored green. In the next section there is a description of how to run the demo and what points to emphasize.

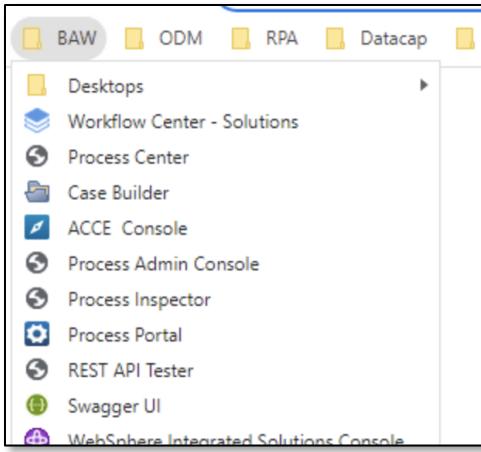
Running the Demo

(top)

The demo consists of a set of UIs that show how a contract might be assessed.

Business Automation Workflow has a user portal that enables user activities to be executed, known as the Process Portal. It is an out of the box application provided by the BAW product.

1. Log on to the Process Portal Environment. Click on the BAW folder and select Process Portal:



For many BAW environments (e.g. SaaS) a Process Portal tile is provided, for Skytap a browser bookmark is often available. The form of the URL is <https://host:port/ProcessPortal/>, e.g. <https://ibmbaw:9443/ProcessPortal/>. There will be a Sign In screen as follows:

A screenshot of a web-based sign-in page titled "Sign in to Business Automation Workflow". The page has a dark blue header and a light blue body. It contains two input fields: "Username" with the value "admin" and "Password" with the value ".....". To the right of the password field is a "Continue" button with a circular arrow icon. At the bottom left, there is a small text note about licensed materials and an IBM logo at the bottom center.

Enter a userid/pwd as appropriate and click on Continue. (admin/admin is usually available.)

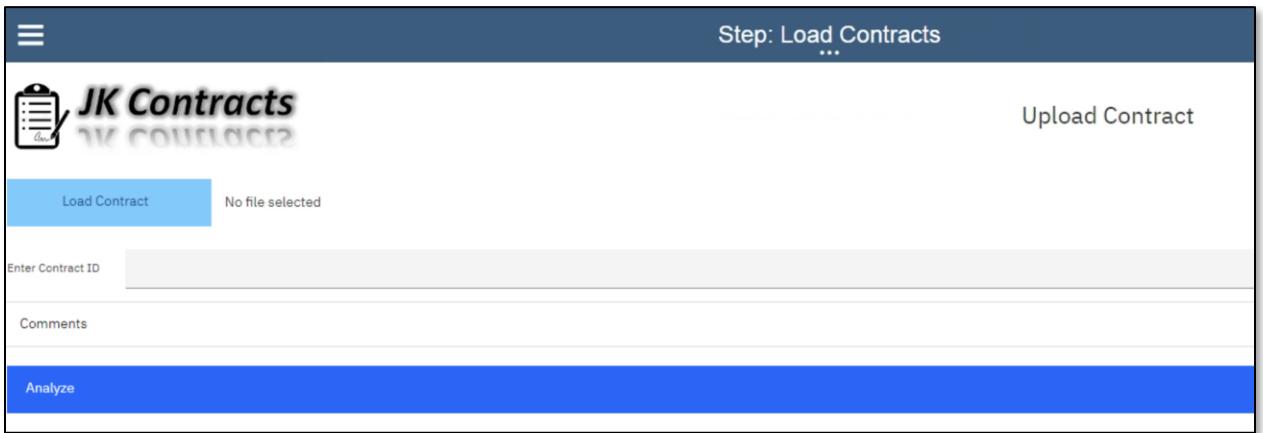
2. The main page for Process Portal is presented:

The screenshot shows a business process management (BPM) application interface. The top navigation bar includes a user profile for 'admin', 'Edit Profile', and 'Log Out'. The top right corner displays performance metrics: 8 Total Open, 0 On Track, 0 At Risk, and 8 Overdue. A search bar at the top right says 'Enter search text...'. The main content area is divided into sections:

- Dashboards:** Shows 'Create Saved Search'.
- Work:** Shows 'Contract Approval for 26612 - IBM Corp - Contract 01-01-13 - IBM 10-9-22.pdf' (Contract Analysis: 6119, Due: May 23, 2022, 3:43:34 PM).
- Processes:** Shows 'Step: Issue Offer Letter to Candidate' (Onboard People: 6143 for Sarah Evans, Due: May 24, 2022, 4:32:30 PM).
- Process Performance:** Shows 'Contract Approval for JEA - 079-17 Group Insurance Plan.pdf' (Contract Analysis: 6155, Contract Mgmt, Due: May 25, 2022, 3:22:59 PM).
- Team Performance:** Shows 'Step: Review Project Details' (ARC Intake: 6166, Due: May 26, 2022, 5:17:47 PM).
- Launch:** Shows 'Step: Get Initial Project Details' (ARC Intake: 6167, Due: May 26, 2022, 5:18:06 PM), 'Step: Summarise Actions from ARC Review' (ARC Intake: 6168, Due: May 26, 2022, 5:21:17 PM), 'Step: Summarise Actions from ARC Review' (ARC Intake: 6169, Due: May 26, 2022, 6:32:36 PM), and 'Contract Approval for 26612 - IBM Corp - Contract 01-01-13 - IBM 10-9-22.pdf' (Contract Analysis: 6176).
- Contract Analysis:** This is the selected item in the Launch list.

There are 3 primary sections to the page:

- The Dashboards section, top left, shows the different dashboards that are available. The selected dashboard is shown in the main space of the portal. Work is the default setting.
 - The Launch section, bottom left, is a list of processes that this user can start. Notice, in the bottom left corner of the screenshot, Contract Analysis, the process that we wish to start
 - The majority of the screen is taken up with the current dashboard or current activity UI.
3. To start a new process instance, click on Contract Analysis, in the Launch list. The first user activity in the process automatically opens:

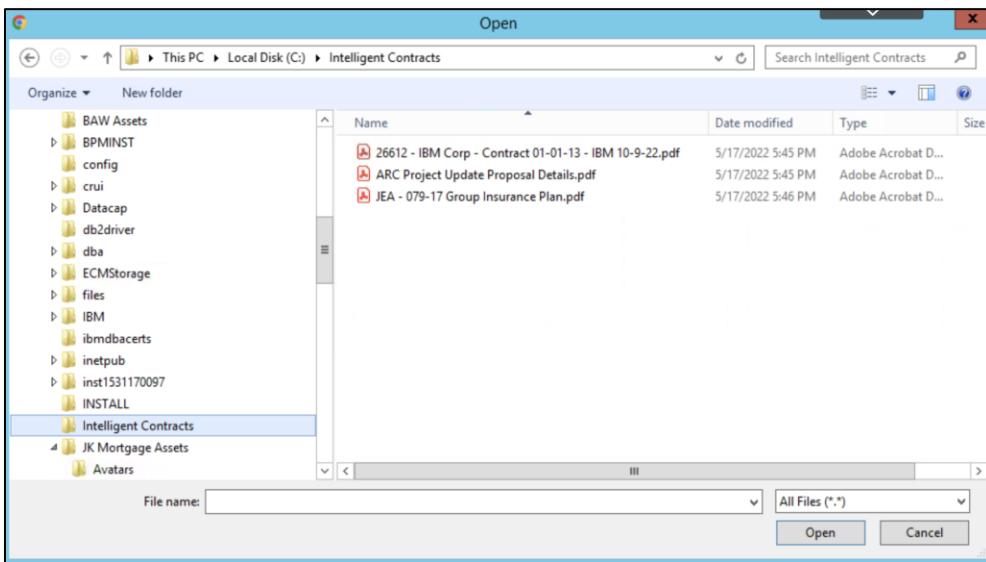


4. Within a browser on your VM, navigate to the link below to download and unzip a zip file containing 2 sample contracts.

https://github.com/snyderbrian/Intelligent-Contracts-Workshop/blob/main/baw_contacts.zip

Unzip to a location on your VM to be imported in the next step.

5. Click on *Load Contract*. This will open a file explorer from which a contract file can be selected. Navigate to where your sample contracts are available, e.g.



The screenshot above shows 3 samples, but you will have only 2. The default processing for the file is that a contract with name beginning “26612” will be predicted as successful. The other files will be predicted as unsuccessful. Select the contract file according to the result that you wish to illustrate and click on open.

6. Note: in testing, the upload sometimes fails but succeeds on a second attempt. The uploaded file is now available to the process and can be seen in the Contracts List which becomes visible when there are contract documents available:
For the example below, choose the one starting with 'JEA'

The screenshot shows a web-based application titled 'JK Contracts'. At the top right, it says 'Step: Load Contracts ...'. On the left, there's a logo of a clipboard with a document icon. Below the title, there's a blue button labeled 'Load Contract' and a text input field showing 'No file selected'. A text input field for 'Enter Contract ID' is also present. The main area is titled 'Contracts List' and contains a table with one row. The table has columns for 'Name', 'File name or URL', and 'Major Version Number'. The single row shows 'JEA - 079-17 Group Insurance Plan.pdf' in all three columns. Below the table is a section titled 'Comments' with a collapsed bar. At the bottom is a blue button labeled 'Analyze'.

Name	File name or URL	Major Version Number
JEA - 079-17 Group Insurance Plan.pdf	JEA - 079-17 Group Insurance Plan.pdf	1.0

7. Enter a Contract ID in the **Enter Contract ID** text box. Any ID is acceptable. If appropriate click on the document and it will open in a new browser window. Note that the documents do not contain contracts and so it might not be appropriate to open the document. If you need a document that is more contract oriented, be sure to have this available as a sample document.
8. Click on the Comment bar to expand the comments section:

This screenshot shows the same application interface as above, but the 'Comments' section is now expanded. The table in the 'Contracts List' section remains the same. Below it, the 'Comments' section is expanded, showing a text input field with 'New Comment' placeholder text and a 'Save' button. At the bottom is a blue 'Analyze' button.

Name	File name or URL	Major Version Number	Last Modified	Modified By
JEA - 079-17 Group Insurance Plan.pdf	JEA - 079-17 Group Insurance Plan.pdf	1.0	6/3/2022	admin

Enter comment in the *New Comment* text area and click on “Add Comment” to add the comment to the process. The comment will appear in the comment log:



(The contents of the comment are not used in processing.) Click on **Analyze** to proceed to the next activity.

9. This will take you back to the process Portal Work page:



Note that there is a new Activity available – “Analysis Results for <filename>”. Select this task to see the results of the ML analysis:

The screenshot shows a web-based AI application for contract analysis. At the top, the title is "Analysis Results for JEA - 079-17 Group Insurance Plan.pdf". Below the title, there's a logo for "JK Contracts" featuring a clipboard icon and the text "JK Contracts" in a stylized font. To the right of the logo, the file name is repeated: "Analysis for JEA - 079-17 Group Insurance Plan.pdf".

The main content area is divided into two main sections:

- Contract Analysis:** This section contains several input fields:
 - File Name: JEA - 079-17 Group Insurance Plan.pdf
 - Contract ID: 1045-DFY
 - Start Date: 3/8/2023
 - End Date: 1/24/2025
 - Duration Days: 688
- Outcome Prediction:** This section contains:
 - Successful Contract: No
 - Success Confidence: 0.735535
 - A comments field with a dropdown arrow.

At the bottom of the page is a large blue button with white text that reads "Forward For Approval".

10. Items to note on this page:

- The Contract Analysis section shows some summary information regarding the contract.
- The Outcome Prediction section shows that the predicted outcome is that this contract will not be successful and there is a confidence value provided with that prediction

11. 'Explainability' is a key tenet of IBM AI and the next step of the demo is focused on this.

- Click on the **View Complete Analysis** button, middle right of the page. A modal will pop up:

Full Analysis

File Name	Contract ID		
JEA - 079-17 Group Insurance Plan.pdf	1045-DFY		
Start Date	End Date	Duration Days	On Time
3/8/2023	1/24/2025	688	Yes
Annual Contract Amount	Contract Range	Contract Type	Sourcing Org
\$10,500,000	High	Under Budget	IT
Expense Type	Intellectual Property	Auto Renewal	Vendor Quality
OPEX	Yes	Yes	4

Show influencers

This shows all of the Contract properties used in the ML model that have an effect on the un/successful outcome of a contract, on an historical basis.

- b. Now click on the **Show Influencers** button:

Full Analysis

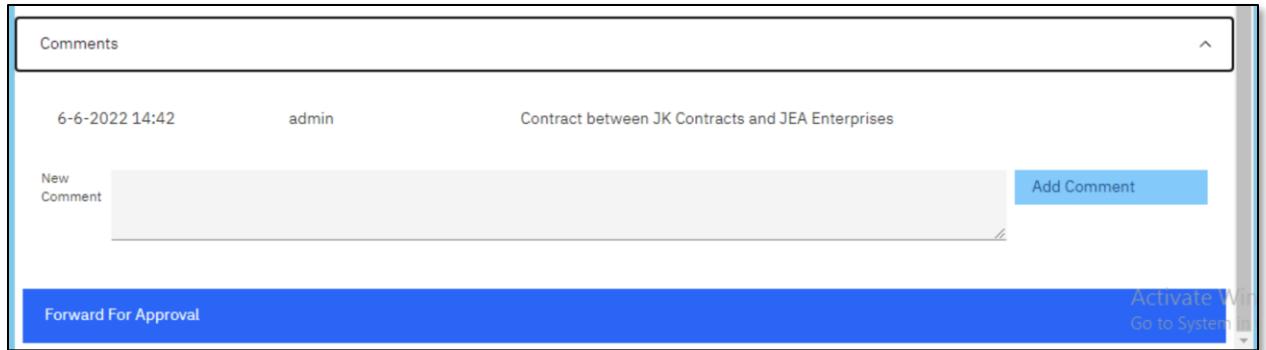
File Name	Contract ID		
JEA - 079-17 Group Insurance Plan.pdf	1045-DFY		
Start Date	End Date	Duration Days	On Time
3/8/2023	1/24/2025	688	Yes
Annual Contract Amount	Contract Range	Contract Type	Sourcing Org
\$10,500,000	High	Under Budget	IT
Expense Type	Intellectual Property	Auto Renewal	Vendor Quality
OPEX	Yes	Yes	4

Show influencers

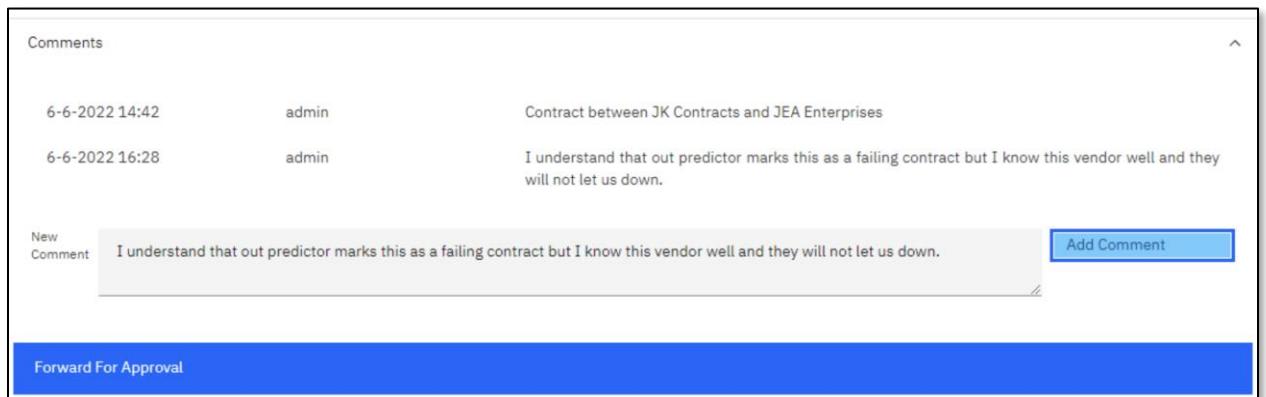
We now show, in red, the contract properties that were most influential in the prediction. For this contract, these properties are Duration Days, Annual Contract Amount, Expense Type, Intellectual Property and Vendor Quality. Dismiss the modal by clicking elsewhere on the page.

Again, note that this data is all part of a vision demo, this is not the result of calls to the ML model.

12. Click on the (collapsed) **Comments** section



You will see the existing comment, made in a previous section, carried through to this step. The next Activity in the process is for a Contracts Approver to review the contract and either approve or send back for re-work. Enter and appropriate comment here for the approver.



Then click on **Forward For Approval**.

13. The flow returns to the Process Portal Work page. Click on the Contract Approval activity

Contract Analysis

File Name	JEA - 079-17 Group Insurance Plan.pdf	Contract ID	1045-DFY
Start Date	3/8/2023	End Date	1/24/2025
			Duration Days 688
View Complete Analysis			

Outcome Prediction

Successful Contract	No	Success Confidence	0.735535
---------------------	----	--------------------	----------

Comments

6-6-2022 14:42	admin	Contract between JK Contracts and JEA Enterprises
6-6-2022 16:28	admin	I understand that our predictor marks this as a failing contract but I know this vendor well and they will not let us down.
New Comment		Add Comment

✖ [Return for Rework](#)

✓ [Approve](#)

This presents a summary and approval page for a Procurement Reviewer/Approver role.
The contract can be approved or returned to the Procurement Analyst.

14. Click on Approve to end the demo.

2. Watson Discovery Contracts Intelligence Workshop

(top)

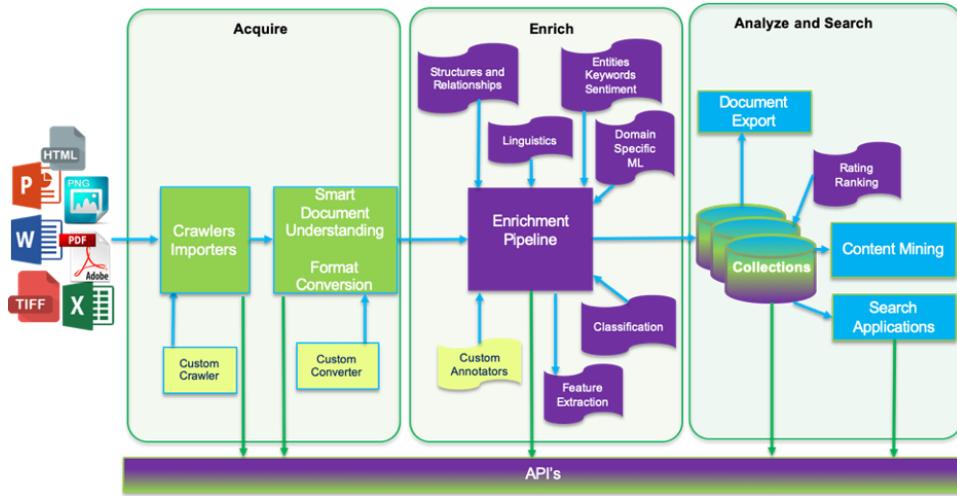
Watson Discovery Data Flow

Watson Discovery provides multiple methods of acquiring and enriching documents of various type. In the diagram below you can see three phases **Acquire, Enrich, Analyze and Search**.

In the **Acquire** stage, data is ingested from one or more data sources, stripped of unnecessary content (such as graphics and formatting) and then passed to the Enrich stage.

In the **Enrich** stage, the data (typically a mix of structured and unstructured text) is processed using techniques such as Natural Language Processing and Machine learning to provide meaning and context to the raw text. This enriched data is stored as a Collection.

The **Analyze and Search** stage uses the enriched data from one or more Collections to conduct discovery and exploration or to enable expert assistance through search-based applications.



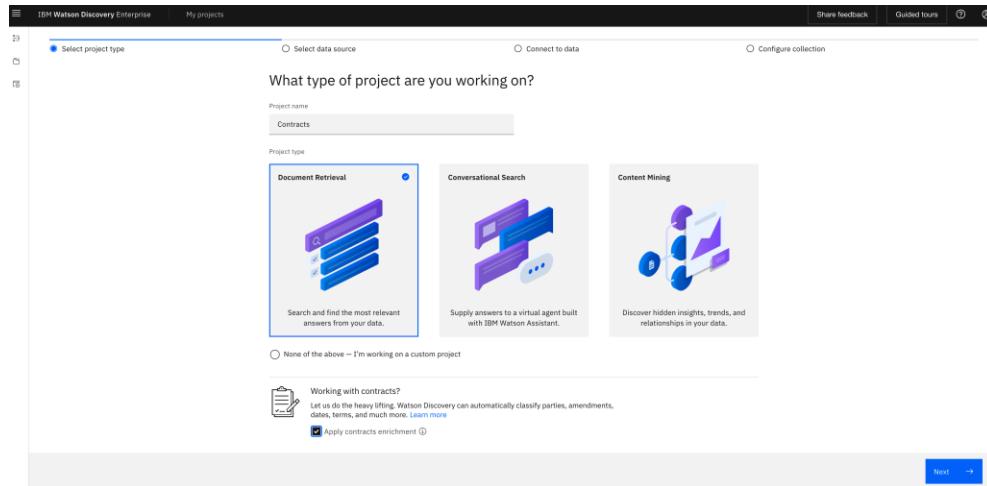
Watson Discovery uses Natural language queries as well as structured queries to find relevant results using passages and highlights across data that has been enriched and ingested. In this particular demo the data ingested is a small number of procurements contracts. We have chosen to apply a pre-built Contracts Intelligence enrichment model during ingestion in order to leverage Watson's understanding of contractual data.

Demo Setup (top)

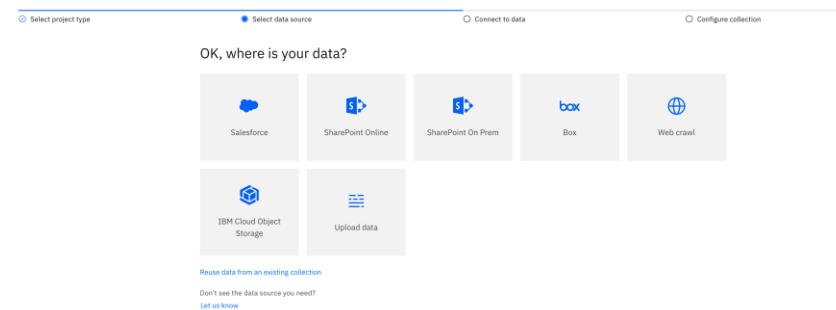
NOTE: This use case demonstration calls for Watson Discovery Enterprise Edition to be licensed and used for the purpose of the “Contract Analysis” feature. However, the workshop includes setup and demonstration instructions for the Plus Edition as well if you cannot access the Enterprise Edition.

1. Add The Watson Discovery service through the IBM Cloud Services Catalog.
<https://cloud.ibm.com/>
2. Once you have launched the Discovery Tooling, look to the right of the initial Project screen for the icon and click on it.
3. Enter a Project name (Contracts Intelligence), Select the “Document Retrieval” project type. Then check the box for “Working with Contracts”. Click Next

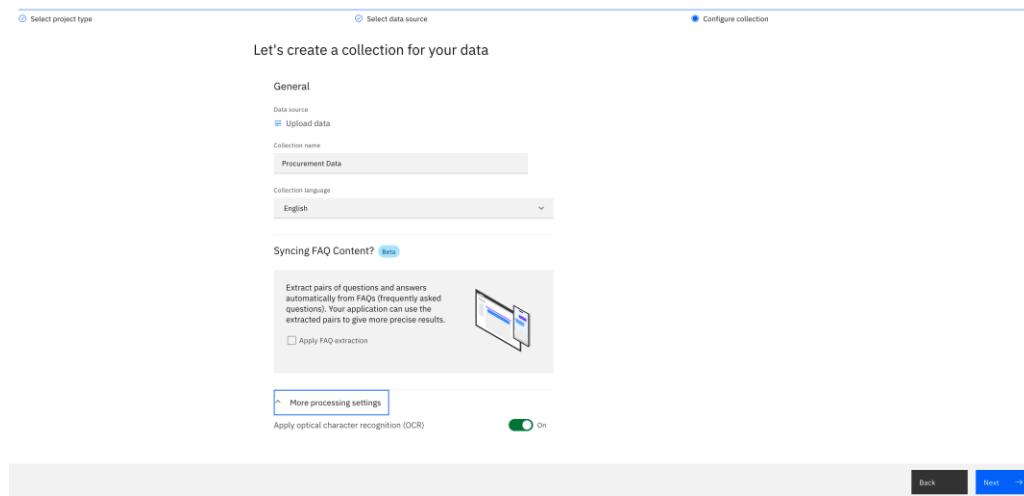
NOTE: If you do not have an Enterprise license, then the “Working with Contracts” option will not be available, and you should just continue with the steps outlined below. The optional demo for this will outline steps for a demonstration without the Contracts Model being used



4. Now select “Upload data”, then click Next.



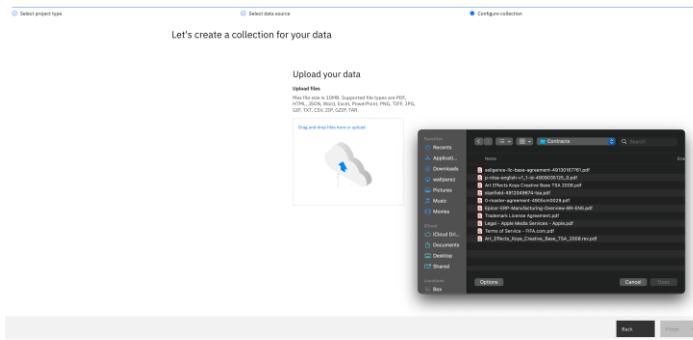
5. Name your collection something unique, open the “More processing settings” options drop down and ensure the OCR option is enabled. (some of the content is scanned as an image, so this will enable us to pull out text). Click Next



- Now, click this link to [download the content found in the github repository for this workshop to your computer and then unzip into a local folder.](#)

This should give you 6 documents.

You can either click and drag the docs from a folder or click within the box to open a local file explorer popup. Then click Finish in the bottom right corner of the screen.



Once the data has loaded, you will see the following screen, which indicates the data has successfully loaded and is ready for the demonstration.

Demonstration (Discovery Enterprise Edition, with Contract Analysis)

(top)

- Launch Watson Discovery Tooling from Services and Software Resource List in [ibm.cloud.com](#).

- Select the **Contract Intelligence Project** from the **My Projects** list. You will now be in the **Improve and customize** panel of Discovery Tooling and ready to demo.
- In the search box enter **Stanfield Intellectual Property** as the query.

In the return results you will see that not only results have been displayed, but also enriched structure from the document now exists in order to use for digging deep into the exact areas of the contract we are interested in.

- Click on **view passage in document** for the first result in the list. This will show the natural understanding of the concept we queried highlighted within the original document.

- Click on **Open advanced view** in the bottom right of the window. This is a Contracts specific User Interface designed to expose the full gambit of the Contracts Intelligence. You can see in this screen, we now have more structured enrichments that have been exposed from the specific document.

- Click on the **Category, Intellectual Property**.

← stanfield-4912049674-tsa.pdf

Contract Data Document

stanfield-4912049674-tsa.pdf

Filters

- Assets (2)
- Assignments
- Audits
- Business Continuity
- Confidentiality
- Deliverables (2)
- Dispute Resolution
- Indemnification (1)
- Intellectual Property (44)
- Insurance
- Liability (2)
- Order of Precedence
- Payment Terms & Billing (38)
- Pricing & Taxes
- Privacy
- Responsibilities
- Safety and Security
- Scope of Work
- Term & Termination (1)
- Warranties (4)

Nature

- Definition (3)
- Disclaimer (1)
- Exclusion (2)

1 / 44

"Affiliates" means entities that control, are controlled by, or are under common control with, a party to this Agreement.

"Agreement" means this Base Agreement and any relevant Statements of Work ("SOW"), Work Authorizations ("WA"), and other attachments or appendices specifically referenced in this Agreement.

"Business Partner Agreement" means an agreement executed between Buyer and Supplier to promote, market, and support

certain products and services.

"Customer" means Buyer's customer.

"Deliverables" means items that Supplier prepares for or provides to Buyer or Customer as described in a SOW and/or WA.

Deliverables include Developed Works, Preexisting Materials, and Tools.

"Developed Works" means all work product (including software and its External) developed in the performance of this Agreement as described in a SOW and/or WA. Developed Works do not include Preexisting Materials, Tools, or items specifically excluded in a SOW and/or WA.

"Electronic Self-Help" means a process where Supplier electronically disables, removes, or otherwise prevents the use of its software product without the Buyer's or Buyer's Customer's cooperation or consent. Electronic Self-Help could be done through electronic or other means (for example, remotely through "back doors" or hidden entrances in the software or through hidden shut-down commands in the software that can be activated by phone or in other ways).

"External" means any pictorial, graphic, audiovisual works, reports or data generated by execution of

Details

Categories
Intellectual Property

Types
Nature: Definition, Party: None

Attributes
DefinedTerm (1)

Now every concept from the contract around Intellectual Property has been identified and highlighted in the document. You can use the top navigation to jump from highlighted passage to highlighted passage. This shows that we have successfully identified the concept of Intellectual Property as an enrichment in the document, which will be crucial as a predictive field with our Machine learning model in Watson Studio.

7. With Intellectual Property still selected, now click on the **Buyer** radio button under the **Party** category. We have now intersected the one area in the contract where Intellectual Property is discussed in regards to the Buyer.
8. Other metadata is extracted as well and can be used to enrich models built with Machine Learning. Click on the **Metadata** tab above the categories.

stanfield-4912049674-tsa.pdf

Metadata

- Pricing & Taxes
- Privacy
- Responsibilities
- Safety and Security
- Scope of Work

This will expose other metadata, such as the effective date of the contract.

Contract Data Document stanfield-4912049674-tsa.pdf 1 / 1

Metadata

Effective dates
2012-06-16

Contract types
Base Agreement
Base Agreement

Parties

INTERNATIONAL BUSINESS MACHINES (Buyer) (2)
STANFIELD SYSTEMS (Supplier) (2)
GLOBAL TECHNICAL SERVICES COUNCIL (1)
Addresses
3039 Cornwallis Road Raleigh, NC 27709-2195

This Base Agreement ("Base Agreement") between International Business Machines Corporation ("Buyer") and Stanfield Systems Incorporated ("Supplier") establishes the basis for a multinational procurement relationship under which Supplier will provide Buyer the Deliverables and Services described in SOWs and/or WAs issued under this Base Agreement. This Base Agreement is effective from June 16, 2012 ("Effective Date") and will remain in effect until terminated.

1.0 Definitions

"Affiliates" means entities that control, are controlled by, or are under common control with, a party to this Agreement.

"Agreement" means this Base Agreement and any relevant Statements of Work ("SOW"), Work Authorizations ("WA"), and other attachments or appendices specifically referenced in this Agreement.

"Business Partner Agreement" means an agreement executed between Buyer and Supplier to promote, market, and support certain products and services.

"Customer" means Buyer's customer.

"Deliverables" means items that Supplier prepares for or provides to Buyer or Customer as described in a SOW and/or WA.

Deliverables include Developed Works, Preexisting Materials, and Tools.

"Developed Works" means all work product (including software and its Externals) developed in the performance of this Agreement as described in a SOW and/or WA. Developed Works do not include

9. You can also add custom enrichments assisted by Watson AI through the Discovery tooling as well. Click on the [/ Improve and customize /](#) hyperlink located at the top left of the window to go back into the main Improve and customize screen. On the right side, click on the **Teach Domain concepts**. This opens more AI assisted tools to further enrich your contracts data by adding custom Dictionary terms, extracting custom entities or even applying custom Machine Learning.

Improve and customize

Q Stanfield Intellectual Property

Category

- Communication
- Intellectual Property
- Confidentiality
- Dispute Resolution
- Indemnification

Show all

Nature

- Disclaimer
- Obligation
- Right
- Exclusion
- Definition

Contract Payment Term

- 12 days
- 45 days

Contract Type

- Base Agreement
- TRADEMARK LICENSE AGREEMENT

enriched_html_tables.row_headers.html

Items per page: 5 1–5 of 11 results

Supplier Role

3rd Best Ltd	
--------------	--

View table in document

Collection: Contracts

Microsoft Word - Art Effects Koya Creative Base TSA 2008.doc

Supplier Phone Support

Company X	Phone Support
-----------	---------------

View table in document

Collection: Contracts

Art Effects and Koya TSA

enriched_html_tables.row_headers.html

1 of 3 pages

IMPROVEMENT TOOL

Customize display

Extract meaning

Teach domain concepts

Dictionary Create and manage lists of industry and business terms.

Patterns **Beta** Teach Discovery to recognize text that matches patterns in your data.

Extract entities Train a model that can recognize terms with special meaning in your data.

Regular expressions Define specific sequences of characters to extract.

Classifiers Apply your own labels to categorize documents.

Machine learning Apply your own rule based, machine learning, or text analysis models.

Advanced rules models Apply your own text extraction models.

Define structure

Improve relevance

Now that we have shown how we can enrich unstructured content, Watson Studio will be used to leverage existing data fields as well as the newly extracted Watson Discovery enrichment fields to create predictive models.

Demonstration (Discovery Plus Edition)

(top)

This alternative Demonstration will rely on a custom field being created as the pre-trained Contracts enrichments are not available. This path can also be shown in addition to the above path to illustrate the fact that customized fields can also be added to the pre-trained models in Discovery.

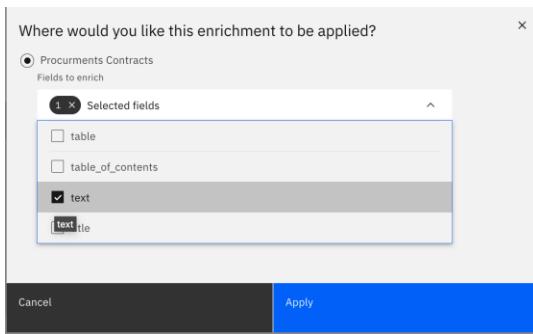
1. Launch Watson Discovery Tooling from Services and Software Resource List in ibm.cloud.com.

- 2.
3. Select the **Contract Intelligence** Project from the **My Projects** list. You will now be in the **Improve and customize** panel of Discovery Tooling and ready to demo.
4. In the search box enter **Stanfield Intellectual Property** as the query. Notice the Entities being displayed on the left. Since we do not have a pre-trained contracts model listing of entities, we will need to show how we can easily start building a custom entity to easily find the concept of intellectual property.

5. On the right side of the screen open the “Teach Domain Concepts” drop down. Now click on the “Dictionaries” option.

Now, click on “New”, then enter the Dictionary name as, “Intellectual Property”. For the included terms, enter...intellectual property, inventions, third party code, and developed works. Lastly, click on the “Save Dictionary” located in the upper right corner of the screen.

6. Now click on the field to which this enrichment will be applied to. In our case, click “text”.



7. The goal is to create an enriched field to be extracted from the unstructured text. Once this has been saved, you will notice a popup that mentions re-processing of the collection has started. It will take a few minutes for the collection to be refreshed with the new field we just created. So, in the meantime, go back to the “Back to Improve and Customize” screen by clicking on the hyperlink in the upper lefthand corner of the screen.

Once the processing has finished and enter a query, you should see the following screen, which contains our newly created field of intellectual property. This shows that we have successfully identified the concept of Intellectual Property as an enrichment in the document, which will be crucial as a predictive field with our Machine learning model in Watson Studio.

Contracts / Improve and customize

Top Entities

- intellectual_property
- inventions
- third party code

JobTitle

Organization

Number

Collections

Available collections

Items per page: 10 1–6 of 6 results

You can even go further and show the exact type of Intellectual Property...

Clicking on one of the sub-entity types, will further slim down the results to show only the passages that contain that term. Try clicking “inventions”, which should yield one result.

Now that we have shown how we can enrich unstructured content, Watson Studio will be used to leverage existing data fields as well as the newly extracted Watson Discovery enrichment fields to create predictive models.

3. Watson Studio With Watson Discovery To Build And Deploy a Contract Success AI Model Workshop

(top)

In our previous demo with Watson Discovery, we learned how it was able to provide Domain Concepts like “*Intellectual Property*” from many contractual documents.

When building our machine learning model to predict contact success, we’re going to merge the unstructured concepts like “*Intellectual Property*” with the historical contract history to build and deploy a more robust machine learning model to predict contract success.

The screenshot shows a search interface for 'Stanfield Intellectual Property'. A red circle highlights the search bar at the top. Below it, a section titled 'Category' lists several checkboxes: Communication, Intellectual Property, Confidentiality, Dispute Resolution, and Indemnification. A 'Show all' link is also present. To the right, a snippet of text discusses the effect of the agreement until fulfilled, mentioning 'Taxes', 'Ongoing Warranties', 'Action', and 'Exchange o'. A 'View passage in document' link is provided. Another red circle highlights the 'Intellectual Property Rights' phrase in the text. Below this, a section for 'Nature' lists radio buttons for Disclaimer, Obligation, Right, Exclusion, and Definition. A 'View passage in document' link is also here. Further down, sections for 'Contract Payment Term' (radio buttons for 12 days and 45 days) and 'Contract Type' (radio button for ' ') are shown. A final red circle highlights the 'Intellectual Property Rights' phrase in another text snippet.

Figure 3 Example of using Watson Discovery To Uncover Common Categories. In addition to cognitive analysis, it will be used to ingest the categories as machine learning attributes to improve model accuracy.

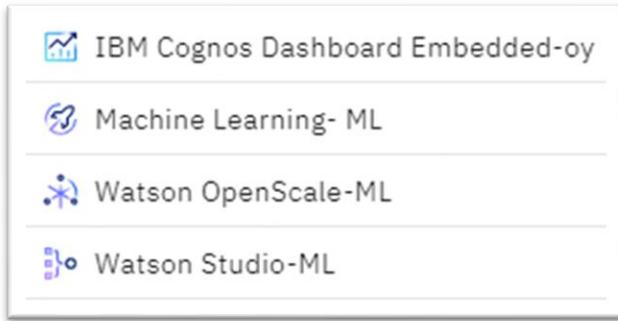
Machine Learning Workshop Goals (top)

In this workshop you'll learn step-by-step how to:

- 1) Access data to build a machine learning model to predict contract success using data assets coming from a trusted catalog
- 2) Automate and accelerate the model creation and selection process and provide more data science to all using AutoAI
- 3) Build models three ways on our platform, one being AutoAI
- 4) Deploy a model for infusion in other applications like Cloud Pack For Business Automation

Required software, access, and files (top)

1. To complete this lab, you will need a **Cloud Pak for Data as a Service (CPDaaS)** account: <https://dataplatform.cloud.ibm.com>
If you don't have a CPDaaS account, use the same URL to sign up for a free trial. The account will be activated in approximately 5 minutes.
2. If you already have an **IBM Cloud** account, make sure that you provisioned the required services
 - a. **Watson Studio**
 - b. **Watson Machine Learning (WML)**
 - c. **Watson OpenScale**
 - d. **IBM Cognos Dashboard Embedded**.
3. Navigate to your *Resource list* in your **IBM Cloud** dashboard: <https://cloud.ibm.com/resources>
4. Check if the mentioned services are displayed under **Services**. If not, search for the services in the **Catalog** and add them.



NOTE: You will likely not have the same endings. (IE. '-oy' and '-ML'). Feel free to customize.

Download These Files From Git

(top)

5. Download the **project zip file** to your machine. It will be imported into an IBM Cloud Pak For Data Project.
6. Please visit this [git repository](#) to download all the files for this workshop.
7. Download [this recording](#) or watch and download [from here](#) before you proceed!
It will step you through the step-by-step demo yourself.

File Descriptions

1) Intelligent-Contracts.zip

Import this zip file when creating a new IBM Watson Studio Project
It will include the following project assets:

- 3 CSV files - Scored_Contracts.csv, Contract_Analysis.csv, Unscored_Contracts.csv

- Python Notebook - ContractSuccessRandomForest-Py38 Using Sklearn - Using Open Source SkLearn Python with a Random Forest Model deployed to IBM Platform
- Modeler Flow - Build and deploy the same Python model without the need for coding
- Dashboard - Historical and Predictive Visualizations using structured and unstructured contract data
- Model - Contract Success Using AutoAI - P3 Snap Random Forest Classifier - This model was generated by AutoAI. We will deploy in the workshop.

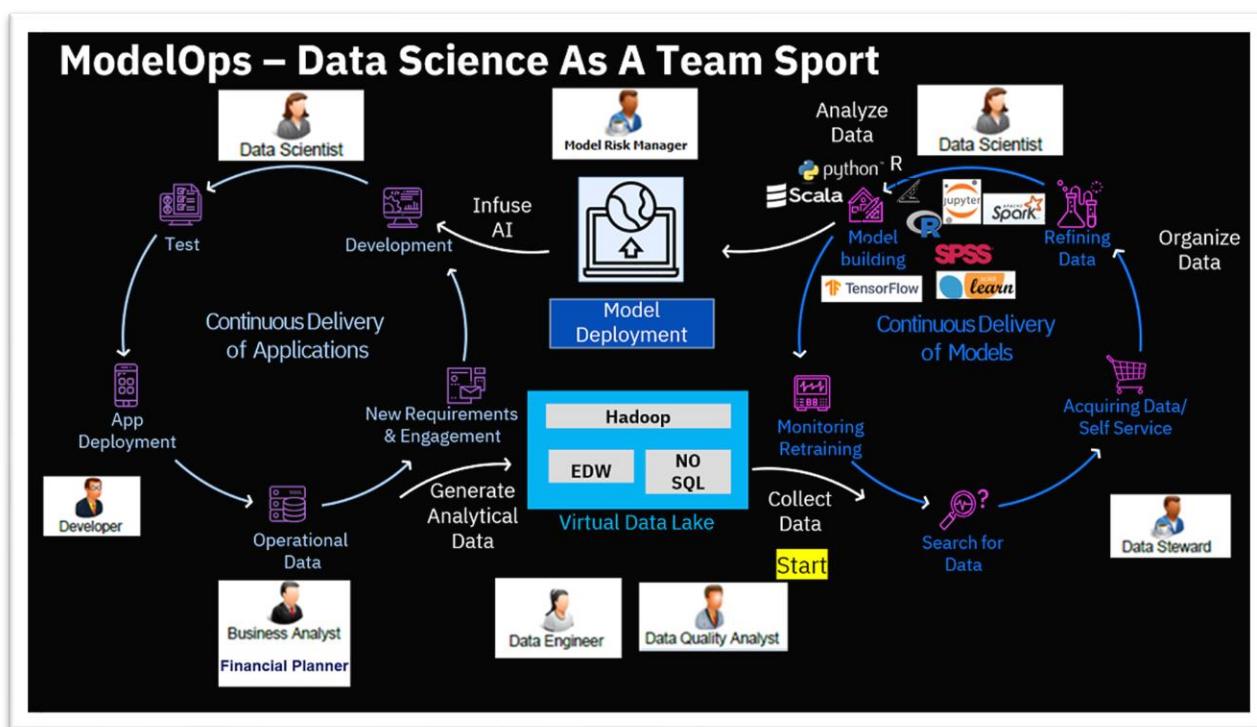
2) Intelligent-Contracts-Workshop-Guide.pdf (CURRENT DOCUMENT)

Use this step-by-step workbook to:

- Automate Contract Workflow (Ingestion, Analysis, Approvals)
Uses Cloud Pak For Business Automation
- b) Enrich Intelligence Accuracy (Extracting Information from Contracts)
Uses Cloud Pak For Data Watson Discovery
- c) Integrate Continuous Improvement (Infusing AI into the Operation)
Uses Cloud Pak For Data Watson Studio

3) data_science_modelops_team_sport.png

ModelOps as a Team Sport image depicting all those involved in delivering AI models and how IBM has them all collaborate on one platform.



4) contracts.zip [Already used in previous workshop]

Contracts used in with Watson Discovery demo. Its concepts and categories will be used in the modelOps model development to improve the accuracy of the machine learning model to be built..

5) modelOpsForContractSuccess.mp4

A recording of the end to end modelOps demo.

6) csv_files.zip

(Optional) Start a new Project in Cloud Pak For Data, import these CSV files and create all the project assets yourself from scratch.

Watch the video as a guide.

7)Trustworthy AI.mp4

(Optional) In this 9 minute recording, learn how IBM provides AI guardrails by monitoring key model metrics on and off our platform using OpenScale to detect bias or drift with model risk workflow to adhere to regulator guidelines like SR 11-7 that requires model risk management for all models in financial services. This demo uses OpenPages to provide the model risk management workflow.

8)ContractSuccessRandomForest-Py38 Using Sklearn.ipynb

(Optional) Import this Python notebook using Open Source Sklearn and Random Forest Model.

Required skills

(top)

We recommend that users who work through this lab:

- Understand the data science model lifecycle
- Have at least beginner knowledge of different methods for creating models

Workshop Start

Getting Data Assets From Governed Catalog

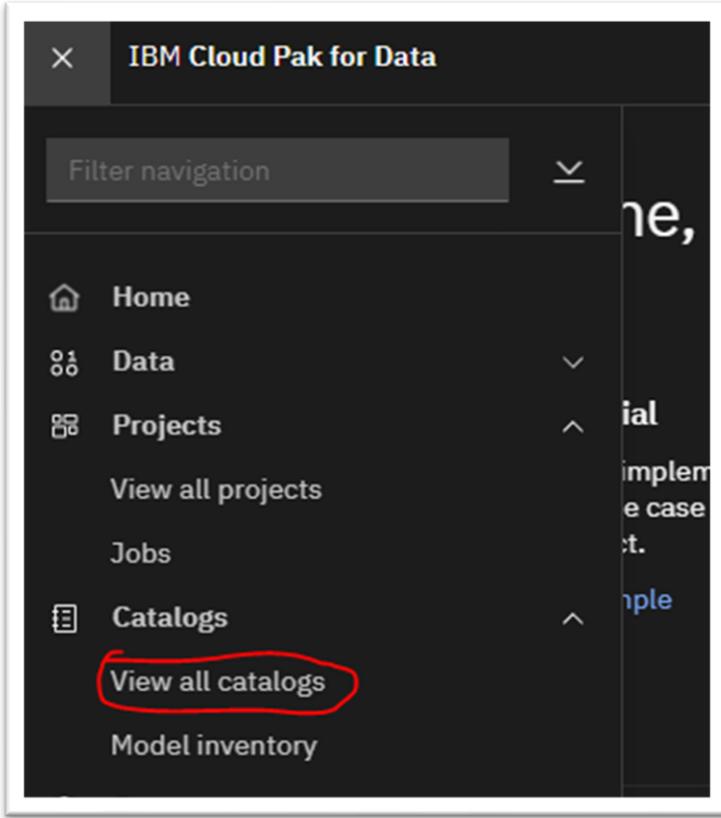
(top)

The data assets in today's demo have been catalogued along with other enterprise data assets making it easy to find and use

- Raw contract data
- Enterprise data connection data containing contract data
- Governed contract data contain policies to redact PII data across all data
- Contract success machine learning models
- Open Source Python/R Studio Notebooks to build test and deploy machine learning for contract success
- Visual contract Dashboards
- Modeler Flows to built test and deploy models without coding
- AutoAI Experiments to determine contract success

1. Sign into [Watson Studio](#)

From the quick navigation on the top left, select **Catalogs → View all Catalogs**



2. After selecting **Platform assets catalog**, notice:

NOTE: Your catalog will look different. You may not have a catalog to choose either. Either case, please use the snapshots below to inform you of this capability to leverage governed data assets to help with contract success.

- Seen below, cataloged assets easily found by asset type, any tag, recently added, and asset type.

Platform assets catalog

Assets Access control Settings

Find assets

Filter by: Any asset type Any tag

Recently added Watson recommended Highly rated

Name	Owner	Tags	Business terms	Asset type
ClaimsHailForecastPredictions.csv	Brian Snyder	hail, weather		Data
Contract Success Using AutoAI - P3 Snap Random Forest Cl...	Brian Snyder	contracts		WML model
Contract_Analysis.csv	Brian Snyder	contracts, contract analysis		Data
ContractSuccessRandomForest-Py38 Using Sklearn	Brian Snyder	contracts, contract model		Notebook

3. NOTE: Your catalog will look different. Please view the snapshot below of an example of using a governed catalog to import governed data assets into a project meant to improve contract success.

When searching on **contract** notice all the assets we have to add to a project improving contract success.

Includes a model, connections to data, open-source notebook, CSV files to train a model and a dashboard to visualize the contract history and predictions.

Since we already have a project ready to go, DO NOT click Add to project.

The screenshot shows the 'Platform assets catalog' interface. At the top, there are tabs for 'Assets', 'Access control', and 'Settings'. A search bar contains the text 'contract'. Below the search bar, there are filter options: 'Filter by:' dropdown set to 'Any asset type', 'Any tag' dropdown set to 'contract', and a 'Clear all' link. A red circle highlights the 'Add to project' button, which is located above a list of assets. The list includes the following items:

Name	Owner	Tags	Business terms	Asset type
Contract Success Using AutoAI - P3 Snap Random Forest Cla...	Brian Snyder	contracts		WML model
Contract_Analysis.csv	Brian Snyder	contracts	contract analysis	Data
ContractSuccessRandomForest-Py38 Using Sklearn	Brian Snyder	contracts	contract model	Notebook
Netezza On IBM Cloud	Brian Snyder			Connection
Scored_Contracts.csv	Brian Snyder	contracts	successful contracts	Data
Successful Contracts Dashboard	Brian Snyder	contracts		Dashboard
Unscored_Contracts.csv	Brian Snyder	contracts	unscored contracts	Data

At the bottom right of the asset list, it says '7 of 7 items'.

Import Contract Data Assets To A New Project Using Intelligent-Contracts.zip (top)

1. From the quick navigation on the top left, select **Projects** → **View all projects**.

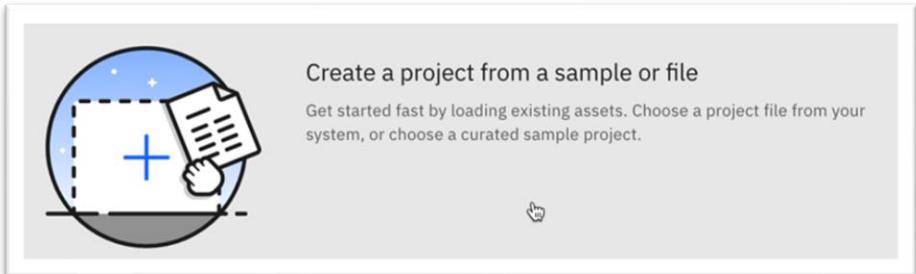
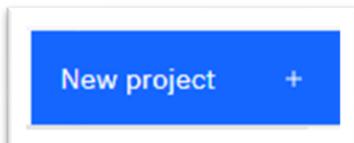
X IBM Cloud Pak for Data

Filter navigation

Welcome, Brian!

- Home
- Data
- Projects
 - View all projects
- Jobs
- Deployments
- Services
 - Services catalog
 - Service instances
- Gallery
- Administration
- Support

- On the far right, click the **New project**, then select **Create a project from a sample or file**.



3. Drag or click and choose the *project zip* file (downloaded from Git) from your machine to the **Upload file** section.

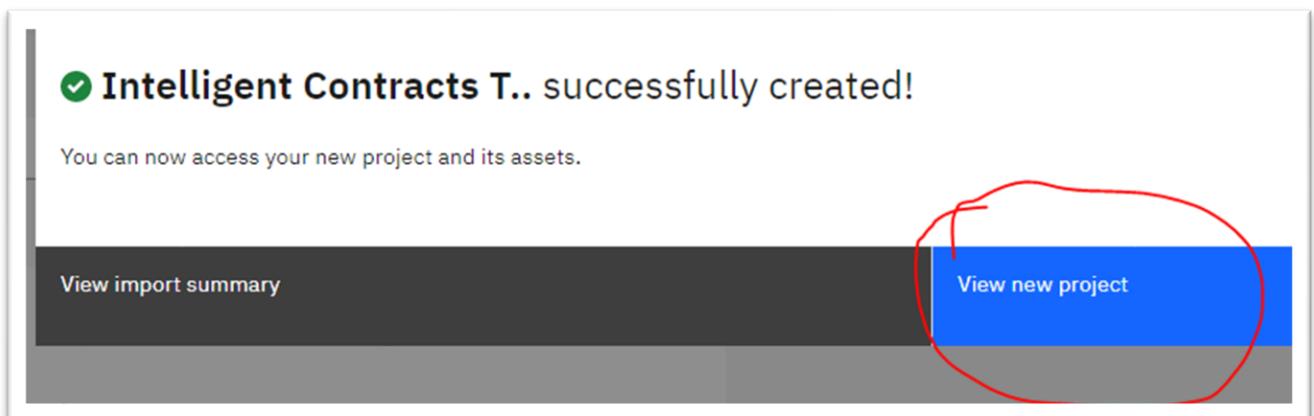
Name your project **Intelligent Contracts**

Select a **Cloud Object Storage** service

Select a **Cognos Dashboard Embedded** service from the dropdown list

Click **Create**.

4. When import completes, click **View new project**



Review Project Overview and Assets
(top)

5. You should see the following landing page with Project **Overview**.

IBM Cloud Pak for Data

Search in your workspaces

Projects / Intelligent Contracts

Overview Assets Jobs Manage

Assets

- ContractSuccessRandomForest-Py38 Using Sklearn
Now by
- Predict Contract Success
Now by
- Successful Contracts Dashboard
Now by

[View all](#)

Resource usage

For this month in this project

0 CUH

Project his

Project Intelligent Contracts Today a

Readme

Intelligent Contracts

1. How do you predict which vendor contracts have highest NPS and predictive ability to successful?
 2. How do you proactively identify which vendor contracts may fail and the reasons why?

Data-driven AI and machine learning project to advance

6. Click the **Assets** Tab

This project contains:

- 3 CSV Files to train a contract success model. Once the model is built, we use it to score contracts from unscorred contracts.
- 1 Visualization Dashboard containing historical and predictive contract success insights.
- 3 ways to build and deploy a model
 - Open Source Notebook
 - SPSS Modeler Flow
 - AutoAI (To be added as part of workshop)
- Saved Model from AutoAI

Projects / Intelligent Contracts

Overview Assets Jobs Manage

Find assets

7 assets

All assets

Asset types

- > Data 3
- > Flows 1
- > Visualizations 1
- > Source Code 1
- > Models 1

All assets

Name
ContractSuccessRandomForest-Py38 Using Sklearn Notebook from local system
Predict Contract Success SPSS Modeler flow
Successful Contracts Dashboard Dashboard
Contract Success Using AutoAI - P3 Snap Random Forest Classifier Model
Scored_Contracts.csv CSV
Contract_Analysis.csv CSV
Unscored_Contracts.csv CSV

View Data
(top)

7. Click on **Data**, and click to view ***Contract_Analysis.csv***

Projects / Intelligent Contracts

Overview **Assets** Jobs Manage

Find assets

8 assets

All assets

Asset types

- 8 Data (3)
- Flows (1)
- Visualizations (1)
- Experiments (1)
- Source Code (1)
- Models (1)

Name	Last modified
Scored_Contracts.csv CSV	2 hours ago
Contract_Analysis.csv CSV	2 hours ago
Unscored_Contracts.csv CSV	2 hours ago

Each row of data represents a historical contract marked as a success or not by the column *Successful Contract*.
The first columns show relational contract data.

Preview Profile Visualization

Schema: 30 Columns
The preview includes only a limited set of columns and rows. ⓘ

Last refresh: just now Refine

Successful Con... String	Effective ... String	Termination ... String	Duration ... String	Duration R... String	Contract Amon... String	Contract R... String	Vendor Qu... String	On Time ... String	Budget ... String	Deliverable ... String	Source ... String
Y	3/8/2023	1/24/2025	688	Medium	10500000	High	1	Y	Under Budget	Services	IT
Y	2/8/2023	6/17/2024	495	Medium	10000000	High	1	Y	At Budget	Services	IT
Y	12/23/2023	5/3/2024	132	Low	8000000	High	1	Y	At Budget	Equipment	HR

The latter columns, are the cognitive concepts (From Watson Discovery) mentioned in that contact.
Notice the last column, *Intellectual Property*, determines if Intellectual property was mentioned in the contract.

Preview Profile Visualization

Schema: 30 Columns
The preview includes only a limited set of columns and rows. ⓘ

Last refresh: 3 minutes ago Refine

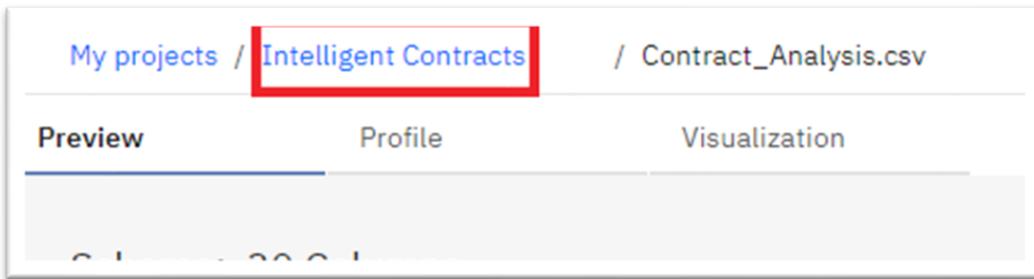
imer	Obligation ... String	Amendm... String	Deliverab... String	Force Maj... String	Liability ... String	Payment Terms & B... String	Term & Termin... String	Contract ... String	Location ... String	Currency ... String	Intellectual Pro... String
N	Y	N	Y	N	Y	Y	Y	Technical Service	United States	USD	N
Y	Y	Y	N	N	Y	N	N	Master Agreeme	United Kingdom	Euro	Y

8. Next, we'll go back to the project and use AutoAI to run this CSV file through many models to determine which model is a best fit to predict contract success.

It will also include the predictive attributes (columns) that correlate the most with a successful contract.

9. For Data Scientists, this accelerates the automation of running test data through many models to determine which is a best fit across a series of metrics normally used to measure model readiness.
For Citizen Data Scientists, those that are not data scientists but would like data science insights, can get a quick idea which predictors should be looked at when looking for ways to improving contract success.

10. To go back to the project, in the upper left breadcrumb trail, click on **Intelligent Contracts**

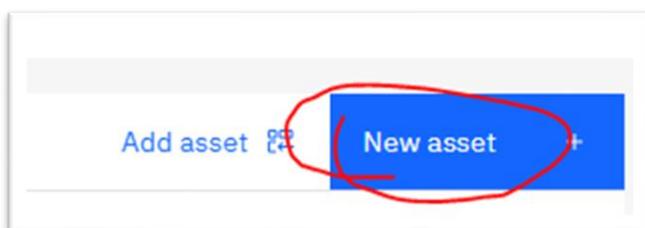


Using AutoAI To Build and Determine Best Fit Model
(top)

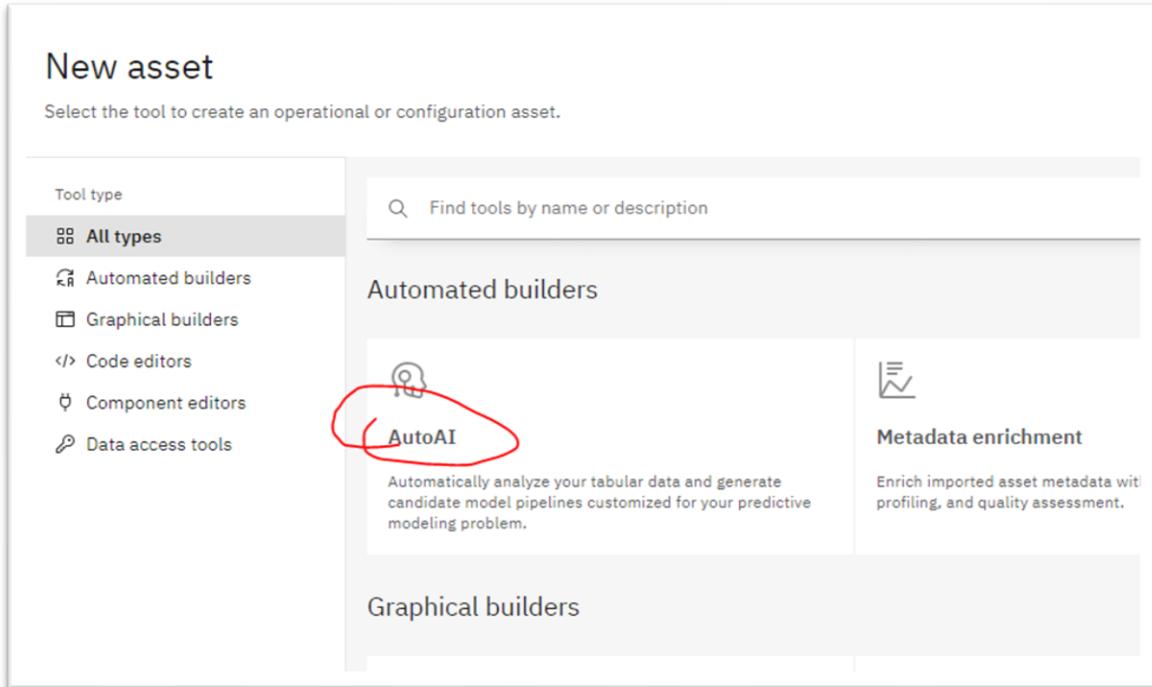
In this next section you will:

- build an AutoAI experiment
- save it as a model, Python Notebook and Experiment
- deploy the model as a live and batch scoring service using a RESTful API

11. Click **New Asset**



12. Choose **AutoAI**



13. Type **Name Predict Contract Success**.

Enter the same for *Description*

Enter **contract** as a tag

Click Associate a Machine Learning service instance

New asset
Create an AutoAI experiment

+ New Gallery sample	Define details Name <input type="text" value="Predict Contract Success"/> Description (optional) <input type="text" value="Predict Contract Success"/> Tags (optional) Add tags to make assets easier to find. <input type="text" value="contract"/>	Define configuration Watson Machine Learning Service Instance No Machine Learning service instances associated with your project. Associate a Machine Learning service instance with your project on the project settings page, then click the reload button below to refresh the instances available for association. Reload Environment definition $8 \text{ vCPU and } 32 \text{ GB RAM}$ This environment definition consumes 20 capacity units per hour for training. The consumption rate differs for joining multiple data sources, depending on your configuration. For details, see Watson Machine Learning plans .
-------------------------	--	---

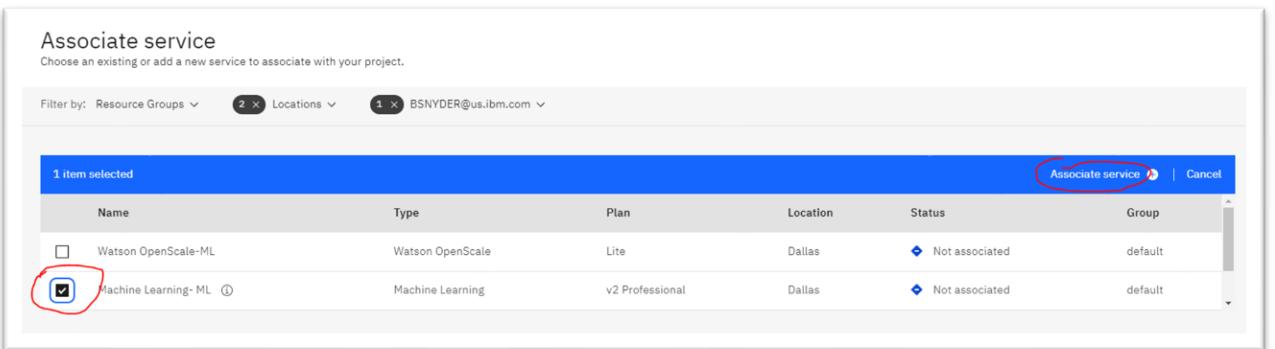
14. Choose the machine learning service you created earlier and click **Associate Service**

Associate service
Choose an existing or add a new service to associate with your project.

Filter by: Resource Groups ▾ 2 × Locations ▾ 1 × BSNYDER@us.ibm.com ▾

1 item selected						
Name	Type	Plan	Location	Status	Group	
<input type="checkbox"/> Watson OpenScale-ML	Watson OpenScale	Lite	Dallas	Not associated	default	
<input checked="" type="checkbox"/> Machine Learning- ML ⓘ	Machine Learning	v2 Professional	Dallas	Not associated	default	

Associate service | Cancel



15. Click Reload

New asset
Create an AutoAI experiment

+ New
Gallery sample

Define details

Name: Predict Contract Success

Description (optional): Predict Contract Success

Tags (optional): Add tags to make assets easier to find.
contract

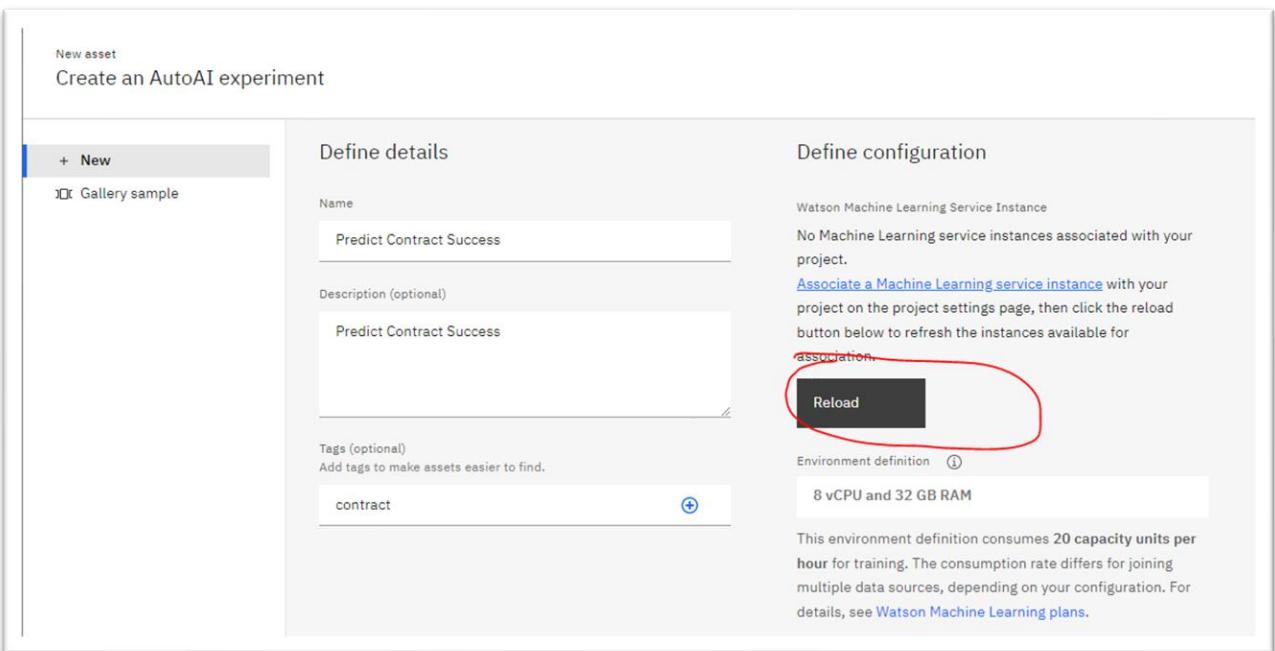
Define configuration

Watson Machine Learning Service Instance
No Machine Learning service instances associated with your project.
[Associate a Machine Learning service instance](#) with your project on the project settings page, then click the reload button below to refresh the instances available for association.

Reload

Environment definition ⓘ
8 vCPU and 32 GB RAM

This environment definition consumes 20 capacity units per hour for training. The consumption rate differs for joining multiple data sources, depending on your configuration. For details, see [Watson Machine Learning plans](#).



16. In the lower right, Click Create

New asset
Create an AutoAI experiment

+ New
Gallery sample

Define details

Name
Predict Contract Success

Description (optional)
Predict Contract Success

Tags (optional)
Add tags to make assets easier to find.
contract

Define configuration

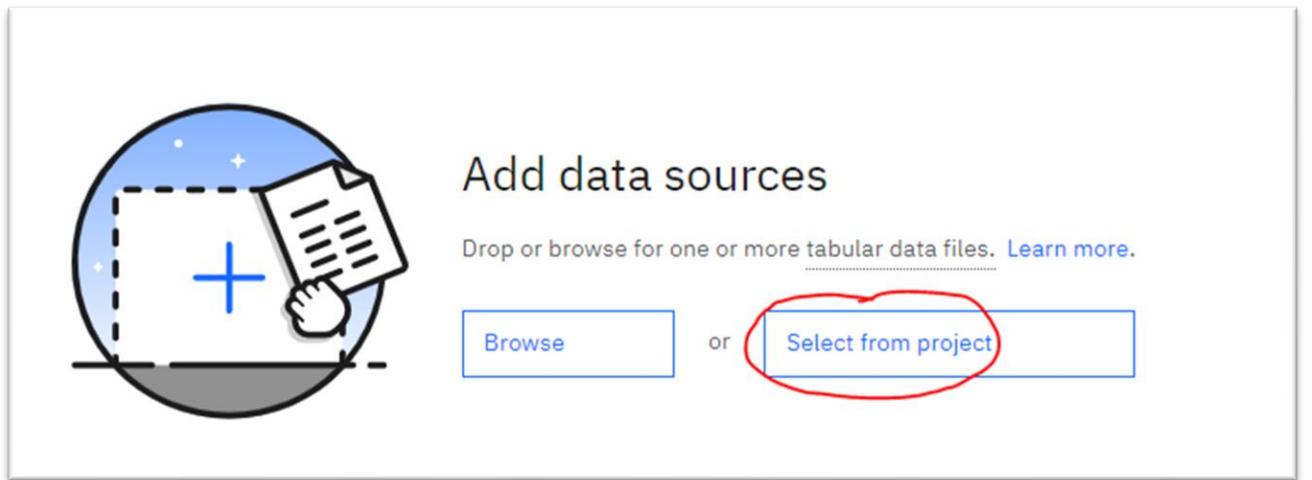
Watson Machine Learning Service Instance
Machine Learning- ML

Environment definition
8 vCPU and 32 GB RAM

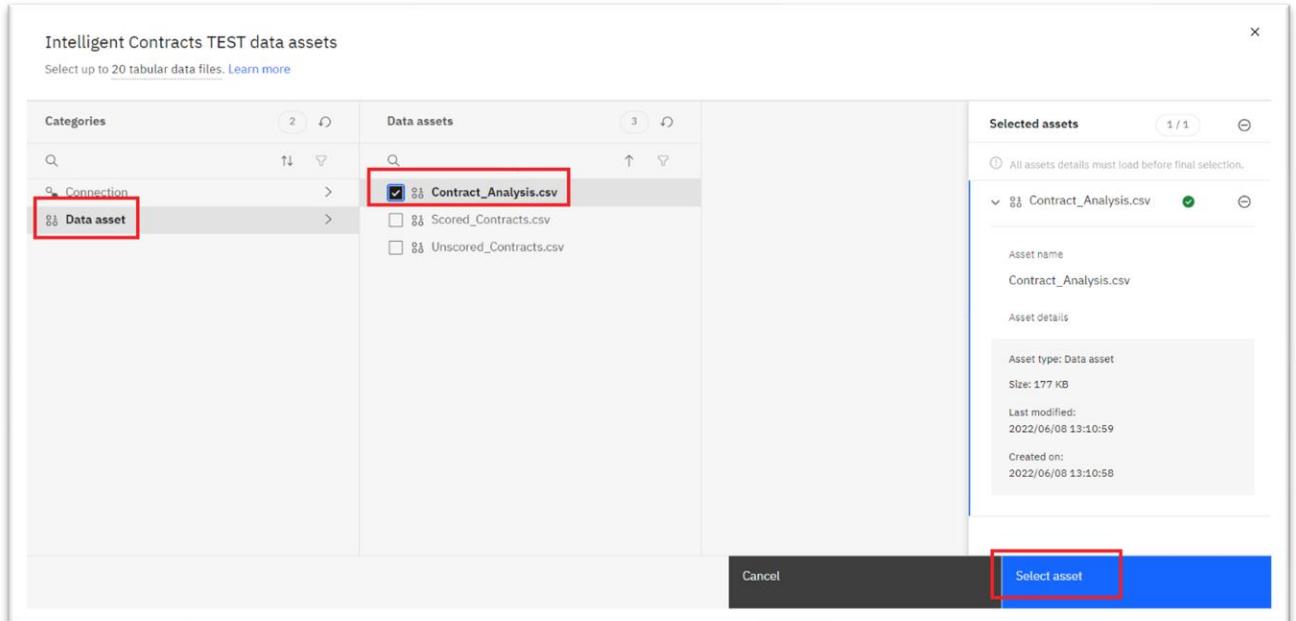
This environment definition consumes 20 capacity units per hour for training. The consumption rate differs for joining multiple data sources, depending on your configuration. For details, see [Watson Machine Learning plans](#).

Cancel Create

17. Click **Select from project**



18. Choose **Data Asset → Contract_Analysis.csv → Select Asset**



19. Choose **No** for creating a time series forecast.

Select **Successful Contract** the field used to determine contract success

Click on **Experiment Settings**

Create a time series forecast?
Enable this option to predict future activity over a specified date/time range. Data must be structured and sequential. [Learn more](#)

What do you want to predict?
Prediction columns [i](#)
Successful Contract

PREDICTION TYPE
Binary Classification

POSITIVE CLASS
Y

CUH used this month: 0 CUH

OPTIMIZED FOR
Accuracy & run time

Experiment settings Run experiment

20. Notice the automated selections accelerating data science for all.

On the general and fairness tab, you have:

- Prediction Type

- Positive Class
- Optimized Metric used to optimize model selection
- Optimized algorithm selection
- Algorithms to include
- Algorithms to use
- Fairness evaluation

Experiment settings

Prediction

Prediction settings

General Fairness Time series

Prediction type
Change the prediction type based on data in the prediction column. Changing the type changes other prediction settings.

Binary classification <input checked="" type="checkbox"/> Classify data into categories. Choose this if your prediction column contains two distinct categories.	Multiclass classification Classify data into categories. Choose this if your prediction column contains multiple distinct categories.	Regression Predict values from a continuous set of values. Choose this if your prediction column contains a large number of values.	Time series forecast Forecast future values in a series. Data must be structured and sequential. Learn more
--	---	--	---

Positive class
Specify the value in your prediction column to measure performance in to a confusion matrix.

Y

Optimized metric
Choose the metric to optimize for the experiment.

None

21. Click on **Data Source, General** Tab to browse the settings:

- Duplicate Rows
- Subsample
- Data imputation
- Text feature engineering
- Final training data set
- Training and holdout method
- Select features to include

Experiment settings

Prediction column Date
Successful Contract (STR) Con

Prediction

Data source

Runtime

Data source settings

General Time series Join

Duplicate rows

To accelerate training, you can opt to skip duplicate rows.

Drop duplicate rows

Subsample

For a large data set, use a subset of data to train the experiment. This speeds up results but may affect accuracy.

Subsample rows

Data imputation

Interpolate missing values in your data source. [Learn more](#)

Categorical imputation strategy ⓘ Numerical imputation strategy ⓘ

Most frequent ▾ Median ▾

Replaces null values with the most repeated value in the column Replaces null values with the value in the middle of the sorted column values

Text feature engineering

When enabled, columns detected as text will be transformed into vectors to better analyze semantic similarity between strings. Enabling this setting may increase run time.

Use text feature engineering

Text feature engineering columns ⓘ

Automatically select text columns Manually specify text columns

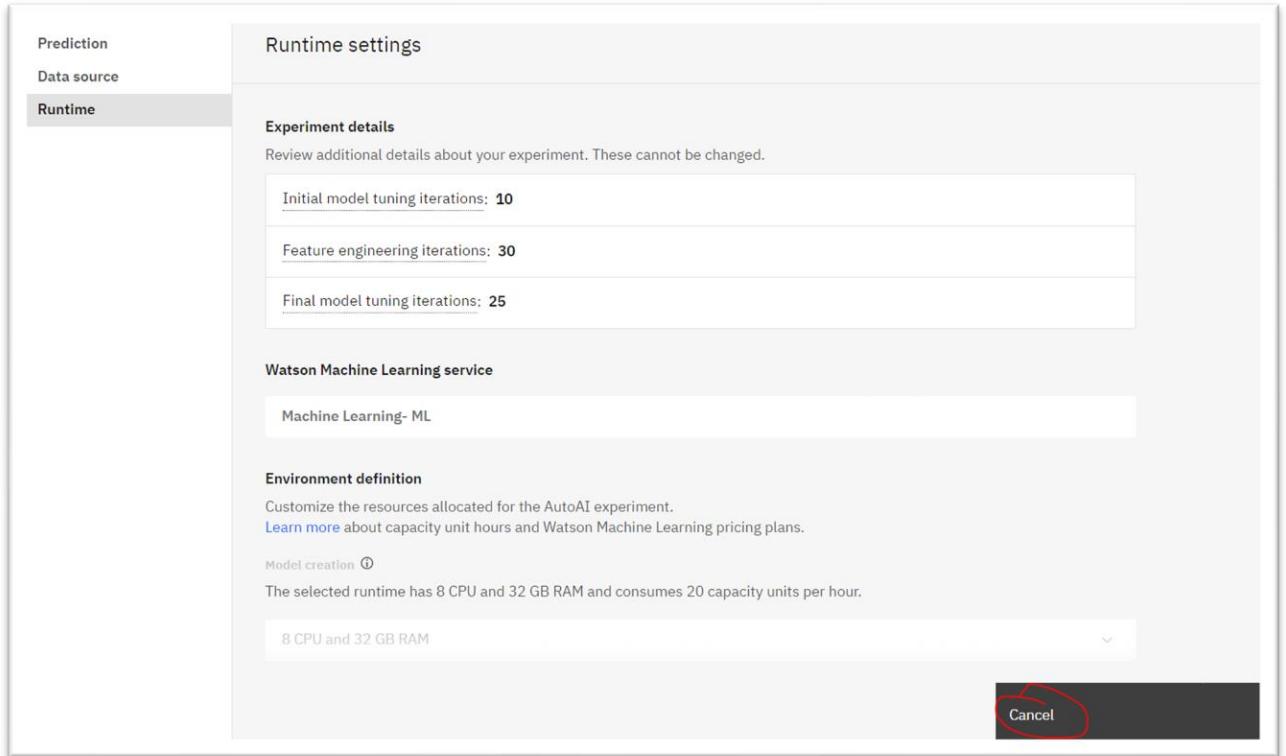
Number of vectors per column ⓘ

20 - +

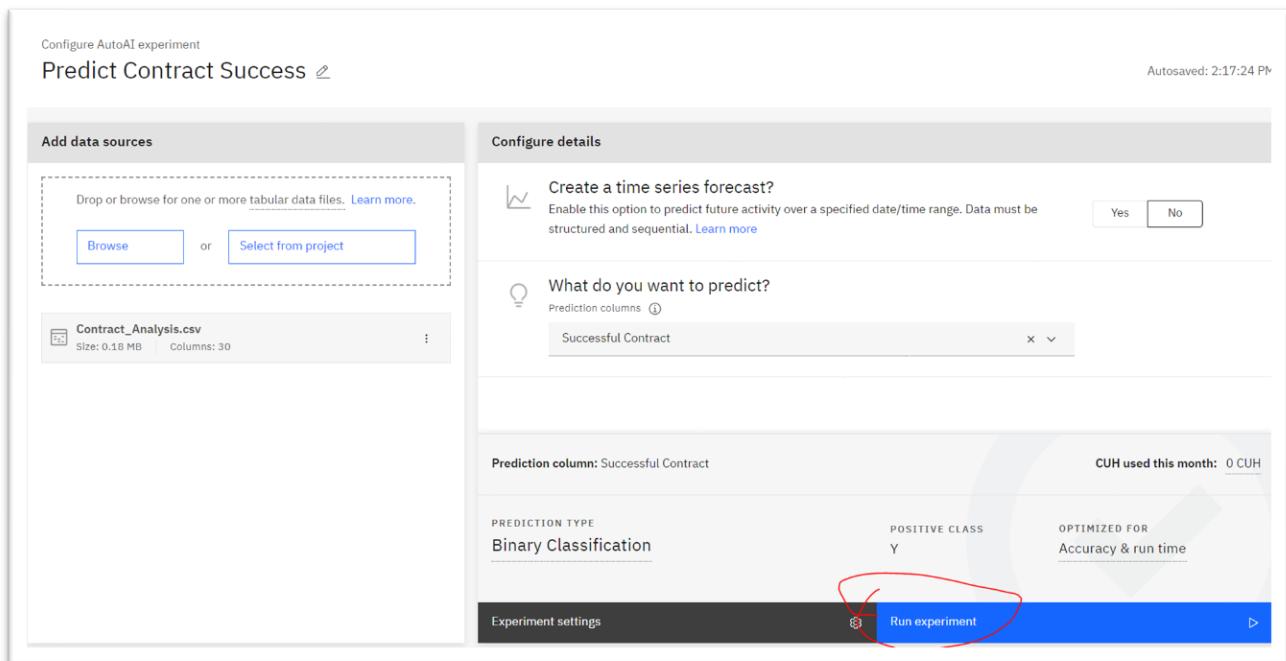
Cancel

22. View the **Runtime Tab** for summary settings.

Click Cancel



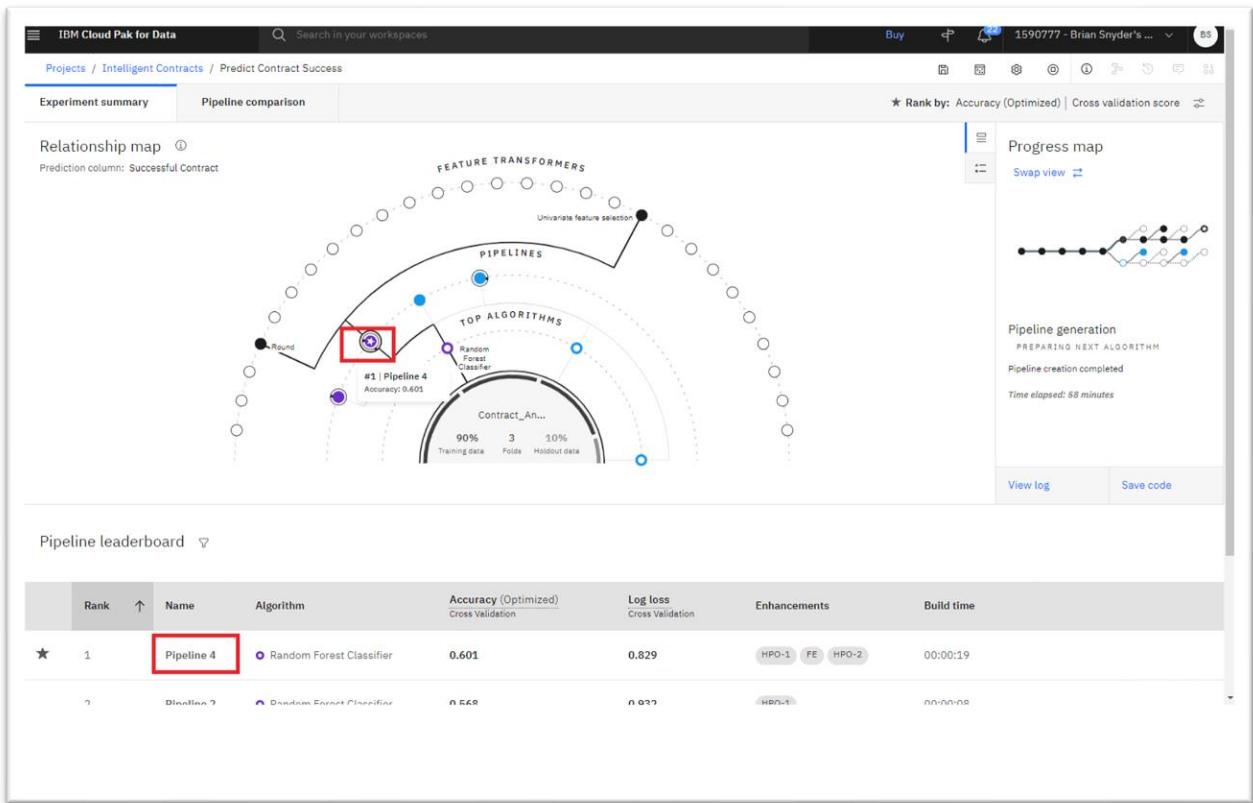
23. In the lower right, click Run Experiment (This will take some time)



24. During execution and at completion you can view the pipelines being built and ranked by **Accuracy**.

In the screenshot below (yours may differ), **Pipeline 4** is ranked the best fit model based on Accuracy.

It included *Univariate feature selection* and *Round* feature transformations to enhance model accuracy.



25. To sort the pipeline results by Log Loss, click **Rank Preferences** and choose **Log loss**

The screenshot shows the Azure Machine Learning studio interface. At the top, there's a navigation bar with 'Buy', a user icon, a bell icon with '22' notifications, the pipeline ID '1590777 - Brian Snyder's ...', and a 'BS' button. Below the navigation bar is a toolbar with various icons. A modal window titled 'Rank by: Accuracy (Optimized) | Cross validation score' is open. This window has a red box around its close button ('X'). Inside, it says 'Rank preferences' and 'Metric'. A dropdown menu is open, showing 'Accuracy (Optimized)' as the selected metric. Other options include 'Average precision', 'Balanced accuracy', and 'F₁'. Under 'F₁', the 'Log loss' metric is highlighted with a red box. Below the dropdown, there are two buttons: 'Precision' and 'Log loss', with 'Log loss' being the active one. A message at the bottom of the dropdown says 'Time elapsed: 64 minutes'. In the background, the Pipeline leaderboard is visible, showing four pipelines with their names, algorithms, accuracy scores, log loss scores, enhancements, and build times.

Rank	Name	Algorithm	Accuracy (Optimized) Cross Validation	Log loss Cross Validation	Enhancements	Build time
1	Pipeline 4	Random Forest Classifier	0.601	0.829	HPO-1 FE HPO-2	00:00:19
2	Pipeline 2	Random Forest Classifier	0.568	0.932	HPO-1	00:00:08
3	Pipeline 7	Decision Tree Classifier	0.564	0.905	HPO-1 FE	00:00:30
4	Pipeline 5	Decision Tree Classifier	0.526	16.382	None	00:00:01

26. Click Pipeline comparison to see all model metrics across all pipelines.



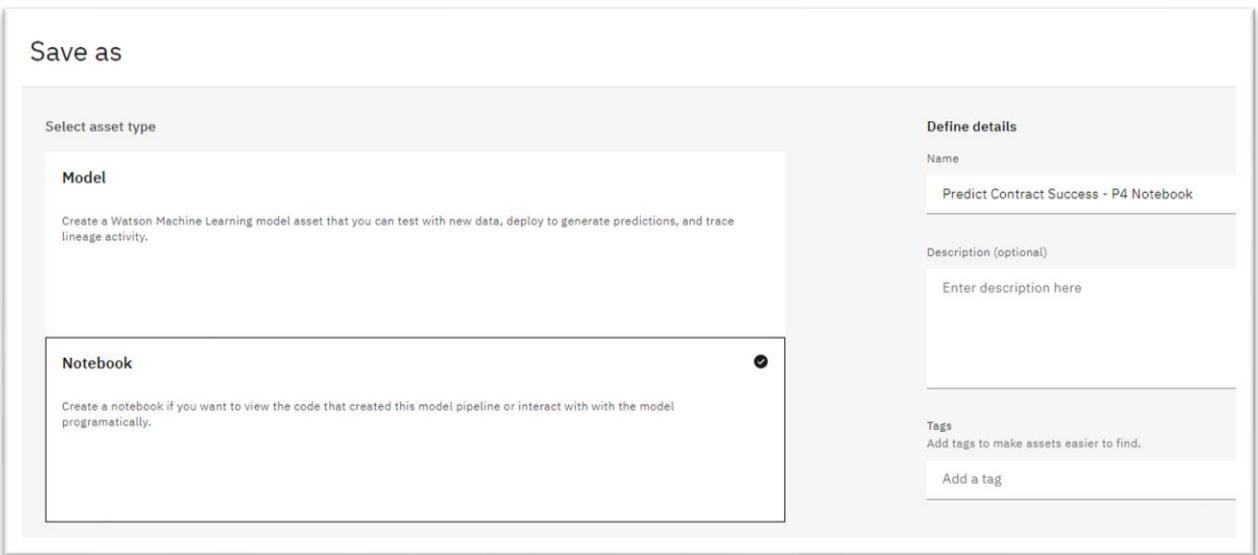
27. Return to the **Experiment summary** tab.

Choose **Save As** to save the best performing model as a notebook or model.

Loss	Enhancements	Build time
is Validation	HPO-1 FE HPO-2	00:00:19
29		Save as

28. Since we already have a model in our project, let's save as a Python Notebook keeping the defaults.

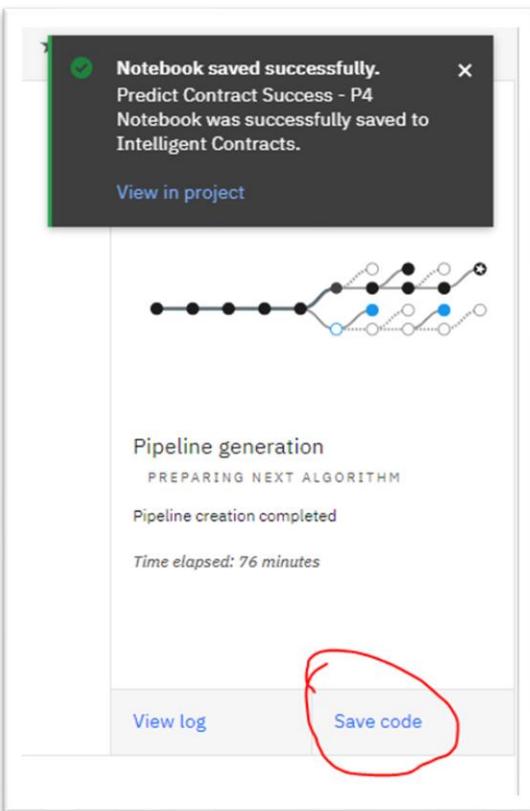
Click **Create**



29. Notice the successful message stating the experiment was saved in Python for further development and automation.

DO NOT click View In Project

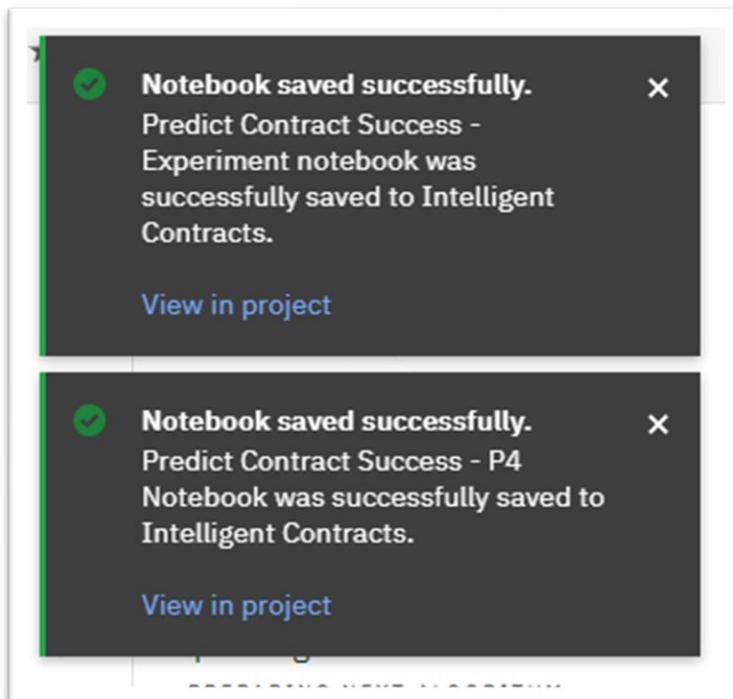
Instead, click **Save Code**



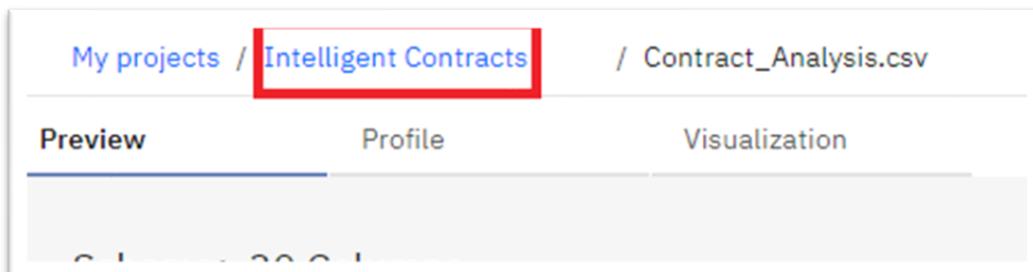
30. Keep the defaults.

Click **Create**.

You should now have 2 success messages stating that the code and ML were saved.



31. Click on the breadcrumb trail to return to the **Intelligent Contracts** Project.



32. When returning to the project notice how under **Source Code** each notebook was saved, Seen below.

Examine each and return to project

Experiment Notebook - AutoAI Notebook v1.16.3

This notebook contains the steps and code to demonstrate support of AutoAI experiments in Watson Machine Learning service. It introduces Python API commands for data retrieval, training experiments, persisting pipelines, testing pipelines, refining pipelines, and scoring the resulting model.

Note: Notebook code generated using AutoAI will execute successfully. If code is modified or reordered, there is no guarantee it will successfully execute. For details, see: [Saving an Auto AI experiment as a notebook](#)

Some familiarity with Python is helpful. This notebook uses Python 3.9 and `ibm_watson_machine_learning` package.

Notebook goals

The learning goals of this notebook are:

- Defining an AutoAI experiment
- Training AutoAI models
- Comparing trained models
- Deploying the model as a web service
- Scoring the model to generate predictions.

Contents

This notebook contains the following parts:

[Setup](#)

[Package installation](#)

[Watson Machine Learning connection](#)

[Experiment configuration](#)

[Experiment metadata](#)

[Working with completed AutoAI experiment](#)

[Get fitted AutoAI optimizer](#)

[Pipelines comparison](#)

[Get pipeline as scikit-learn pipeline model](#)

[Inspect pipeline](#)

[Visualize pipeline model](#)

Pipeline 4 Notebook - AutoAI Notebook v1.16.3

Consider these tips for working with an auto-generated notebook:

- Notebook code generated using AutoAI will execute successfully. If you modify the notebook, we cannot guarantee it will run successfully.
- This pipeline is optimized for the original data set. The pipeline might fail or produce sub-optimum results if used with different data. If you want to use a different data set, consider retraining the AutoAI experiment to generate a new pipeline. For more information, see [Cloud Platform](#).
- Before modifying the pipeline or trying to re-fit the pipeline, consider that the code converts dataframes to numpy arrays before fitting the pipeline (a current restriction of the preprocessor pipeline).

Notebook content

This notebook contains a Scikit-learn representation of AutoAI pipeline. This notebook introduces commands for getting data, training the model, and testing the model.

Some familiarity with Python is helpful. This notebook uses python 3.9 and scikit-learn 1.0.2.

Notebook goals

- Scikit-learn pipeline definition
- Pipeline training
- Pipeline evaluation

Contents

This notebook contains the following parts:

[Setup](#)

- [Package installation](#)
- [AutoAI experiment metadata](#)
- [Watson Machine Learning connection](#)
- [Pipeline inspection](#)

Build a Model Using Open Source Python
(top)

1) Navigate back to your project.

Click to edit **Source Code → ContractSuccessRandomForest-Py38 Using Sklearn**

By choosing edit, you'll be opening your own runtime to edit the Python Notebook

Peruse the results. Do not edit.

Notice the *Watson Machine Learning* Python library used to build test and deploy the machine learning model to our platform for ingestion later in the workshop.

[Return to project.](#)

The screenshot shows the IBM Cloud Pak for Data interface. The left sidebar lists 'Asset types': Data (0), Flows (1), Visualizations (1), Experiments (1), Source Code (3), Notebook (3), and Models (1). The main area displays a table of 'Source Code' assets:

Name	Last modified
Predict Contract Success - Experiment notebook	18 minutes ago Brian Snyder (You)
Predict Contract Success - P4 Notebook	20 minutes ago Brian Snyder (You)
ContractSuccessRandomForest-Py38 Using Sklearn	3 hours ago Notebook from local system

A context menu is open over the third asset, showing options: View, Edit (highlighted), Duplicate, Create job, Publish to catalog, Change environment..., and Delete.

Build a Model Using SPSS Modeler Flows (top)

A flow uses the very same sequential steps to build and deploy a model but without coding. Modeler flows accelerate the model build process for data scientists and analysts.

1) Click to edit **Flows → Predict Contract Success**

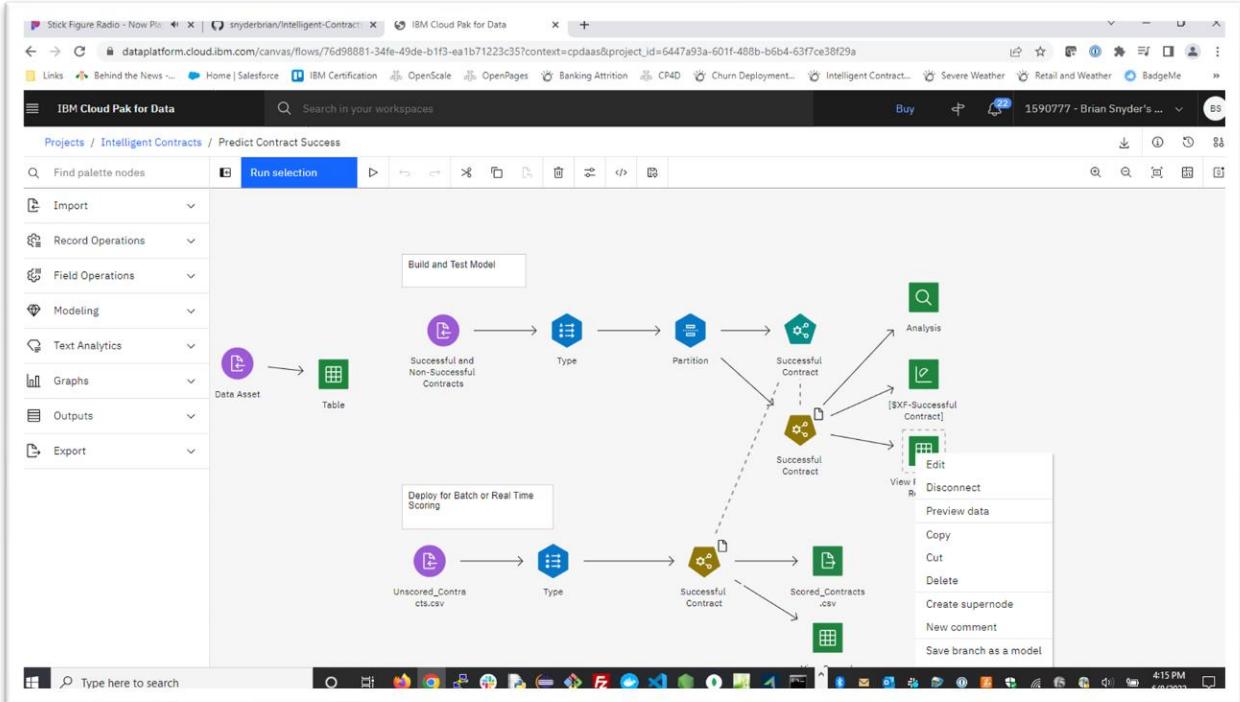
2) Click **Start runtime**

3) The top stream ingests the same training data used by the others, sets the target, runs the data through an auto classifier ending with a model ensemble to predict contract success.

Right click on the node labeled **View Predictive Results**

Open the output on the right.

Notice the same training data as before but at the end are two extra columns to show the prediction for that contract and its corresponding confidence.

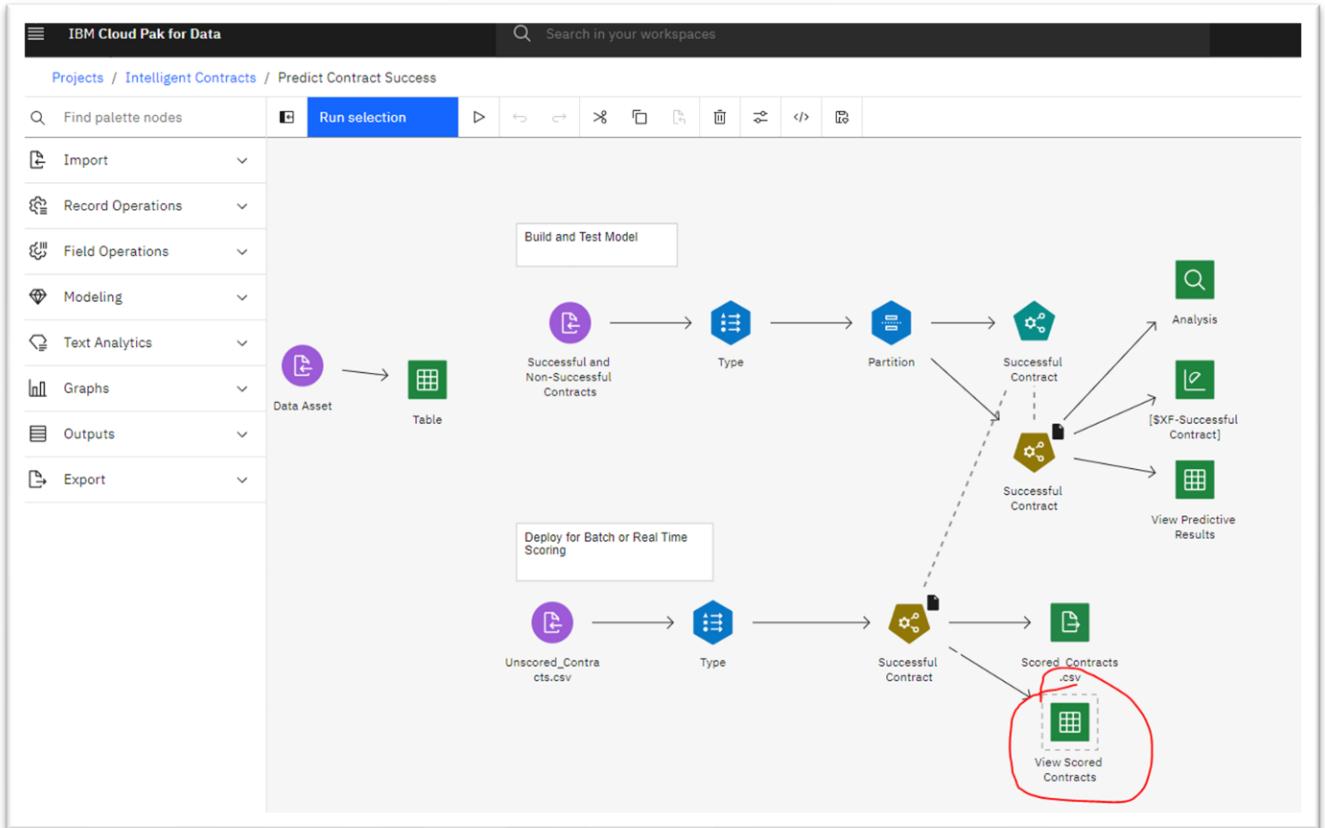


View Output: View Predictive Results (33 fields, 949 records)

ables	Force Majeure	Liability	Payment Terms & Billing	Term & Termination	Contract Type	Location	Currency	Intellectual Property	Partition	\$XF-Successful Contract	\$FC-Successful Contract
Y	N	Y		Y	Technical Services Agreement	United States	USD	N	1_Training	N	0.494
N	N	Y		N	Master Agreement	United Kingdom	Euro	Y	1_Training	N	0.372
N	N	N		N	Base Agreement	England	Euro	Y	1_Training	N	0.365
Y	N	N		Y	Base Agreement	U.S.	USD	Y	2_Testing	N	0.670
Y	N	N		Y	Base Agreement	U.S.	USD	Y	1_Training	N	0.325
N	N	N		Y	Renewal	United Kingdom	Euro	Y	1_Training	N	0.497

4) To use this model to score some unscored contracts, at the end of the 2nd stream on the bottom, right click and View **Scored Contracts** → Run

Open up the 2nd result to view the scored contract results.



View Output: View Scored Contracts (31 fields, 949 records)												
ent	Deliverables	Force Majeure	Liability	Payment Terms & Billing	Term & Termination	Contract Type	Location	Currency	Intellectual Property	\$XF-Successful Contract	\$XFC-Successful Contract	
N	N	N	N	N	Y	Base Agreement	United Kingdom	Euro	N	N	0.490	
N	N	N	N	N	Y	Technical Services Agreement	U.S.	USD	N	N	0.327	
N	N	N	N	N	N	Master Agreement	England	Euro	N	N	0.408	
Y	N	N	N	Y	N	Base Agreement	U.S.	USD	N	N	0.481	
N	Y	Y	N	N	Y	Technical Services Agreement	United Kingdom	Euro	N	N	0.664	
Y	Y	Y	N	N	N	Master Agreement	U.S.	USD	N	N	0.503	
N	N	Y	N	N	N	Base Agreement	United States	USD	N	N	0.626	
N	N	N	N	N	Y	Base Agreement	U.S.	USD	N	N	0.505	
..	

5) Navigate to your project where we will deploy a model and learn how to access it.

Deploying an AutoAI Model

(top)

The last phase of the AI Ladder is to Infuse the model in a downstream application like Cloud Pak For Business Automation to improve contract success.

This section will show how to deploy a model and then access it programmatically.

1) Within your project, click **Models**

Choose **Promote to space**

The screenshot shows the Alteryx interface with a sidebar on the left listing asset types: Data (3), Flows (1), SPSS Modeler flow (1), Visualizations (1), Experiments (1), Source Code (3), and Models (1). A specific item, 'Contract Success Using AutoAI - P3 Snap Random Model', is selected and highlighted with a red box. A context menu is open on the right side of the selected item, containing options: Publish to catalog (blue box), Promote to space (red box), Delete (gray box), and Promote to space (gray box). The 'Promote to space' option is also highlighted with a red box.

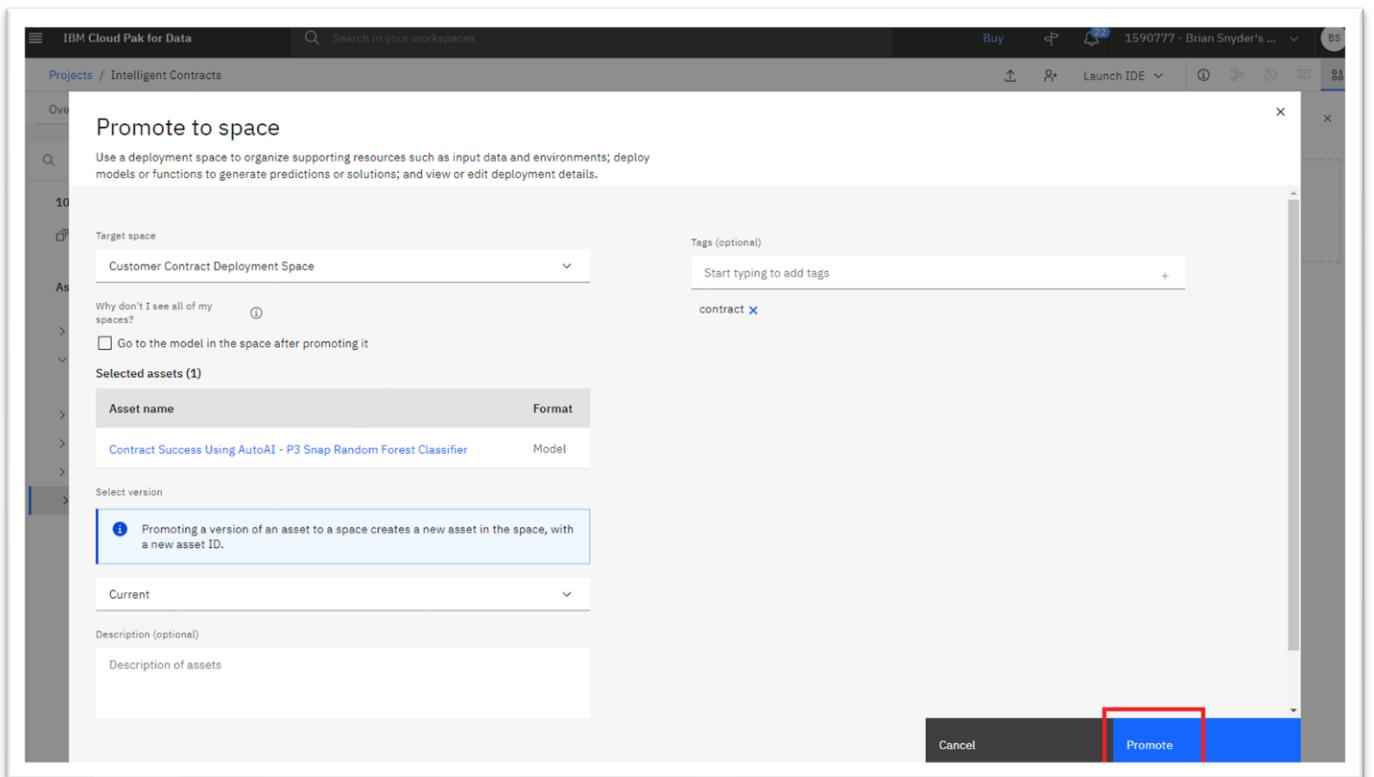
2) Choose **Customer Contract Deployment Space**.

If it doesn't exist, please **create a new deployment space** with name **Customer Contract Deployment Space**

The screenshot shows the 'Promote to space' dialog box. At the top, it says 'Promote to space' and provides a description: 'Use a deployment space to organize supporting resources such as input data and environments; deploy models or functions to generate predictions or solutions; and view or edit deployment details.' Below this, there is a section labeled 'Target space' with a dropdown menu. The dropdown menu lists several deployment spaces: 'Customer Churn Deployment Space' (highlighted with a red box), 'Create a new deployment space' (highlighted with a red box), 'Customer Churn Deployments', 'Customer Contract Deployment Space' (highlighted with a red box), 'FSS Deployed Models Space', and 'Golden Rock Preproduction Space'. At the bottom of the dialog box, there is a 'Select version' section.

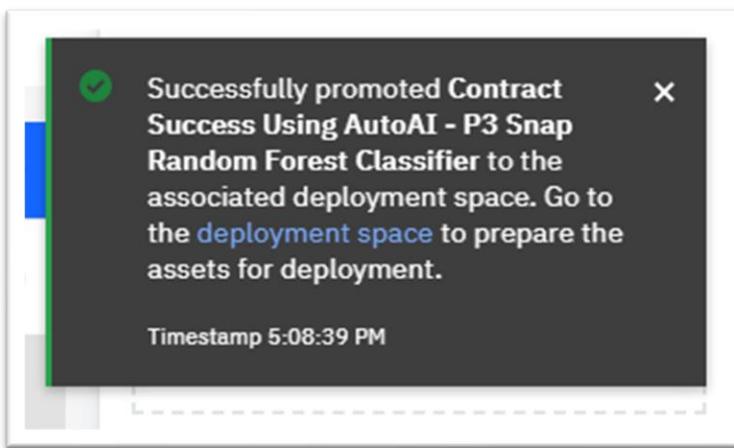
3) Leave all the defaults.

Click Promote



4) Once promoted, you'll get a success message.

Click on **deployment space** to be taken to the place where it is deployed.



5) Notice how the asset has been promoted.

Click on the rocket icon to deploy

The screenshot shows the 'Customer Contract Deployment Space' interface. The 'Assets' tab is selected. A search bar at the top left contains the placeholder 'What assets are you looking for?'. To the right, a warning message says 'Assets with warnings Show'. Below the search bar, a section titled 'Models (1)' is expanded. A table lists one item:

Name	Type	Software specification	Tags	Last modified	Actions
Contract Success Using AutoAI - P3 Snap Random For...	wml-hybrid_0.1	hybrid_0.1	contract	Jun 8, 2022 5:08 PM	Deploy

A red box highlights the 'Deploy' button in the actions column.

6) Choose **Online**

Use **Contract Success Deployment** as the name and description

Add tag of **contract**

Click **Create**

Create a deployment

Associated asset

Contract Success Using AutoAI - P3 Snap Random Forest Classifier

Deployment type

Online

Run the model on data in real-time, as data is received by a web service.

Batch

Run the model against data as a batch process.

Name

Contract Success Deployment

Description

Contract Success Deployment

Tags

Add tags to make assets easier to find.

Add a tag

contract 

7) Click on the **Deployments** tab.

Notice how it is deployed!

Click on **Contract Success Deployment** in the name column to see how to use and test it.

The screenshot shows the 'Customer Contract Deployment Space' interface. At the top, there's a navigation bar with 'Deployments /' and a search bar. Below it is a sub-header 'Customer Contract Deployment Space'. A horizontal menu bar includes 'Overview', 'Assets', 'Deployments' (which is highlighted with a blue border), 'Jobs', and 'Manage'. A search bar below the menu contains the placeholder 'What deployments are you looking for?'. The main content area is titled 'Deployments (1)' and lists one item:

Name	Type	Status	Asset	Tags	Last modified
Contract Success Deployment	Online	Deployed	Contract Success Using AutoAI - P3 Snap Random Forest Classifier	contract	Jun 8, 2022 5:13 PM

Infusing and Testing an AI Model With RESTful URL And Code Snippets (top)

- 8) Click through the tabs **cURL, Java, JavaScript, Python and Scala** to view code snippets on how use the RESTful URL downstream like we saw earlier in the workflow portion of the workshop.
Notice the **Direct link** as well.

The screenshot shows the 'Contract Success Deployment' details page. At the top, there's a header with 'IBM Cloud Pak for Data', a search bar, and a 'Buy' button. Below the header, the deployment name is shown along with its status ('Deployed') and type ('Online'). A note says 'Press F11 to exit full screen'.

The main content area has tabs for 'API reference' (which is selected and highlighted with a blue border), 'Test', and 'Deployment details'. Under 'API reference', there's a section for 'Direct link' with a URL: <https://us-south.ml.cloud.ibm.com/ml/v4/deployments/d5a429ed-0b66-4c7e-bc1f-c659ca5c8a92/predictions?version=20>. There's also a 'Bearer <token>' field and an 'IAM' button.

Below the direct link, there's a section for 'Code snippets' with tabs for 'cURL' (selected), 'Java', 'JavaScript', 'Python', and 'Scala'. The 'cURL' tab displays the following code:

```
# NOTE: you must set $API_KEY below using information retrieved from your IBM Cloud account.
curl --insecure -X POST --header "Content-Type: application/x-www-form-urlencoded" --header "Accept: application/json"
--data-urlencode "grant_type=urn:ibm:params:oauth:grant-type:apikey"
--data-urlencode "apikey=$API_KEY" "https://iam.cloud.ibm.com/identity/token"

# the above CURL request will return an auth token that you will use as $IAM_TOKEN in the scoring request below
# TODO: manually define and pass values to be scored below
curl -X POST --header "Content-Type: application/json" --header "Accept: application/json" --header "Authorization: Bearer $IAM_TOKEN" -d '{"input_data": [{"fields": [$ARRAY_OF_INPUT_FIELDS], "values": [$ARRAY_OF_VALUES_TO_BE_SCORED], "another_array_of_values_to_be_scored": $ANOTHER_ARRAY_OF_VALUES_TO_BE_SCORED}]}' "https://us-south.ml.cloud.ibm.com/ml/v4/deployments/d5a429ed-0b66-4c7e-bc1f-c659ca5c8a92/predictions?version=20"
```

- 9) Click on the **Test Tab**
Click **provide input data as JSON**

Copy and paste the JSON below into the **Body** of the **Enter Input Data** box

Click **Predict**

```
{"input_data": [
  {"fields": [
    "Effective Date", "Termination Date", "Duration Days", "Duration Range",
    "Contract Amount (yr)", "Contract Range", "Vendor Quality", "On Time", "Budget",
    "Deliverable Type",
    "Sourcing Organization", "Expense Type", "Budget Line Item", "Auto
    Renewal", "Indemnification", "Supplier", "Contract Number", "Disclaimer",
    "Obligation", "Amendment",
    "Deliverables", "Force Majeure", "Liability", "Payment Terms & Billing",
    "Term & Termination", "Contract Type", "Location", "Currency", "Intellectual
    Property"],
   "values": [
     ["3/8/2023", "1/24/2025", 688, "Medium", 10500000, "High", 1, "N", "Over
      Budget", "Services", "IT", "OPEX", "9C-6443", "Y", "N", "Stanfield Systems
      Incorporated",
      12345, "N", "N", "N", "N", "N", "N", "Y", "Base Agreement", "United
      Kingdom", "Euro", "Y"]]]}
```

This contract is predicted to NOT be a success with a prediction confidence of 67%.

The screenshot shows the 'Contract Success Deployment' interface. In the 'Test' tab, the 'Enter input data' section contains the JSON provided above. The 'Result' section displays the prediction output:

```
{
  "predictions": [
    {
      "fields": [
        "prediction",
        "probability"
      ],
      "values": [
        [
          "N",
          [
            0.6793989206311795,
            0.32960187936882055
          ]
        ]
      ]
    }
  ]
}
```

Thanks for taking the time to run this workshop to learn hands-on how to build, deploy and infuse a machine learning model into a business workflow to improve contract success.

(top)

Appendix

Trustworthy AI – Model Monitoring and Model Risk Management

Rising Concerns on trust in AI decisions

Enterprises need AI Governance for two important reasons. First, while there aren't many regulations today with strict rules on AI, they are starting to pop up. The most formalized one is SR 11-7, which is a set of guidelines around model risk management in financial services companies. It describes the model validation process and ownership required for any model coming from a financial services company. The European Union release guidelines last year around AI development and are actively working on stricter regulations. Canada was one of the first countries to establish a National AI Strategy and now require all public agencies to do an impact analysis on AI models before they're built.

Rising concerns on trust in AI decisions

The collage includes the following headlines:

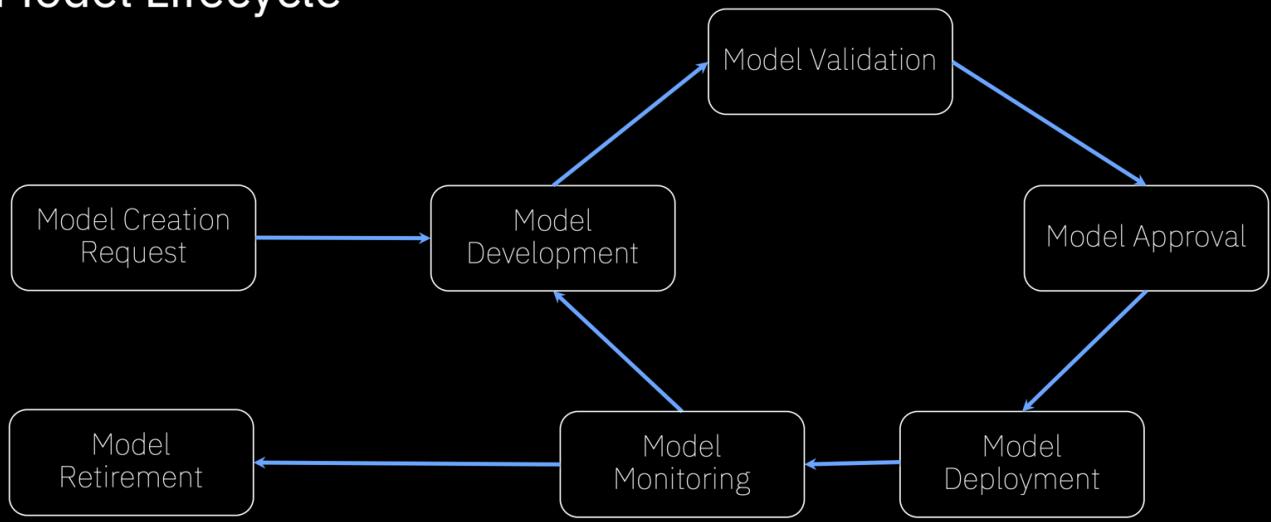
- YouTube sued for using AI to racially profile content creators**
- BlackRock shelves unexplainable AI liquidity models**
- Data science during COVID-19: Some reassembly required**
- Can AI models respond to black swan events like COVID-19?**
- Over-Segmenting In Financial Services Is So Over - Bye, Bye**
- Apple Card algorithm sparks gender bias allegations against Goldman Sachs**
- Amazon scraps secret AI recruiting tool that showed bias against women**
- EFF to HUD: Algorithms Are No Excuse for Discrimination**

...and regulators are catching up

USA SR 11-7 requires model risk management for all models in financial services	European Union 2021 – Draft regulation for trust in AI development
2019–Proposal for Algorithmic Accountability Act	2019–Guidelines for AI development
2021 – US Govt. National AI Initiative Act	Mexico 2018–General principles for AI development in the government
Canada 2017–National AI Strategy launched. Impact Analysis	Partnerships on AI Partnership between tech companies to study best practices and impact of AI
2020–All public agencies must do an impact analysis for AI models	AI Now Institute NYU research center focused on social implications of AI

IBM's Trustworthy AI can be used with models created on and off of our platform. No matter where created, all models go through creation, development, validation, approval, are deployed to production, monitored for bias, drift, and accuracy over time that include explainable reasons and suggestions on how to improve metric performance.

Model Lifecycle



Let's look at the Aspects of Trustworthy AI and some common use cases.

Fairness: Are we treating all groups the same or are we creating privileged groups?

Robustness: Are we using the right metrics to evaluate AI?

Drift: Can we detect drops in model accuracy over time alerting us when the model needs to be rebuilt with new test data?

Explainability: Can I explain why there's bias and drift and provide transaction level reasons why?

Transparency, Can we increase understanding of why and how AI was created?

These aspects are used with lending, loan origination, loan default, collections, and the other use cases seen here

