Watson Studio SPSS Modeler Overview

Introduction

In this lab you will learn how to implement analytics in **SPSS Modeler**, a well-known visual data mining workbench which is part of **Watson Studio.** The lab will introduce the SPSS Modeler capability using the trafficking datasets. The lab will guide the development of an SPSS Modeler stream that will prepare the input data to train and evaluate a machine learning model for predicting the trafficking risk based on the travel itinerary.

End-to-End Data Science

The general flow of the End to End Data Science PoT will be guided by the activities shown in Figure 1- End to End Flow. The SPSS capability spans the Prepare Data, Build Model, and Save and Deploy activities.

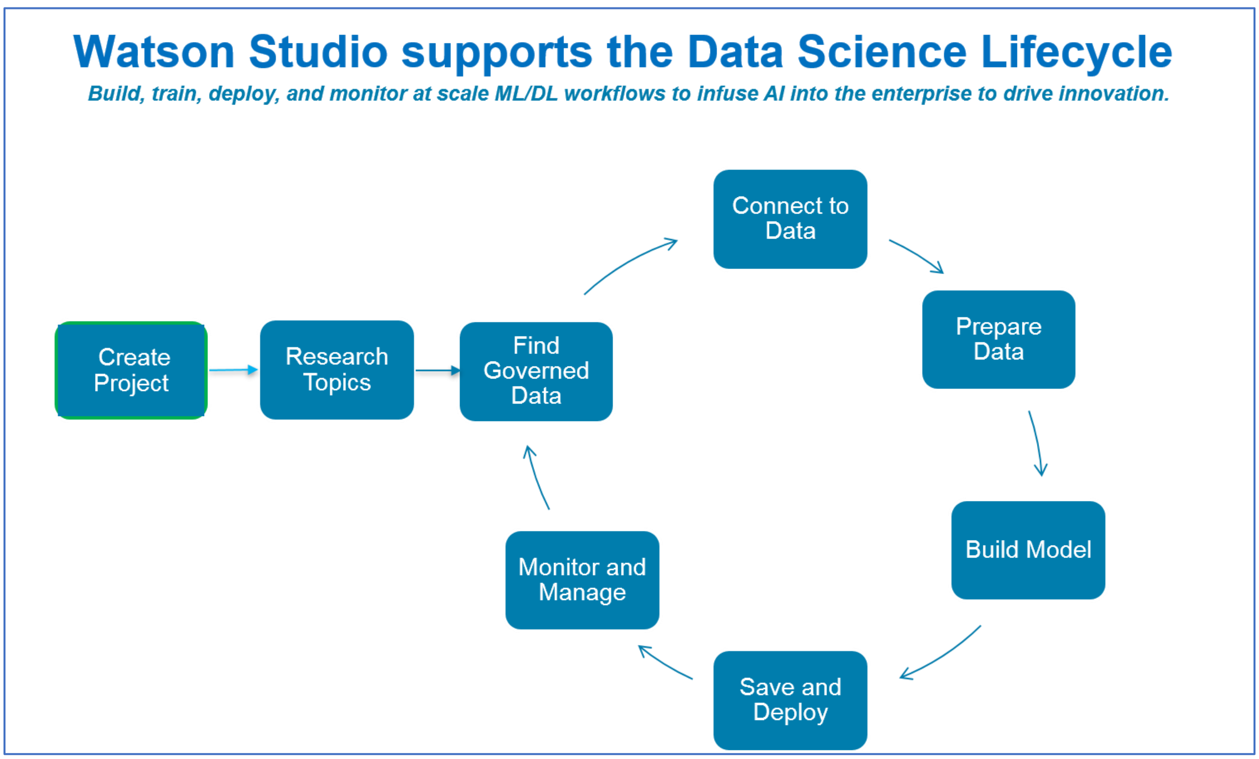


Figure 1- End to End Flow

Background

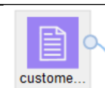
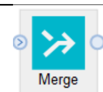
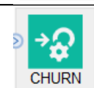
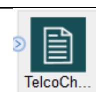
SPSS Modeler is a visual data mining workbench. Modeler can be used to complete all tasks in analytic application development

- Data understanding

- Data preparation
- Model building
- Model evaluation

Assets developed in Modeler are called “flows”. Another frequently used term in Modeler documentation is “streams” (used in Modeler desktop documentation). A flow starts with one or several data sources. Using visual nodes, a user can apply different operations to data. Data “flows” from one node to another in the direction of the arrows.

Visual nodes in modeler are color-coded and organized by type of operation: **Import**, **Record Operations**, **Field Operations, Graphs, Modeling, Output,** and **Export** (data sources). Most operations are well-known functions in data preparation and analytics, such as sampling, filtering, binning, etc.

The data sources are purple	
Data preparation operations are blue	
Algorithms are green	
The models that are created based on algorithms are orange	
Different types of output (graphs, tables, external files) are black	
The nodes with a star icon are called “supernodes” because they contain several nodes. Supernodes are used for visual organization of the flow.	

If a user needs more information about a particular node, it can be looked up in Modeler documentation. SPSS also publishes the **Algorithms Guide** that explains how machine learning algorithms are implemented in Modeler.

Female Human Trafficking Data

The data sets used for this lab consist of **simulated** travel itinerary data. The use case corresponds to an analyst reviewing the travel data to assign a risk of trafficking. The risk is recorded as the VETTING _LEVEL column in the dataset. Some of the records have already been analyzed and have a VETTING_LEVEL of low (value is 30), medium (value is 20), or high risk (value is 10). Others have not yet been vetted (value is 100). We will use the data that has been vetted to train a model to predict the risk for the unvetted records. This can be used to automate the process and augment the analyst. For example, one option would be to send the predicted high-risk persons to the analyst for further investigation.

The OCCUPATION data included in the travel data is very granular. For modeling purposes, it was decided to categorize the OCCUPATION data. Two additional datasets are used for this purpose. The occupation.csv dataset maps the granular occupation data to a category code. The categories dataset maps a category code to a category description. These datasets will be joined to the main dataset to prepare the data for modeling.

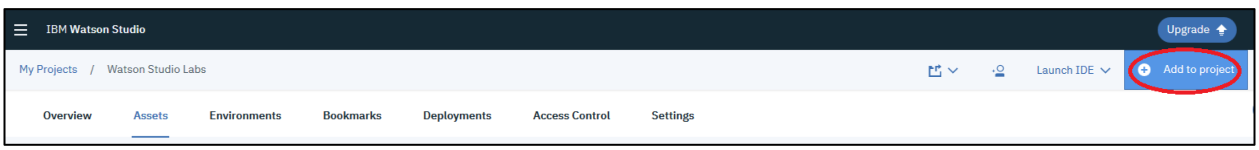
Other columns in the dataset are similarly very granular and could also be categorized for modeling purposes. This lab does not include steps to accomplish this, but it would be similar to what was done for the occupation column.

Lab Steps

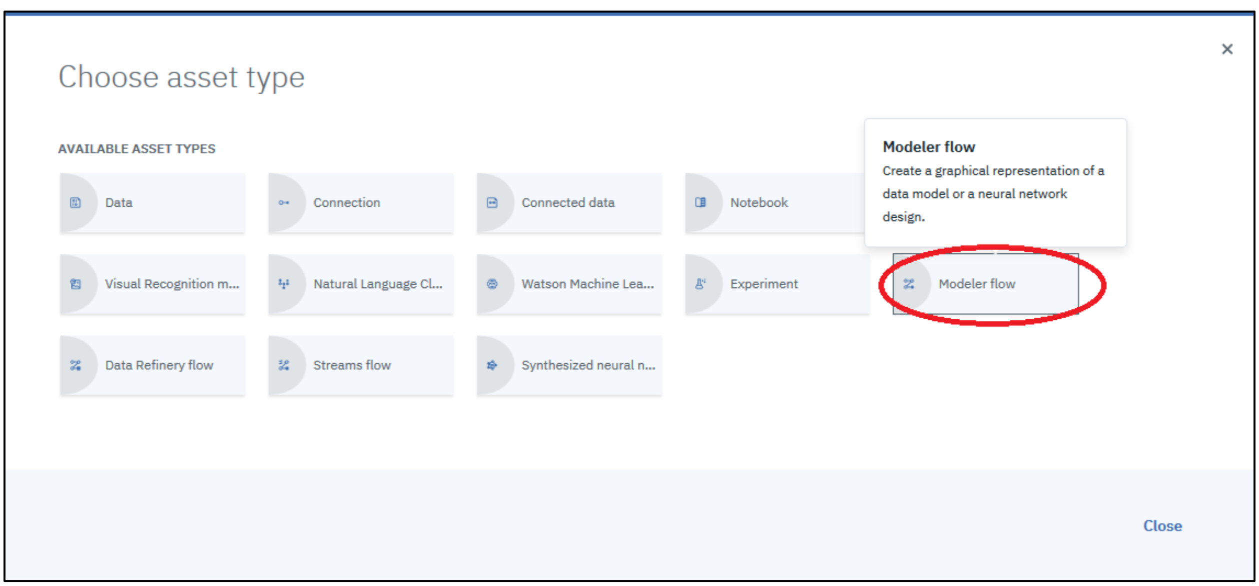
In this section, we will create a Machine Learning flow using SPSS nodes.

Step 1 - Create a New Flow

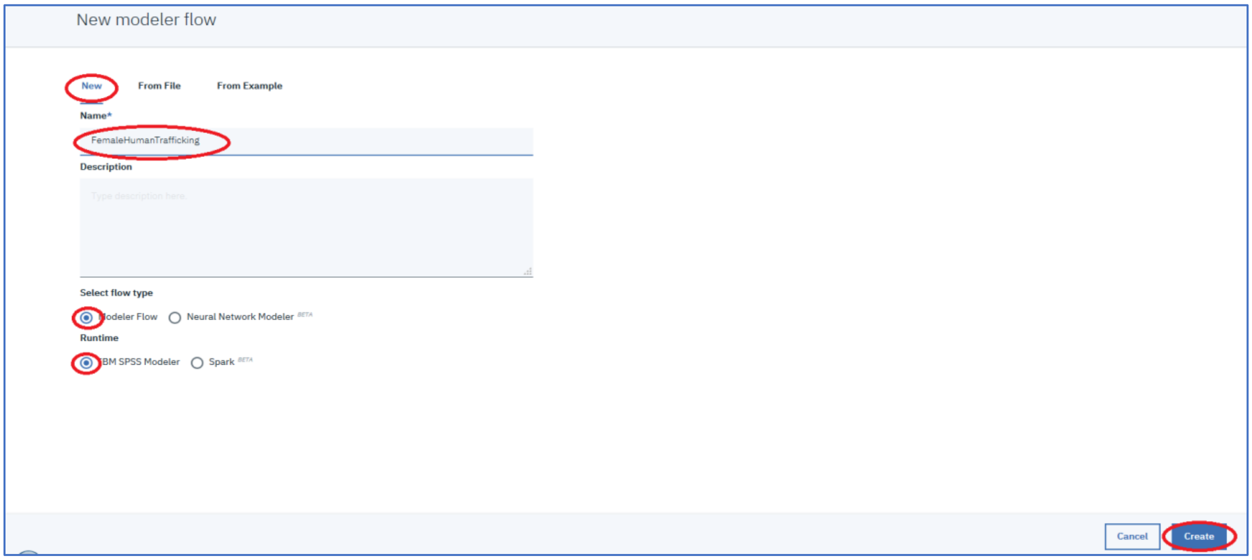
1. In the Watson Studio project, click on **Add to project**.



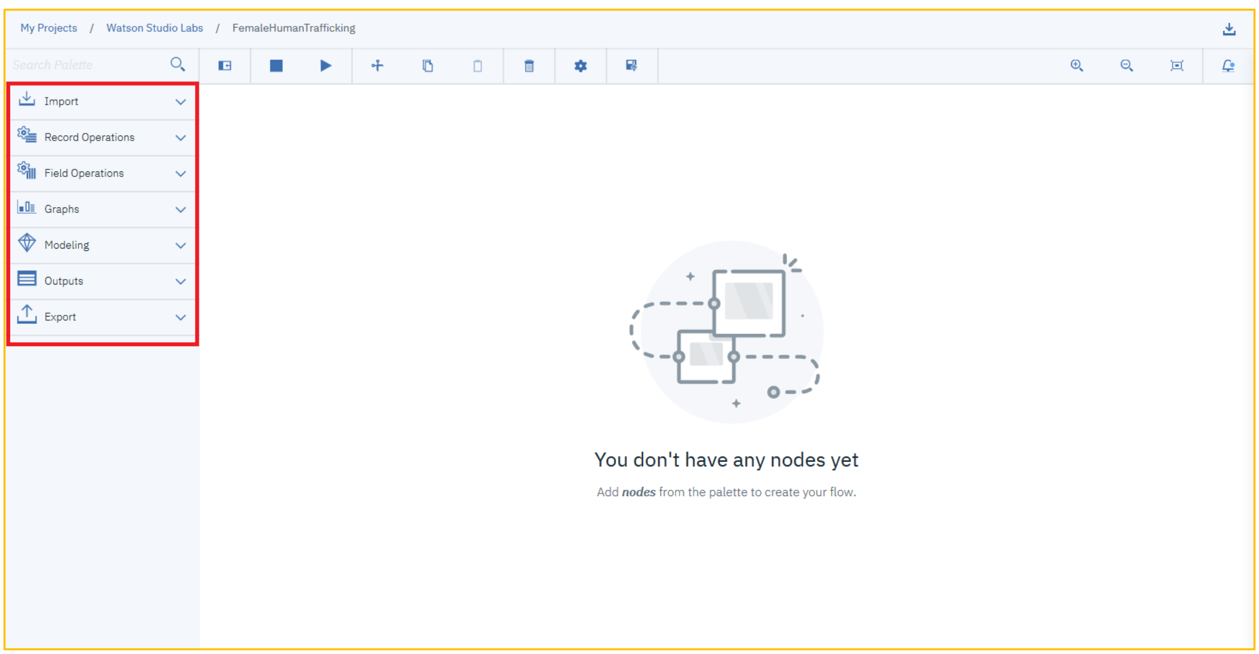
2. Select **Modeler Flow**.



3. Enter a **Name** for the flow, optionally enter a **Description**, click on **Modeler Flow** for the **flow type** (should be the default), click on **IBM SPSS Modeler** for the **Runtime** (should be the default), and click on **Create.**

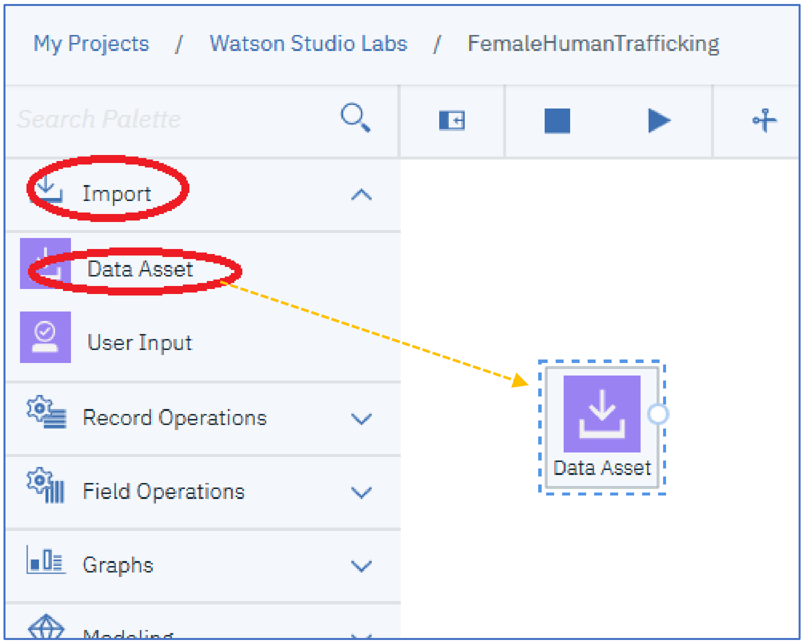


4. This opens the Flow Editor. Note the palette of operations on the left-hand side.

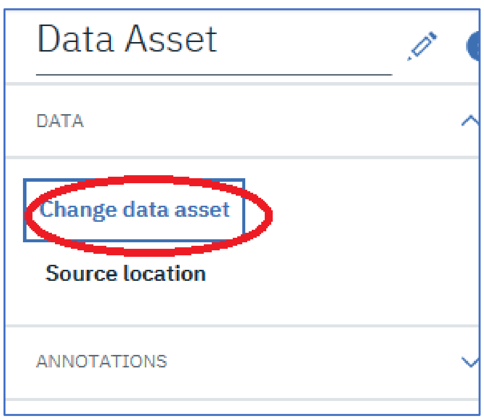


Step 2 - Load the Trafficking Datasets

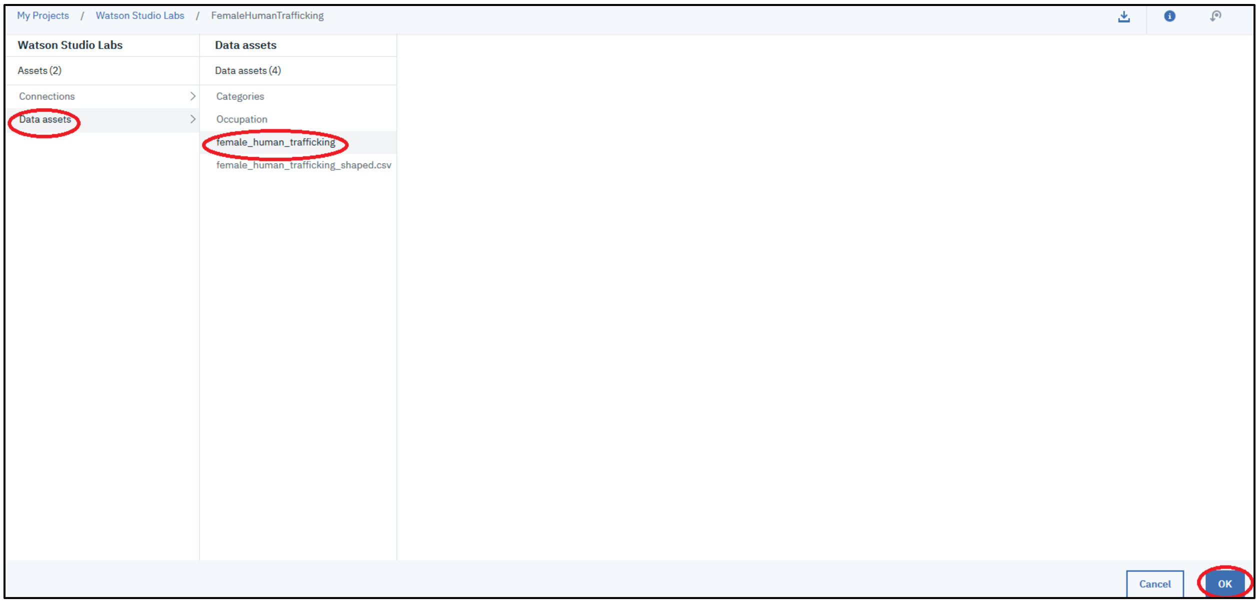
1. Click on **Import** and then **Data Asset** and hold the left mouse key on the Data Asset icon and **drag it onto the left side of the canvas**. Release the left mouse key.



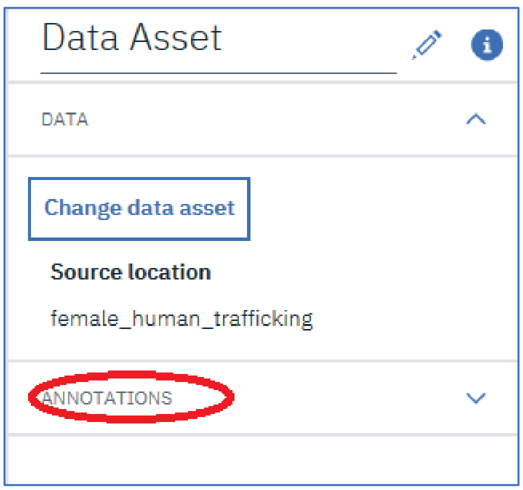
2. Double click on the **Data Asset**. In the window pane on the right-hand-side click on **Change data asset**.



3. Click on **Data Assets**, click on **female_human_trafficking**, then click **OK**.

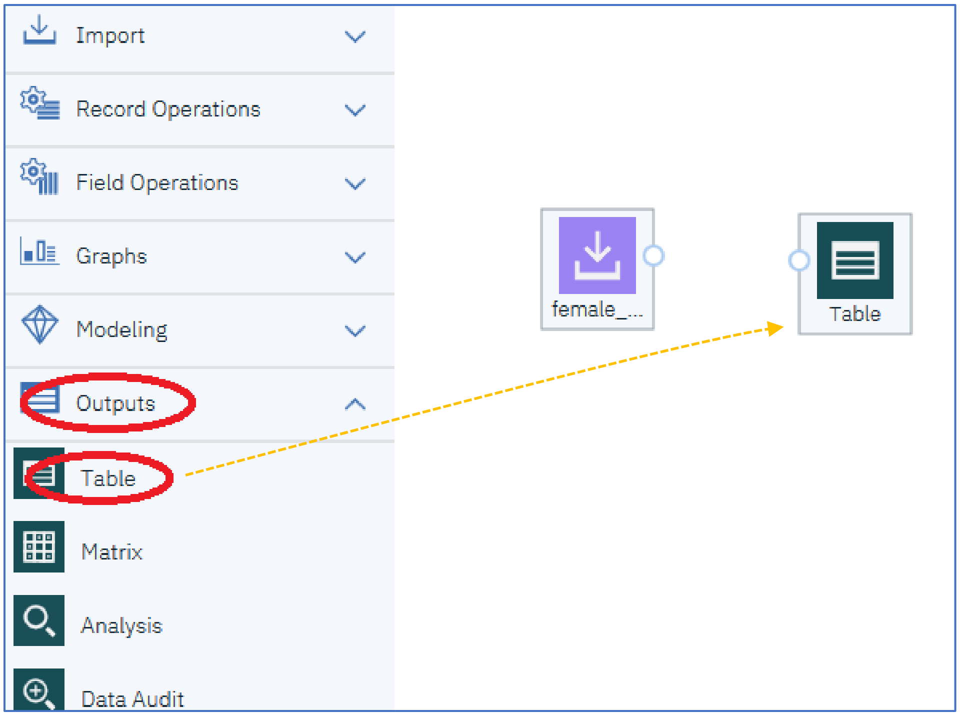


4. Click on **ANNOTATIONS.**

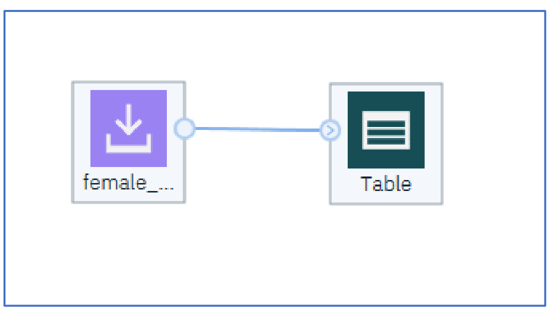


5. Click on **Custom name**, and type **female_human_trafficking**, and click on **Save**.

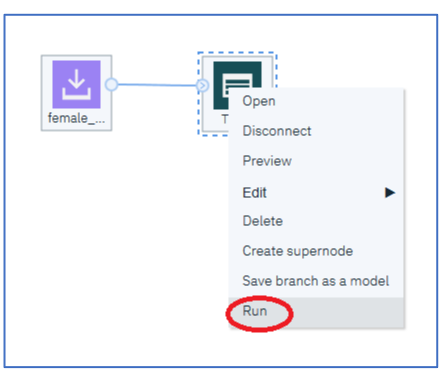
6. Click on the **Outputs** menu item in the Node Palette on the left and then click on the **Table** icon and drag the icon to the right of the female_human_trafficking to display its contents. If the Node Palette is not visible, click on the Node Palette icon 

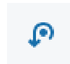


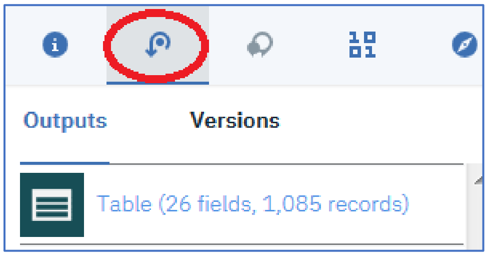
7. Connect the right side of the female_human_trafficking icon to the left side of the Table icon. This is accomplished by clicking on the little circle at the right side of the female_human_trafficking icon holding the left mouse key and dragging the mouse to the little circle on the left side of the Table icon, and then releasing the left mouse key.



8. Right click on the **Table** icon and select **Run**.



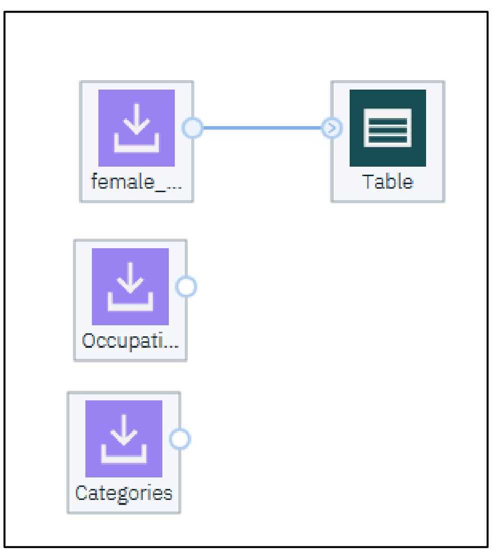
9. The “Running Flow” prompt will appear and then when completed a Table output selection will appear on the right side of the screen under the **Outputs** tab. If the Table output selection does not appear, select the  icon.



10. Double click on the Table selection and the contents of the female_human_trafficking is displayed. Each row contains travel information for a person. We will use this data to make predictions on trafficking risk.

INTERNAL_ID	VETTING_LEVEL	DESCRIPTION	NAME	GENDER	BIRTH_DATE	BIRTH_COUNTRY	BIRTH_COUNTRY_CODE	OCCUPATION	ADDRESS	SSN	PASSPORT_NUMBER	PASSPORT_COUNTRY	PASSPORT_COUNTRY_CODE
785	20	NA	Sara Nunez	F	1978-12-28	Ghana	GH	Industrial/product designer	7369 Kevin Hwy, Missouri City, Texes 77498	583-76-7251	775799149	Ghana	GH
786	100	NA	Sara Schultz	F	1983-08-10	Ghana	GH	Ranger/warden	1064 Jorge Mountain, Amador City, California 95601	127-01-5146	433319392	Ghana	GH
787	100	NA	Mackenzie Emi Cooley	F	2000-11-13	Ghana	GH	Food technologist	2296 Anthony Fld Ste 412, Marshall, None 63540	011-35-8270	928594311	Ghana	GH
788	100	NA	Rea Ray	F	1996-01-13	Ghana	GH	TEFL teacher	7285 David Mews, Weed, California 96094	141-99-0502	729531890	Ghana	GH
789	100	NA	Becky Anthony	F	1996-01-23	Ghana	GH	Lighting technician, broadcasting/film /video	96566 Nancy Road Suite 085, Salt Lake City, Utah 48170	160-78-9480	572668476	Ghana	GH

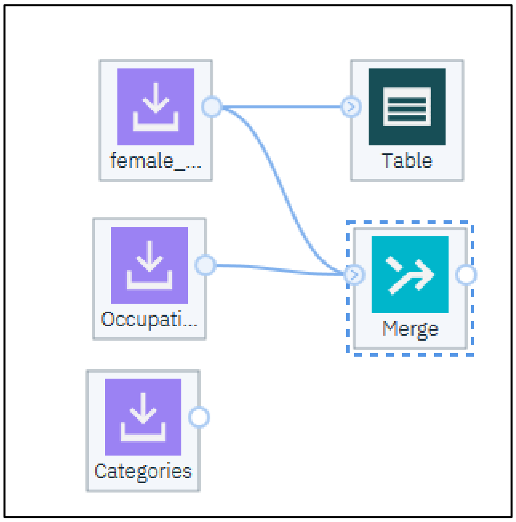
11. Repeat steps 1-5 for the occupation dataset and then repeat steps 1-5 for the categories dataset. When complete, the canvas should appear as below.



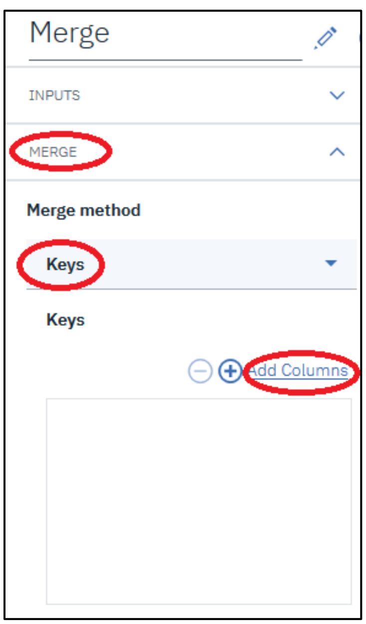
Step 3 - Join the Data Sources

In this step we will join the data sources using **Merge** Nodes.

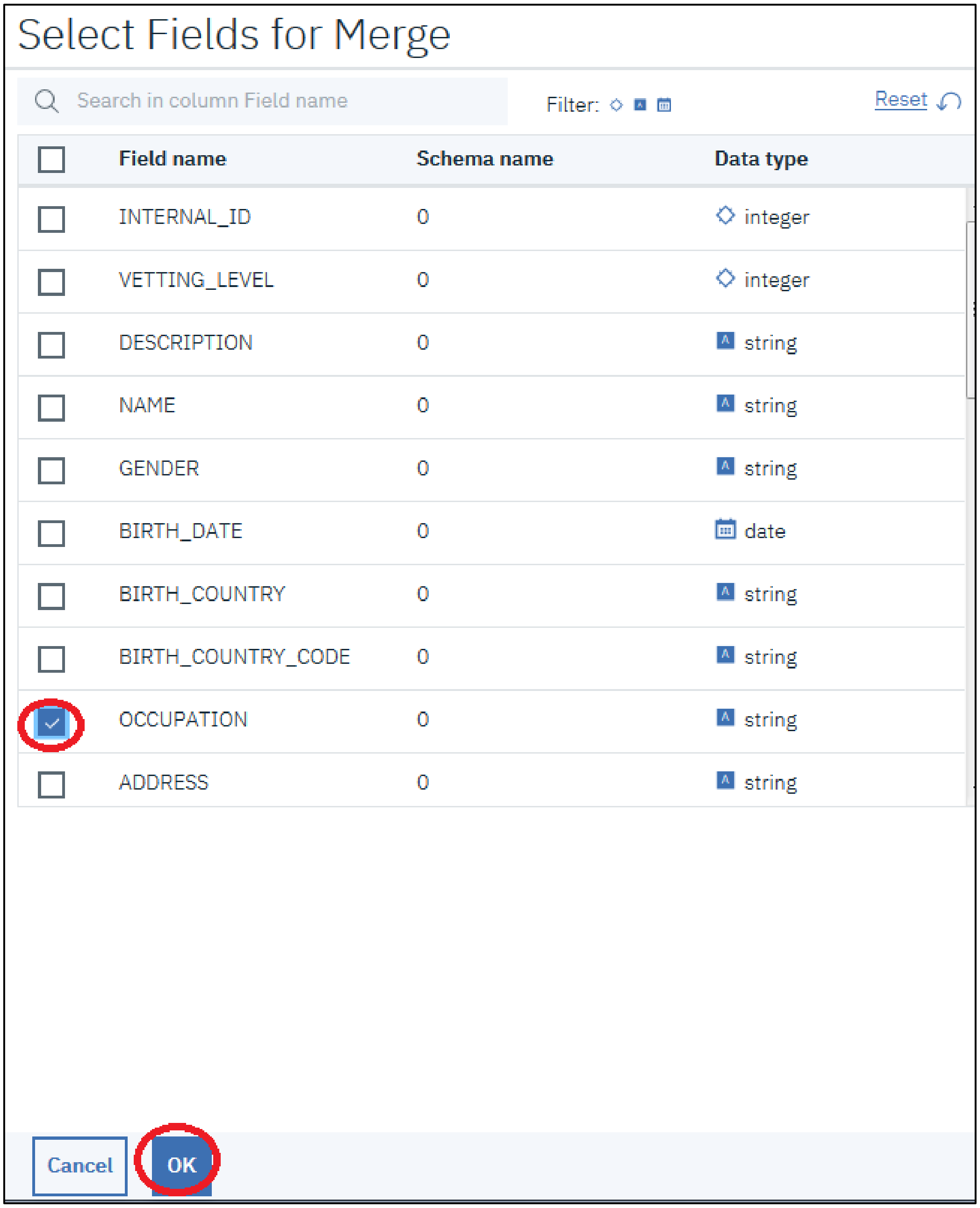
1. Add a **Merge** node to the flow by clicking on the **Record Operations** menu in the Node Palette, and then dragging the **Merge** node to the right of the **Occupations** data source. If the Node Palette is not visible, click on the Node Palette icon . Connect the **female_human_trafficking** data source to the Merge node. Connect the **Occupations** data source to the **Merge** node. The canvas should appear as below.



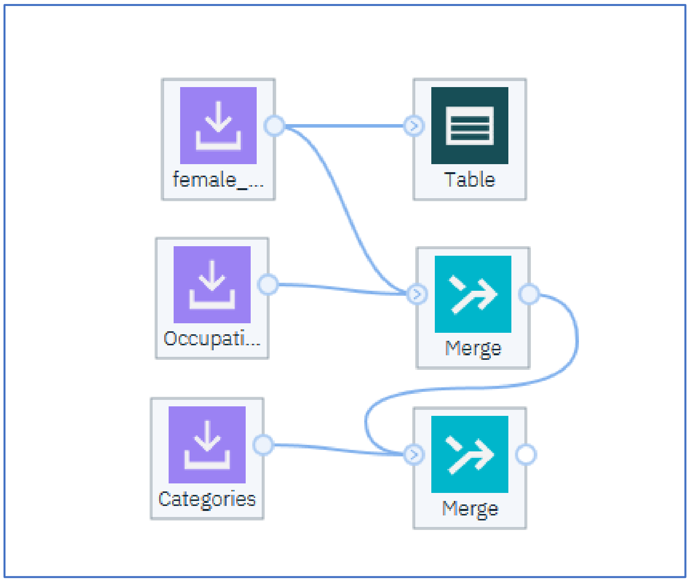
2. Double-click on the **Merge** Node. Click on **MERGE**, then click on **Keys** for the Merge method, and click on **Add Columns**.



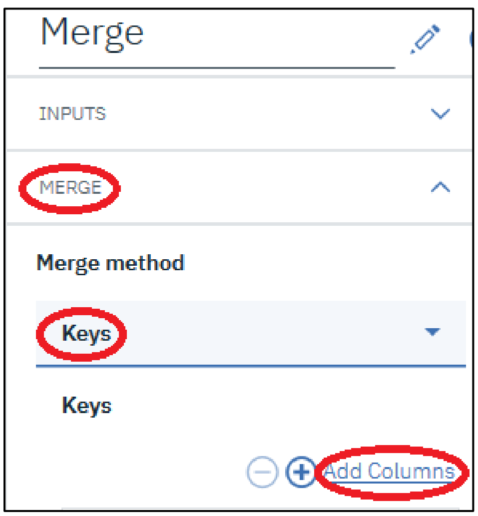
3. Click on **Occupation** and then click on **Ok**



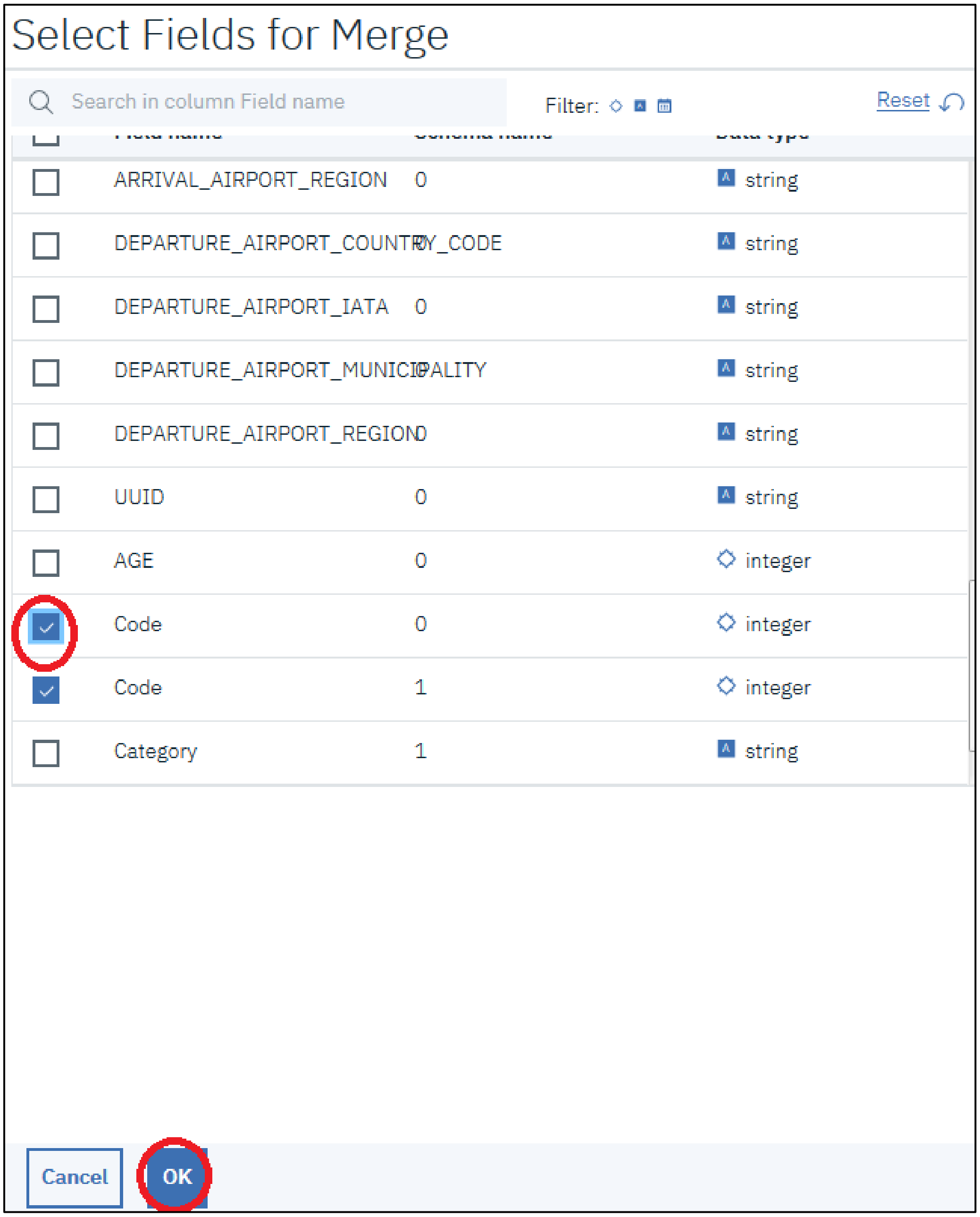
4. Add a **Merge** node to the flow by clicking on the **Record Operations** menu in the Node Palette, and then dragging the **Merge** node to the right of the **Categories** data source. If the Node Palette is not visible, click on the Node Palette icon. Connect the prior **Merge** node source to this **Merge** node. Connect the **Categories** data source to the **Merge** node. The canvas should appear as below.



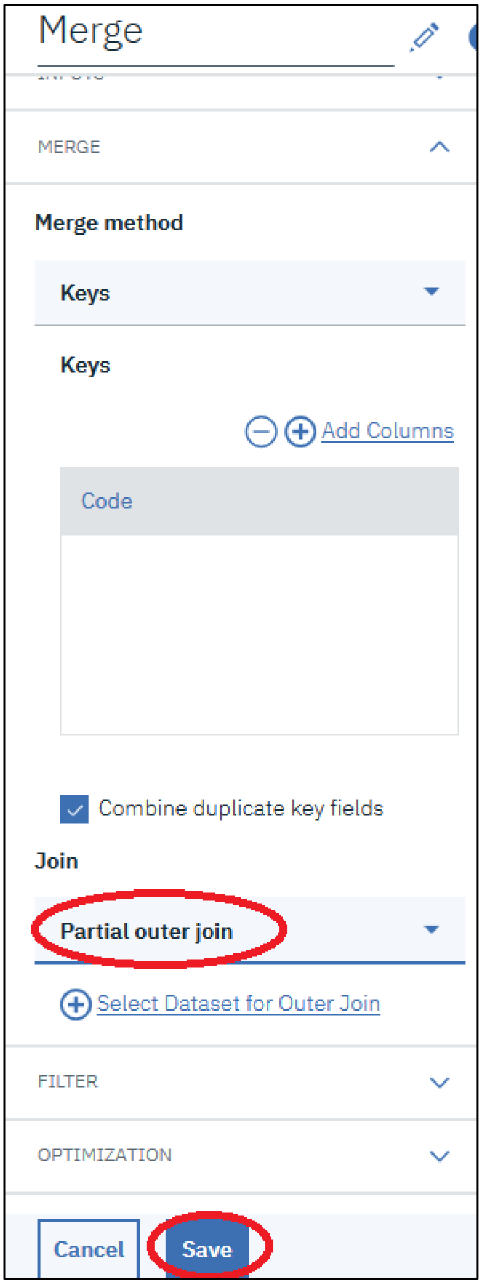
5. Double click on the second **Merge** node to set the merge options. Click on **MERGE**, click on **Keys** for the Merge method, and then click on **Add Columns** to add the key columns.



6. Scroll down and click on the **Code** checkbox. The second Code checkbox should get automatically checked. Click on **OK**.



7. Click on **Partial Outer Join** and then click **Save**.

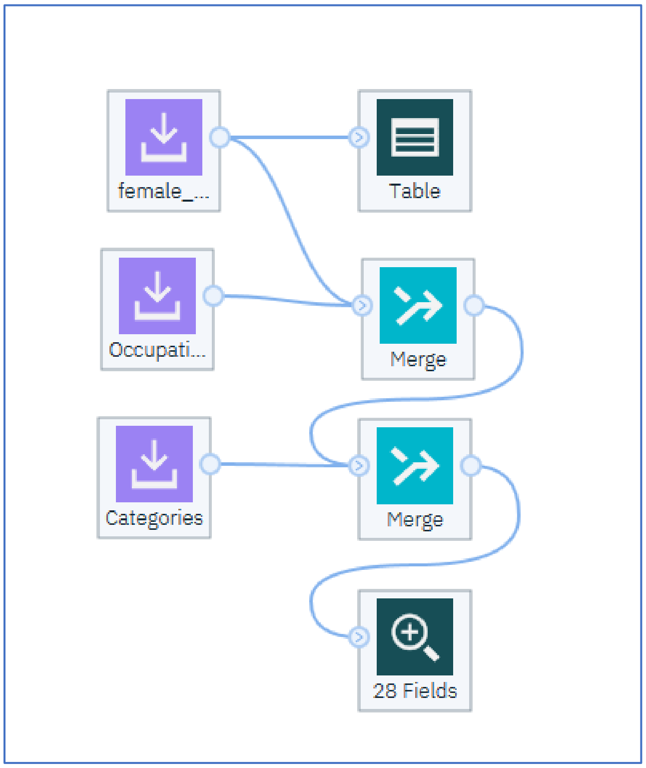


Step 4 - Explore the Data using the Data Audit Node

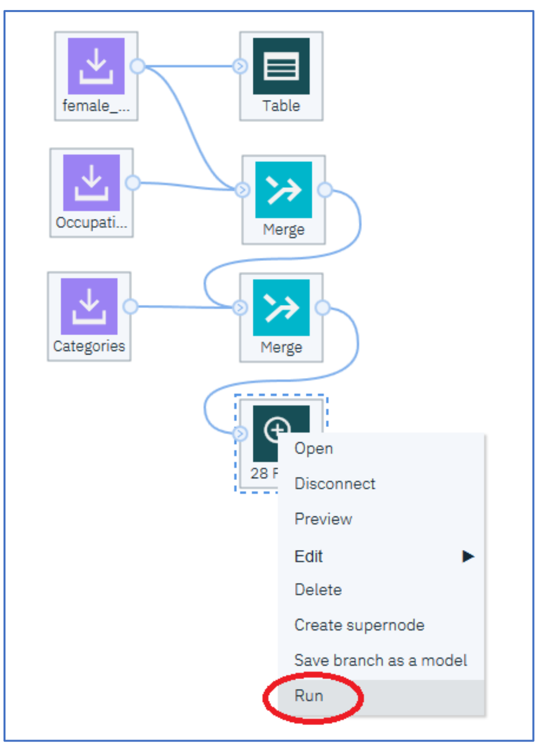
The SPSS Modeler has a Data Audit node that provides profiling information on the input data that is useful for cleansing and preparing the data. It provides a comprehensive first look at the data, including summary statistics, as well as information about outliers, missing values, and extremes.

1. Add a **Data Audit** node to the flow clicking on the **Outputs** menu item in the Node Palette, and then dragging the **Data Audit** node to underneath the **Type** node. If the Node

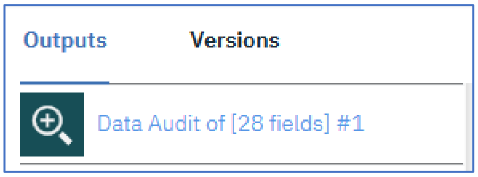
Palette is not visible, click on the Node Palette icon . Connect the node to the Data Audit node. The canvas should appear as below.



2. Right click on the **Data Audit** node and click **Run**.



3. The “Running Flow” prompt will appear and then when completed a Data Audit output selection will appear on the right side of the screen under the **Outputs** tab. If the **Outputs** tab doesn’t display, click on the  icon.



4. Double click on the **Data Audit of [28 fields]** to view the Data Audit output. The top section of the Data Audit report displays profiling information. For modeling purposes, fields that have only 1 unique value, or have many unique values should be eliminated. In addition, certain fields are directly related such as PASSPORT_COUNTRY, PASSPORT_COUNTRY_CODE, BIRTH_COUNTRY, and BIRTH_COUNTRY_CODE. Only one of these fields need to be retained. The fields that we will keep for modeling purposes are VETTING_LEVEL, Category, AGE, COUNTRIES_VISITED_COUNT, ARRIVAL_AIRPORT_REGION, DEPARTURE_AIRPORT_COUNTRY, PASSPORT_COUNTRY. Later in the lab we will apply a filter operation to retain these fields.

	Field	Graph	Measurement	Min	Max	Mean	Std. Dev	Skewness	Unique	Valid
1	Code		Continuous	1	15	7.950	4.238	0.263	--	1085
2	OCCUPATION		Categorical	--	--	--	--	--	--	1085
3	INTERNAL_ID		Continuous	1	1085	543.000	313.357	0.000	--	1085
4	VETTING_LEVEL		Continuous	10	100	80.498	34.211	-1.216	--	1085
5	DESCRIPTION		Categorical	--	--	--	--	--	1	1085
6	NAME		Categorical	--	--	--	--	--	--	1085
7	GENDER		Categorical	--	--	--	--	--	1	1085
8	BIRTH_DATE		Continuous	1970-01-03	2002-03-06	--	--	--	--	1085
9	BIRTH_COUNTRY		Categorical	--	--	--	--	--	6	1085
10	BIRTH_COUNTRY_CODE		Categorical	--	--	--	--	--	6	1085
11	ADDRESS		Categorical	--	--	--	--	--	--	1085
12	SSN		Categorical	--	--	--	--	--	--	1085
13	PASSPORT_NUMBER		Continuous	177305	998019937	487294331.813	292536731.107	0.024	--	1085
14	PASSPORT_COUNTRY		Categorical	--	--	--	--	--	6	1085
15	PASSPORT_COUNTRY_CODE		Categorical	--	--	--	--	--	6	1085
16	COUNTRIES_VISITED		Categorical	--	--	--	--	--	--	1085
17	COUNTRIES_VISITED_COUNT		Continuous	1	12	4.392	2.838	0.966	--	1085
18	ARRIVAL_AIRPORT_COUNTRY_CODE		Categorical	--	--	--	--	--	1	1085

19	ARRIVAL_AIRPORT_IATA		Categorical	--	--	--	--	--	159	1085
20	ARRIVAL_AIRPORT_MUNICIPALITY		Categorical	--	--	--	--	--	144	1085
21	ARRIVAL_AIRPORT_REGION		Categorical	--	--	--	--	--	46	1085
22	DEPARTURE_AIRPORT_COUNTRY_CODE		Categorical	--	--	--	--	--	104	1085
23	DEPARTURE_AIRPORT_IATA		Categorical	--	--	--	--	--	238	1085
24	DEPARTURE_AIRPORT_MUNICIPALITY		Categorical	--	--	--	--	--	226	1085
25	DEPARTURE_AIRPORT_REGION		Categorical	--	--	--	--	--	220	1085
26	UUID		Categorical	--	--	--	--	--	--	1085
27	AGE		Continuous	15	47	30.811	9.344	-0.034	--	1085
28	Category		Categorical	--	--	--	--	--	15	1085

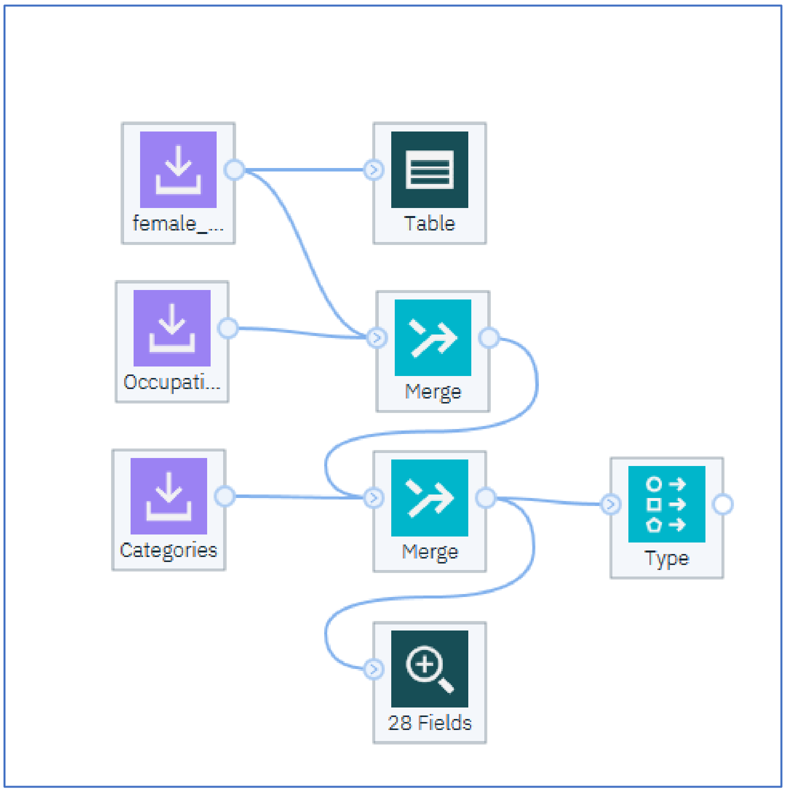
5. Scroll down to view the bottom section. It displays data quality checks in the form of missing values or anomalous values. In our travel data simulator, we didn't simulate any of those type of values!

	Field	Measurement	Outliers	Extremes	Action	Impute Missing	Method	% Complete	Valid Records	Null Value	Empty String	White Space	Blank Value
1	Code	Continuous	0	0	None	Never	Fixed	100.000	1085	0	0	0	0
2	OCCUPATION	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
3	INTERNAL_ID	Continuous	0	0	None	Never	Fixed	100.000	1085	0	0	0	0
4	VETTING_LEVEL	Continuous	0	0	None	Never	Fixed	100.000	1085	0	0	0	0
5	DESCRIPTION	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
6	NAME	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
7	GENDER	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
8	BIRTH_DATE	Continuous	0	0	None	Never	Fixed	100.000	1085	0	0	0	0
9	BIRTH_COUNTRY	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
10	BIRTH_COUNTRY_CODE	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
11	ADDRESS	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
12	SSN	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
13	PASSPORT_NUMBER	Continuous	0	0	None	Never	Fixed	100.000	1085	0	0	0	0
14	PASSPORT_COUNTRY	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
15	PASSPORT_COUNTRY_CODE	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
16	COUNTRIES_VISITED	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
17	COUNTRIES_VISITED_COUNT	Continuous	0	0	None	Never	Fixed	100.000	1085	0	0	0	0
18	ARRIVAL_AIRPORT_COUNTRY_CODE	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
19	ARRIVAL_AIRPORT_IATA	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
20	ARRIVAL_AIRPORT_MUNICIPALITY	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
21	ARRIVAL_AIRPORT_REGION	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
22	DEPARTURE_AIRPORT_COUNTRY_CODE	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
23	DEPARTURE_AIRPORT_IATA	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
24	DEPARTURE_AIRPORT_MUNICIPALITY	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
25	DEPARTURE_AIRPORT_REGION	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
26	UUID	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0
27	AGE	Continuous	0	0	None	Never	Fixed	100.000	1085	0	0	0	0
28	Category	Categorical	--	--	--	Never	Fixed	100.000	1085	0	0	0	0

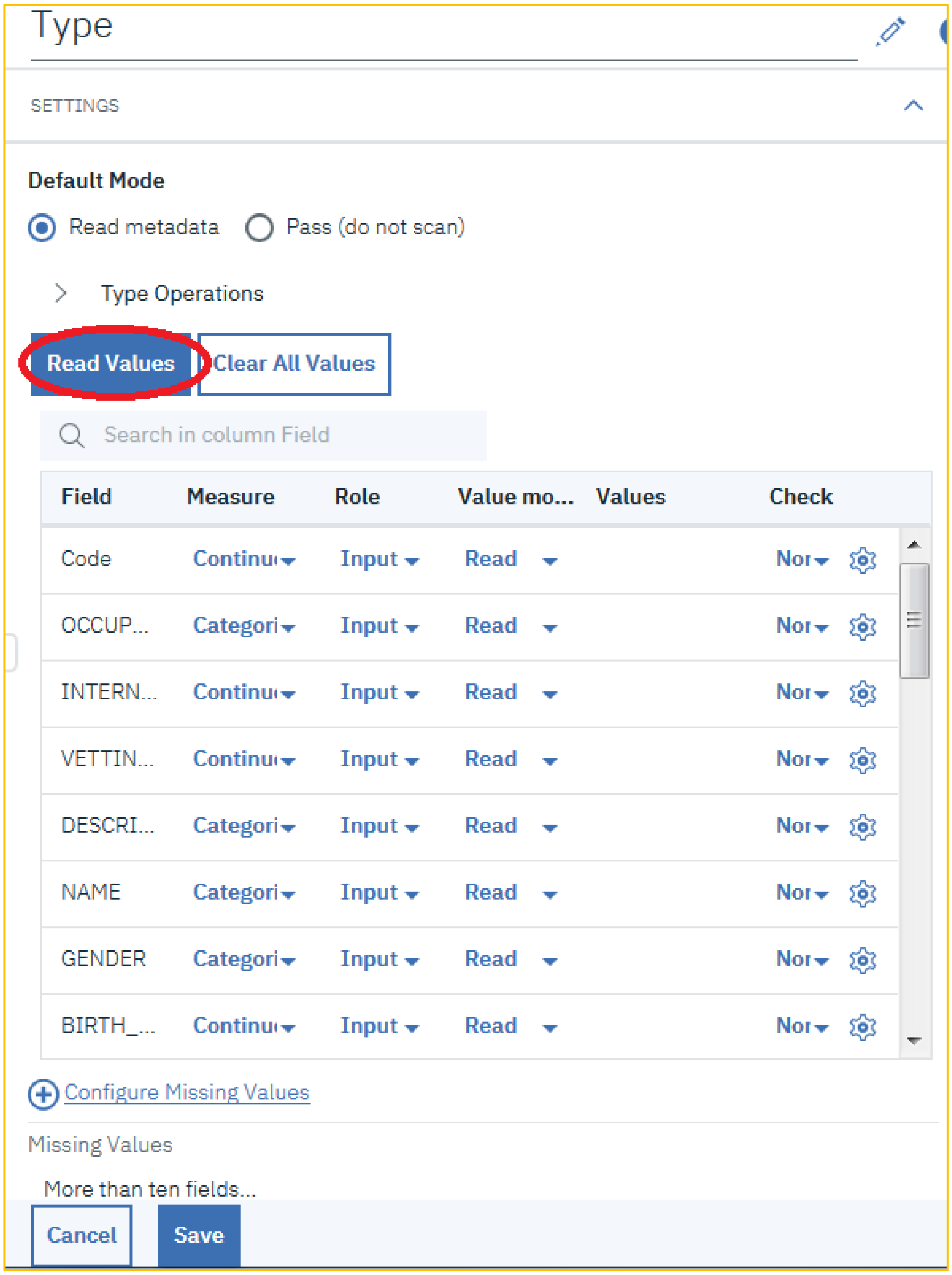
Step 5 - Explore the Data using Graph Nodes.

Let's explore the data using Graph Nodes. The Distribution node, and the Histogram node will be used to explore some of the characteristics of the trafficking data. First, we will add a Type node to the canvas. The Type node specifies field metadata and properties. We will change the measurement property for the "Code" and "VETTING_LEVEL" fields that were derived as "Continuous" (by scanning the data values) to "Nominal".

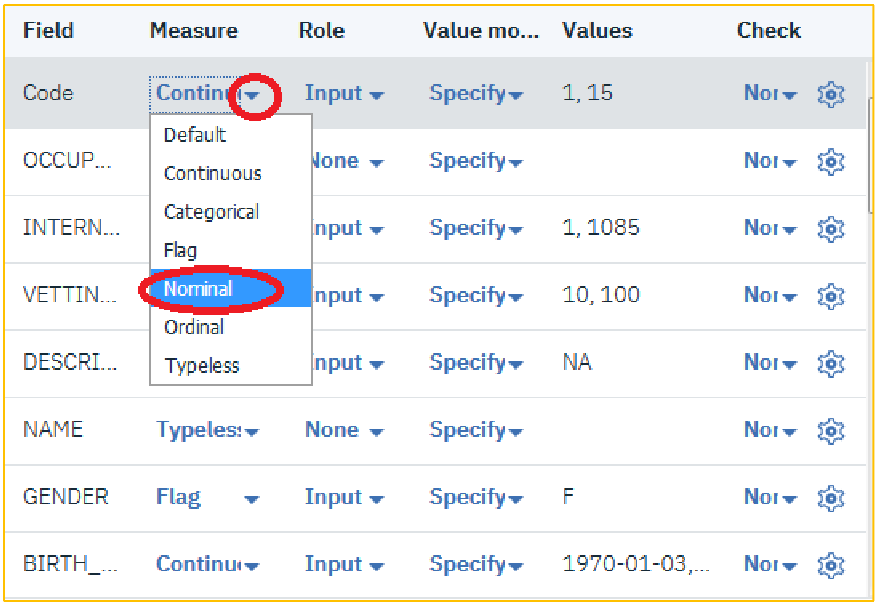
1. Add a **Type** node to the flow by clicking on the **Field Operations** menu item in the Node Palette and then drag the **Type** node to the right of the second **Merge** node. If the Node Palette is not visible, click on the Node Palette icon . Connect the **Merge** node to the **Type** node. The canvas should appear as below.



2. Double click on the **Type** node. This will open a **Type** menu pallet on the right side of the screen.
3. Click on **Read Values**.

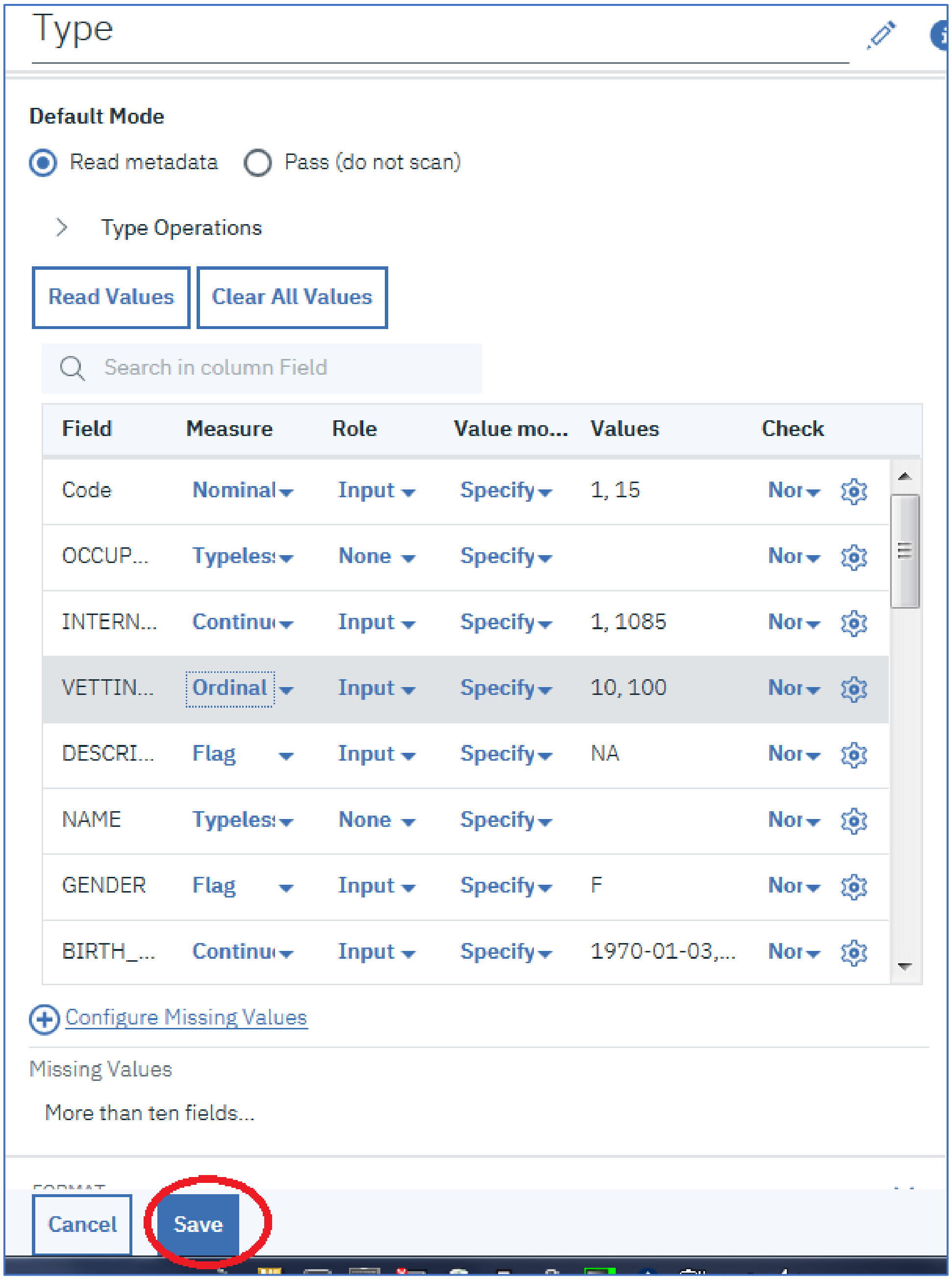


4. Select the dropdown in the **Measure** column next to **Code**. Change the **Measure** to **Nominal**.

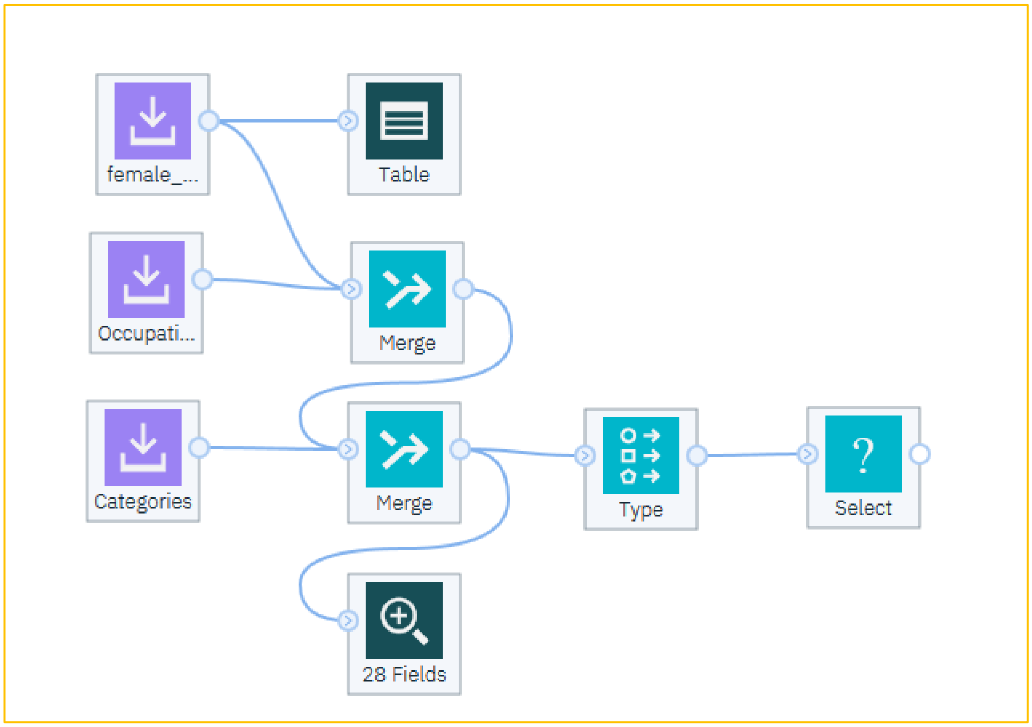


5. Using the same procedure, change the **Measure** of VETTING_LEVEL to **Nominal**.

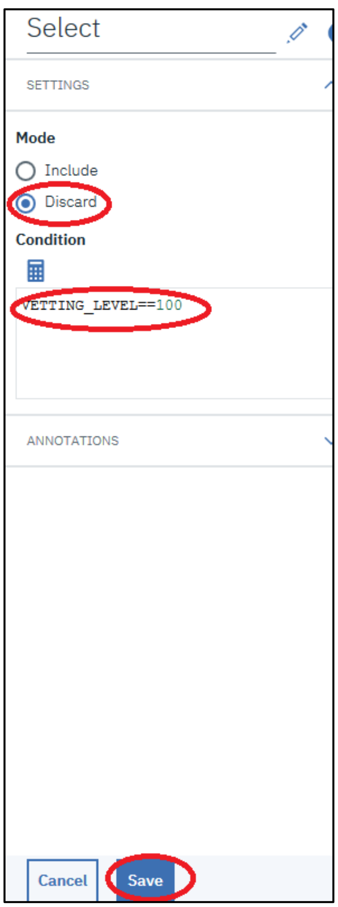
6. Click **Save**.



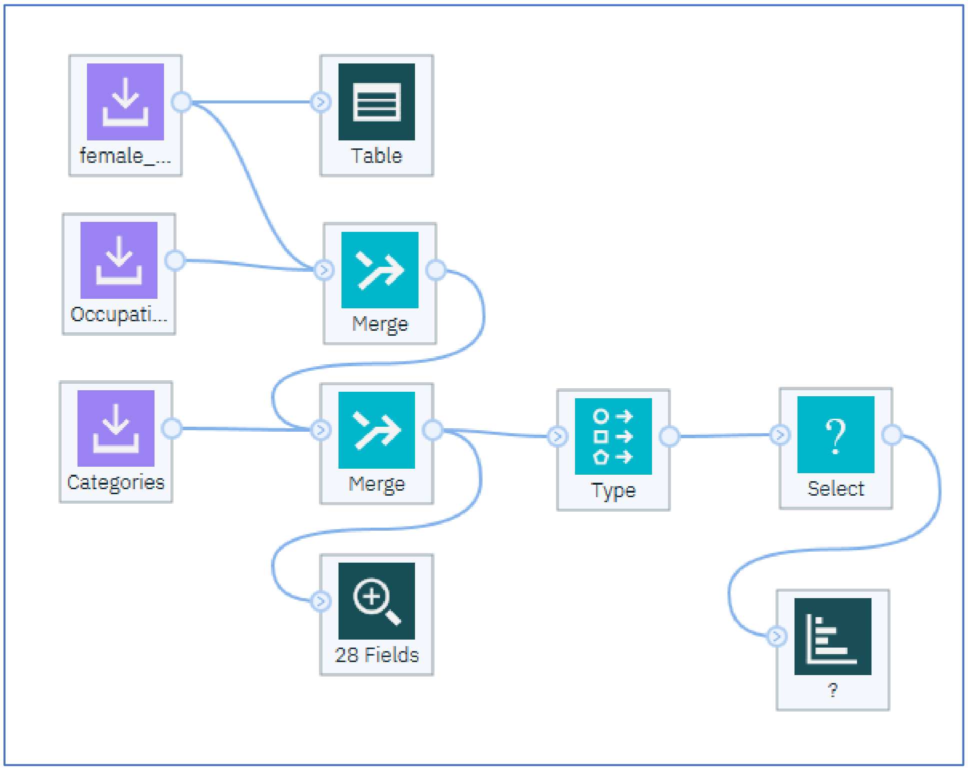
7. We will now discard the unvetted records. Add a **Select** node to the flow by clicking on the **Record Operations** menu item in the Node Palette and then dragging the **Select** node to the canvas to the right of the **Type** node. If the Node Palette is not visible, click on the Node Palette icon . The canvas should appear as below.



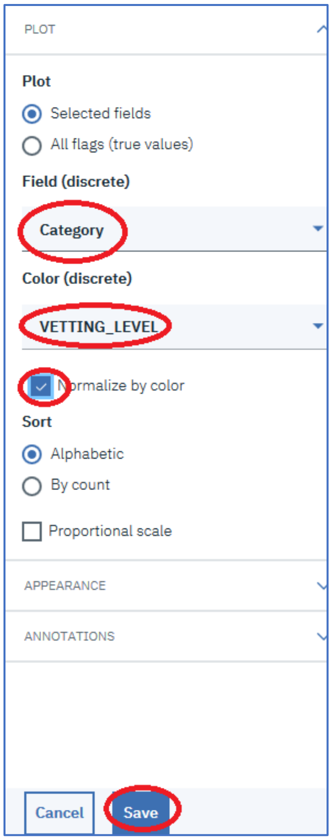
8. Double-click the **Select** node.



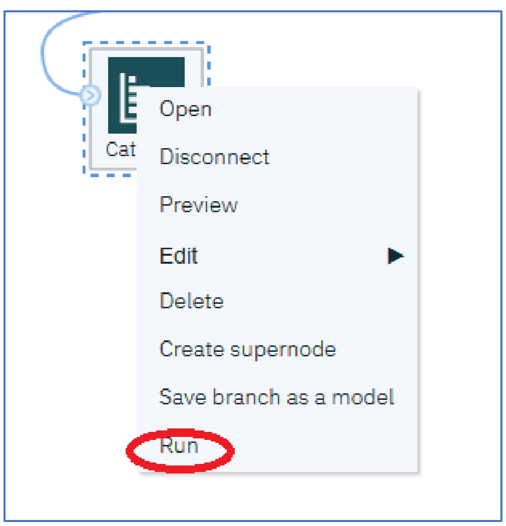
9. Add a **Distribution** node to the flow by clicking on the **Graph** menu item and then dragging the **Distribution** node to the canvas underneath the **Select** node. If the Node Palette is not visible, click on the Node Palette icon . Connect the **Select** node to the **Distribution** node. The canvas should appear as below. The ? indicates that the fields to be plotted have not been identified.



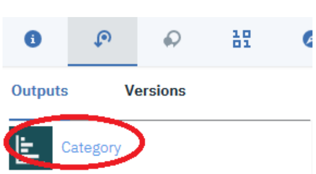
10. Double click on the Distribution Node. In the **Field (discrete)** dropdown, select **Category**. In the Color (discrete) dropdown, select **VETTING_LEVEL**. Click on the **normalize by color** checkbox, and then click **Save**.



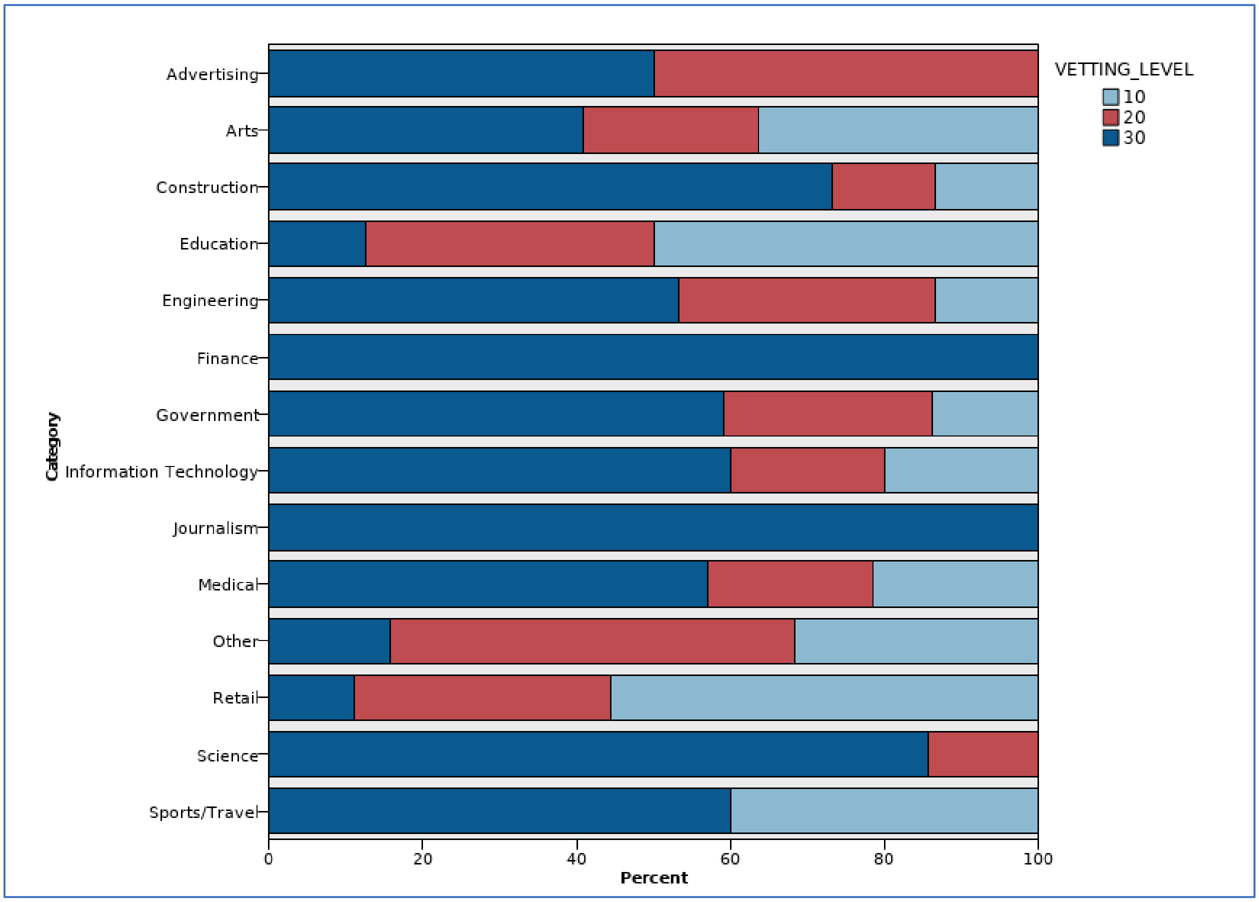
11. Right click on the Distribution node and select **Run**.



12. The Distribution output will appear under the **Outputs** tab. Double-click on Categories to view the graph.

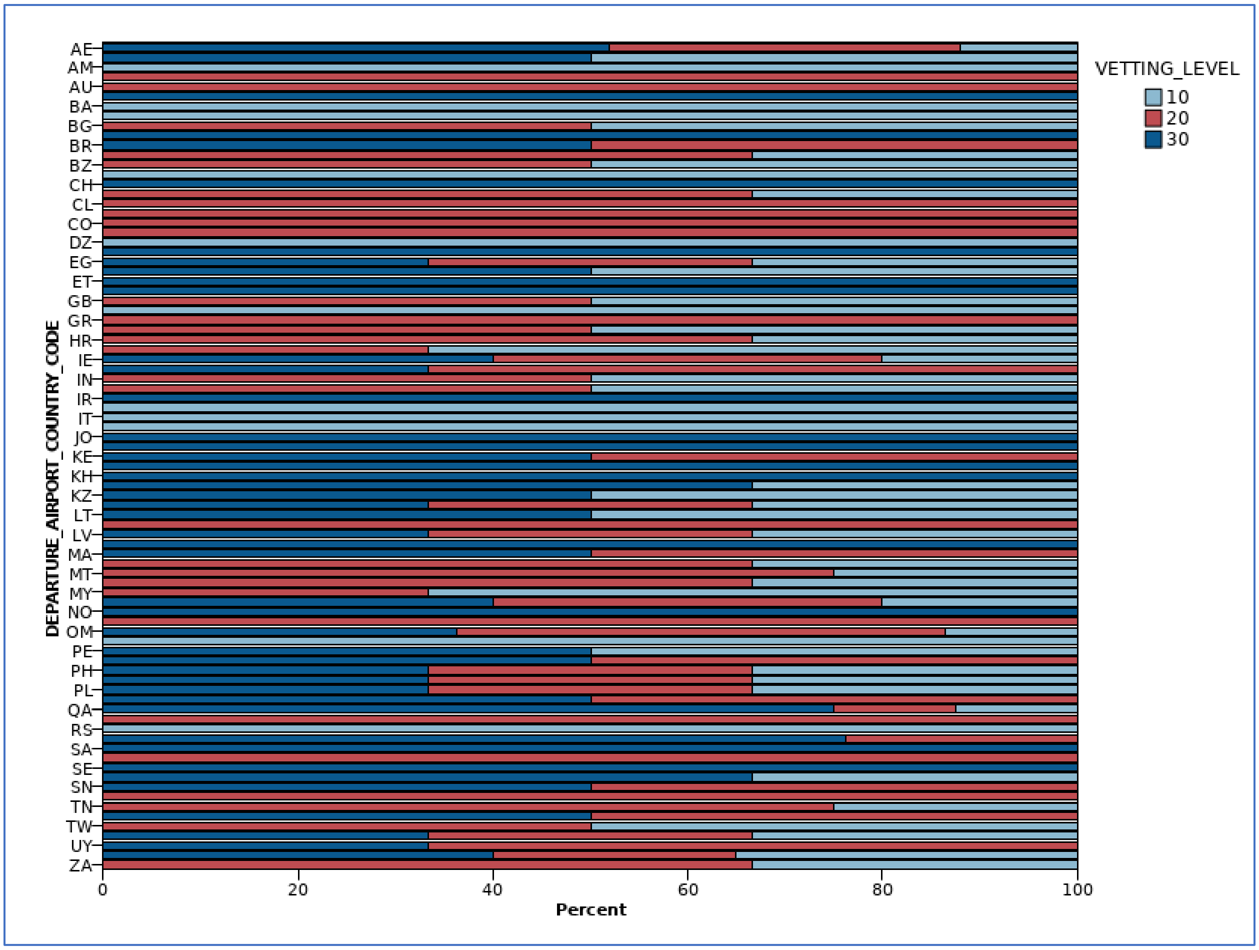


13. We can see from the graph that the VETTING_LEVEL does differ based on Category.

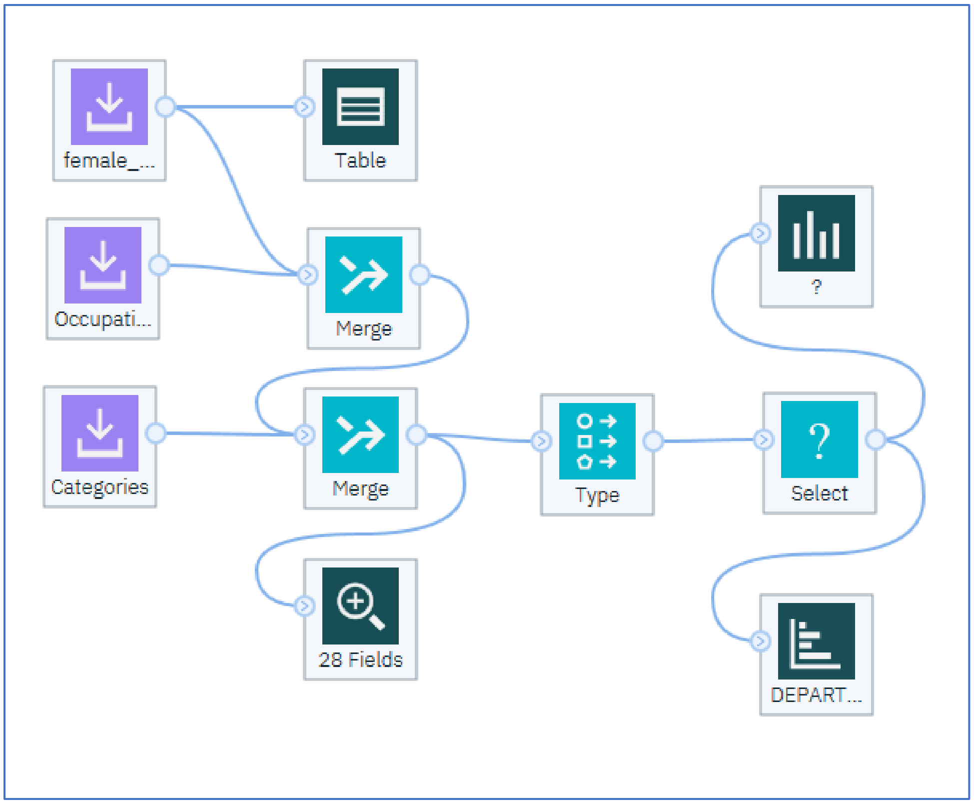


14. Return to the flow by clicking on FemaleHumanTrafficking breadcrumb at top.

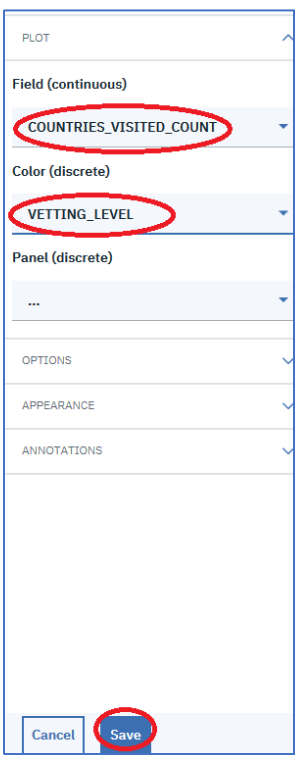
15. You can change the distribution graph to show the **VETTING_LEVEL** by **DEPARTURE_AIRPORT_COUNTRY_CODE** by double clicking on the Distribution node and replacing **Category** with **DEPARTURE_AIRPORT_COUNTRY_CODE** and clicking Save. Re-run the graph by right clicking on the Distribution node and selecting Run. Double click on the **DEPARTURE_AIRPORT_COUNTRY_CODE** in the **Outputs** pane to display the graph.



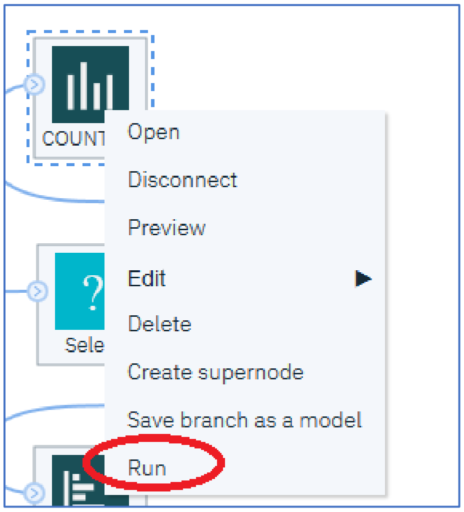
16. Add a **Histogram** node to the flow by clicking on the **Graphs** menu item and then dragging the **Histogram** node to the canvas above the **Select** node. If the Node Palette is not visible, click on the Node Palette icon . Connect the **Select** node to the **Histogram** node. The canvas should appear as below. The ? indicates that the fields to be plotted have not been identified.



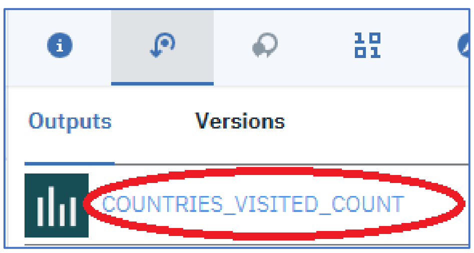
17. Double click on the **Histogram** node. Select **COUNTRIES_VISITED_COUNT** from the Field (continuous) dropdown. Select **VETTING_LEVEL** from the Color (discrete) dropdown. Click on **Save**.

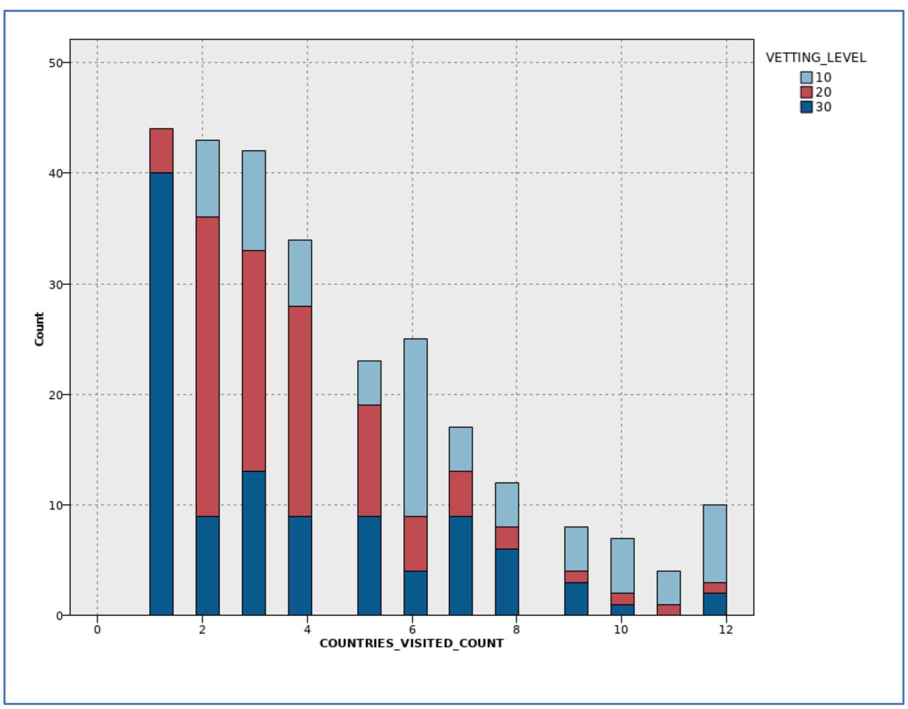


18. Right click on the **Histogram** node and select **Run**.

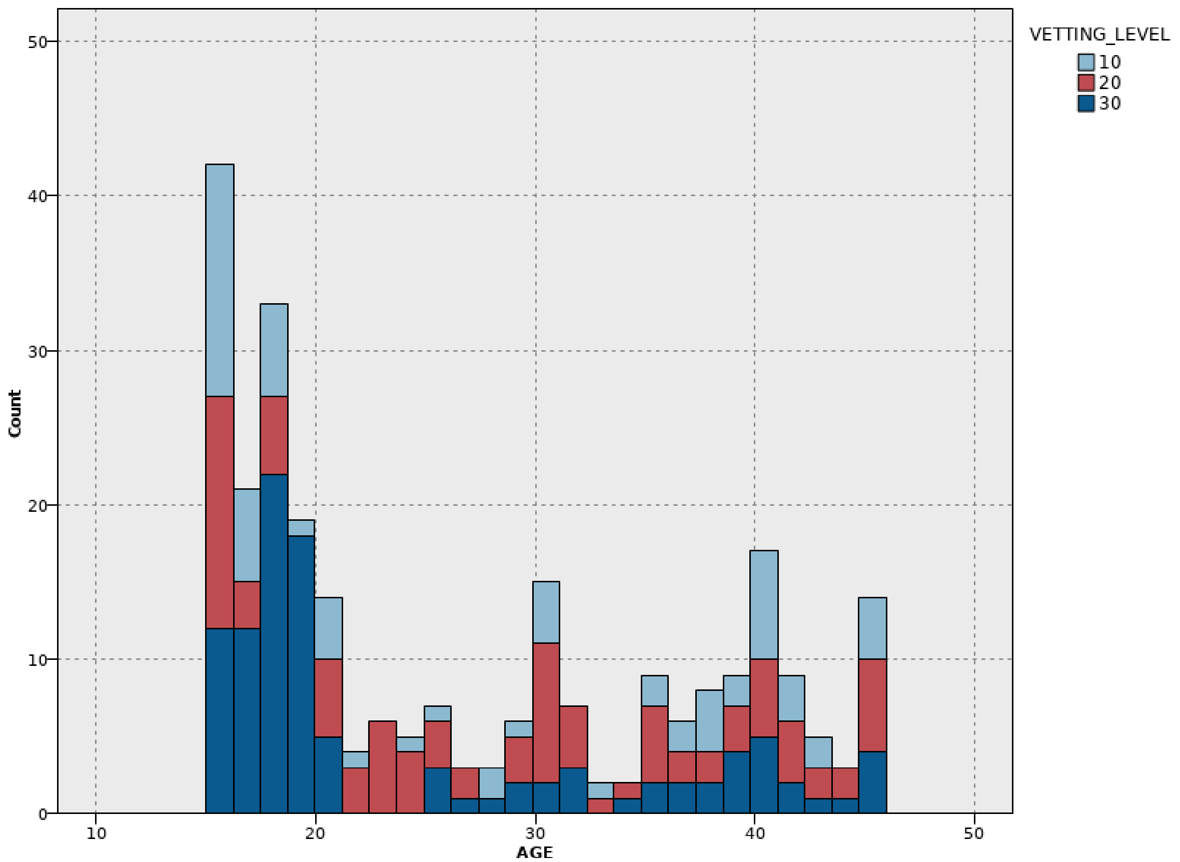


19. Double click on the **COUNTRIES_VISITED_COUNT** under the **Outputs** tab at the right of the screen.





20. The general trend appears to be that the more countries visited, the higher likelihood to be a “High Risk”. You can change the histogram to show the **AGE** by **VETTING_LEVEL** by double clicking on the Histogram node and replacing **COUNTRIES_VISITED_COUNT** with **AGE** and clicking **Save**. Re-run the graph by right clicking on the **Histogram** node and selecting **Run**. Double click on the **AGE** in the **Outputs** pane to display the graph.



Step 6 - Prepare the Data for Modeling

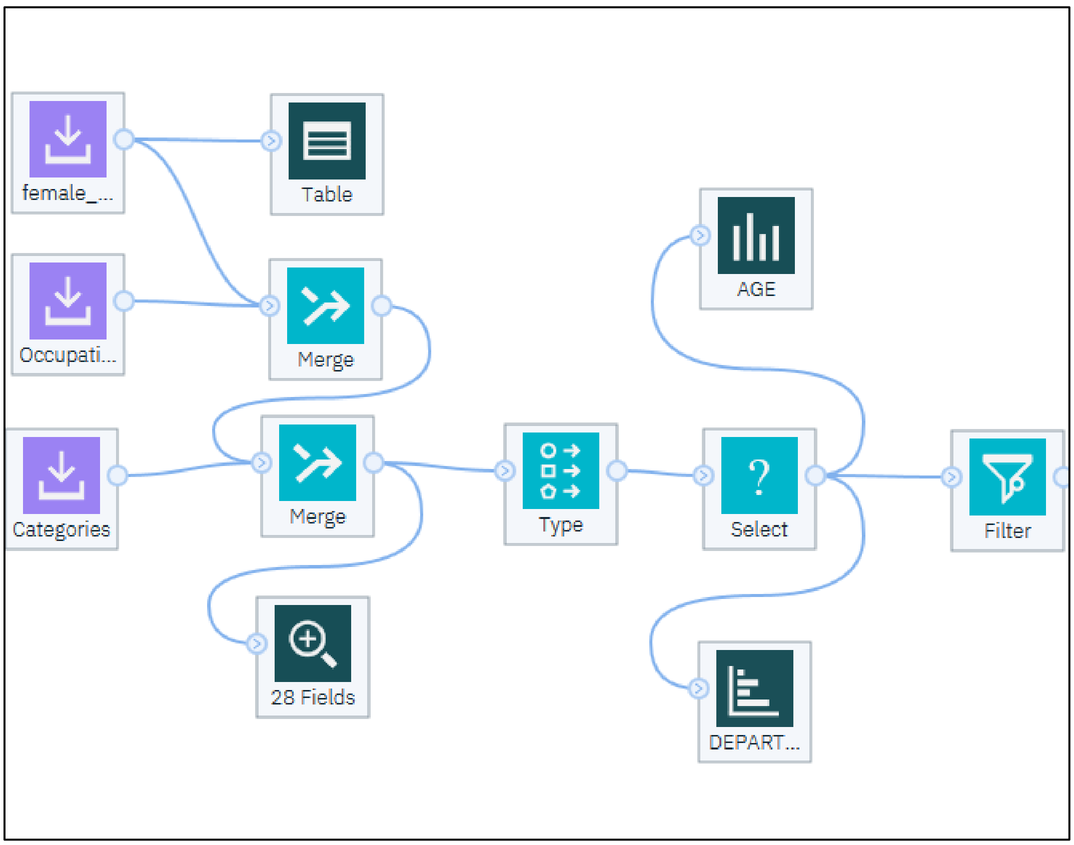
Based on our exploration of the data, there are several transformations that are needed to prepare the data for modeling. This section will introduce, the **Filter** node and the **Reclassify** node that will do the necessary transformations. The **Filter** and **Reclassify** nodes act on a field level.

Filter node – The **Filter** node performs two functions. It specifies fields that can be dropped or the fields that should be retained. It also allows fields to be renamed. We will retain the following fields – VETTING_LEVEL, COUNTRIES_VISITED_COUNT,

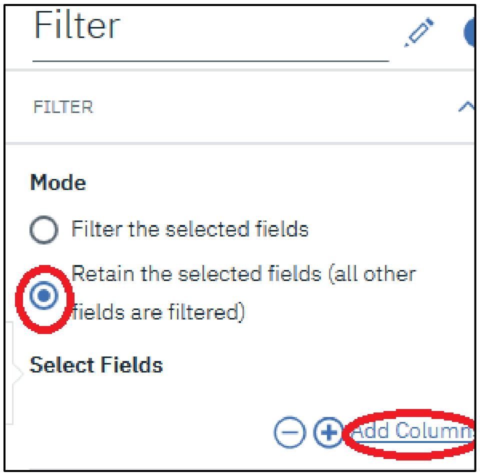
ARRIVAL_AIRPORT_REGION, DEPARTURE_AIRPORT_COUNTRY_CODE, AGE, and Category.

Reclassify node – The **Reclassify** node allows us to map input values to output values. We will use this node to map the VETTING_LEVEL values of 10, 20, 30, and 100 to “High Risk”, “Medium Risk”, “Low Risk”, and “Unvetted” respectively.

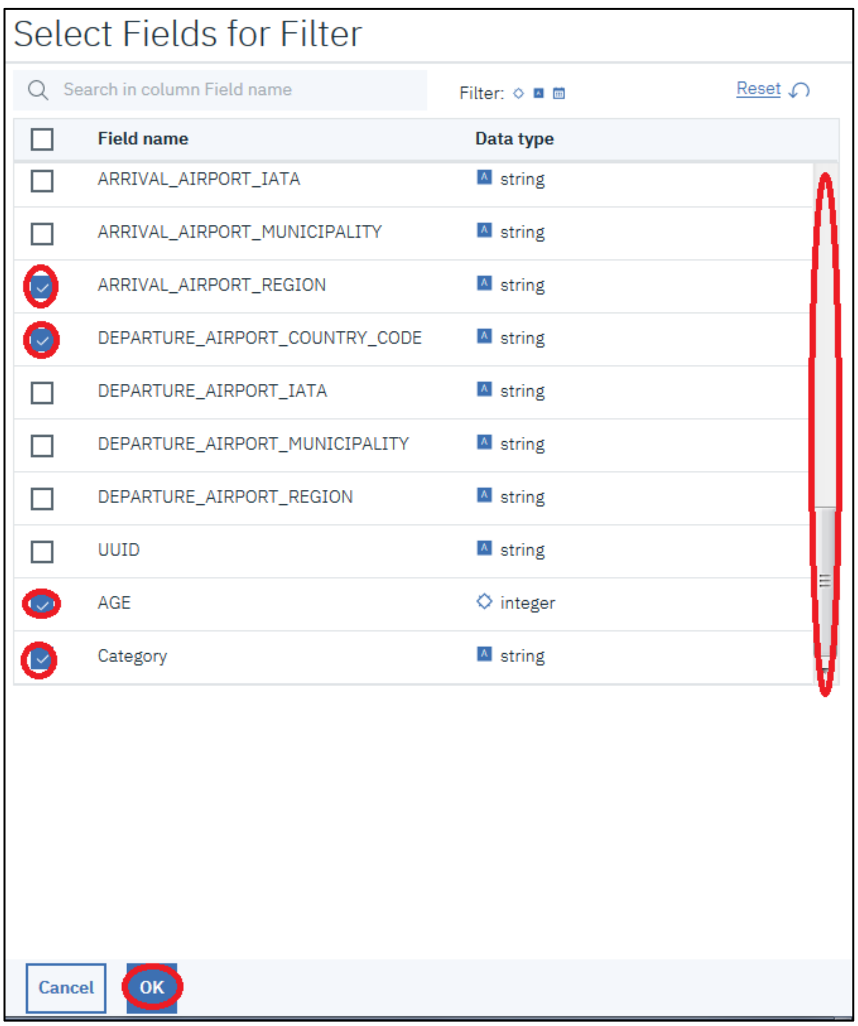
1. Add a **Filter** node to the flow by clicking on the **Field Operations** menu in the Node Palette and then dragging the **Filter** node to the canvas to the right of the **Select** node. Connect the **Select** node to the **Filter** node. If the Node Palette is not visible, click on the Node Palette icon **.**The canvas should appear as below.



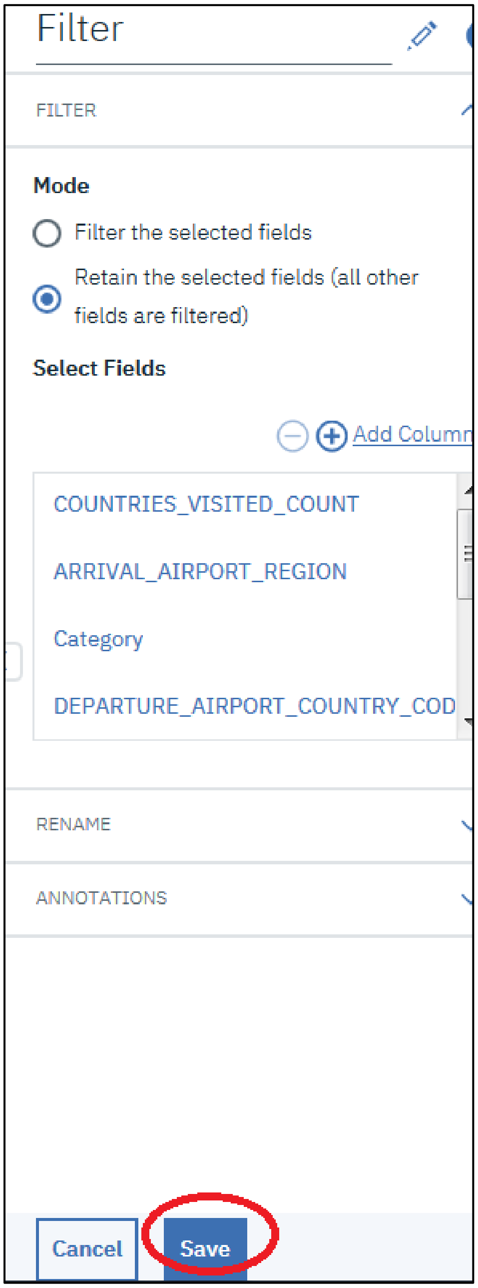
2. Double-click on the **Filter** node. **Click on Retain the selected …,** and click **Add Column.**



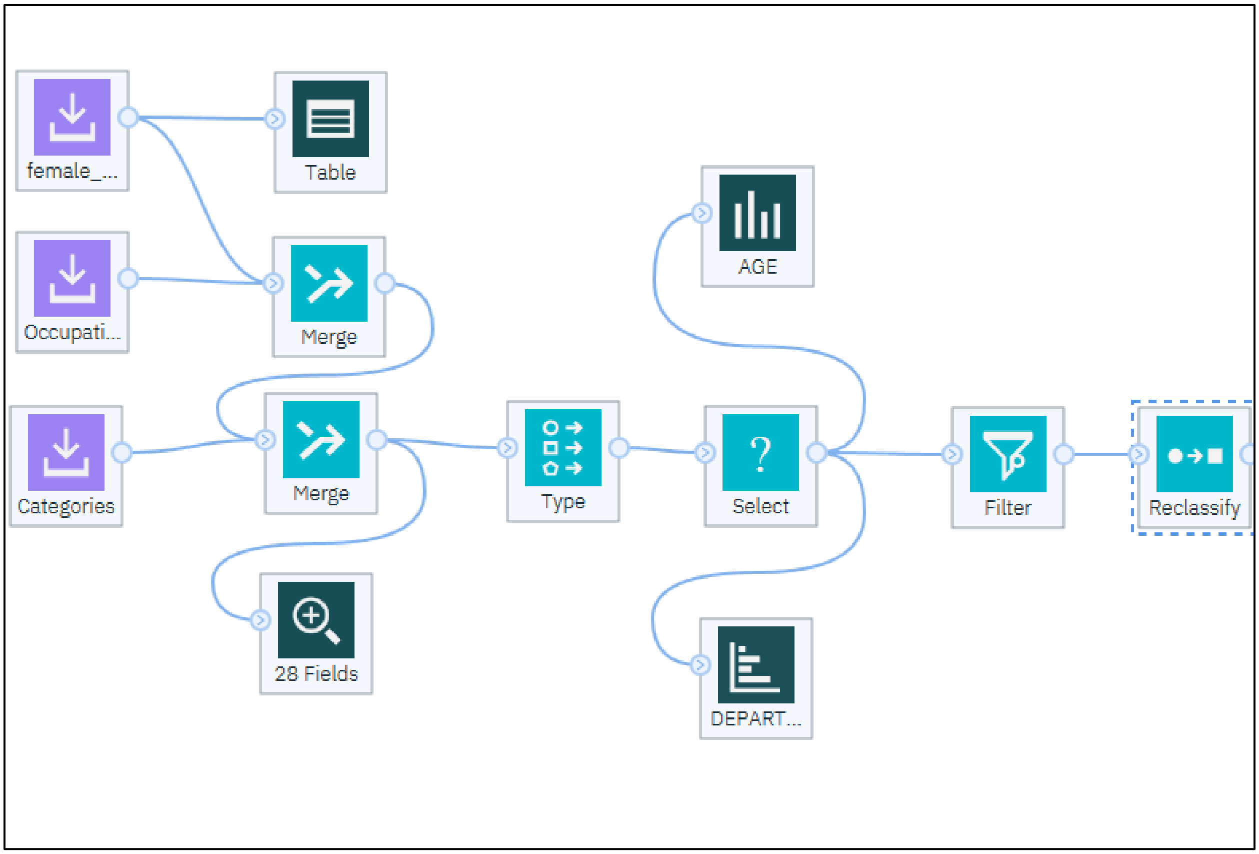
3. Click on VETTING_LEVEL, PASSPORT_COUNTRY, COUNTRIES_VISITED_COUNT, ARRIVAL_AIRPORT_REGION, DEPARTURE_AIRPORT_COUNTRY_CODE, AGE, and Category, then click OK. Scroll as required to check all of the above fields.



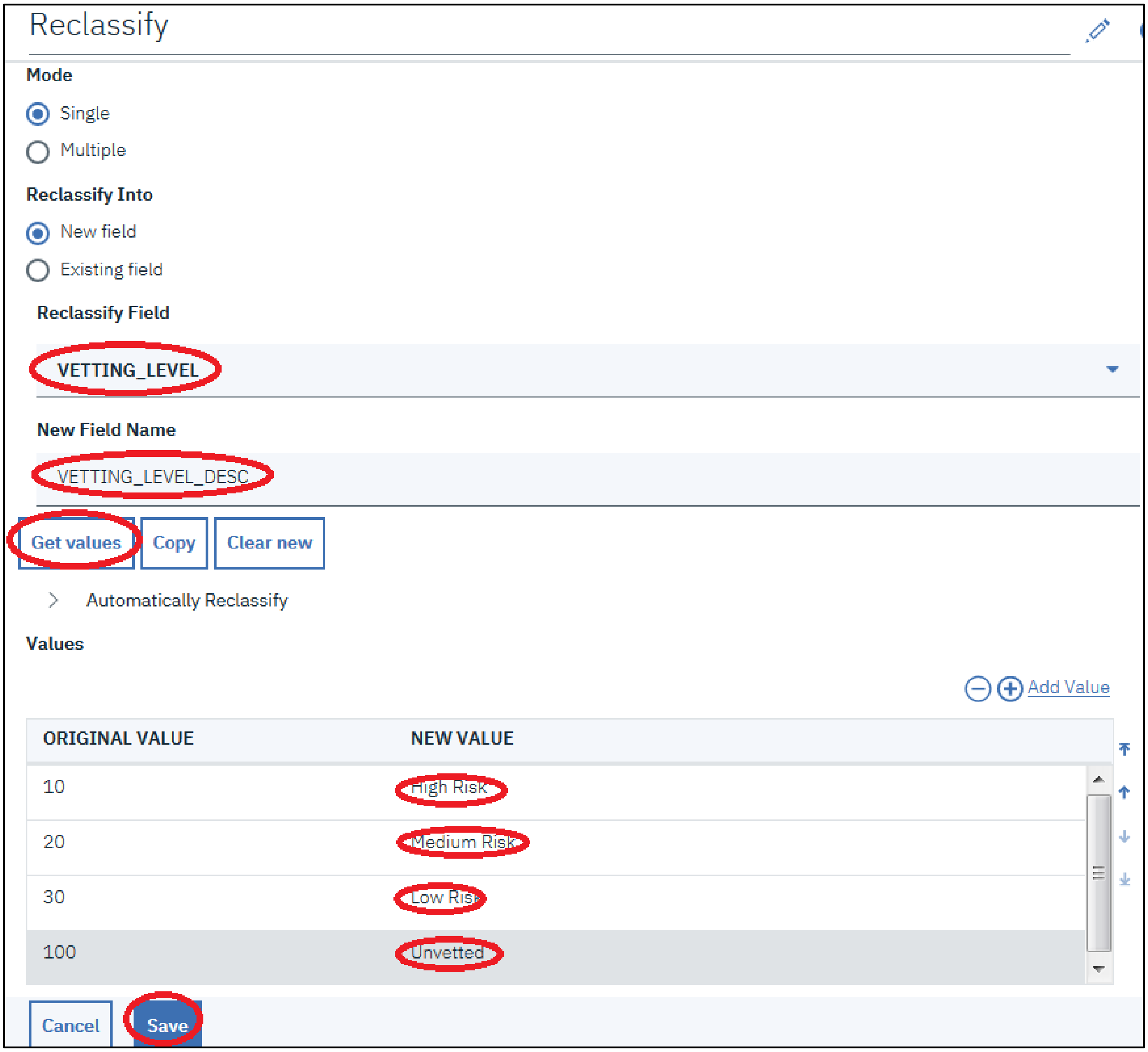
4. Click **Save**.



5. Add a **Reclassify** node to the canvas by clicking on the **Field Operations** menu item in the Node palette, and then dragging the **Reclassify** node onto the canvas to the right of the **Filter** node. If the Node Palette is not visible, click on the Node Palette icon  first. Connect the **Filter** node to the **Reclassify** node. The canvas should appear as below.



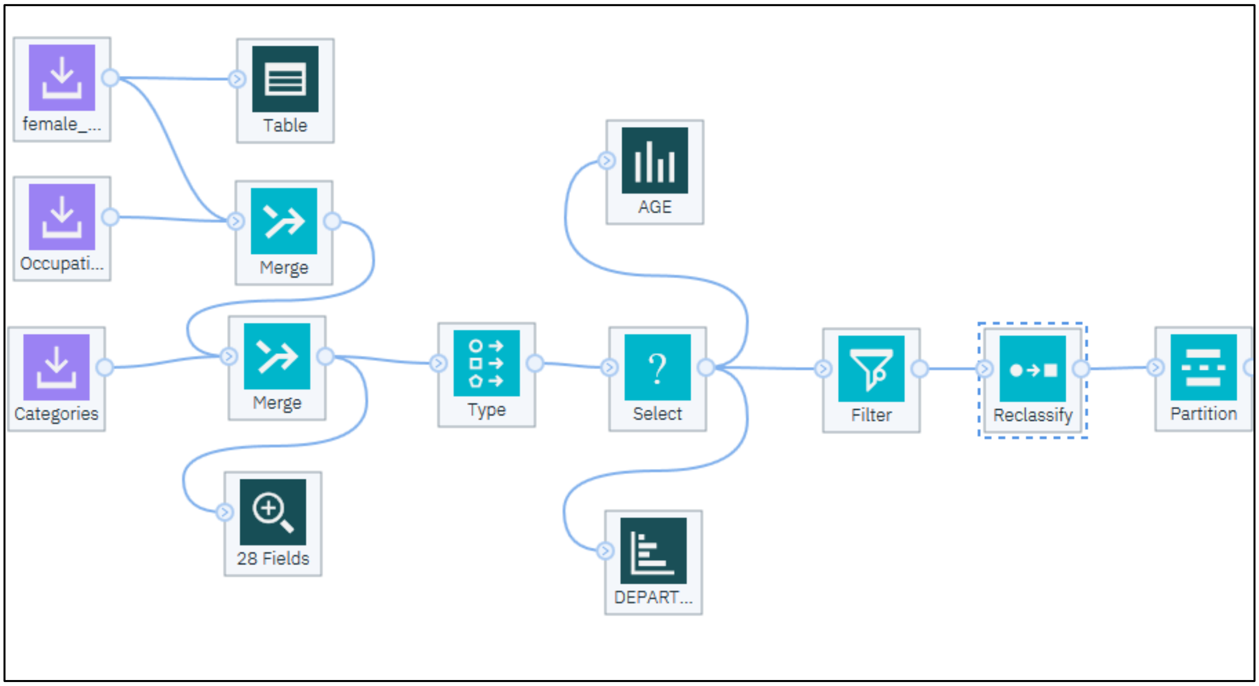
6. Double-click on the **Reclassify** node. Configure the **Reclassify** node as follows. Select **VETTING_LEVEL** for the **Reclassify** field. Enter **VETTING_LEVEL_DESC** for the **New Field Name**, click on **Get Values**, enter in “High Risk” as the new value for “10”, “Medium Risk” as the new value for “20”, “Low Risk” as the new value for “30”, and “Unvetted” as the new value for “100”. Click on **Save**.



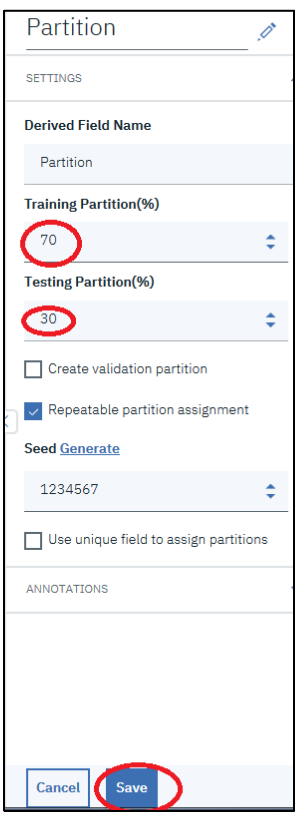
Step 7 - Modeling and Evaluation

Now that the data is prepared, we can start the modeling effort. First, we will add a **Partition** node to divide the data set into Training and Testing sets. In addition, a **Type** node is needed prior to modeling to set the roles of the data fields. Then we will add several modeling nodes and use the Training set to train the model. Finally, we will add **Analysis** nodes to evaluate the results.

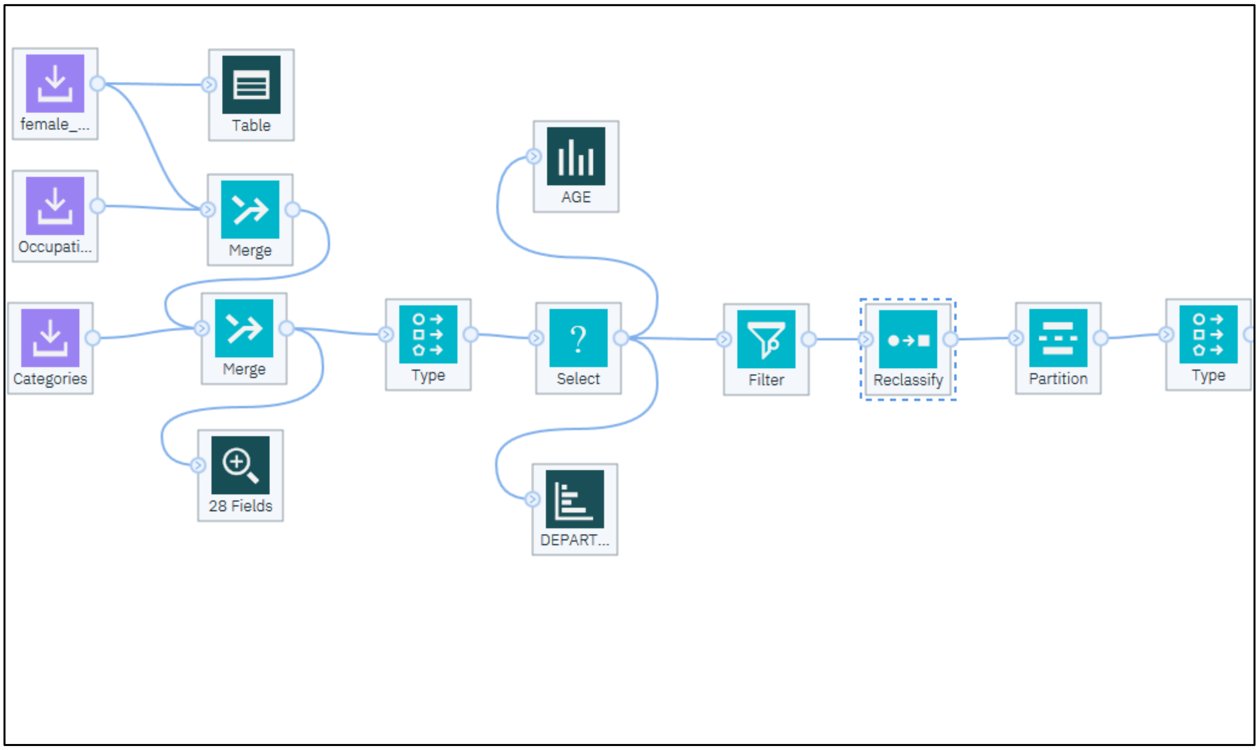
1. Add a **Partition** node to the canvas by clicking on the **Field Operations** menu item in the Node Palette, and then dragging the **Partition** node onto the canvas to the right of the **Reclassify** node. If the Node Palette is not visible, click on the Node Palette icon . Connect the **Reclassify** node to the **Partition** node. The canvas should appear as below.



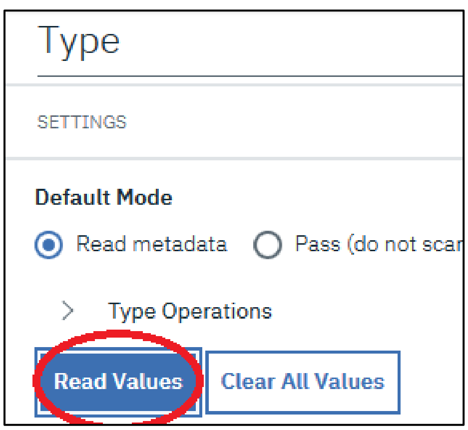
2. Double-click on the **Partition** node. Use a 70-30 breakdown between training and testing. Leave the other defaults and click **Save**.



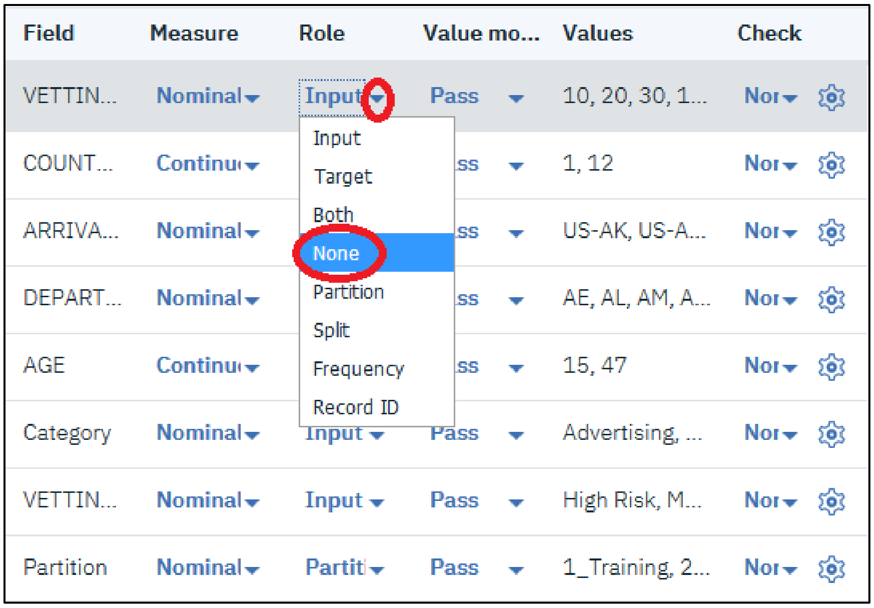
3. Add a **Type** node to the canvas by clicking on the **Field Operations** menu item in the Node palette, and then dragging the **Type** node onto the canvas to the right of the **Partition** node. If the Node Palette is not visible, click on the Node Palette icon first. Connect the **Partition** node to the **Type** node. The canvas should appear as below.



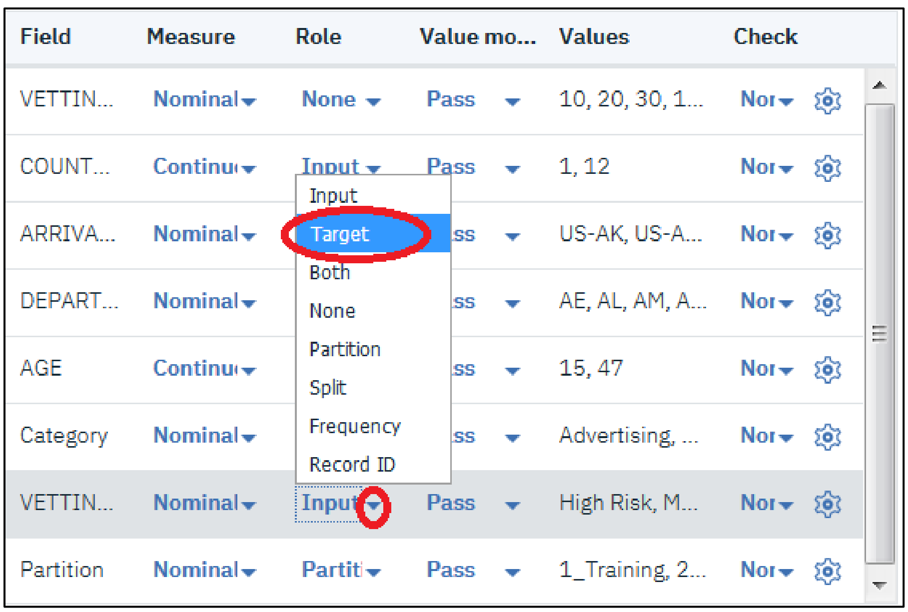
4. Double-click on the **Type** Node. Click on **Read Values**.



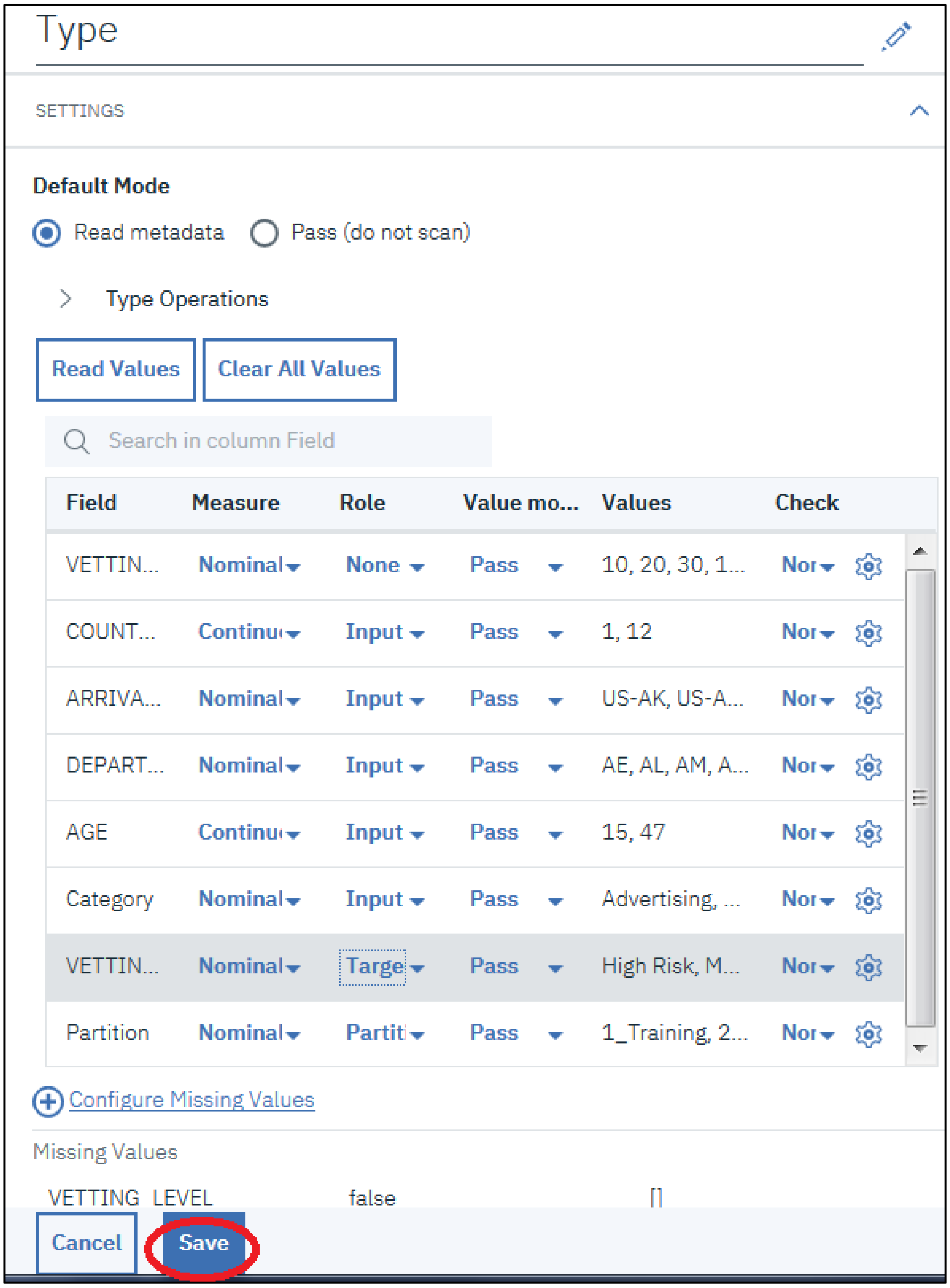
5. Change the role of **VETTING_LEVEL** to None.



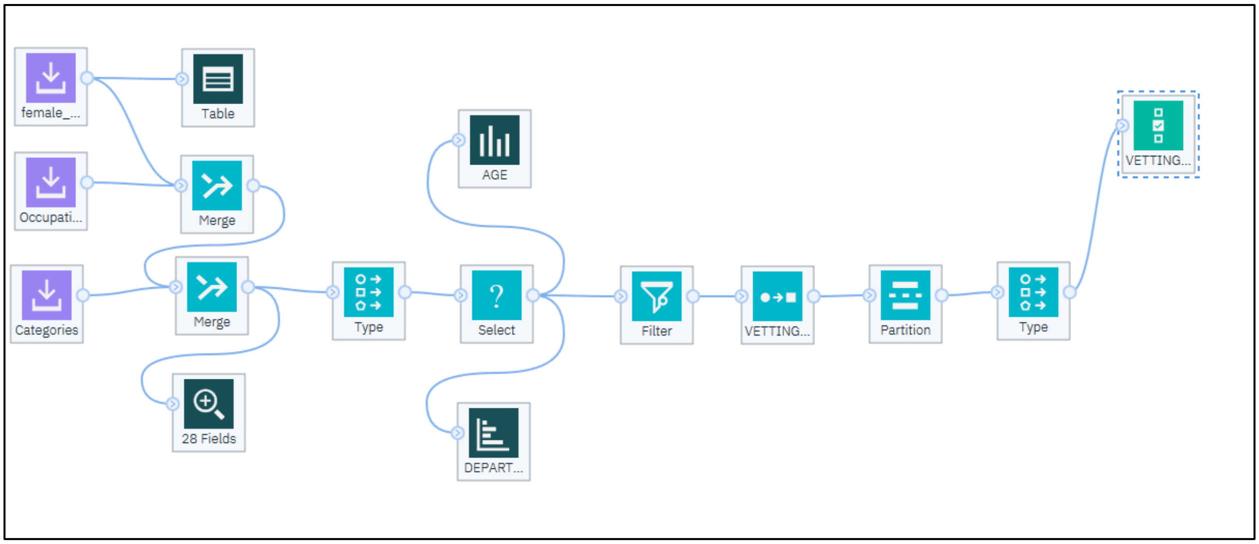
6. Change role of **VETTING_LEVEL_DESC** to **Target**.



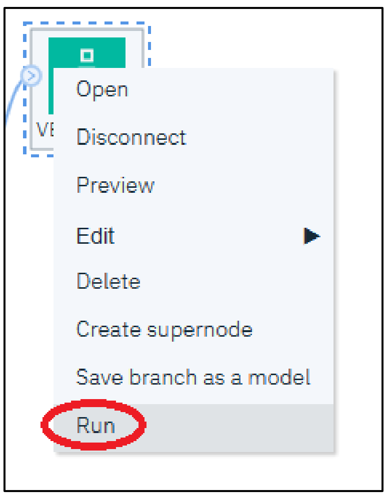
7. Click **Save**.



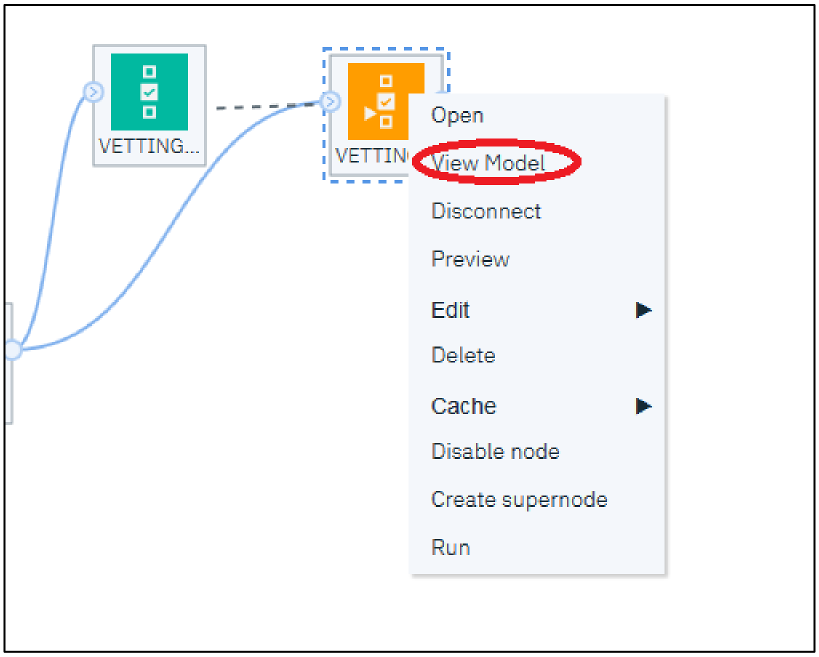
7. Add a **Feature Selection** node by clicking on the **Modeling** menu item in the Node palette and dragging the **Feature Selection** node onto the canvas to the right of the **Type** node. Connect the **Type** node to the **Feature Selection** node. The canvas should appear as below. The Feature Selection node provides the correlation of each of the input features to the target field. It gives an indication of the Importance of each feature.



8. Right-click on **Feature Selection** and click **Run**.



9. A **Model** node is created. Drag the **Model** node to the right of the **Feature Selection** node. Right-click on the **Model** node and click **View Model**.

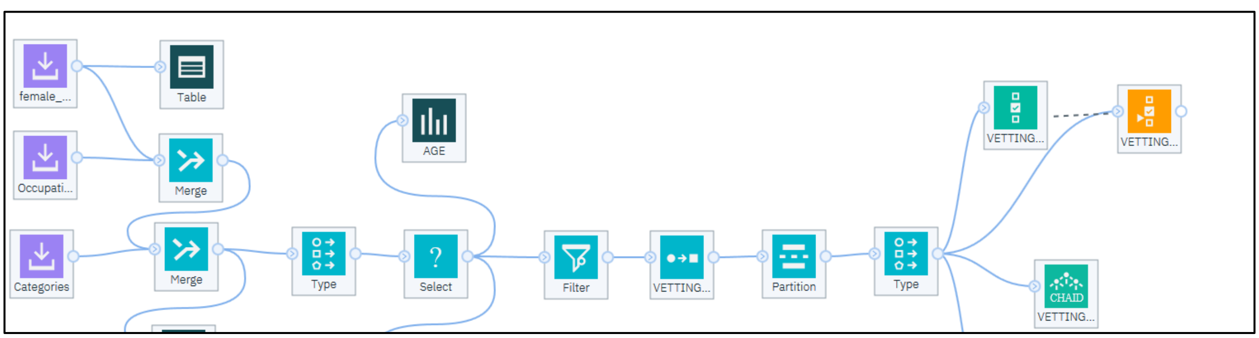


10. The Feature Selection output is displayed. Note that the ranges for what is Important can be changed in the modeling options. According to the default criteria, the COUNTRIES_VISITED_COUNT, Category, and AGE are the most important features.

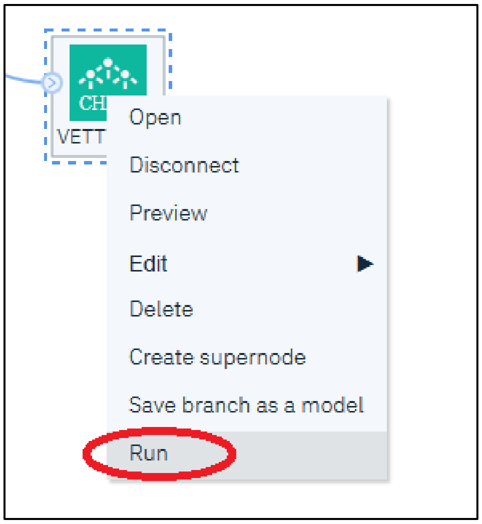
VETTING_LEVEL_DESC

		Rank	Field	Measurement	Importance	Value
1	true	1	COUNTRIES_VISITED_COUNT	range	Important	1.0
2	true	2	Category	set	Important	1.0
3	true	3	AGE	range	Important	0.968
4	false	4	DEPARTURE_AIRPORT_COUNTRY_CODE	set	Unimportant	0.867
5	false	5	ARRIVAL_AIRPORT_REGION	set	Unimportant	0.737

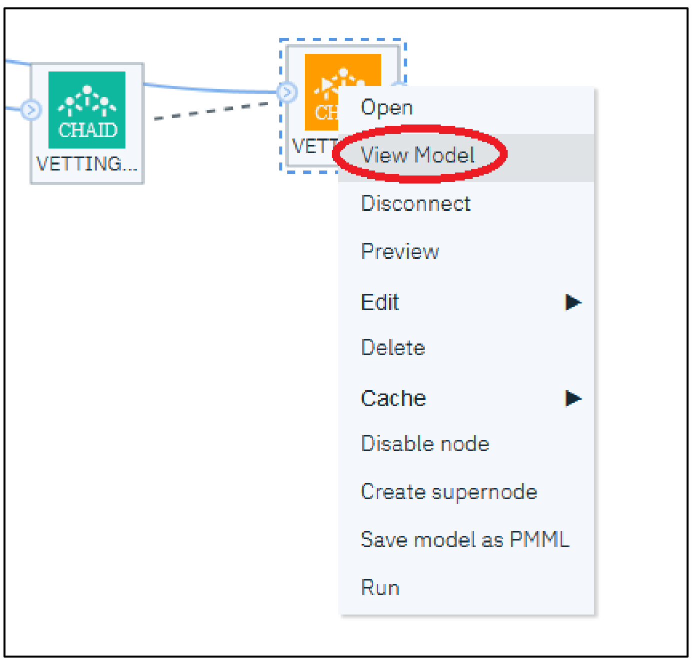
7. Add a **CHAID** node by clicking on the **Modeling** menu item in the Node palette and dragging the **CHAID** node onto the canvas to the right of the **Type** node. Connect the **Type** node to the **CHAID** node. The canvas should appear as below.



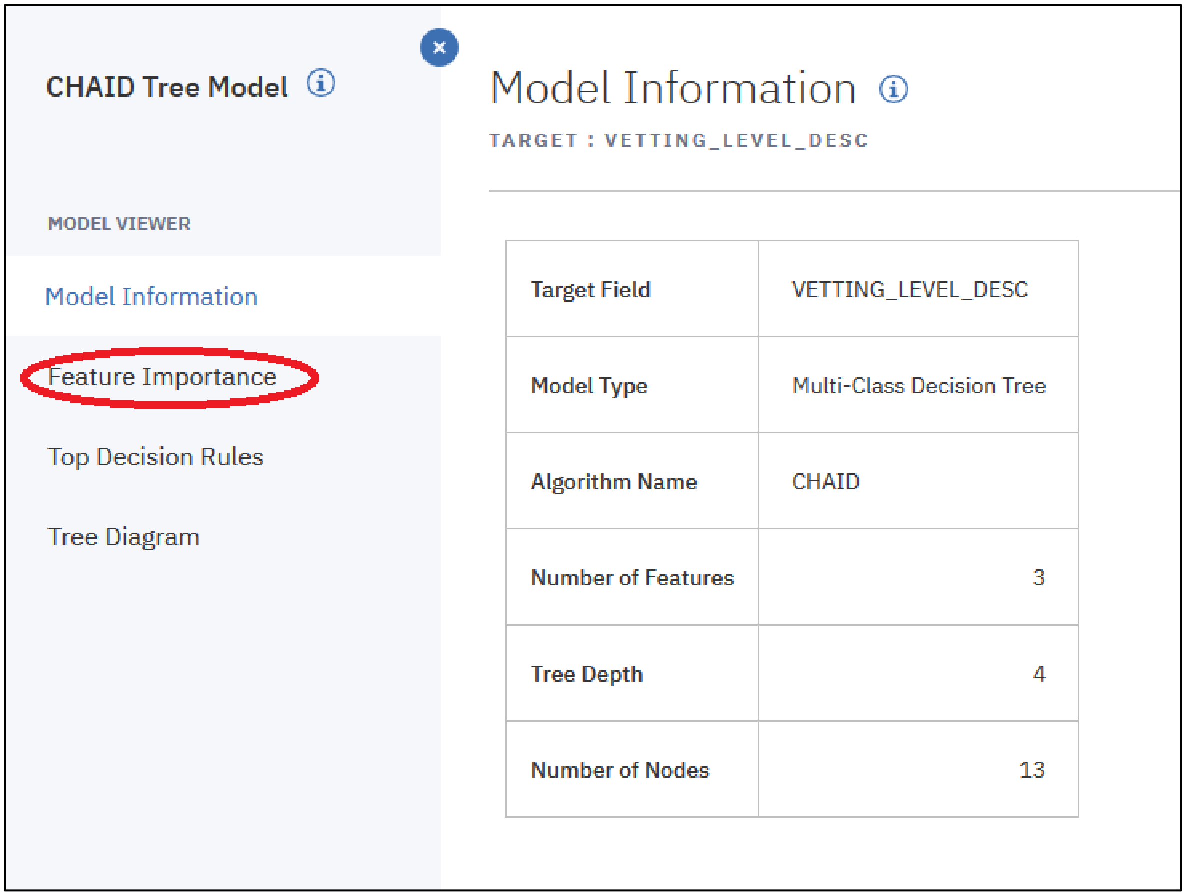
8. Right-click on the CHAID node and click Run.



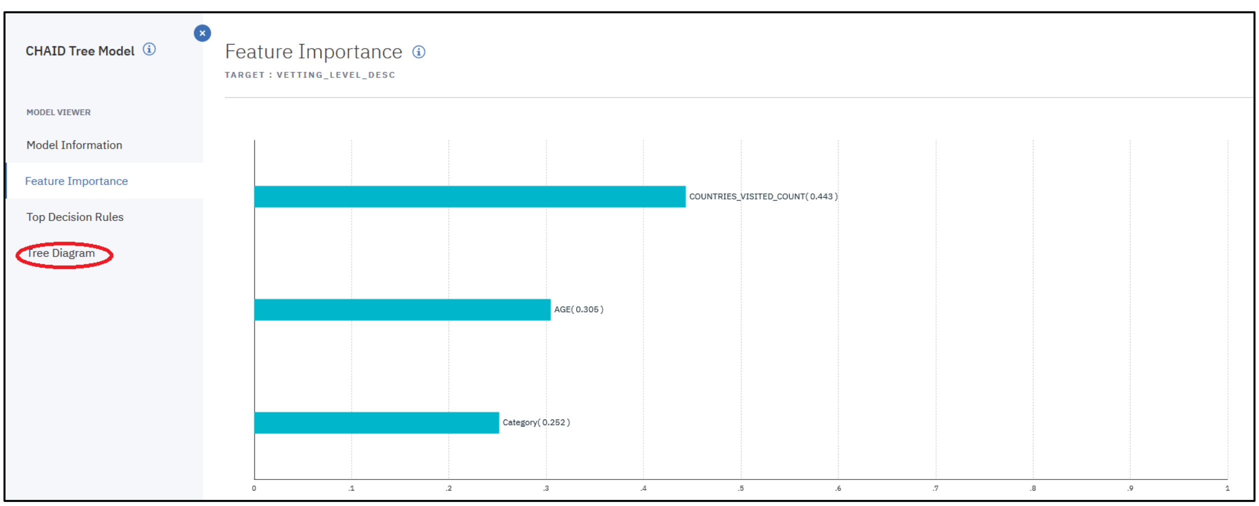
9. A **Model** node is created. Drag the **Model** node to the right of the **CHAID** node. Right-click on the **Model** node and click **View Model**.



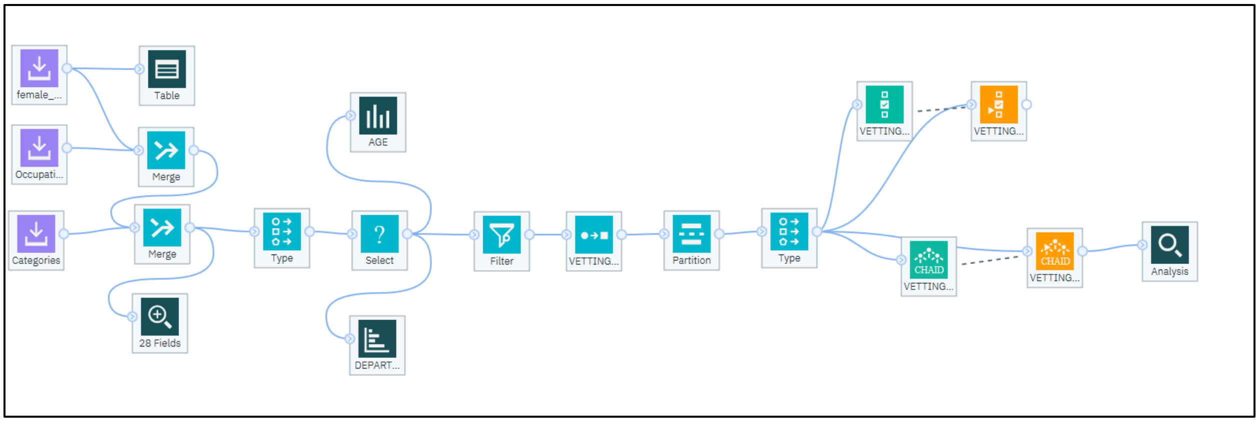
10. The Model Information is displayed. Click on **Feature Importance**.



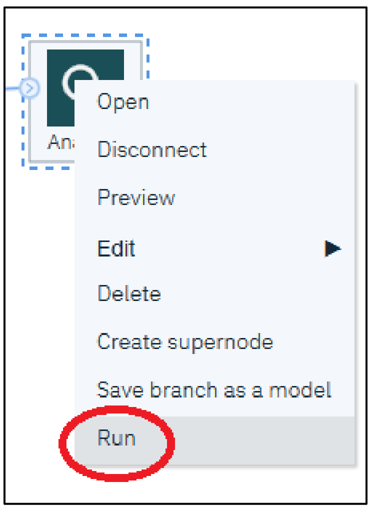
11. Feature Importance is displayed with similar results to the Feature Selection output. Click on **Tree Diagram and/or Top Decision Rules** to see the algorithm output.



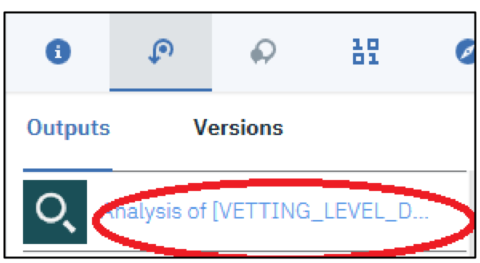
7. Add an Analysis node by clicking on the Output menu item in the Node palette and dragging the Analysis node onto the canvas to the right of the CHAID Model node. Connect the CHAID Model node to the Analysis node. The canvas should appear as below. The canvas should appear as below.



8. Right-click the **Analysis** node and click **Run**.



9. Double-click on the Analysis results in the Output area.



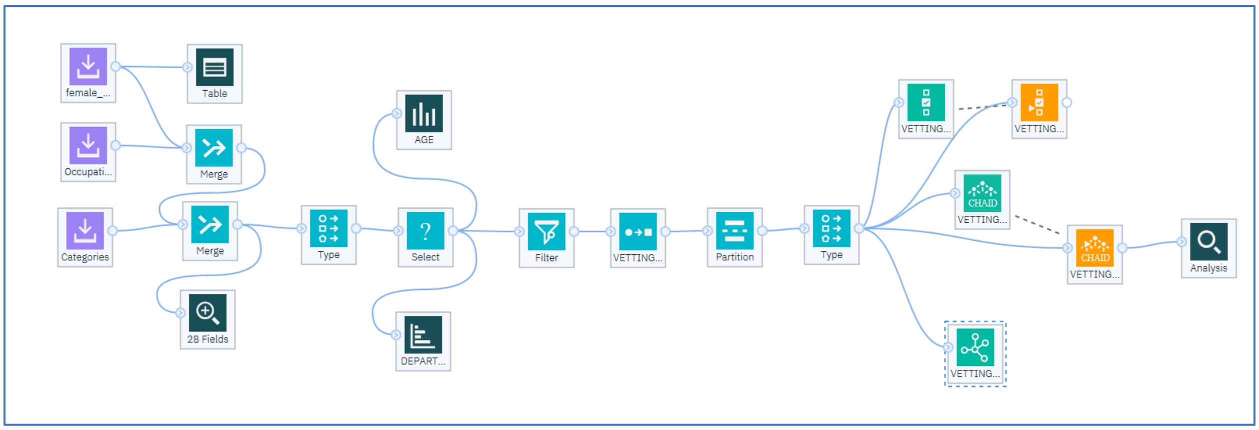
10. Accuracy results are displayed for the CHAID algorithm.

Results for output field VETTING_LEVEL_DESC

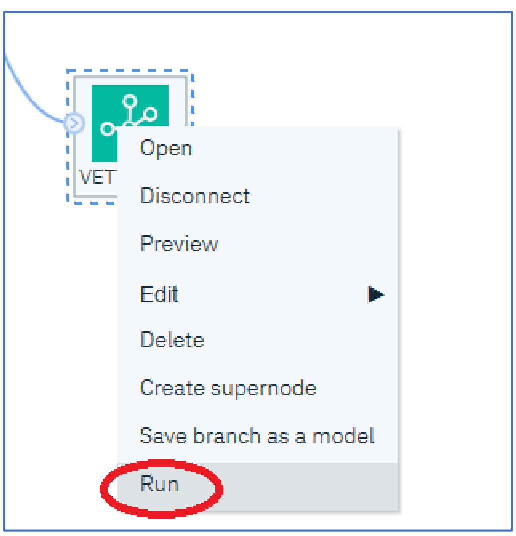
Comparing $R-VETTING_LEVEL_DESC with VETTING_LEVEL_DESC

'Partition'	1_Training		2_Testing	
Correct	142	77.6%	61	70.93%
Wrong	41	22.4%	25	29.07%
Total	183		86	

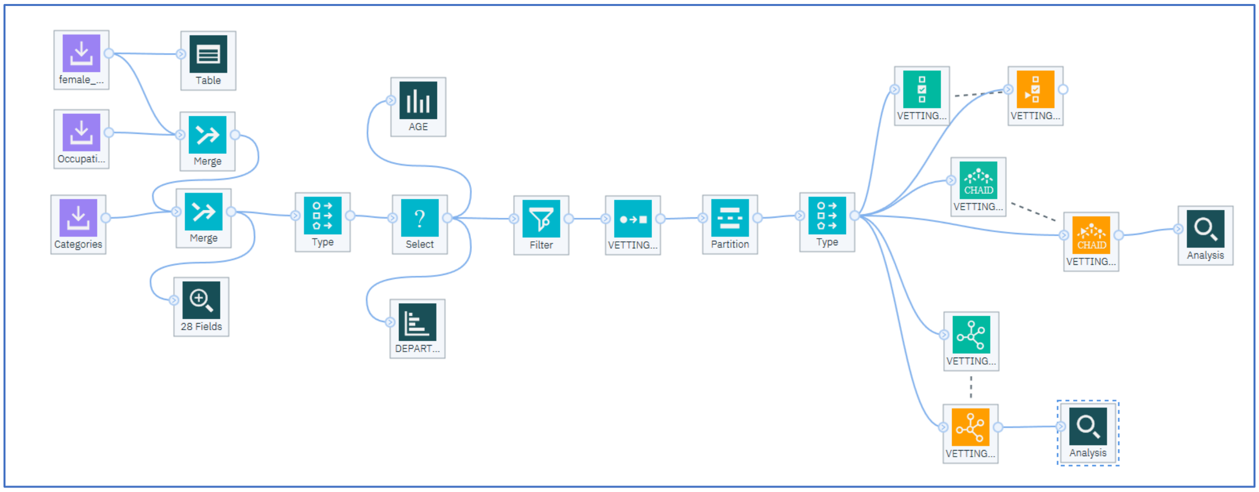
11. Add a **Random Forest** node by clicking on the **Modeling** menu item in the Node palette and dragging the **Random Forest** node onto the canvas underneath the **CHAID** node. Connect the **Type** node to the **Random Forest** node. The canvas should appear as below.



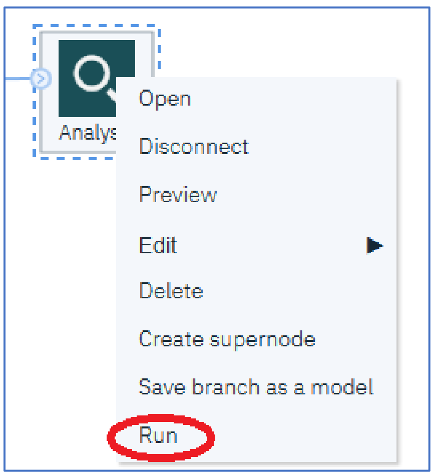
12. Right-click the **Random Forest** node and click **Run**.



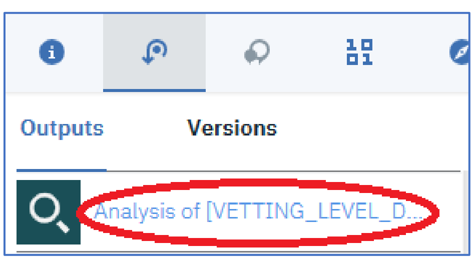
13. A **Random Forest Model** node is created. The **Random Forest Model** node does not have a **View Model** option. Add an **Analysis** node to the right of the **Random Forest Model** node by clicking on the **Outputs** menu of the Node Palette. Connect the **Analysis** node to the **Random Forest Model** node. The canvas should appear as shown below.



14. Right-click on the **Analysis** node and click **Run**.



15. The **Analysis** node output appears in the **Outputs** area. Double-click **Analysis of …**



16. The results appear below.

Results for output field VETTING_LEVEL_DESC

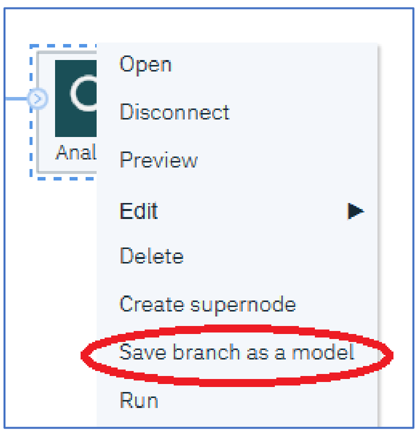
Comparing $R-VETTING_LEVEL_DESC with VETTING_LEVEL_DESC

'Partition'	1_Training		2_Testing	
Correct	168	91.8%	66	76.74%
Wrong	15	8.2%	20	23.26%
Total	183		86	

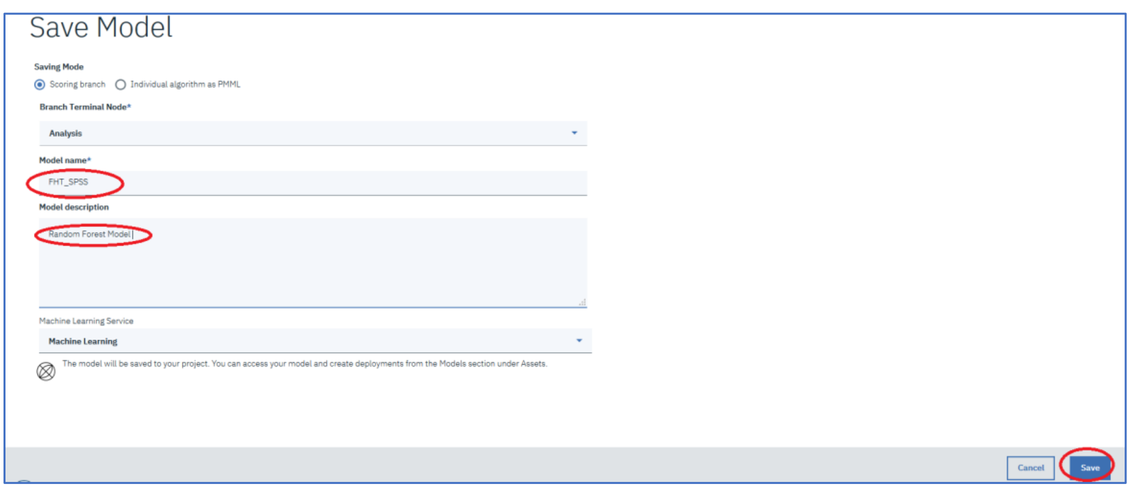
Step 8 - Saving a Model – needs to be written.

Now that we have created and evaluated a model, we will save the model as an asset. This saved model can be deployed at a future date, removing the need to recreate the same model from scratch.

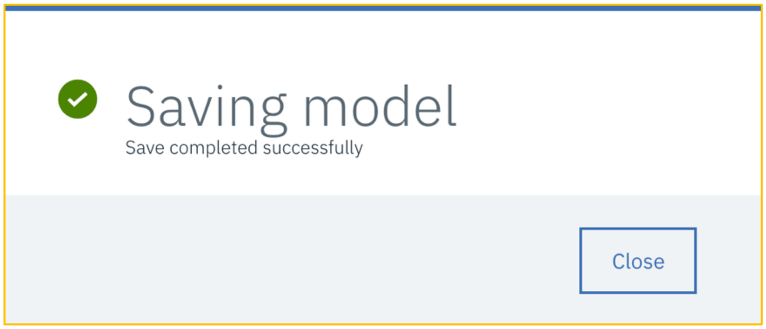
1. Right click on the Random Forest Analysis node and then click on **Save branch as a model**.



2. Type in “**FHT_SPSS**” as the Model Name, optionally add a **Description**, and click **Save**.



3. Click **Close**.



4. Navigate to your project “assets” page. Click on **Watson Studio Labs**.

5. Note that the model you built is now saved as an asset and the work you have completed can be easily reused in the future.