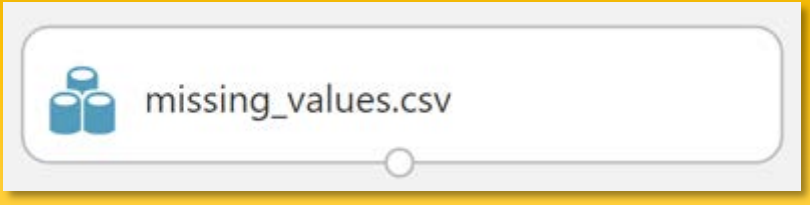
Missing value handling

MISSING VALUE HANDLING



Missing value handling

In this session

1. Replace missing values with the mean
2. Replace missing values with the median
3. Replace missing values with an interpolated estimate
4. Replace missing values with a constant
5. Replace missing values using imputation
6. Replace missing values with a missing rank
7. Replace missing values with a dummy
8. Replace missing values with 0
9. Create an indicator variable for "missing."
10. Replace missing values with a string
11. Add an indicator variable showing which strings are considered "missing."
12. Delete columns that are missing too many values to be useful
13. Delete rows that are missing critical values

Missing value handling

We need data that is:

- Relevant
- Connected
- Accurate
- Enough to work with

Missing value handling

Example of missing values dataset

Column 0	age	years_seniority	income	parking_space	attending_party	entree	pets	emergency_contact
Tony	48	27		1	5	shrimp		Pepper
Donald	67	25	86	10	2	beef		Jane
Henry	69	21	95	6	1	chicken	62	Janet
Janet	62	21	110	3	1	beef		Henry
Nick		17		4				
Bruce	37	14	63		1	veggie		NA
Steve	83		77	7	1	chicken		n/a
Clint	27	9	118	9		shrimp	3	None
Wanda	19	7	52	2	2	shrimp		empty
Natasha	26	4	162	5	3			_
Carol		3	127	11	1	veggie	1	""""
Mandy	44	2	68	8	1	chicken		null

Missing value handling

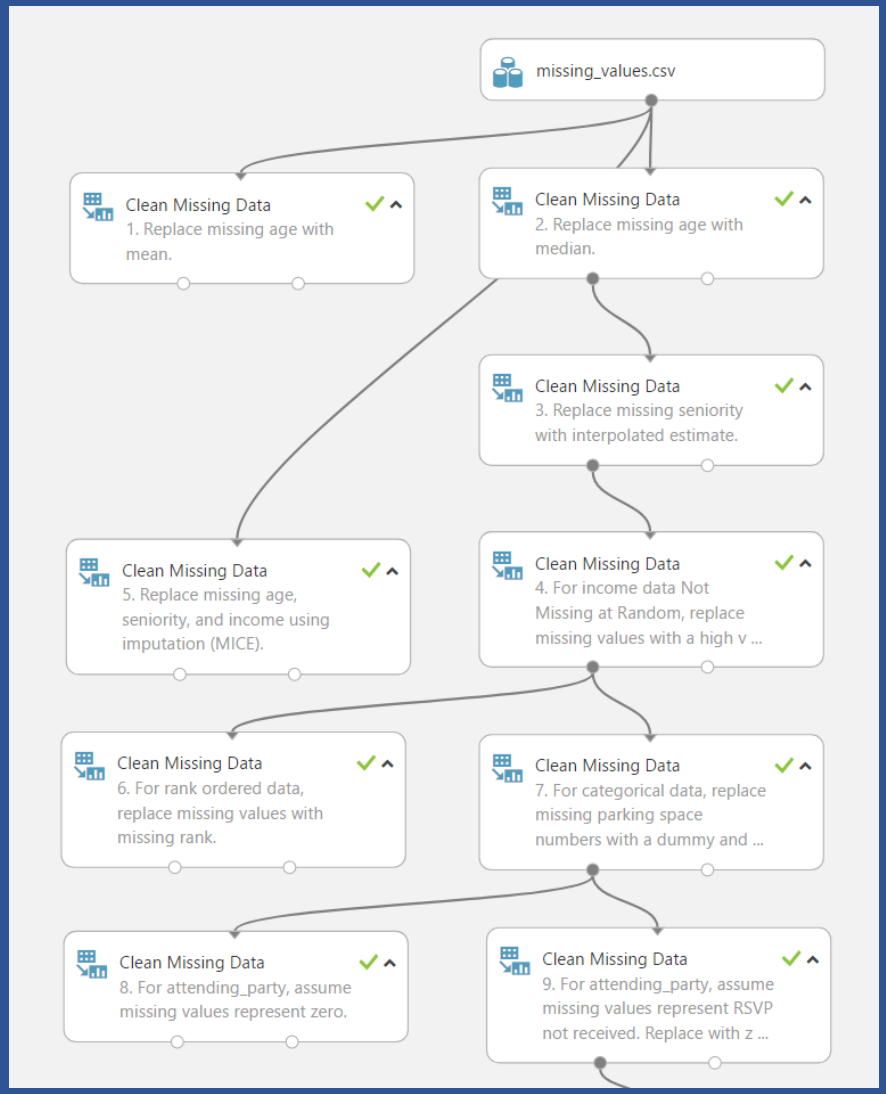
Example of missing values dataset CSV file

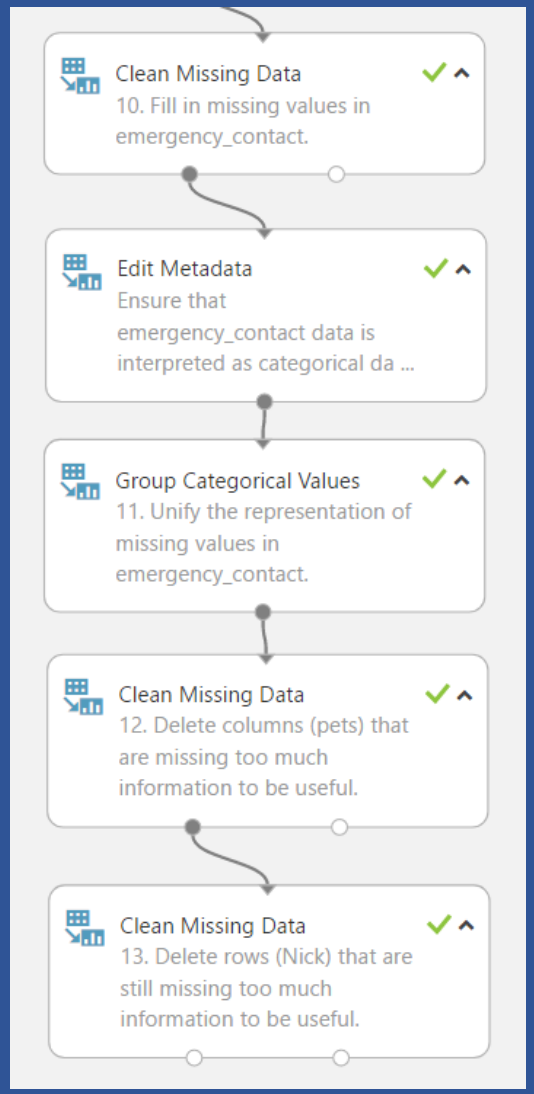
missing_values.csv

	A	B	C	D	E	F	G	H	I
1		age	years_seniority	income	parking_space	attending_party	entree	pets	emergency_contact
2	Tony	48	27		1	5	shrimp		Pepper
3	Donald	67	25	86	10	2	beef		Jane
4	Henry	69	21	95	6	1	chicken	62	Janet
5	Janet	62	21	110	3	1	beef		Henry
6	Nick		17		4				
7	Bruce	37	14	63		1	veggie		NA
8	Steve	83		77	7	1	chicken		n/a
9	Clint	27	9	118	9		shrimp	3	None
10	Wanda	19	7	52	2	2	shrimp		empty
11	Natasha	26	4	162	5	3			_
12	Carol		3	127	11	1	veggie	1	""
13	Mandy	44	2	68	8	1	chicken		null

Missing value handling

Experiment: Methods for handling missing values

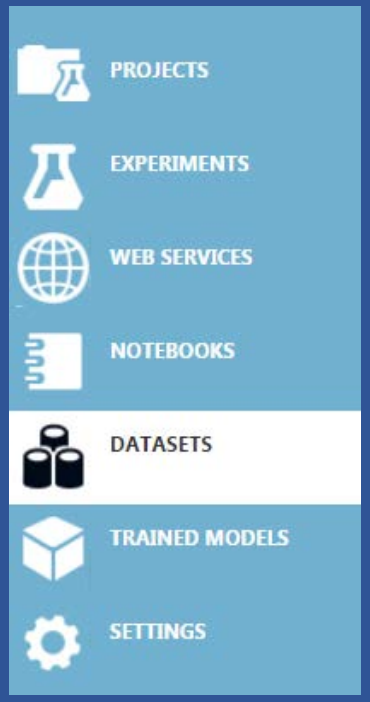


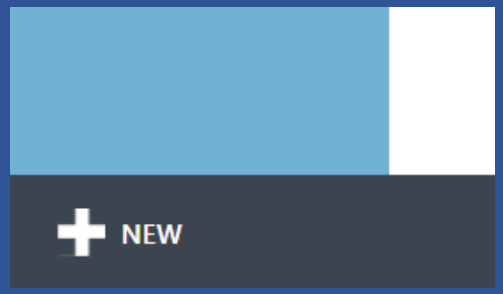


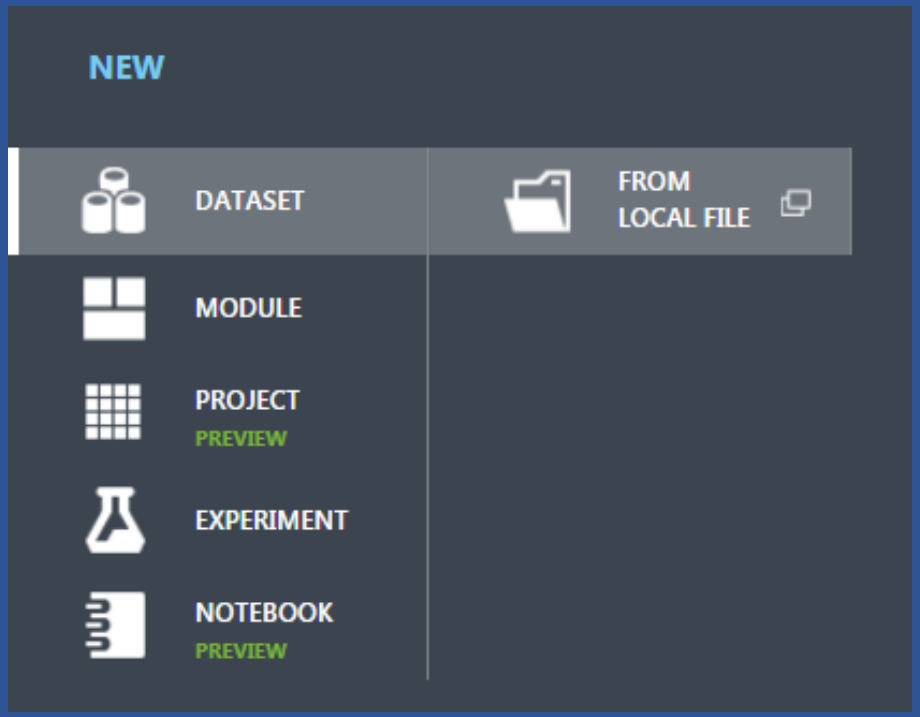
Missing value handling

Import local data file to Azure ML Studio Dataset

1. Select Datasets tab from menu
2. Click New (+) at the button left corner
3. Click “From local file”

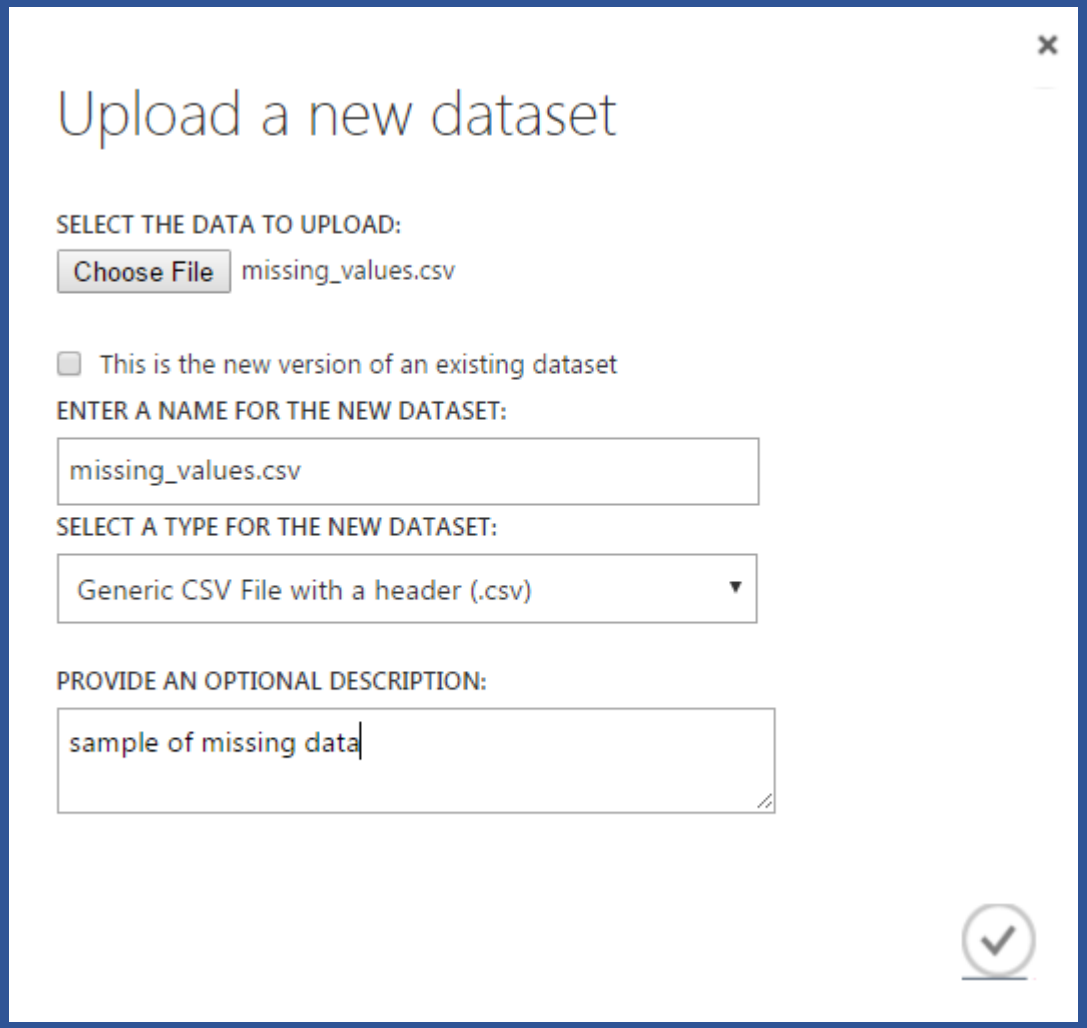






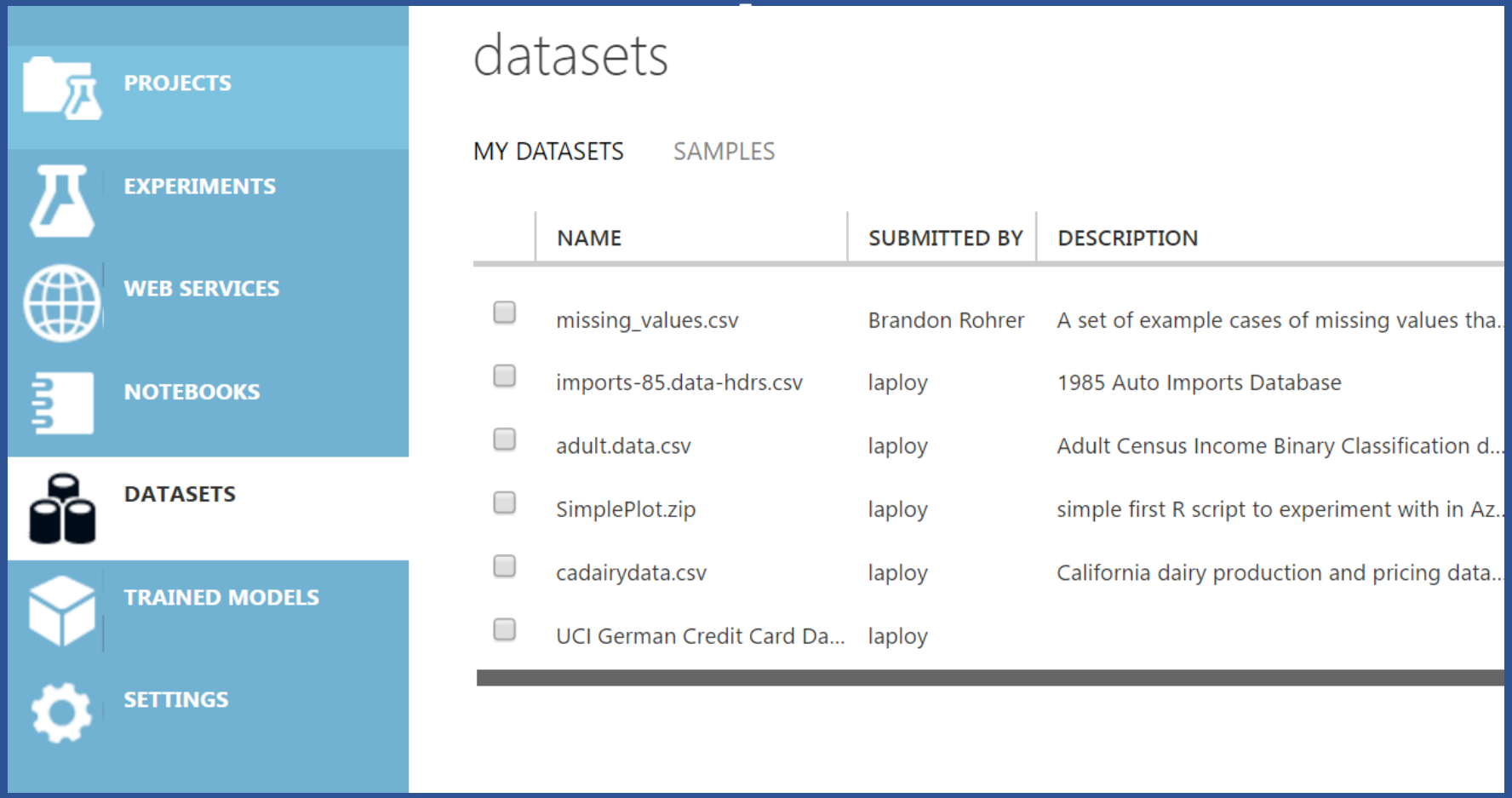
Missing value handling

4. Choose file and type description



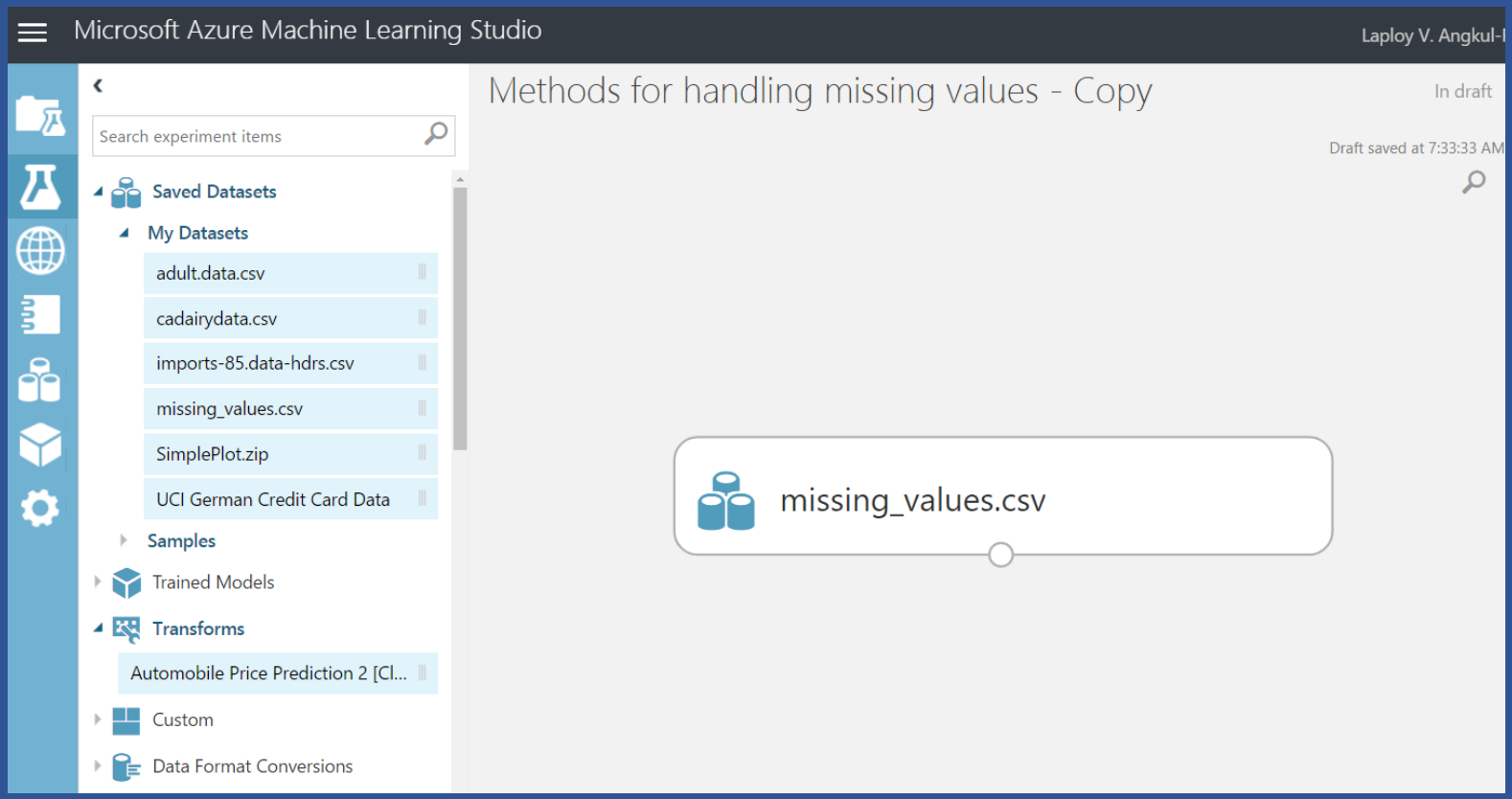
Missing value handling

Saved datasets list



Missing value handling

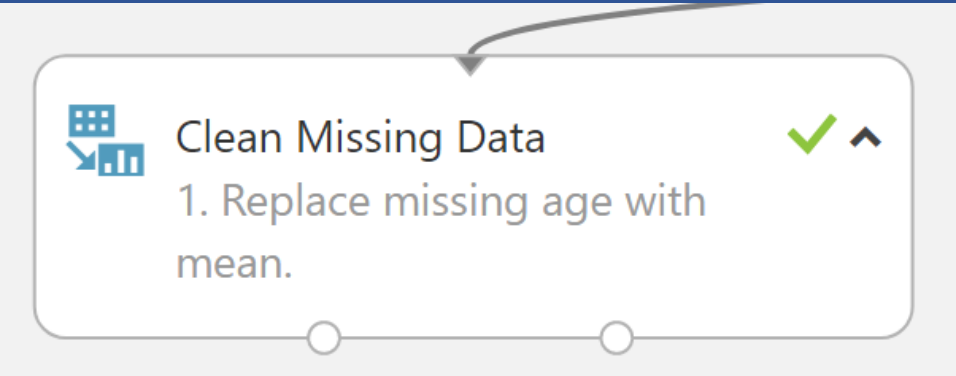
- Create new blank Experiment
- Select missing_values.csv from Saved Datasets
- Drag & drop into canvas

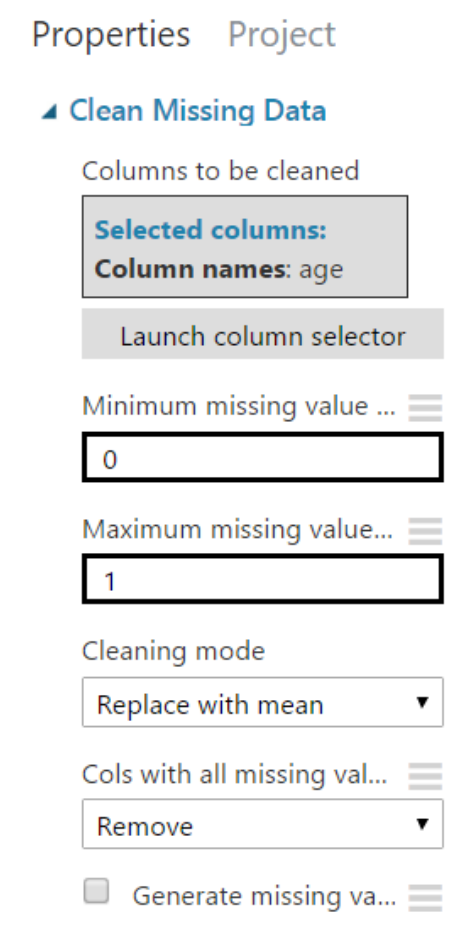


Missing value handling

Replace missing values with the mean

- Change project name to “Methods for handling missing values”
- Drag & drop Clean Missing Data module
- Select column age
- Configure “Cleaning mode” to Replace with mean
- Comment = 1. Replace missing age with mean.
- Run/Visualize

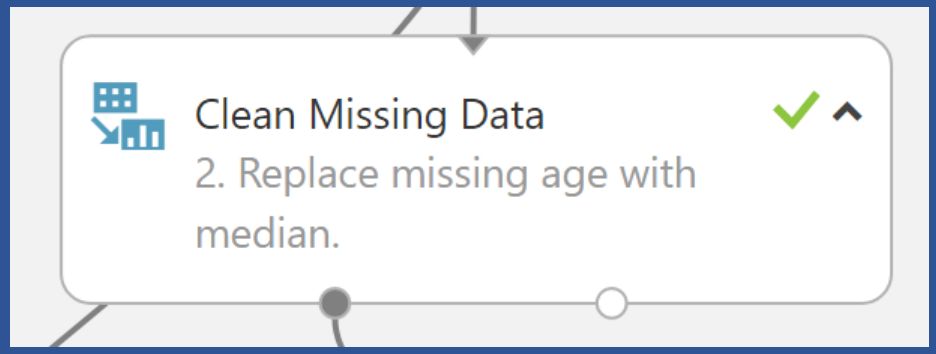


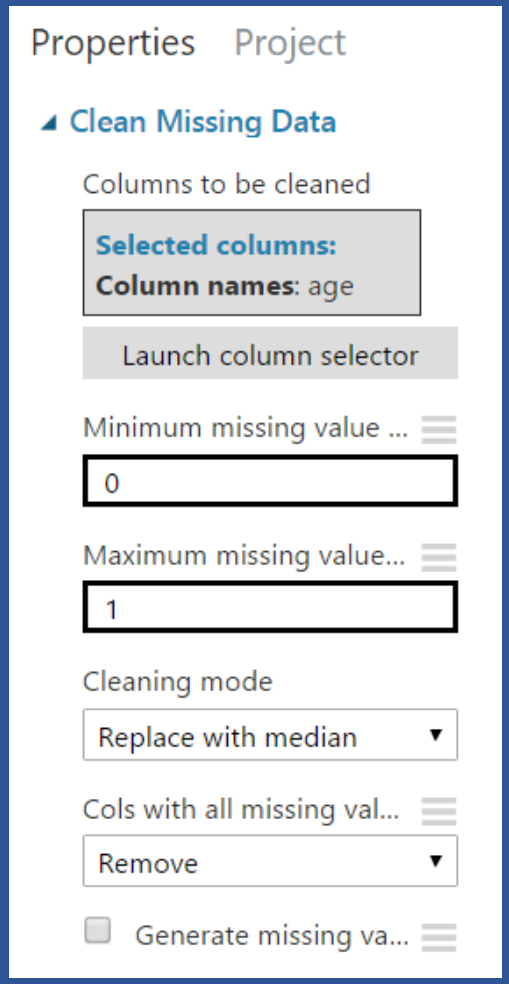


Missing value handling

Replace missing values with the median

- Drag & drop Clean Missing Data module
- Select column age
- Configure “Cleaning mode” to Replace with median
- Comment = 2. Replace missing age with median.
- Run/Visualize

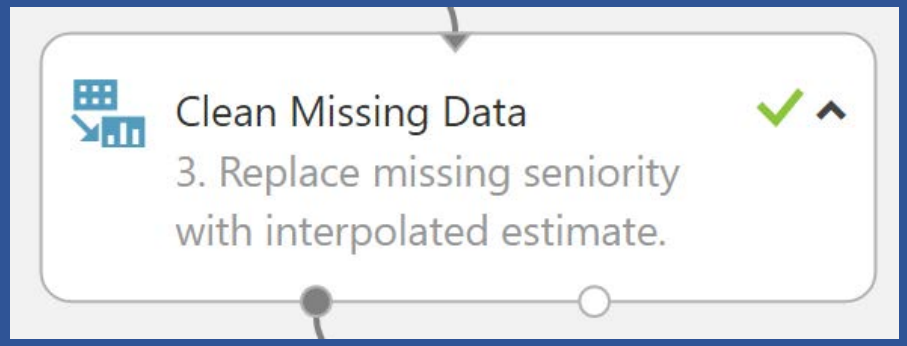


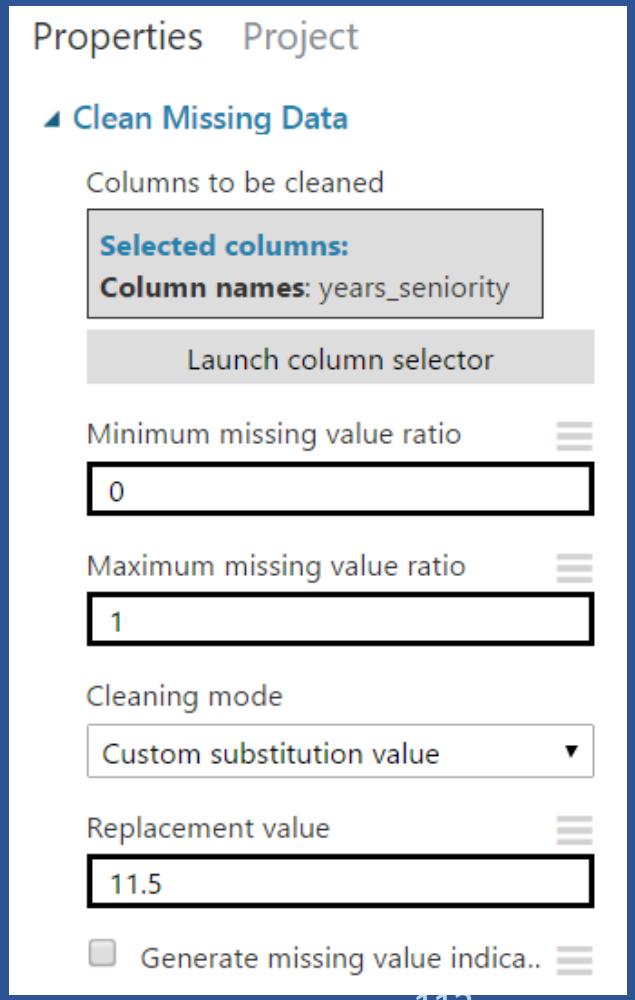


Missing value handling

Replace missing values with an interpolated estimate

- Drag & drop Clean Missing Data module
- Select column year_seniority
- Configure “Cleaning mode” to Custom substitution value
- Set Replacement value to 11.5
- Comment = 3. Replace missing seniority with interpolated estimate.
- Run/Visualize

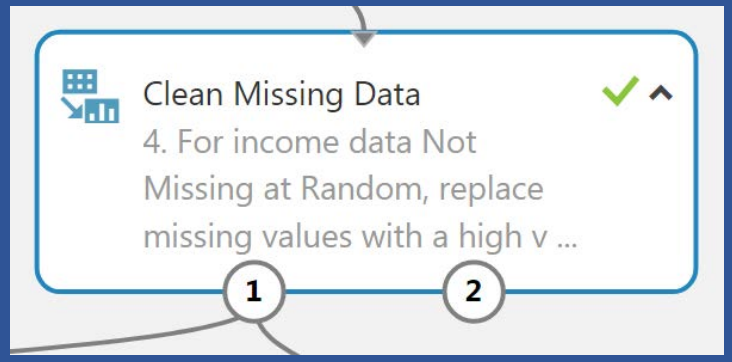


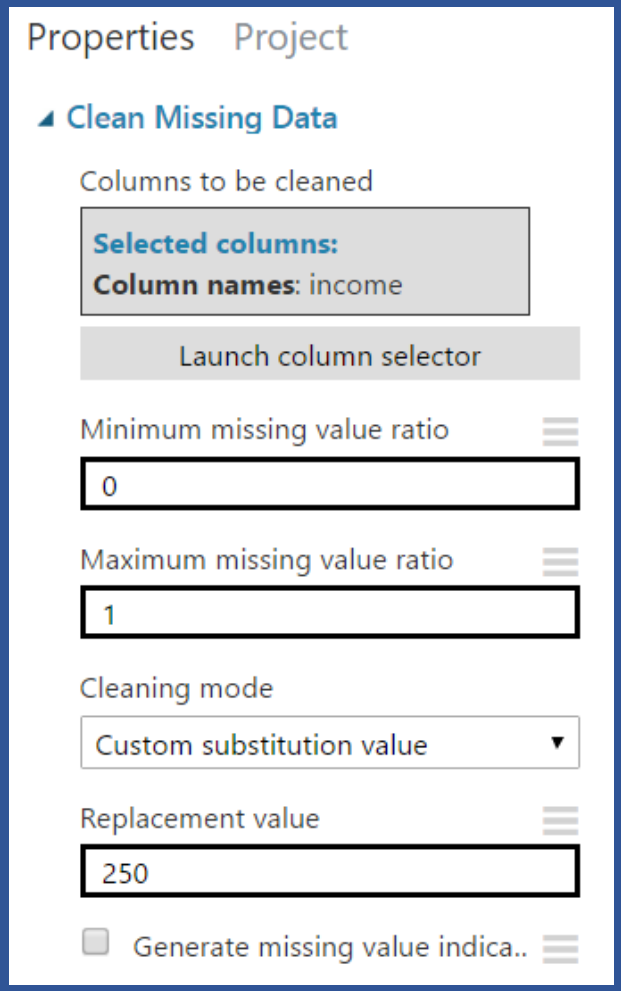


Missing value handling

Replace missing values with a constant

- Drag & drop Clean Missing Data module
- Select column income
- Configure "Cleaning mode" to Custom substitution value
- Set Replacement value to 250
- Comment = 4. For income data Not Missing at Random, replace missing values with a high value.
- Run/Visualize

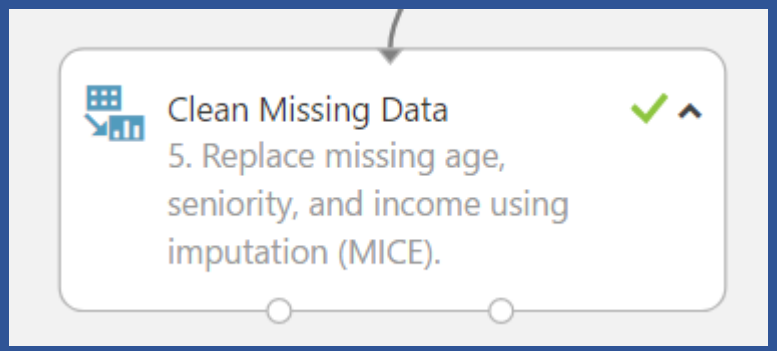


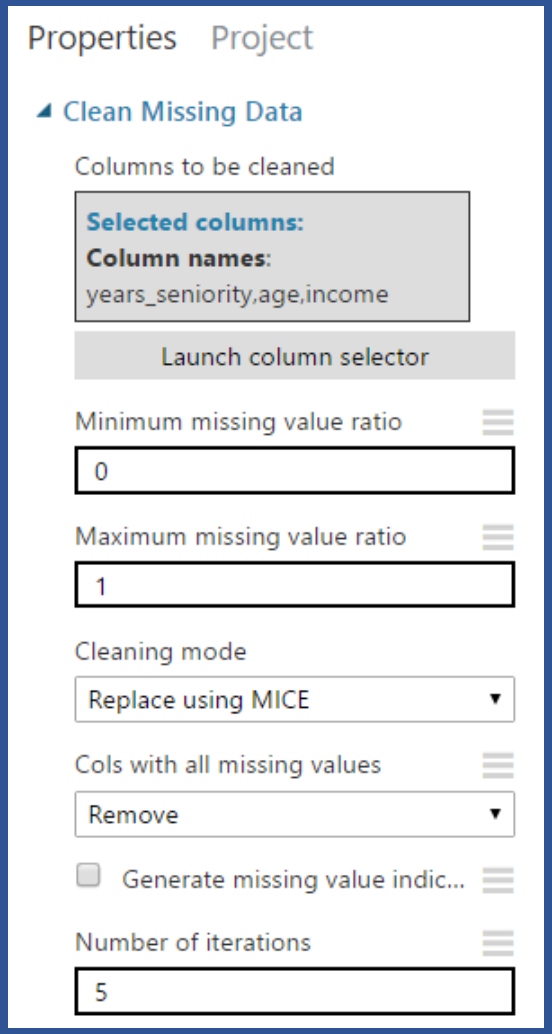


Missing value handling

Replace missing values using imputation

- Drag & drop Clean Missing Data module
- Select column years_seniority.age.income
- Configure “Cleaning mode” to Replace using MICE
- Cols with all missing values = Remove
- Number of iterations = 5
- Comment = 5. Replace missing age, seniority, and income using imputation (MICE).
- Run/Visualize

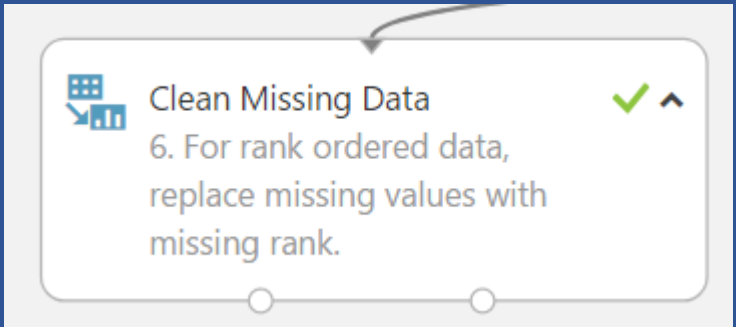


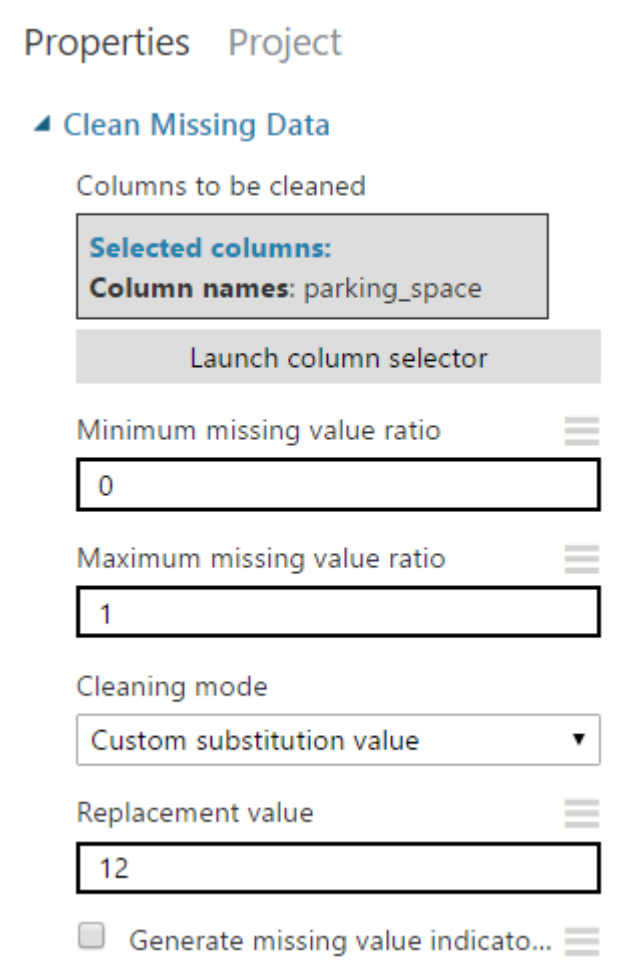


Missing value handling

Replace missing values with a missing rank

- Drag & drop Clean Missing Data module
- Select column parking_space
- Configure "Cleaning mode" to Custom substitution value
- Replacement value = 12
- Comment = 6. For rank ordered data, replace missing values with missing rank.
- Run/Visualize

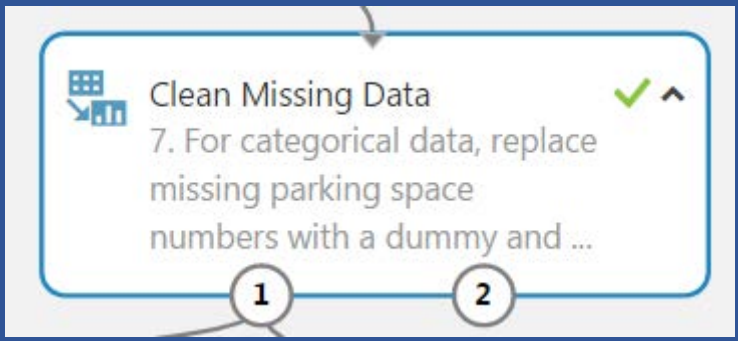


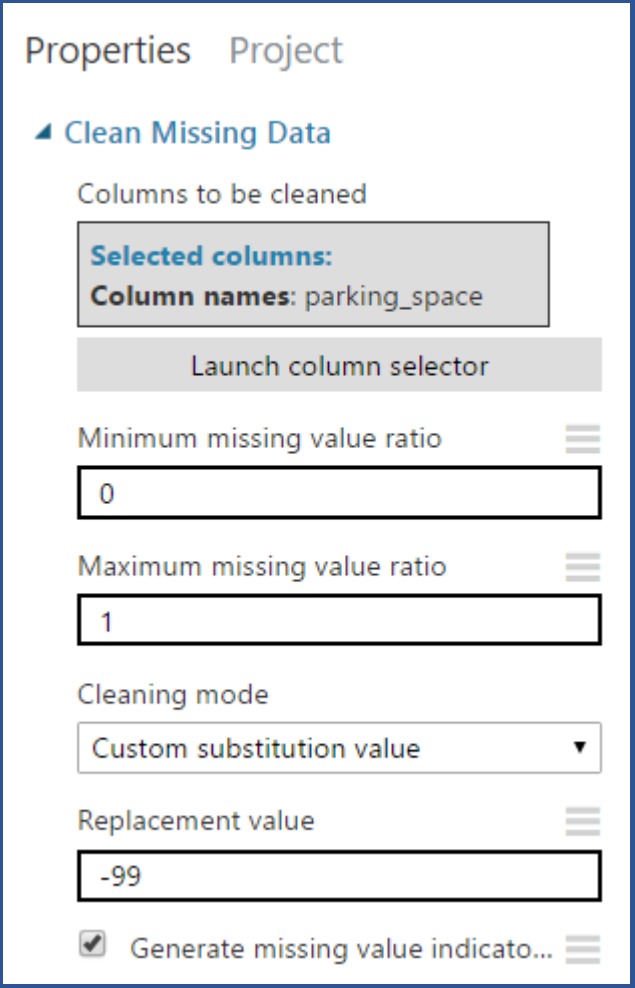


Missing value handling

Replace missing values with a dummy

- Drag & drop Clean Missing Data module
- Select column parking_space
- Configure “Cleaning mode” to Custom substitution value
- Replacement value = -99
- Comment = 7. For categorical data, replace missing parking space numbers with a dummy and include a missing values indicator column
- Run/Visualize

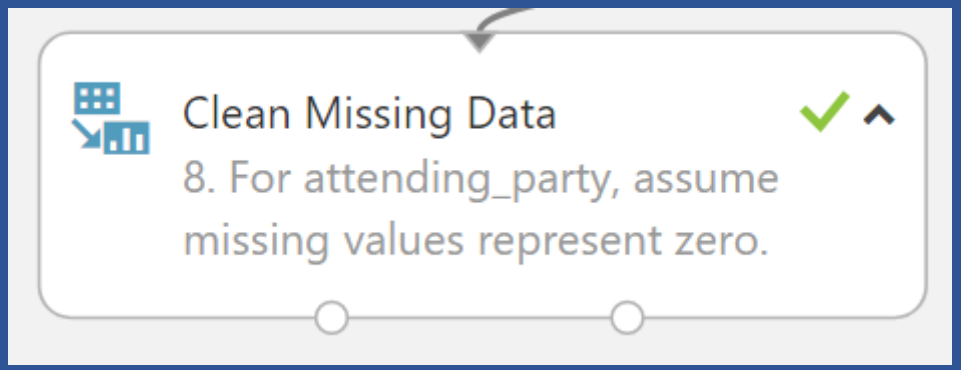


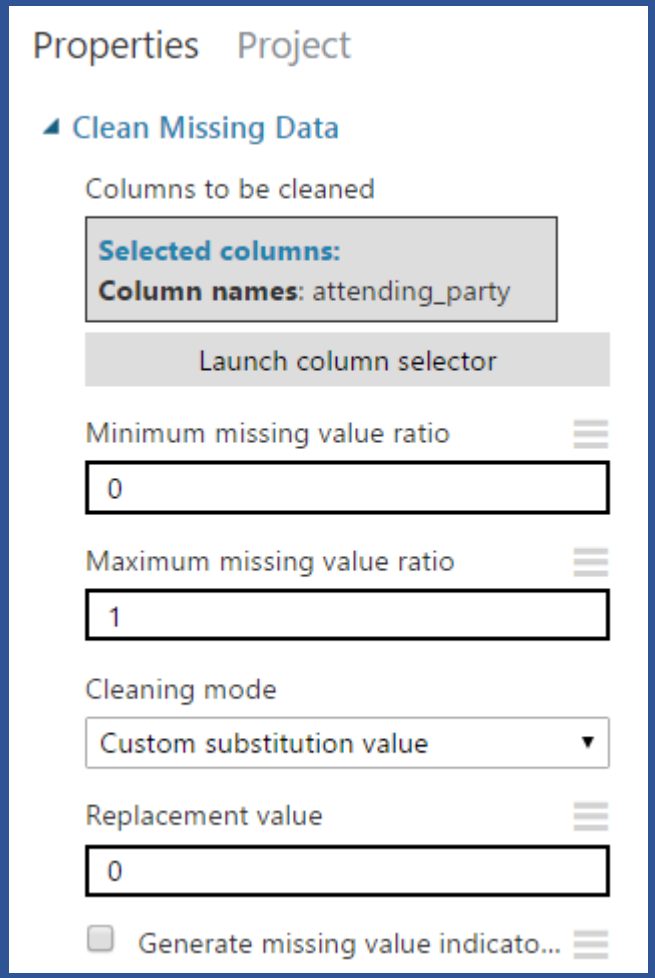


Missing value handling

Replace missing values with 0

- Drag & drop Clean Missing Data module
- Select column attending_party
- Configure “Cleaning mode” to Custom substitution value
- Replacement value = 0
- Comment = 8. For attending_party, assume missing values represent zero.
- Run/Visualize

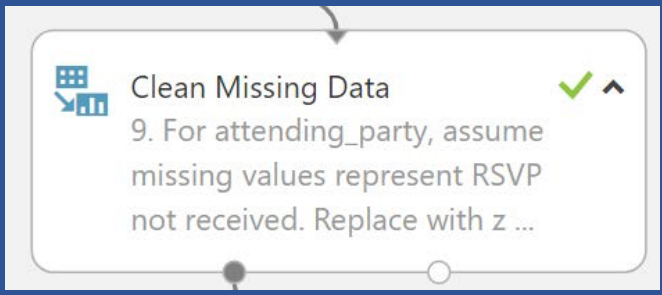


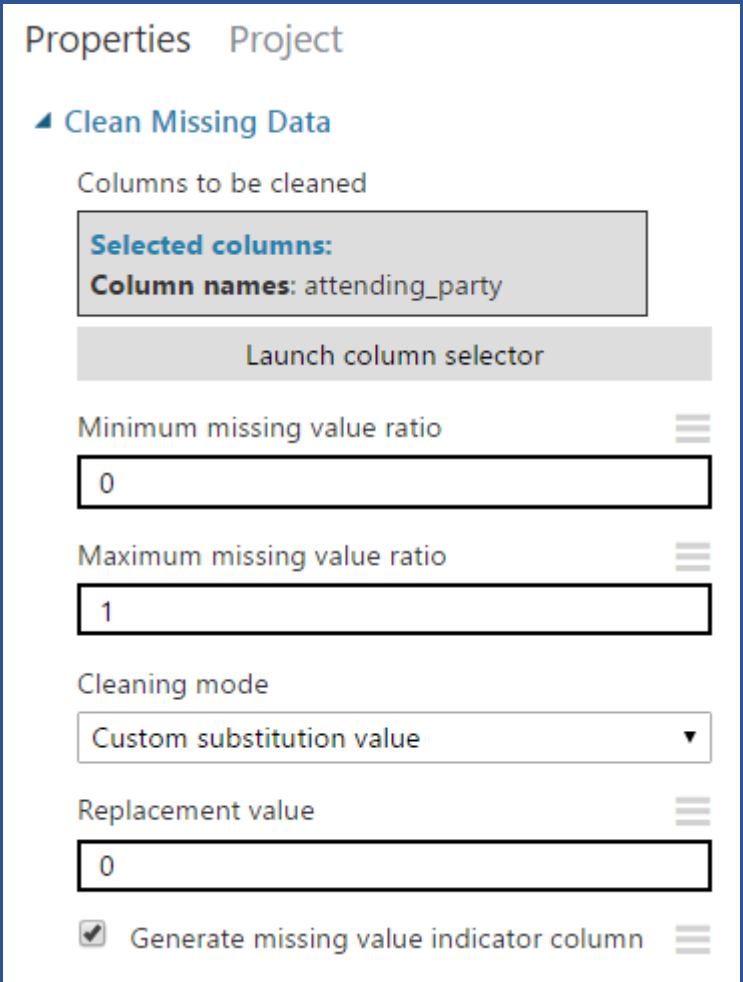


Missing value handling

Create an indicator variable for "missing."

- Drag & drop Clean Missing Data module
- Select column attending_party
- Configure “Cleaning mode” to Custom substitution value
- Check Generate missing value indication column
- Replacement value = 0
- Comment = 9. For attending_party, assume missing values represent RSVP not received. Replace with zero, but add a missing value indicator column.
- Run/Visualize

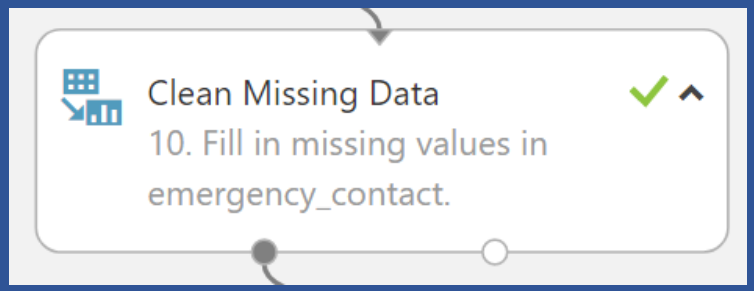


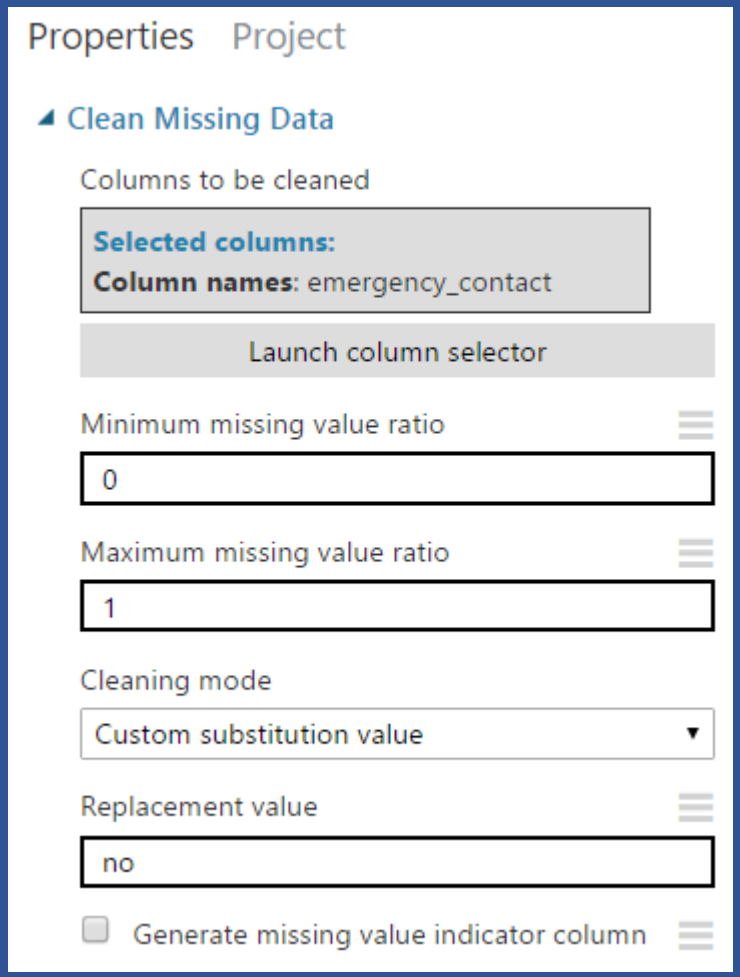


Missing value handling

Replace missing values with a string

- Drag & drop Clean Missing Data module
- Select column emergency_contact
- Configure "Cleaning mode" to Custom substitution value
- Replacement value = no
- Comment = 10. Fill in missing values in emergency_contact.
- Run/Visualize

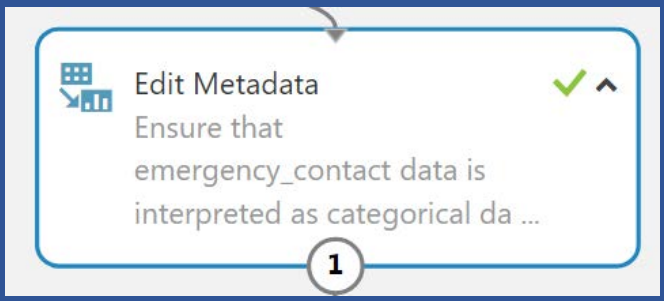


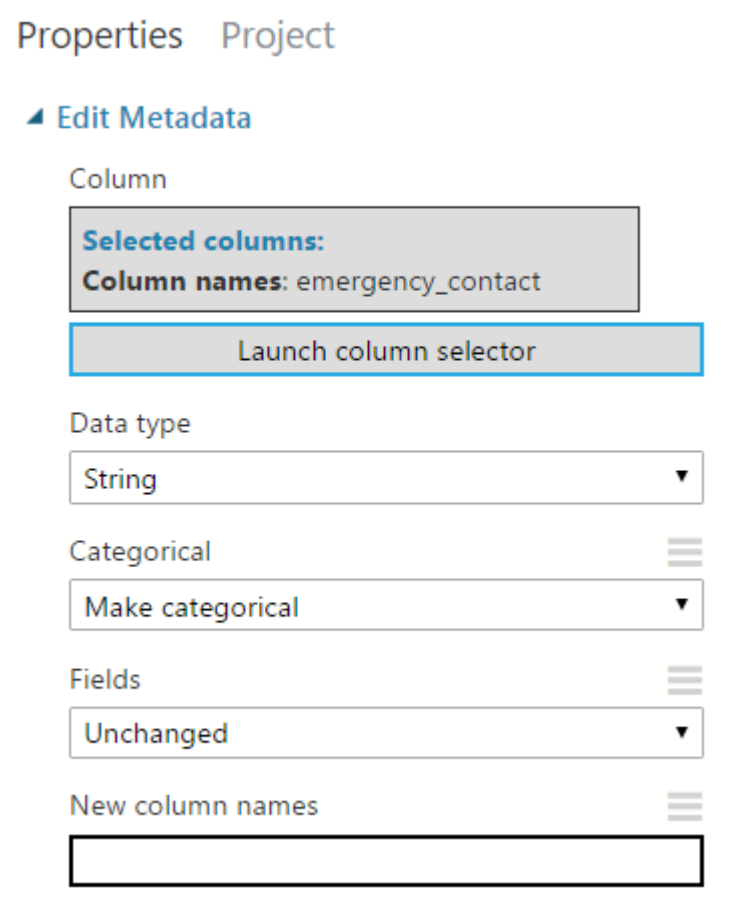


Missing value handling

Change metadata to categorical data

- Drag & drop Edit Metadata
- Select column emergency_contact
- Configure “Cleaning mode” to Custom substitution value
- Data type = String
- Categorical = Make categorical
- Comment = Ensure that emergency_contact data is interpreted as categorical data.
- Run/Visualize

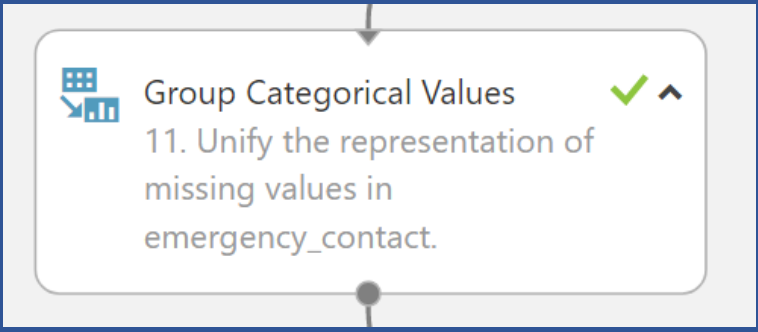


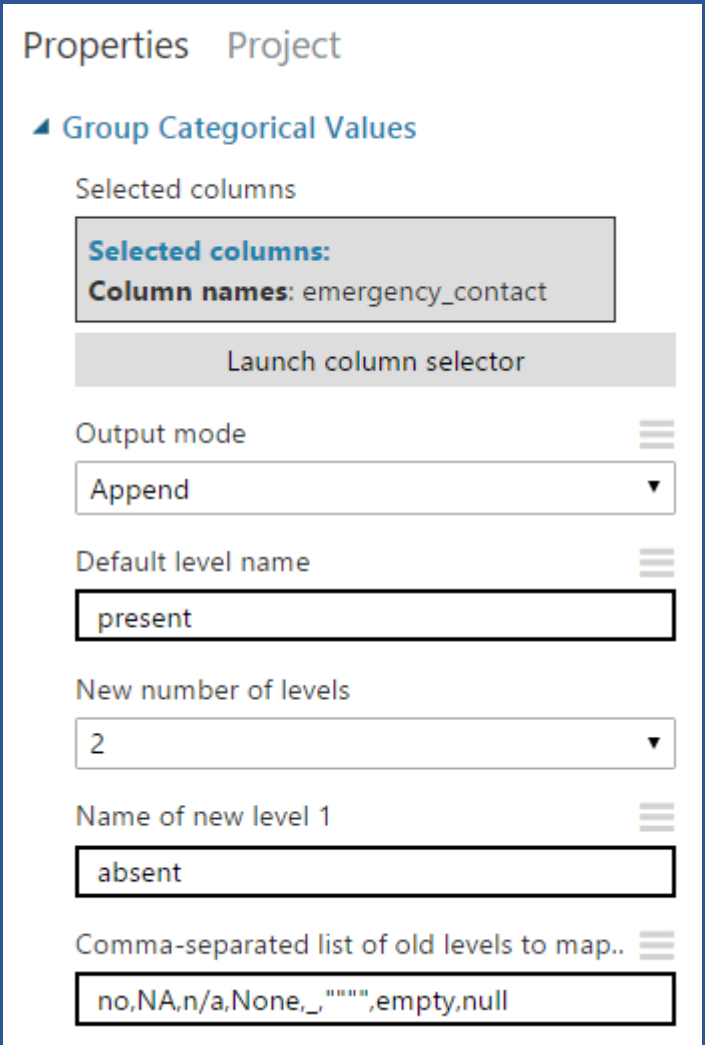


Missing value handling

Add an indicator variable showing which strings are considered "missing."

- Drag & drop Group Categorical Values
- Select column emergency_contact
- Configure “Cleaning mode” to Custom substitution value
- Output mode = Append
- Default level name = present
- New number of levels = 2
- Name of new level 1 = absent
- Comma-separate list of level to map to new level 1 = no,NA,n/a,None,_,"""",empty,null
- Comment = 11. Unify the representation of missing values in emergency_contact.
- Run/Visualize

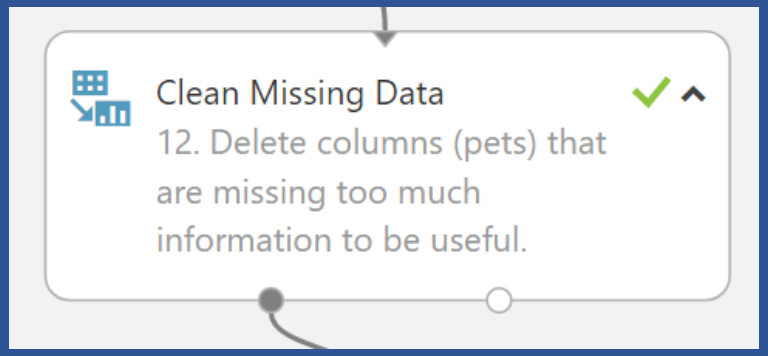


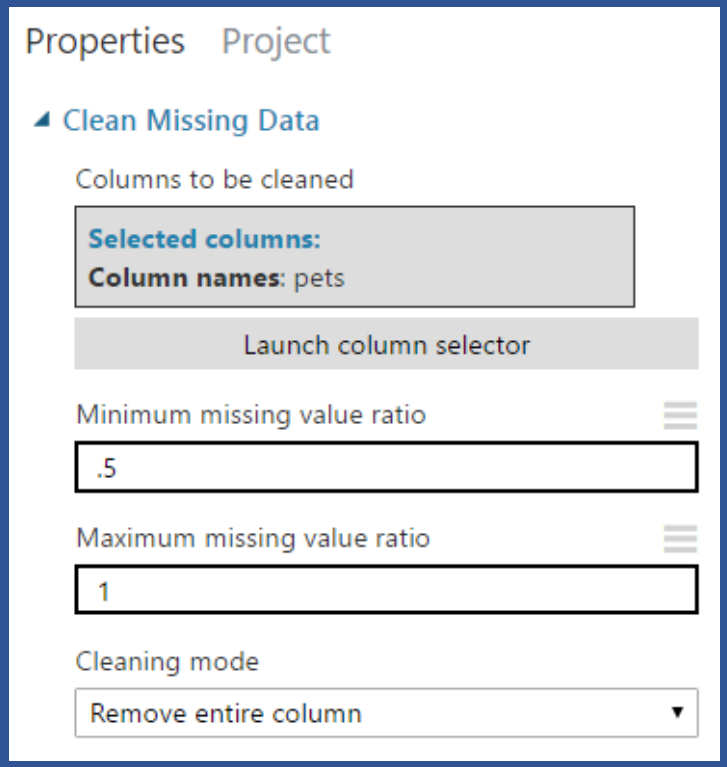


Missing value handling

Delete columns that are missing too many values to be useful

- Drag & drop Clean Missing Data
- Select column pets
- Configure "Cleaning mode" to Remove entire column
- Comment = 12. Delete columns (pets) that are missing too much information to be useful.
- Run/Visualize

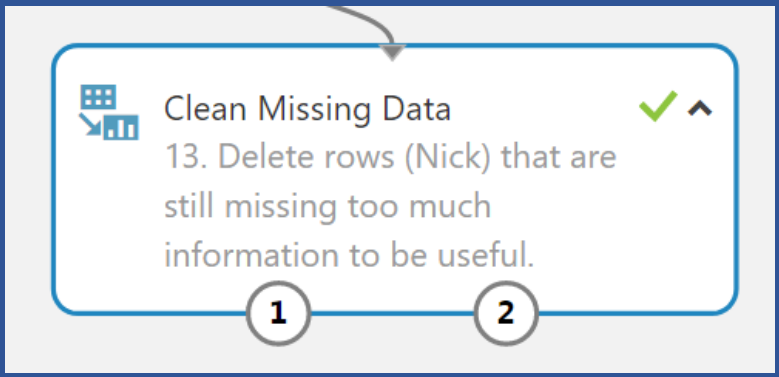


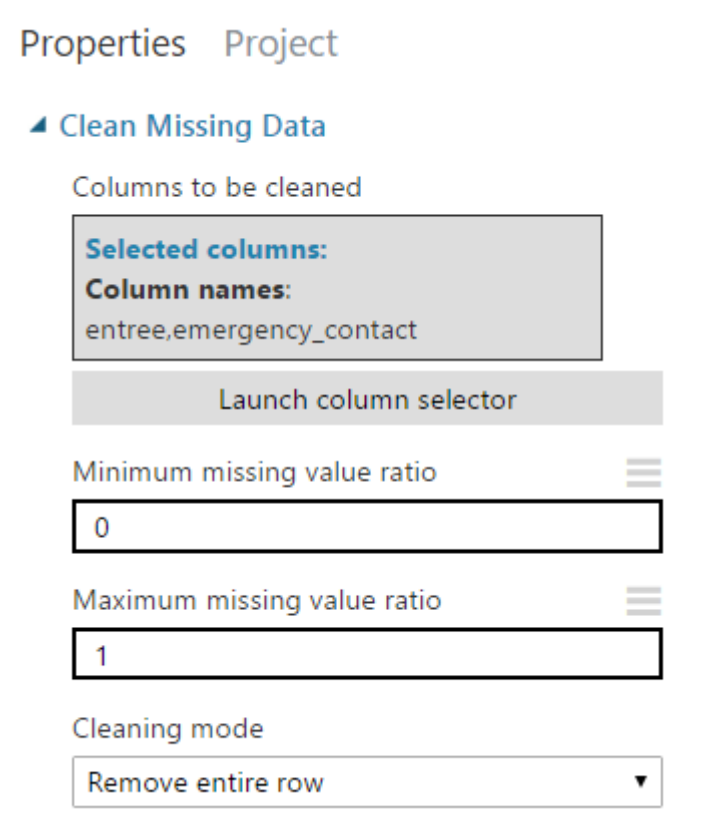


Missing value handling

Delete rows that are missing critical values

- Drag & drop Clean Missing Data
- Select column entree.emergency_contact
- Configure “Cleaning mode” to Remove entire row
- Comment = 13. Delete rows (Nick) that are still missing too much information to be useful.
- Run/Visualize





Missing value handling

Final result

Column 0	age	years_seniority	income	parking_space	attending_party	entree	emergency_contact	parking_space_IsMissing
Tony	48	27	250	1	5	shrimp	Pepper	false
Donald	67	25	86	10	2	beef	Jane	false
Henry	69	21	95	6	1	chicken	Janet	false
Janet	62	21	110	3	1	beef	Henry	false
Bruce	37	14	63	-99	1	veggie	NA	true
Steve	83	12	77	7	1	chicken	n/a	false
Clint	27	9	118	9	0	shrimp	None	false
Wanda	19	7	52	2	2	shrimp	empty	false
Carol	46	3	127	11	1	veggie	""	false
Mandy	44	2	68	8	1	chicken	null	false

Missing value handling

More information

Clean Missing Data: Specifies how to handle the values missing from a dataset

https://msdn.microsoft.com/library/azure/d2c5ca2f-7323-41a3-9b7e-da917c99f0c4

This Experiment

https://gallery.cortanaintelligence.com/Experiment/Missing-values