

Automated Data Analysis Report

Table of Contents

1. Clustering Results 2. ANOVA Results 3. Cluster Variability 4. Rule Metrics Comparison 5. Top Unique Rules per Cluster 6. Top 10 Common Rules 7. Cluster Visualizations

1. Clustering Results

Best Parameters: {'epsilon': 4.180812541640952, 'min_samples': 4, 'silhouette': 0.5462857069724237},
Best Silhouette Score: 0.546

2. ANOVA Results

Results for capital-gain: F-value = 228027.175, P-value = 0.000

Tukey-HSD Test Results: Multiple Comparison of Means - Tukey HSD, FWER=0.05

```
===== group1 group2 meandiff p-adj
lower upper reject ----- 1 2 13.3387 0.0 13.2937 13.3837 True 1 3
1.0125 0.0 0.9949 1.0301 True 1 4 -0.0 1.0 -0.0143 0.0143 False 2 3 -12.3262 0.0 -12.3703 -12.2821
True 2 4 -13.3387 0.0 -13.3816 -13.2958 True 3 4 -1.0125 0.0 -1.0238 -1.0012 True
-----
```

Results for capital-loss: F-value = 259301.391, P-value = 0.000

Tukey-HSD Test Results: Multiple Comparison of Means - Tukey HSD, FWER=0.05

```
===== group1 group2 meandiff p-adj
lower upper reject ----- 1 2 -4.6088 0.0 -4.6511 -4.5665 True 1 3
-4.6088 0.0 -4.6254 -4.5922 True 1 4 -4.6088 0.0 -4.6223 -4.5954 True 2 3 0.0 1.0 -0.0415 0.0415
False 2 4 -0.0 1.0 -0.0403 0.0403 False 3 4 -0.0 1.0 -0.0106 0.0106 False
-----
```

Results for positive_capital_gain: F-value = inf, P-value = 0.000

Tukey-HSD Test Results: Multiple Comparison of Means - Tukey HSD, FWER=0.05

```
===== group1 group2 meandiff p-adj
lower upper reject ----- 1 2 3.5999 0.0 3.5999 3.5999 True 1 3
3.5999 0.0 3.5999 3.5999 True 1 4 -0.0 0.0 -0.0 -0.0 True 2 3 0.0 0.0 0.0 0.0 True 2 4 -3.5999 0.0
-3.5999 -3.5999 True 3 4 -3.5999 0.0 -3.5999 -3.5999 True -----
```

Results for positive_capital_loss: F-value = inf, P-value = 0.000

Tukey-HSD Test Results: Multiple Comparison of Means - Tukey HSD, FWER=0.05

```
===== group1 group2 meandiff p-adj
lower upper reject ----- 1 2 -4.6989 0.0 -4.6989 -4.6989 True 1 3
-4.6989 0.0 -4.6989 -4.6989 True 1 4 -4.6989 0.0 -4.6989 -4.6989 True 2 3 -0.0 0.0 -0.0 -0.0 True 2 4
-0.0 0.0 -0.0 -0.0 True 3 4 -0.0 0.0 -0.0 -0.0 True -----
```

Results for age_education_interaction: F-value = 436.789, P-value = 0.000

Tukey-HSD Test Results: Multiple Comparison of Means - Tukey HSD, FWER=0.05

```
===== group1 group2 meandiff p-adj
lower upper reject ----- 1 2 0.8181 0.0 0.6055 1.0306 True 1 3
0.0993 0.0118 0.016 0.1825 True 1 4 -0.4841 0.0 -0.5517 -0.4165 True 2 3 -0.7188 0.0 -0.9272
-0.5104 True 2 4 -1.3021 0.0 -1.5048 -1.0995 True 3 4 -0.5833 0.0 -0.6366 -0.5301 True
-----
```

3. Cluster Variability

	antecedent support consequent support support confidence \					
	count	107.000000	107.000000	107.000000	107.000000	
	mean	0.083740	0.243636	0.048353	0.620479	
	std	0.045382	0.086054	0.023328	0.156351	
	min	0.029992	0.125719	0.027116	0.420732	
	25%	0.045193	0.182005	0.030403	0.467670	
	50%	0.067379	0.202958	0.036565	0.577586	
	75%	0.112572	0.256368	0.057313	0.780303	
	max	0.202958	0.410846	0.110107	0.917808	
	lift leverage conviction zhangs_metric total_items \					
	count	107.000000	107.000000	107.000000	107.000000	
	mean	2.742092	0.028951	2.434190	0.654361	
	std	0.921510	0.015991	1.158408	0.125715	
	min	1.794985	0.013956	1.327059	0.488225	
	25%	2.034365	0.017920	1.459066	0.545493	
	50%	2.285053	0.023929	1.895184	0.600917	
	75%	3.255464	0.029946	3.161177	0.781146	
	max	5.463524	0.074919	7.168036	0.872680	
3	coverage					
	count	107.000000				
	mean	0.083740				
	std	0.045382				
	min	0.029992				
	25%	0.045193				
	50%	0.067379				
	75%	0.112572				
	max	0.202958				
	antecedent support consequent support support confidence \					
	count	84.000000	84.000000	84.000000	84.000000	
	mean	0.104050	0.262216	0.058999	0.614567	
	std	0.069485	0.080317	0.035814	0.187857	
	min	0.029878	0.145305	0.025305	0.395207	
	25%	0.051265	0.201912	0.031340	0.437138	
	50%	0.076101	0.223768	0.043524	0.552176	
	75%	0.139138	0.344592	0.068107	0.752674	
	max	0.344592	0.437263	0.142643	0.991416	
4	lift leverage conviction zhangs_metric total_items coverage					
	count	84.000000	84.000000	84.000000	84.000000	84.000000
	mean	2.386512	0.033274	5.248958	0.635994	2.904762
	std	0.455398	0.020977	12.523368	0.099000	0.295307
	min	1.747838	0.012210	1.293575	0.462519	2.000000
	25%	2.039033	0.018263	1.447832	0.567646	3.000000
	50%	2.343404	0.024154	1.673277	0.619573	3.000000
	75%	2.623155	0.041694	3.012710	0.709479	3.000000
	max	4.146542	0.087095	65.558819	0.931602	3.000000

		antecedent support	consequent support	support	confidence \		
	count	121.000000	121.000000	121.000000	121.000000		
	mean	0.076982	0.254484	0.048076	0.681212		
	std	0.048871	0.081904	0.025380	0.172412		
	min	0.026694	0.112252	0.026010	0.417323		
	25%	0.043121	0.199863	0.031485	0.531429		
	50%	0.060233	0.220397	0.034908	0.647887		
	75%	0.092402	0.296372	0.056810	0.825397		
	max	0.220397	0.396988	0.123203	1.000000		
		lift	leverage	conviction	zhangs_metric	total_items \	
	count	121.000000	121.000000	121.000000	121.000000	121.000000	
	mean	2.826871	0.029753	inf	0.672363	2.900826	
	std	0.874105	0.016434	NaN	0.102405	0.300138	
	min	1.973658	0.013525	1.370859	0.524092	2.000000	
	25%	2.186272	0.018517	1.665150	0.586575	3.000000	
	50%	2.469574	0.024001	2.187918	0.634925	3.000000	
	75%	3.028221	0.034722	4.186069	0.786848	3.000000	
	max	5.826753	0.079154	inf	0.865708	3.000000	
			coverage				
		count	121.000000				
		mean	0.076982				
		std	0.048871				
		min	0.026694				
		25%	0.043121				
		50%	0.060233				
		75%	0.092402				
		max	0.220397				
1							
		antecedent support	consequent support	support	confidence \		
	count	24.000000	24.000000	24.000000	24.000000		
	mean	0.048925	0.138172	0.037634	0.785230		
	std	0.010406	0.055561	0.005268	0.099019		
	min	0.032258	0.077419	0.032258	0.666667		
	25%	0.043548	0.108065	0.032258	0.714286		
	50%	0.051613	0.129032	0.038710	0.750000		
	75%	0.053226	0.148387	0.038710	0.833333		
	max	0.070968	0.296774	0.051613	1.000000		
		lift	leverage	conviction	zhangs_metric	total_items	coverage
	count	24.000000	24.000000	24.000000	24.000000	24.000000	24.000000
	mean	6.266899	0.031079	inf	0.868886	2.875000	0.048925
	std	1.880070	0.004561	NaN	0.056527	0.337832	0.010406
	min	3.369565	0.022685	2.748387	0.726667	2.000000	0.032258
	25%	5.054348	0.028377	3.203226	0.845805	3.000000	0.043548
	50%	5.794449	0.031384	3.470968	0.873016	3.000000	0.051613
	75%	7.799679	0.033933	5.293548	0.906081	3.000000	0.053226
2	max	10.219780	0.042456	inf	0.944820	3.000000	0.070968

4. Rule Metrics Comparison

mean	std	min	25%	50%	75%
04794584438373	0.15635136856818543	0.42073170731707316	0.467670011148272	0.5775862068965517	0.78030303030
45667263102756	0.1878566850199141	0.395206527281999	0.43713793237028264	0.5521755153060461	0.75267441860
12121151123935	0.17241245748440304	0.4173228346456693	0.5314285714285715	0.6478873239436619	0.82539682539
52302789802789	0.09901864756375088	0.6666666666666666	0.7142857142857143	0.75	0.83333333333
49058149800485	0.17700274639572697	0.39316325501663807	0.46019592388244573	0.5493871665465033	0.74370860927

5. Top Unique Rules per Cluster

Cluster 3:

Rule: frozenset({'education_Masters'}) -> frozenset({'age_education_interaction_(494.0, 1350.0]', 'sex_Male'}) (Support: 0.060, Confidence: 0.590, Lift: 1.812)
Rule: frozenset({'age_education_interaction_(261.0, 369.0]', 'occupation_aggregated_Other'}) -> frozenset({'education_HS-grad'}) (Support: 0.034, Confidence: 0.562, Lift: 2.191)
Rule: frozenset({'marital-status_Married-civ-spouse', 'workclass_Self-emp-inc'}) -> frozenset({'occupation_aggregated_Exec-managerial'}) (Support: 0.028, Confidence: 0.507, Lift: 2.417)
Rule: frozenset({'hours_per_week_binned_41-50', 'age_education_interaction_(261.0, 369.0]')) -> frozenset({'education_HS-grad'}) (Support: 0.057, Confidence: 0.504, Lift: 1.964)
Rule: frozenset({'native_country_aggregated_United-States', 'workclass_Self-emp-inc'}) -> frozenset({'occupation_aggregated_Exec-managerial'}) (Support: 0.029, Confidence: 0.483, Lift: 2.299)

Cluster 4:

Rule: frozenset({'relationship_Wife'}) -> frozenset({'marital-status_Married-civ-spouse'}) (Support: 0.043, Confidence: 0.991, Lift: 2.267)
Rule: frozenset({'relationship_Wife', 'race_White'}) -> frozenset({'marital-status_Married-civ-spouse'}) (Support: 0.036, Confidence: 0.991, Lift: 2.266)
Rule: frozenset({'relationship_Wife', 'workclass_Private'}) -> frozenset({'marital-status_Married-civ-spouse'}) (Support: 0.030, Confidence: 0.990, Lift: 2.265)
Rule: frozenset({'relationship_Wife', 'native_country_aggregated_United-States'}) -> frozenset({'marital-status_Married-civ-spouse'}) (Support: 0.037, Confidence: 0.990, Lift: 2.264)
Rule: frozenset({'relationship_Own-child', 'hours_per_week_binned_21-30'}) -> frozenset({'marital-status_Never-married'}) (Support: 0.029, Confidence: 0.956, Lift: 2.775)

Cluster 1:

Rule: frozenset({'education_Doctorate', 'race_White'}) -> frozenset({'age_education_interaction_(494.0, 1350.0]')) (Support: 0.031, Confidence: 1.000, Lift: 2.519)
Rule: frozenset({'education_Doctorate', 'native_country_aggregated_United-States'}) -> frozenset({'age_education_interaction_(494.0, 1350.0]')) (Support: 0.029, Confidence: 1.000, Lift: 2.519)
Rule: frozenset({'education_Doctorate'}) -> frozenset({'age_education_interaction_(494.0, 1350.0]')) (Support: 0.034, Confidence: 0.980, Lift: 2.470)
Rule: frozenset({'education_Doctorate', 'marital-status_Married-civ-spouse'}) -> frozenset({'age_education_interaction_(494.0, 1350.0]')) (Support: 0.029, Confidence: 0.977, Lift: 2.470)

2.460)

Rule: frozenset({'education_Doctorate', 'sex_Male'}) -> frozenset({'age_education_interaction_(494.0, 1350.0]'}) (Support: 0.026, Confidence: 0.974, Lift: 2.454)

Cluster 2:

Rule: frozenset({'education_HS-grad', 'age_education_interaction_(494.0, 1350.0]'}) -> frozenset({'hours_per_week_binned_41-50'}) (Support: 0.032, Confidence: 1.000, Lift: 3.370)
Rule: frozenset({'occupation_aggregated_Prof-specialty', 'race_Asian-Pac-Islander'}) -> frozenset({'education_Prof-school'}) (Support: 0.032, Confidence: 1.000, Lift: 3.370)
Rule: frozenset({'race_Asian-Pac-Islander', 'marital-status_Married-civ-spouse'}) -> frozenset({'native_country_aggregated_Other'}) (Support: 0.039, Confidence: 0.857, Lift: 10.220)
Rule: frozenset({'race_Asian-Pac-Islander', 'workclass_Private'}) -> frozenset({'native_country_aggregated_Other'}) (Support: 0.032, Confidence: 0.833, Lift: 9.936)
Rule: frozenset({'marital-status_Married-civ-spouse', 'occupation_aggregated_Craft-repair'}) -> frozenset({'education_HS-grad'}) (Support: 0.032, Confidence: 0.833, Lift: 5.616)

6. Top 10 Common Rules Sorted by Absolute Coverage Difference

Rule: frozenset({'relationship_Own-child', 'marital-status_Never-married'}) (Abs Coverage Difference: 0.292)
Rule: frozenset({'relationship_Own-child', 'marital-status_Never-married'}) (Abs Coverage Difference: 0.275)
Rule: frozenset({'relationship_Not-in-family', 'race_White', 'marital-status_Never-married'}) (Abs Coverage Difference: 0.271)
Rule: frozenset({'relationship_Own-child', 'marital-status_Never-married'}) (Abs Coverage Difference: 0.271)
Rule: frozenset({'relationship_Not-in-family', 'marital-status_Never-married', 'native_country_aggregated_United-States'}) (Abs Coverage Difference: 0.265)
Rule: frozenset({'marital-status_Never-married', 'relationship_Own-child', 'native_country_aggregated_United-States'}) (Abs Coverage Difference: 0.260)
Rule: frozenset({'relationship_Own-child', 'marital-status_Never-married', 'native_country_aggregated_United-States'}) (Abs Coverage Difference: 0.256)
Rule: frozenset({'relationship_Own-child', 'marital-status_Never-married'}) (Abs Coverage Difference: 0.254)
Rule: frozenset({'relationship_Not-in-family', 'marital-status_Never-married'}) (Abs Coverage Difference: 0.252)
Rule: frozenset({'relationship_Own-child', 'marital-status_Never-married', 'native_country_aggregated_United-States'}) (Abs Coverage Difference: 0.242)

7. Cluster Visualizations

