Data Mining Lab 3

Name : Zain Al Abidin
Roll no : 21L-6260

Dataset # 1

Relation: weather-weka.filters.unsupervised.attribute.ReplaceMissingValues				
No.	1: outlook Nominal	2: temperature Numeric	3: humidity Numeric	4: windy Nominal	5: play Nominal
1	sunny	85.0	85.0	FALSE	no
2	sunny	80.0	90.0	TRUE	no
3	overcast	83.0	86.0	FALSE	yes
4	rainy	73.8461538...	96.0	FALSE	yes
5	rainy	68.0	80.0	FALSE	yes
6	rainy	65.0	70.0	TRUE	no
7	overcast	64.0	65.0	TRUE	yes
8	sunny	72.0	95.0	FALSE	no
9	sunny	69.0	82.5384...	FALSE	yes
10	rainy	75.0	80.0	FALSE	yes
11	sunny	75.0	70.0	TRUE	yes
12	overcast	72.0	90.0	TRUE	yes
13	overcast	81.0	75.0	FALSE	yes
14	rainy	71.0	91.0	TRUE	no

After replacing missing values this is our dataset

No.	1: outlook Nominal	2: temperature Numeric	3: humidity Numeric	4: windy Nominal	5: play Nominal
1	sunny	1.0	0.64516...	FALSE	no
2	sunny	0.76190476...	0.80645...	TRUE	no
3	overcast	0.90476190...	0.67741...	FALSE	yes
4	rainy	0.46886446...	1.0	FALSE	yes
5	rainy	0.19047619...	0.48387...	FALSE	yes
6	rainy	0.04761904...	0.16129...	TRUE	no
7	overcast	0.0	0.0	TRUE	yes
8	sunny	0.38095238...	0.96774...	FALSE	no
9	sunny	0.23809523...	0.56575...	FALSE	yes
10	rainy	0.52380952...	0.48387...	FALSE	yes
11	sunny	0.52380952...	0.16129...	TRUE	yes
12	overcast	0.38095238...	0.80645...	TRUE	yes
13	overcast	0.80952380...	0.32258...	FALSE	yes
14	rainy	0.33333333...	0.83870...	TRUE	no

After normalization this is our dataset. (with scale 1 and translation 0)

Dataset # 2

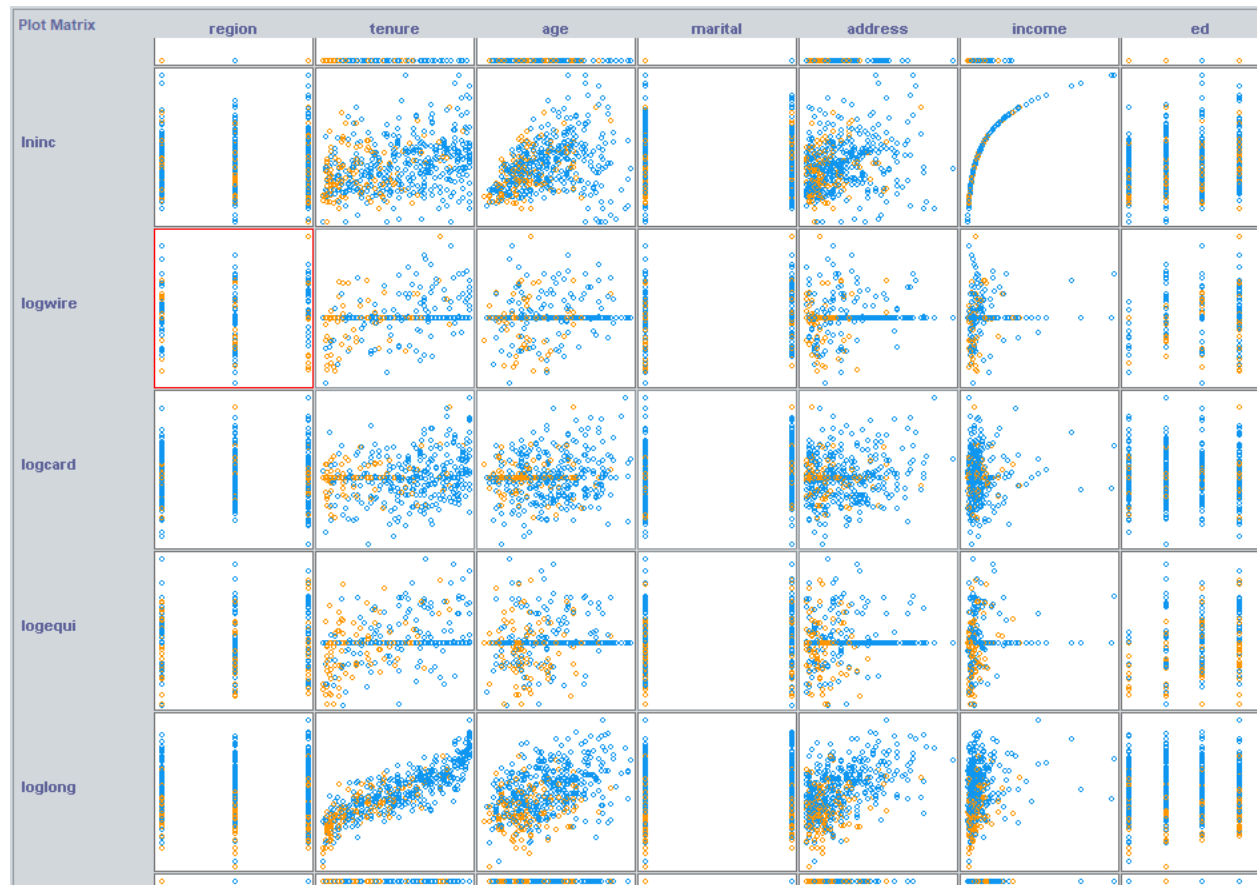The table contains missing values therefore we replace the missing values with the average of each attribute.

Relation: small_telco_labOne

No.	1: region	2: tenure	3: age	4: marital	5: address	6: income	7: ed	8: employ	9: retire	10: gender	11: reside	12: longmon	13: longten	14: internet	15: ebill	16: loglong	17: logequi	18: logcard	19: logwire	20: lninc	21: custcat	22: churn
	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric
1	2.0	13.0	44.0	1.0	9.0	64.0	4.0	5.0	0.0	0.0	2.0	3.7	37.45	0.0	0.0	1.30833...		2.01490...		4.158...	1.0	1.0
2	3.0	11.0	33.0	1.0	7.0	136.0	5.0	5.0	0.0	0.0	6.0	4.4	42.0	0.0	0.0	1.48160...		2.72457...	3.57515...	4.912...	4.0	1.0
3	3.0	68.0	52.0	1.0	24.0	116.0	1.0	29.0	0.0	1.0	2.0	18.15	1300.6	0.0	0.0	2.89867...		3.40949...		4.753...	3.0	0.0
4	2.0	33.0	33.0	0.0	12.0	33.0	2.0	0.0	0.0	1.0	1.0	9.45	288.8	0.0	0.0	2.24601...				3.496...	1.0	1.0
5	2.0	23.0	30.0	1.0	9.0	30.0	1.0	2.0	0.0	0.0	4.0	6.3	157.05	0.0	0.0	1.84054...				3.401...	3.0	0.0
6	2.0	41.0	39.0	0.0	17.0	78.0	2.0	16.0	0.0	1.0	1.0	11.8	487.4	0.0	0.0	2.46809...		2.60268...		4.356...	3.0	0.0
7	3.0	45.0	22.0	1.0	2.0	19.0	2.0	4.0	0.0	1.0	5.0	10.9	504.5	1.0	1.0	2.38876...		2.16905...		2.944...	2.0	1.0
8	2.0	38.0	35.0	0.0	5.0	76.0	2.0	10.0	0.0	0.0	3.0	6.05	239.55	1.0	1.0	1.80005...	3.91402...	3.14630...	4.17284...	4.330...	4.0	0.0
9	3.0	45.0	59.0	1.0	7.0	166.0	4.0	31.0	0.0	0.0	5.0	9.75	449.05	0.0	0.0	2.27726...		2.48490...		5.111...	3.0	0.0
10	1.0	68.0	41.0	1.0	21.0	72.0	1.0	22.0	0.0	0.0	3.0	24.15	1659.7	0.0	0.0	3.18428...		2.80336...		4.276...	2.0	0.0
11	2.0	5.0	33.0	0.0	10.0	125.0	4.0	5.0	0.0	1.0	1.0	4.85	17.25	1.0	1.0	1.57897...	3.26384...			4.828...	1.0	1.0
12	3.0	7.0	35.0	0.0	14.0	80.0	2.0	15.0	0.0	1.0	1.0	7.1	47.45	0.0	0.0	1.96009...		3.16758...		4.382...	3.0	0.0
13	1.0	41.0	38.0	1.0	8.0	37.0	2.0	9.0	0.0	1.0	3.0	8.55	308.7	0.0	0.0	2.14593...		3.73169...		3.610...	1.0	0.0
14	2.0	57.0	54.0	1.0	30.0	115.0	4.0	23.0	0.0	1.0	3.0	15.6	825.35	1.0	1.0	2.74727...	3.84374...		4.11169...	4.744...	4.0	1.0
15	2.0	9.0	46.0	0.0	3.0	25.0	1.0	8.0	0.0	1.0	2.0	4.4	36.8	0.0	0.0	1.48160...				3.218...	1.0	0.0
16	1.0	29.0	38.0	1.0	12.0	75.0	5.0	1.0	0.0	0.0	4.0	5.1	146.25	1.0	0.0	1.62924...	3.40949...	2.42036...		4.317...	2.0	0.0
17	3.0	60.0	57.0	0.0	38.0	162.0	2.0	30.0	0.0	0.0	1.0	16.15	946.9	0.0	0.0	2.78192...	3.44361...	3.40119...		5.087...	3.0	0.0
18	3.0	34.0	48.0	0.0	3.0	49.0	2.0	6.0	0.0	1.0	3.0	6.65	230.8	0.0	0.0	1.89461...				3.891...	3.0	0.0
19	2.0	1.0	24.0	0.0	3.0	20.0	1.0	3.0	0.0	0.0	1.0	1.05	1.05	0.0	0.0	0.04879...				2.995...	1.0	0.0
20	1.0	26.0	29.0	1.0	3.0	77.0	4.0	2.0	0.0	0.0	4.0	6.7	140.95	1.0	1.0	1.90210...	3.87328...	3.18841...	3.64544...	4.343...	4.0	1.0
21	3.0	6.0	30.0	0.0	7.0	16.0	3.0	1.0	0.0	1.0	1.0	3.75	25.65	1.0	0.0	1.32175...	3.52046...	2.92852...		2.772...	2.0	1.0
22	1.0	68.0	52.0	1.0	17.0	120.0	1.0	24.0	0.0	0.0	2.0	20.7	1391.05	0.0	0.0	3.03013...		3.09104...		4.787...	1.0	0.0
23	3.0	53.0	33.0	0.0	10.0	101.0	5.0	4.0	0.0	1.0	2.0	5.3	253.35	1.0	1.0	1.66770...	3.90399...	3.28653...	3.93963...	4.615...	4.0	0.0
24	3.0	55.0	48.0	1.0	19.0	67.0	1.0	25.0	0.0	0.0	3.0	15.05	810.45	0.0	0.0	2.71137...		3.30505...		4.204...	1.0	0.0
25	3.0	14.0	43.0	1.0	18.0	36.0	1.0	5.0	0.0	0.0	5.0	12.5	153.75	0.0	0.0	2.52572...		2.89037...		3.583...	3.0	0.0
26	2.0	1.0	21.0	0.0	0.0	33.0	2.0	0.0	0.0	1.0	3.0	2.2	2.2	0.0	0.0	0.78845...		3.70130...		3.496...	3.0	0.0
27	2.0	42.0	40.0	0.0	7.0	37.0	2.0	8.0	0.0	1.0	1.0	8.25	399.15	1.0	1.0	2.11021...	3.60821...	3.33220...	3.62167...	3.610...	4.0	0.0
28	3.0	25.0	33.0	1.0	11.0	31.0	1.0	5.0	0.0	0.0	4.0	9.1	234.95	0.0	0.0	2.20827...				3.433...	3.0	0.0
29	1.0	9.0	21.0	1.0	1.0	17.0	2.0	2.0	0.0	1.0	3.0	2.9	25.25	0.0	0.0	1.06471...				2.833...	1.0	0.0
30	2.0	13.0	33.0	1.0	9.0	19.0	4.0	0.0	0.0	1.0	2.0	5.55	75.25	1.0	1.0	1.71379...	3.30871...			2.944...	2.0	0.0
31	1.0	56.0	37.0	1.0	6.0	36.0	1.0	13.0	0.0	1.0	2.0	10.6	582.6	1.0	1.0	2.36085...	3.43720...	2.90416...		3.583...	2.0	0.0
32	1.0	71.0	53.0	1.0	27.0	155.0	5.0	12.0	0.0	0.0	2.0	21.0	1519.2	1.0	1.0	3.04452...		3.52636...	3.91102...	5.043...	4.0	0.0
33	1.0	35.0	50.0	1.0	26.0	140.0	2.0	21.0	0.0	1.0	4.0	6.5	247.55	0.0	0.0	1.87180...		3.55534...		4.941...	3.0	0.0
34	1.0	11.0	27.0	1.0	8.0	55.0	5.0	0.0	0.0	0.0	3.0	4.8	54.1	1.0	0.0	1.56861...	2.97297...			4.007...	2.0	0.0
35	2.0	60.0	46.0	1.0	13.0	163.0	3.0	24.0	0.0	0.0	2.0	33.9	1947.95	1.0	1.0	3.52341...	3.79885...	2.62103...	4.01186...	5.093...	4.0	0.0
36	3.0	20.0	35.0	1.0	11.0	52.0	4.0	0.0	0.0	0.0	2.0	4.25	82.7	1.0	1.0	1.44691...	3.41936...			3.951...	2.0	1.0
37	2.0	54.0	60.0	0.0	38.0	211.0	4.0	25.0	0.0	0.0	1.0	21.15	1228.7	1.0	1.0	3.05163...	3.83622...	3.99360...	4.00460...	5.351...	4.0	0.0
38	1.0	44.0	57.0	1.0	1.0	186.0	2.0	17.0	0.0	0.0	2.0	9.8	428.25	0.0	0.0	2.28238...		3.58351...	3.72930...	5.225...	3.0	0.0
39	1.0	11.0	41.0	1.0	0.0	39.0	1.0	1.0	0.0	1.0	2.0	6.55	67.8	0.0	0.0	1.87946...		2.98315...		3.663...	3.0	1.0
40	2.0	72.0	57.0	0.0	34.0	22.0	2.0	35.0	1.0	1.0	1.0	41.75	3043.05	0.0	0.0	3.73169...		2.93119...		3.091...	3.0	0.0
41	3.0	10.0	41.0	0.0	7.0	30.0	1.0	7.0	0.0	0.0	1.0	2.5	31.25	0.0	0.0	0.91629...		3.98434...		3.401...	3.0	0.0
42	2.0	15.0	28.0	0.0	0.0	29.0	2.0	4.0	0.0	1.0	1.0	4.25	78.0	0.0	0.0	1.44691...		2.87638...		3.367...	3.0	0.0
43	2.0	27.0	28.0	1.0	4.0	23.0	2.0	8.0	0.0	0.0	5.0	6.2	180.15	0.0	0.0	1.82454...				3.135...	1.0	0.0
44	1.0	9.0	36.0	1.0	14.0	62.0	4.0	10.0	0.0	0.0	6.0	5.65	43.3	1.0	1.0	1.73165...	3.84481...		3.88156...	4.127...	4.0	1.0
45	1.0	64.0	43.0	1.0	20.0	76.0	4.0	20.0	0.0	1.0	4.0	14.7	897.05	0.0	0.0	2.68784...		2.39789...		4.330...	3.0	0.0
46	1.0	65.0	41.0	1.0	3.0	74.0	4.0	16.0	0.0	0.0	2.0	14.5	963.3	1.0	1.0	2.67414...	3.61091...	2.83321...		4.304...	2.0	0.0
47	1.0	49.0	51.0	1.0	27.0	63.0	4.0	19.0	0.0	0.0	5.0	12.85	585.6	1.0	1.0	2.55334...		2.65675...		4.143...	2.0	0.0
48	3.0	47.0	41.0	1.0	0.0	36.0	4.0	8.0	0.0	0.0	2.0	7.75	361.0	1.0	1.0	2.04769...	3.62300...	2.91777...	3.65842...	3.583...	4.0	1.0
49	3.0	9.0	34.0	1.0	9.0	33.0	2.0	8.0	0.0	1.0	4.0	2.95	18.9	0.0	0.0	1.08180...	3.13331...			3.496...	1.0	1.0
50	1.0	5.0	36.0	0.0	14.0	29.0	2.0	9.0	0.0	1.0	1.0	3.25	16.8	1.0	1.0	1.17865...		2.74084...	3.28653...	3.367...	3.0	1.0
51	2.0	30.0	34.0	1.0	4.0	27.0	2.0	1.0	0.0	0.0	5.0	6.3	150.9	1.0	0.0	1.84054...	3.11351...			3.295...	1.0	1.0
52	1.0	56.0	52.0	1.0	28.0	49.0	2.0	12.0	0.0	0.0	4.0	24.75	1349.05	0.0	0.0	3.20882...		3.10234...		3.891...	2.0	0.0
53	3.0	10.0	22.0	0.0	0.0	24.0	4.0	0.0	0.0	1.0	1.0	7.8	63.0	1.0	1.0	2.05412...	3.61765...	3.11351...	3.40286...	3.178...	4.0	0.0
54	1.0	7.0	26.0	1.0	3.0	26.0	2.0	2.0	0.0	0.0	5.0	4.85	33.7	0.0	0.0	1.57897...				3.258...	1.0	0.0
55	1.0	52.0	27.0	0.0	6.0	47.0	3.0	5.0	0.0	0.0	2.0	6.25	330.4	0.0	1.0	1.83258...		2.65675...		3.850...	1.0	0.0
56	2.0	36.0	45.0	1.0	1.0	94.0	2.0	18.0	0.0	1.0	5.0	7.2	258.75	1.0	0.0	1.97408...	3.34462...			4.543...	1.0	1.0

After replacing missing values this is our table

Viewer

Relation: small_telco_labOne-weka.filters.unsupervised.attribute.ReplaceMissingValues

No.	1: region	2: tenure	3: age	4: marital	5: address	6: income	7: ed	8: employ	9: retire	10: gender	11: reside	12: longmon	13: longten	14: internet	15: ebill	16: loglong	17: logequi	18: logcard	19: logwire	20: lninc	21: custcat	22: churn
	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric
1	2.0	13.0	44.0	1.0	9.0	64.0	4.0	5.0	0.0	0.0	2.0	3.7	37.45	0.0	0.0	1.30833...	3.56809...	2.01490...	3.59829...	4.158...	1.0	1.0
2	3.0	11.0	33.0	1.0	7.0	136.0	5.0	5.0	0.0	0.0	6.0	4.4	42.0	0.0	0.0	1.48160...	3.56809...	2.72457...	3.57515...	4.912...	4.0	1.0
3	3.0	68.0	52.0	1.0	24.0	116.0	1.0	29.0	0.0	1.0	2.0	18.15	1300.6	0.0	0.0	2.89867...	3.56809...	3.40949...	3.59829...	4.753...	3.0	0.0
4	2.0	33.0	33.0	0.0	12.0	33.0	2.0	0.0	0.0	1.0	1.0	9.45	288.8	0.0	0.0	2.24601...	3.56809...	2.85420...	3.59829...	3.496...	1.0	1.0
5	2.0	23.0	30.0	1.0	9.0	30.0	1.0	2.0	0.0	0.0	4.0	6.3	157.05	0.0	0.0	1.84054...	3.56809...	2.85420...	3.59829...	3.401...	3.0	0.0
6	2.0	41.0	39.0	0.0	17.0	78.0	2.0	16.0	0.0	1.0	1.0	11.8	487.4	0.0	0.0	2.46809...	3.56809...	2.60268...	3.59829...	4.356...	3.0	0.0
7	3.0	45.0	22.0	1.0	2.0	19.0	2.0	4.0	0.0	1.0	5.0	10.9	504.5	1.0	1.0	2.38876...	3.56809...	2.16905...	3.59829...	2.944...	2.0	1.0
8	2.0	38.0	35.0	0.0	5.0	76.0	2.0	10.0	0.0	0.0	3.0	6.05	239.55	1.0	0.0	1.80005...	3.91402...	3.14630...	4.17284...	4.330...	4.0	0.0
9	3.0	45.0	59.0	1.0	7.0	166.0	4.0	31.0	0.0	0.0	5.0	9.75	449.05	0.0	0.0	2.27726...	3.56809...	2.48490...	3.59829...	5.111...	3.0	0.0
10	1.0	68.0	41.0	1.0	21.0	72.0	1.0	22.0	0.0	0.0	3.0	24.15	1659.7	0.0	0.0	3.18428...	3.56809...	2.80336...	3.59829...	4.276...	2.0	0.0
11	2.0	5.0	33.0	1.0	10.0	125.0	4.0	5.0	0.0	1.0	1.0	4.85	17.25	1.0	1.0	1.57897...	3.26384...	2.85420...	3.59829...	4.828...	1.0	1.0
12	3.0	7.0	35.0	0.0	14.0	80.0	2.0	15.0	0.0	1.0	1.0	7.1	47.45	1.0	0.0	1.96009...	3.56809...	3.16758...	3.59829...	4.382...	3.0	0.0
13	1.0	41.0	38.0	1.0	8.0	37.0	2.0	9.0	0.0	1.0	3.0	8.55	308.7	0.0	0.0	2.14593...	3.56809...	3.73169...	3.59829...	3.610...	1.0	0.0
14	2.0	57.0	54.0	1.0	30.0	115.0	4.0	23.0	0.0	1.0	3.0	15.6	825.35	1.0	0.0	2.74727...	3.84374...	2.85420...	4.11169...	4.744...	4.0	1.0
15	2.0	9.0	46.0	0.0	3.0	25.0	1.0	8.0	0.0	1.0	2.0	4.4	36.8	0.0	0.0	1.48160...	3.56809...	2.85420...	3.59829...	3.218...	1.0	0.0
16	1.0	29.0	38.0	1.0	12.0	75.0	5.0	1.0	0.0	0.0	4.0	5.1	146.25	1.0	0.0	1.62924...	3.40949...	2.42036...	3.59829...	4.317...	2.0	0.0
17	3.0	60.0	57.0	0.0	38.0	162.0	2.0	30.0	0.0	0.0	1.0	16.15	946.9	0.0	0.0	2.78192...	3.44361...	3.40119...	3.59829...	5.087...	3.0	0.0
18	3.0	34.0	48.0	0.0	3.0	49.0	2.0	6.0	0.0	1.0	3.0	6.65	230.8	0.0	0.0	1.89461...	3.56809...	2.85420...	3.59829...	3.891...	3.0	0.0
19	2.0	1.0	24.0	0.0	3.0	20.0	1.0	3.0	0.0	0.0	1.0	1.05	1.05	0.0	0.0	0.04879...	3.56809...	2.85420...	3.59829...	2.995...	1.0	0.0
20	1.0	26.0	29.0	1.0	3.0	77.0	4.0	2.0	0.0	0.0	4.0	6.7	140.95	1.0	1.0	1.90210...	3.87328...	3.18841...	3.64544...	4.343...	4.0	1.0
21	3.0	6.0	30.0	0.0	7.0	16.0	3.0	1.0	0.0	1.0	1.0	3.75	25.65	1.0	0.0	1.32175...	3.52046...	2.85420...	2.92852...	2.772...	2.0	1.0
22	1.0	68.0	52.0	1.0	17.0	120.0	1.0	24.0	0.0	0.0	2.0	20.7	1391.05	0.0	0.0	3.03013...	3.56809...	3.09104...	3.59829...	4.787...	1.0	0.0
23	3.0	53.0	33.0	1.0	10.0	101.0	5.0	4.0	0.0	1.0	2.0	5.3	253.35	1.0	1.0	1.66770...	3.90399...	3.28653...	3.93963...	4.615...	4.0	0.0
24	3.0	55.0	48.0	1.0	19.0	67.0	1.0	25.0	0.0	0.0	3.0	15.05	810.45	0.0	0.0	2.71137...	3.56809...	3.30505...	3.59829...	4.204...	1.0	0.0
25	3.0	14.0	43.0	1.0	18.0	36.0	1.0	5.0	0.0	0.0	5.0	12.5	153.75	0.0	0.0	2.52572...	3.56809...	2.89037...	3.59829...	3.583...	3.0	0.0
26	2.0	1.0	21.0	0.0	0.0	33.0	2.0	0.0	0.0	1.0	3.0	2.2	2.2	0.0	0.0	0.78845...	3.56809...	3.70130...	3.59829...	3.496...	3.0	0.0
27	2.0	42.0	40.0	0.0	7.0	37.0	2.0	8.0	0.0	1.0	1.0	8.25	399.15	1.0	0.0	2.11021...	3.60821...	3.33220...	3.62167...	3.610...	4.0	0.0
28	3.0	25.0	33.0	1.0	11.0	31.0	1.0	5.0	0.0	0.0	4.0	9.1	234.95	0.0	0.0	2.20827...	3.56809...	2.85420...	3.59829...	3.433...	3.0	0.0
29	1.0	9.0	21.0	1.0	1.0	17.0	2.0	2.0	0.0	1.0	3.0	2.9	25.25	0.0	0.0	1.06471...	3.56809...	2.85420...	3.59829...	2.833...	1.0	0.0
30	2.0	13.0	33.0	1.0	9.0	19.0	4.0	0.0	0.0	1.0	2.0	5.55	75.25	1.0	1.0	1.71379...	3.30871...	2.85420...	3.59829...	2.944...	2.0	0.0
31	1.0	56.0	37.0	1.0	6.0	36.0	1.0	13.0	0.0	1.0	2.0	10.6	582.6	1.0	0.0	2.36085...	3.43720...	2.90416...	3.59829...	3.583...	2.0	0.0
32	1.0	71.0	53.0	1.0	27.0	155.0	5.0	12.0	0.0	0.0	2.0	21.0	1519.2	1.0	1.0	3.04452...	3.56809...	3.52636...	3.91102...	5.043...	4.0	0.0
33	1.0	35.0	50.0	1.0	26.0	140.0	2.0	21.0	0.0	1.0	4.0	6.5	247.55	0.0	0.0	1.87180...	3.56809...	3.55534...	3.59829...	4.941...	3.0	0.0
34	1.0	11.0	27.0	1.0	8.0	55.0	5.0	0.0	0.0	0.0	3.0	4.8	54.1	1.0	0.0	1.56861...	2.97297...	2.85420...	3.59829...	4.007...	2.0	0.0
35	2.0	60.0	46.0	1.0	13.0	163.0	3.0	24.0	0.0	0.0	2.0	33.9	1947.95	1.0	1.0	3.52341...	3.79885...	2.62103...	4.01186...	5.093...	4.0	0.0
36	3.0	20.0	35.0	1.0	11.0	52.0	4.0	0.0	0.0	0.0	2.0	4.25	82.7	1.0	0.0	1.44691...	3.41936...	2.85420...	3.59829...	3.951...	2.0	1.0
37	2.0	54.0	60.0	0.0	38.0	211.0	4.0	25.0	0.0	0.0	1.0	21.15	1228.7	1.0	1.0	3.05163...	3.83622...	3.99360...	4.00460...	5.351...	4.0	0.0
38	1.0	44.0	57.0	0.0	1.0	186.0	2.0	17.0	0.0	0.0	2.0	9.8	428.25	0.0	0.0	2.28238...	3.56809...	3.58351...	3.72930...	5.225...	3.0	0.0
39	1.0	11.0	41.0	1.0	0.0	39.0	1.0	1.0	0.0	1.0	2.0	6.55	67.8	0.0	0.0	1.87946...	3.56809...	2.98315...	3.59829...	3.663...	3.0	1.0
40	2.0	72.0	57.0	0.0	34.0	22.0	2.0	35.0	1.0	1.0	1.0	41.75	3043.05	0.0	0.0	3.73169...	3.56809...	2.93119...	3.59829...	3.091...	3.0	0.0
41	3.0	10.0	41.0	0.0	7.0	30.0	1.0	7.0	0.0	0.0	1.0	2.5	31.25	0.0	0.0	0.91629...	3.56809...	3.98434...	3.59829...	3.401...	3.0	0.0
42	2.0	15.0	28.0	1.0	0.0	29.0	2.0	4.0	0.0	1.0	1.0	4.25	78.0	0.0	0.0	1.44691...	3.56809...	2.87638...	3.59829...	3.367...	3.0	0.0
43	2.0	27.0	28.0	1.0	4.0	23.0	2.0	8.0	0.0	0.0	5.0	6.2	180.15	0.0	0.0	1.82454...	3.56809...	2.85420...	3.59829...	3.135...	1.0	0.0
44	1.0	9.0	36.0	1.0	14.0	62.0	4.0	10.0	0.0	0.0	6.0	5.65	43.3	1.0	0.0	1.73165...	3.84481...	2.85420...	3.88156...	4.127...	4.0	1.0
45	1.0	64.0	43.0	1.0	20.0	76.0	4.0	20.0	0.0	1.0	4.0	14.7	897.05	0.0	0.0	2.68784...	3.56809...	2.39789...	3.59829...	4.330...	3.0	0.0
46	1.0	65.0	41.0	1.0	3.0	74.0	4.0	16.0	0.0	0.0	2.0	14.5	963.3	1.0	1.0	2.67414...	3.61091...	2.83321...	3.59829...	4.304...	2.0	0.0
47	1.0	49.0	51.0	1.0	27.0	63.0	4.0	19.0	0.0	0.0	5.0	12.85	585.6	1.0	0.0	2.55334...	3.56809...	2.65675...	3.59829...	4.143...	1.0	0.0
48	3.0	47.0	41.0	1.0	0.0	36.0	4.0	8.0	0.0	0.0	2.0	7.75	361.0	1.0	1.0	2.04769...	3.62300...	2.91777...	3.65842...	3.583...	4.0	1.0
49	3.0	9.0	34.0	1.0	9.0	33.0	2.0	8.0	0.0	1.0	4.0	2.95	18.9	0.0	0.0	1.08180...	3.13331...	2.85420...	3.59829...	3.496...	1.0	0.0
50	1.0	5.0	36.0	0.0	14.0	29.0	2.0	9.0	0.0	1.0	1.0	3.25	16.8	1.0	1.0	1.17865...	3.56809...	2.74084...	3.28653...	3.367...	3.0	1.0
51	2.0	30.0	34.0	1.0	4.0	27.0	2.0	1.0	0.0	0.0	5.0	6.3	150.9	1.0	0.0	1.84054...	3.11351...	2.85420...	3.59829...	3.295...	1.0	1.0
52	1.0	56.0	52.0	1.0	28.0	49.0	2.0	12.0	0.0	0.0	4.0	24.75	1349.05	0.0	1.0	3.20882...	3.56809...	3.10234...	3.59829...	3.891...	2.0	0.0
53	3.0	10.0	22.0	0.0	0.0	24.0	4.0	0.0	0.0	0.0	1.0	7.8	63.0	1.0	1.0	2.05412...	3.61765...	3.11351...	3.40286...	3.178...	4.0	0.0
54	1.0	7.0	26.0	1.0	3.0	26.0	2.0	2.0	0.0	0.0	5.0	4.85	33.7	0.0	0.0	1.57897...	3.56809...	2.85420...	3.59829...	3.258...	1.0	0.0
55	1.0	52.0	27.0	0.0	6.0	47.0	3.0	5.0	0.0	0.0	2.0	6.25	330.4	0.0	1.0	1.83258...	3.56809...	2.65675...	3.59829...	3.850...	1.0	0.0

We replaced missing values so that we can find outliers and extreme values by using interquartile range, because we can't find the IQR if we have missing values.

However since there are a lot of missing values, if we replace all the values with the average then our data will become biased. Regardless of that we will still be able to detect outliers.
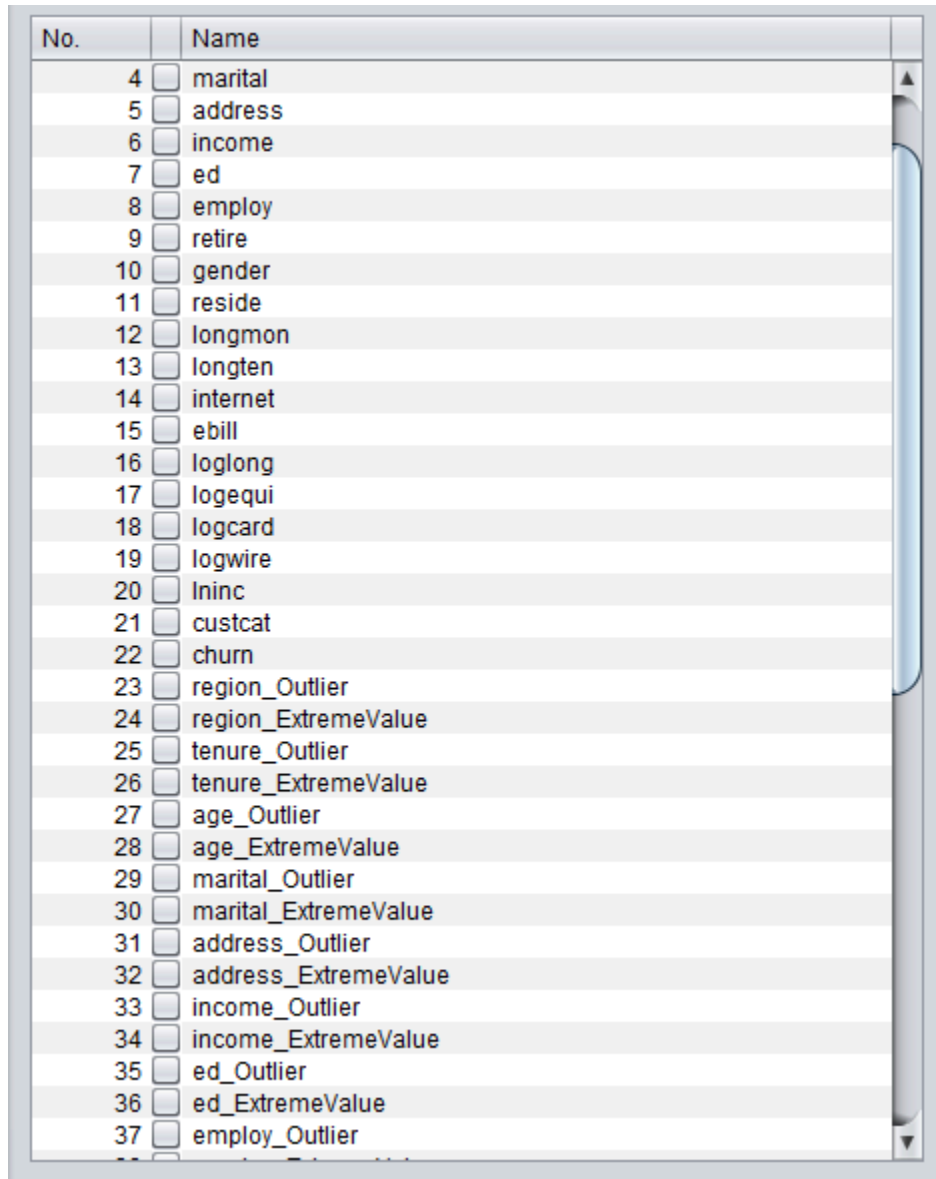
After applying IQR we have 2 extra columns now

Relation: small_telco_labOne-weka.filters.unsupervised.attribute.ReplaceMissingValues-weka.filters.unsupervised.attribute.InterquartileRange-Rfirst-last-O3.0-E6.0

No.	1: region	2: tenure	3: age	4: marital	5: address	6: income	7: ed	8: employ	9: retire	10: gender	11: reside	12: longmon	13: longten	14: internet	15: ebill	16: loglong	17: logequi	18: logcard	19: logwire	20: lninc	21: custcat	22: churn	23: Outlier	24: ExtremeValue
1	1.0	68.0	41.0	1.0	21.0	72.0	1.0	22.0	0.0	0.0	3.0	24.15	1659.7	0.0	0.0	3.18428...	3.56809...	2.80336...	3.59829...	4.276...	2.0	0.0	no	no
2	1.0	41.0	38.0	1.0	8.0	37.0	2.0	9.0	0.0	1.0	3.0	8.55	308.7	0.0	0.0	2.14593...	3.56809...	3.73169...	3.59829...	3.610...	1.0	0.0	no	no
3	1.0	68.0	52.0	1.0	17.0	120.0	1.0	24.0	0.0	0.0	2.0	20.7	1391.05	0.0	0.0	3.03013...	3.56809...	3.09104...	3.59829...	4.787...	1.0	0.0	no	no
4	1.0	9.0	21.0	1.0	1.0	17.0	2.0	2.0	0.0	1.0	3.0	2.9	25.25	0.0	0.0	1.06471...	3.56809...	2.85420...	3.59829...	2.833...	1.0	0.0	no	no
5	1.0	35.0	50.0	1.0	26.0	140.0	2.0	21.0	0.0	1.0	4.0	6.5	247.55	0.0	0.0	1.87180...	3.56809...	3.55534...	3.59829...	4.941...	3.0	0.0	no	no
6	1.0	11.0	41.0	1.0	0.0	39.0	1.0	1.0	0.0	1.0	2.0	6.55	67.8	0.0	0.0	1.87946...	3.56809...	2.98315...	3.59829...	3.663...	3.0	1.0	no	no ▼
7	1.0	64.0	43.0	1.0	20.0	76.0	4.0	20.0	0.0	1.0	4.0	14.7	897.05	0.0	0.0	2.68784...	3.56809...	2.39789...	3.59829...	4.330...	3.0	0.0	no	no
8	1.0	49.0	51.0	1.0	27.0	63.0	4.0	19.0	0.0	0.0	5.0	12.85	585.6	0.0	1.0	2.55334...	3.56809...	2.65675...	3.59829...	4.143...	2.0	0.0	no	no
9	1.0	56.0	52.0	1.0	28.0	49.0	2.0	12.0	0.0	0.0	4.0	24.75	1349.05	0.0	0.0	3.20882...	3.56809...	3.10234...	3.59829...	3.891...	2.0	0.0	no	no
10	1.0	7.0	26.0	1.0	3.0	26.0	2.0	2.0	0.0	0.0	5.0	4.85	33.7	0.0	0.0	1.57897...	3.56809...	2.85420...	3.59829...	3.258...	1.0	0.0	no	no
11	1.0	52.0	27.0	0.0	6.0	47.0	3.0	5.0	0.0	0.0	2.0	6.25	330.4	0.0	1.0	1.83258...	3.56809...	2.65675...	3.59829...	3.850...	1.0	0.0	no	no
12	1.0	58.0	62.0	1.0	36.0	27.0	1.0	0.0	0.0	0.0	2.0	15.5	967.1	0.0	0.0	2.74084...	3.56809...	3.54095...	3.59829...	3.295...	1.0	0.0	no	no
13	1.0	16.0	27.0	0.0	5.0	37.0	3.0	5.0	0.0	0.0	4.0	6.0	80.7	0.0	0.0	1.79175...	3.56809...	2.85420...	3.59829...	3.610...	1.0	0.0	no	no
14	1.0	40.0	57.0	1.0	15.0	22.0	2.0	9.0	0.0	0.0	2.0	8.55	381.5	0.0	0.0	2.14593...	3.56809...	2.98315...	3.59829...	3.091...	1.0	0.0	no	no
15	1.0	20.0	42.0	0.0	4.0	17.0	3.0	5.0	0.0	0.0	1.0	7.8	175.85	0.0	0.0	2.05412...	3.56809...	2.85420...	3.59829...	2.833...	1.0	0.0	no	no
16	1.0	40.0	38.0	1.0	10.0	85.0	3.0	12.0	0.0	0.0	2.0	10.6	384.8	0.0	0.0	2.36085...	3.56809...	2.85420...	3.59829...	4.442...	3.0	1.0	no	no
17	1.0	67.0	68.0	0.0	28.0	244.0	1.0	47.0	0.0	1.0	1.0	30.25	2186.2	0.0	0.0	3.40949...	3.56809...	3.42588...	3.59829...	5.497...	3.0	0.0	no	no
18	1.0	42.0	47.0	1.0	17.0	212.0	4.0	17.0	0.0	0.0	2.0	7.45	320.9	0.0	0.0	2.00821...	3.56809...	3.20982...	3.59829...	5.356...	3.0	0.0	no	no
19	1.0	55.0	53.0	1.0	21.0	34.0	1.0	8.0	0.0	0.0	2.0	5.7	304.4	0.0	0.0	1.74046...	3.56809...	2.85420...	3.59829...	3.526...	3.0	0.0	no	no
20	1.0	35.0	61.0	0.0	23.0	41.0	2.0	11.0	0.0	0.0	1.0	9.6	353.55	0.0	0.0	2.26176...	3.56809...	2.52129...	3.59829...	3.713...	1.0	0.0	no	no
21	1.0	13.0	54.0	0.0	2.0	31.0	4.0	2.0	0.0	0.0	1.0	5.85	97.0	1.0	1.0	1.76644...	3.56809...	2.85420...	3.59829...	3.433...	1.0	0.0	no	no
22	1.0	59.0	42.0	0.0	1.0	68.0	2.0	21.0	0.0	1.0	1.0	17.3	997.85	0.0	0.0	2.85070...	3.56809...	2.95751...	3.59829...	4.219...	3.0	0.0	no	no
23	1.0	13.0	34.0	0.0	11.0	20.0	3.0	0.0	0.0	1.0	1.0	4.8	71.05	1.0	0.0	1.56861...	3.56809...	2.85420...	3.59829...	2.995...	1.0	0.0	no	no
24	1.0	40.0	29.0	1.0	6.0	40.0	2.0	8.0	0.0	1.0	5.0	13.0	502.95	0.0	0.0	2.56494...	3.56809...	2.85420...	3.59829...	3.688...	3.0	0.0	no	no
25	1.0	48.0	55.0	0.0	15.0	79.0	1.0	25.0	0.0	0.0	1.0	13.8	668.65	0.0	0.0	2.62466...	3.56809...	3.23867...	3.59829...	4.369...	3.0	0.0	no	no
26	1.0	42.0	44.0	1.0	2.0	99.0	2.0	21.0	0.0	0.0	3.0	22.05	841.55	0.0	0.0	3.09331...	3.56809...	2.27726...	3.59829...	4.595...	3.0	0.0	no	no
27	1.0	65.0	37.0	0.0	8.0	56.0	2.0	15.0	0.0	0.0	1.0	10.25	681.95	0.0	0.0	2.32727...	3.56809...	2.37490...	3.59829...	4.025...	2.0	0.0	no	no
28	1.0	3.0	24.0	1.0	2.0	20.0	2.0	3.0	0.0	1.0	5.0	3.35	7.55	1.0	0.0	1.20896...	3.56809...	2.22462...	3.59829...	2.995...	3.0	0.0	no	no
29	1.0	18.0	48.0	1.0	20.0	41.0	1.0	2.0	0.0	1.0	2.0	4.35	59.15	0.0	0.0	1.47017...	3.56809...	2.07944...	3.59829...	3.713...	1.0	0.0	no	no
30	1.0	64.0	55.0	0.0	28.0	104.0	1.0	26.0	0.0	1.0	1.0	15.0	960.95	0.0	0.0	2.70805...	3.56809...	3.66995...	3.59829...	4.644...	3.0	0.0	no	no
31	1.0	71.0	39.0	0.0	2.0	40.0	3.0	17.0	0.0	0.0	1.0	36.25	2553.7	0.0	0.0	3.59043...	3.56809...	3.65065...	3.59829...	3.688...	3.0	0.0	no	no
32	1.0	17.0	51.0	1.0	10.0	95.0	2.0	15.0	0.0	1.0	2.0	7.45	132.9	0.0	0.0	2.00821...	3.56809...	2.85420...	3.59829...	4.553...	1.0	1.0	no	no
33	1.0	35.0	43.0	0.0	12.0	224.0	3.0	17.0	0.0	0.0	1.0	7.7	271.55	0.0	0.0	2.04122...	3.56809...	2.52129...	3.59829...	5.411...	1.0	0.0	no	no
34	1.0	8.0	30.0	0.0	1.0	34.0	2.0	9.0	0.0	1.0	1.0	4.25	28.65	0.0	0.0	1.44691...	3.56809...	2.58399...	3.59829...	3.526...	3.0	0.0	no	no
35	1.0	22.0	33.0	0.0	9.0	54.0	1.0	10.0	0.0	0.0	1.0	11.05	246.7	0.0	0.0	2.40243...	3.56809...	2.93119...	3.59829...	3.988...	3.0	0.0	no	no
36	1.0	28.0	40.0	1.0	1.0	47.0	2.0	9.0	0.0	1.0	3.0	8.1	224.25	0.0	0.0	2.09186...	3.56809...	3.34990...	3.59829...	3.850...	3.0	0.0	no	no
37	1.0	71.0	47.0	1.0	23.0	142.0	1.0	30.0	0.0	0.0	2.0	32.2	2237.35	0.0	0.0	3.47196...	3.56809...	4.40976...	3.59829...	4.955...	2.0	0.0	yes	no
38	1.0	24.0	26.0	0.0	7.0	55.0	2.0	7.0	0.0	1.0	1.0	7.6	175.8	0.0	0.0	2.02814...	3.56809...	2.85420...	3.59829...	4.007...	1.0	0.0	no	no
39	1.0	45.0	66.0	0.0	43.0	144.0	2.0	13.0	0.0	1.0	1.0	7.75	338.8	1.0	0.0	2.04769...	3.56809...	2.56494...	3.59829...	4.969...	2.0	0.0	no	no
40	1.0	71.0	56.0	0.0	23.0	170.0	1.0	30.0	0.0	1.0	1.0	14.2	1001.2	0.0	0.0	2.65324...	3.56809...	3.40119...	3.59829...	5.135...	4.0	0.0	no	no
41	1.0	8.0	63.0	1.0	1.0	31.0	1.0	9.0	0.0	0.0	2.0	2.25	16.8	0.0	0.0	0.81093...	3.56809...	2.42036...	3.59829...	3.433...	3.0	0.0	no	no
42	1.0	16.0	24.0	1.0	5.0	24.0	3.0	2.0	0.0	0.0	5.0	9.4	124.2	0.0	0.0	2.24070...	3.56809...	2.69124...	3.59829...	3.178...	3.0	0.0	no	no
43	1.0	36.0	58.0	0.0	34.0	80.0	1.0	21.0	0.0	1.0	1.0	8.5	298.25	0.0	0.0	2.14006...	3.56809...	2.14006...	3.59829...	4.382...	2.0	0.0	no	no
44	1.0	61.0	46.0	0.0	5.0	318.0	3.0	18.0	0.0	1.0	1.0	28.9	1796.7	0.0	0.0	3.36384...	3.56809...	4.43970...	3.59829...	5.762...	3.0	0.0	yes	no
45	1.0	35.0	39.0	1.0	11.0	30.0	3.0	2.0	0.0	1.0	3.0	6.85	224.85	0.0	0.0	1.92424...	3.56809...	2.85420...	3.59829...	3.401...	3.0	1.0	no	no
46	1.0	23.0	35.0	1.0	0.0	23.0	2.0	1.0	0.0	0.0	5.0	6.7	153.9	0.0	0.0	1.90210...	3.56809...	2.85420...	3.59829...	3.135...	3.0	0.0	no	no
47	1.0	30.0	27.0	0.0	4.0	47.0	4.0	2.0	0.0	1.0	2.0	10.75	296.9	1.0	0.0	2.37490...	3.56809...	3.05635...	3.59829...	3.850...	2.0	0.0	no	no
48	1.0	45.0	52.0	0.0	15.0	46.0	5.0	8.0	0.0	1.0	1.0	9.4	402.1	0.0	1.0	2.24070...	3.56809...	2.16905...	3.59829...	3.828...	2.0	1.0	no	no
49	1.0	13.0	45.0	1.0	3.0	99.0	3.0	8.0	0.0	1.0	2.0	8.7	103.4	1.0	0.0	2.16332...	3.56809...	3.16758...	3.59829...	4.595...	3.0	1.0	no	no
50	1.0	37.0	51.0	1.0	15.0	54.0	1.0	15.0	0.0	0.0	3.0	9.55	323.65	0.0	0.0	2.25654...	3.56809...	2.11021...	3.59829...	3.988...	3.0	0.0	no	no
51	1.0	54.0	43.0	0.0	12.0	53.0	2.0	12.0	0.0	0.0	1.0	14.35	775.9	0.0	0.0	2.66374...	3.56809...	2.81839...	3.59829...	3.970...	2.0	0.0	no	no
52	1.0	34.0	55.0	0.0	2.0	48.0	2.0	11.0	0.0	0.0	1.0	4.25	143.35	0.0	0.0	1.44691...	3.56809...	2.85420...	3.59829...	3.871...	1.0	0.0	no	no
53	1.0	37.0	54.0	1.0	35.0	183.0	2.0	22.0	0.0	0.0	3.0	7.3	257.6	0.0	0.0	1.98787...	3.56809...	2.01490...	3.59829...	5.209...	3.0	0.0	no	no
54	1.0	28.0	31.0	1.0	0.0	42.0	4.0	5.0	0.0	1.0	3.0	12.25	373.8	0.0	0.0	2.50552...	3.56809...	2.85420...	3.59829...	3.737...	3.0	0.0	no	no
55	1.0	20.0	41.0	1.0	7.0	67.0	4.0	14.0	0.0	1.0	4.0	7.25	149.1	0.0	0.0	1.98100...	3.56809...	2.85420...	3.59829...	4.204...	1.0	0.0	no	no
56	1.0	72.0	41.0	1.0	21.0	63.0	1.0	24.0	0.0	0.0	3.0	41.95	3114.75	0.0	0.0	3.73647...	3.56809...	3.50405...	3.59829...	4.143...	3.0	0.0	yes	no

Scatter plot matrix row labels: lninc, logwire, logcard, logequi, loglong

After turning detectionperAttribute to TRUE. A column of extreme values and outliers is generated for each attribute.

No.		Name
4	☐	marital
5	☐	address
6	☐	income
7	☐	ed
8	☐	employ
9	☐	retire
10	☐	gender
11	☐	reside
12	☐	longmon
13	☐	longten
14	☐	internet
15	☐	ebill
16	☐	loglong
17	☐	logequi
18	☐	logcard
19	☐	logwire
20	☐	lninc
21	☐	custcat
22	☐	churn
23	☐	region_Outlier
24	☐	region_ExtremeValue
25	☐	tenure_Outlier
26	☐	tenure_ExtremeValue
27	☐	age_Outlier
28	☐	age_ExtremeValue
29	☐	marital_Outlier
30	☐	marital_ExtremeValue
31	☐	address_Outlier
32	☐	address_ExtremeValue
33	☐	income_Outlier
34	☐	income_ExtremeValue
35	☐	ed_Outlier
36	☐	ed_ExtremeValue
37	☐	employ_Outlier

Therefore now we have a total of 68 attributes

Current relation

Relation: small_telco_labOne-weka.filters.unsuper...   Attributes: 68
Instances: 930   Sum of weights: 930

After removing the outliers we now have a total of 930 rows.

This is the final visualization