

# The ontario-road-distances data

March 8, 2011

The data:

Barrie,0,260,190,405,500,145,125,330,180,260,220,250,430,120,160,315,595,200,1285,90,430  
Belleville,260,0,290,155,250,255,280,75,280,360,315,400,230,360,105,455,805,300,1495,190,545  
Brantford,190,290,0,420,535,40,300,340,40,85,105,430,500,185,230,185,755,90,1245,85,275  
Brockville,405,155,420,0,95,405,405,80,425,510,465,420,110,510,255,605,850,445,1525,340,695  
Cornwall,500,250,535,95,0,500,450,180,520,605,560,465,100,605,340,700,895,540,1570,435,790  
Hamilton,145,255,40,405,500,0,270,330,60,125,70,395,470,190,200,220,740,50,1430,70,310  
Huntsville,125,280,300,405,450,270,0,350,280,365,330,130,350,240,195,440,545,310,1230,215,510  
Kingston,330,75,340,80,180,330,350,0,350,430,390,460,175,430,180,530,875,370,1565,260,620  
Kitchener,180,280,40,425,520,60,280,350,0,100,130,405,490,150,220,190,750,110,1440,105,285  
London,260,360,85,510,605,125,365,430,100,0,190,495,570,210,300,100,840,180,1525,185,190  
NiagaraFalls,220,315,105,465,560,70,330,390,130,190,0,455,530,260,260,290,800,20,1490,130,380  
NorthBay,250,400,430,420,465,395,130,460,405,495,455,0,365,370,320,565,430,435,1105,345,680  
Ottawa,430,230,500,110,100,470,350,175,490,570,530,365,0,545,270,670,795,510,1465,400,760  
OwenSound,120,360,185,510,605,190,240,430,150,210,260,370,545,0,275,255,685,240,1375,190,390  
Peterborough,160,105,230,255,340,200,195,180,220,300,260,320,270,275,0,400,700,240,1390,135,510  
Sarnia,315,455,185,605,700,220,440,530,190,100,290,565,670,255,400,0,910,275,1600,280,160  
SaultSteMarie,595,805,755,850,895,740,545,875,750,840,800,430,795,685,700,910,0,780,690,690,610  
StCatharines,200,300,90,445,540,50,310,370,110,180,20,435,510,240,240,275,780,0,1470,110,365  
ThunderBay,1285,1495,1245,1525,1570,1430,1230,1565,1440,1525,1490,1105,1465,1375,1390,1600,610  
Toronto,90,190,85,340,435,70,215,260,105,185,130,345,400,190,135,280,690,110,1375,0,370  
Windsor,430,545,275,695,790,310,555,620,285,190,380,680,760,390,490,160,1025,365,1715,370,0

The SAS code and output:

```
options linesize=75;

data dist(type=distance);
  infile "ontario-road-distances.dat" delimiter=",";
  input team $ Barrie Belleville Brantford Brockville Cornwall
         Hamilton Huntsville Kingston Kitchener London NiagaraFalls NorthBay
         Ottawa OwenSound Peterborough Sarnia SaultSteMarie StCatharines
         ThunderBay Toronto Windsor;

proc print;
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proc cluster method=average outtree=tree;
  id team;

proc tree horizontal;
  id team;

run;

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Obs	team	Barrie	Belleville	Brantford	Brockville	Cornwall	Hamilton	
1	Barrie	0	260	190	405	500	145	
2	Bellevil	260	0	290	155	250	255	
3	Brantfor	190	290	0	420	535	40	
4	Brockvil	405	155	420	0	95	405	
5	Cornwall	500	250	535	95	0	500	
6	Hamilton	145	255	40	405	500	0	
7	Huntsvil	125	280	300	405	450	270	
8	Kingston	330	75	340	80	180	330	
9	Kitchene	180	280	40	425	520	60	
10	London	260	360	85	510	605	125	
11	NiagaraF	220	315	105	465	560	70	
12	NorthBay	250	400	430	420	465	395	
13	Ottawa	430	230	500	110	100	470	
14	OwenSoun	120	360	185	510	605	190	
15	Peterbor	160	105	230	255	340	200	
16	Sarnia	315	455	185	605	700	220	
					Niagara	North		Owen
Obs	Huntsville	Kingston	Kitchener	London	Falls	Bay	Ottawa	Sound
1	125	330	180	260	220	250	430	120
2	280	75	280	360	315	400	230	360
3	300	340	40	85	105	430	500	185
4	405	80	425	510	465	420	110	510
5	450	180	520	605	560	465	100	605
6	270	330	60	125	70	395	470	190
7	0	350	280	365	330	130	350	240
8	350	0	350	430	390	460	175	430
9	280	350	0	100	130	405	490	150
10	365	430	100	0	190	495	570	210
11	330	390	130	190	0	455	530	260
12	130	460	405	495	455	0	365	370
13	350	175	490	570	530	365	0	545

14	240	430	150	210	260	370	545	0
15	195	180	220	300	260	320	270	275
16	440	530	190	100	290	565	670	255
			Sault	St	Thunder			
Obs	Peterborough	Sarnia	SteMarie	Catharines	Bay	Toronto	Windsor	
1	160	315	595	200	1285	90	430	
2	105	455	805	300	1495	190	545	
3	230	185	755	90	1245	85	275	
4	255	605	850	445	1525	340	695	
5	340	700	895	540	1570	435	790	
6	200	220	740	50	1430	70	310	
7	195	440	545	310	1230	215	555	
8	180	530	875	370	1565	260	620	
9	220	190	750	110	1440	105	285	
10	300	100	840	180	1525	185	190	
11	260	290	800	20	1490	130	380	
12	320	565	430	435	1105	345	680	
13	270	670	795	510	1465	400	760	
14	275	255	685	240	1375	190	390	
15	0	400	700	240	1390	135	490	
16	400	0	910	275	1600	280	160	

Obs	team	Barrie	Belleville	Brantford	Brockville	Cornwall	Hamilton	
17	SaultSte	595	805	755	850	895	740	
18	StCathar	200	300	90	445	540	50	
19	ThunderB	1285	1495	1245	1525	1570	1430	
20	Toronto	90	190	85	340	435	70	
21	Windsor	430	545	275	695	790	310	
					Niagara	North		Owen
Obs	Huntsville	Kingston	Kitchener	London	Falls	Bay	Ottawa	Sound
17	545	875	750	840	800	430	795	685
18	310	370	110	180	20	435	510	240
19	1230	1565	1440	1525	1490	1105	1465	1375
20	215	260	105	185	130	345	400	190
21	555	620	285	190	380	680	760	390
			Sault	St	Thunder			
Obs	Peterborough	Sarnia	SteMarie	Catharines	Bay	Toronto	Windsor	
17	700	910	0	780	690	690	1025	
18	240	275	780	0	1470	110	365	
19	1390	1600	690	1470	0	1375	1715	
20	135	280	690	110	1375	0	370	
21	490	160	1025	365	1715	370	0	

The CLUSTER Procedure  
Average Linkage Cluster Analysis  
Root-Mean-Square Distance Between Observations      590.026

# Cluster History

NCL	--Clusters Joined---			FREQ	Norm	T
					RMS	i
					Dist	e
20	NiagaraF	StCathar	2	0.0339		
19	Brantfor	Hamilton	2	0.0678		T
18	CL19	Kitchene	3	0.0864		
17	Bellevil	Kingston	2	0.1271		
16	CL18	Toronto	4	0.1489		
15	Brockvil	Cornwall	2	0.161		
14	London	Sarnia	2	0.1695		
13	CL16	CL20	6	0.1742		
12	CL15	Ottawa	3	0.1782		
11	Barrie	OwenSoun	2	0.2034		
10	Huntsvil	NorthBay	2	0.2203		
9	CL17	Peterbor	3	0.2497		
8	CL14	Windsor	3	0.2977		
7	CL11	CL13	8	0.3246		
6	CL9	CL12	6	0.3842		
5	CL7	CL8	11	0.4606		
4	CL6	CL10	8	0.6431		
3	CL5	CL4	19	0.7445		
2	SaultSte	ThunderB	2	1.1694		
1	CL3	CL2	21	1.9625		

