

## Comparative Analysis of KNN and SVM in Multicriteria Inventory Classification Using TOPSIS

### RESULT

Sample Size: Row:100; features: Annual Requirement, Average Unit Cost (Dollars), Lead Time (Weeks)

#### Data Set:

Item	Annual Requirement	Average Unit Cost (Dollars)	Lead Time (Weeks)
9	120000	2.21	8
4	113544	25.32	6
48	96000	2.21	8
2	89600	2.49	12
68	77612	53.67	12
79	73684	74.59	8
25	61408	58.87	16
51	58800	34.99	8
6	57360	70.32	4
49	56228	62.34	12
50	48276	38.1	8
10	44000	95.03	10
1	44460	39.25	12
69	40000	2.49	6
76	37444	34.99	6
12	36000	2.49	8
32	35200	34.99	10
59	33840	69.04	8
65	34400	2.12	8
90	30480	69.36	8
11	30000	34.99	6
3	28200	81.45	6
20	28800	34.99	6
42	26320	66.69	8
66	20800	170.95	10
23	24000	96.66	12
92	24120	34.99	8
15	24000	35.17	8
41	23400	34.99	4
19	24000	25.56	4
85	22800	42.62	8
13	20952	36.95	8
5	20400	38.1	12
89	19700	34.99	12
18	20160	69.69	6
35	20000	64.36	8
44	20840	2.36	8
22	18776	36.73	12

84	20000	37.29	4
57	20000	2.49	6
21	19200	2.26	10
16	18800	2.12	8
17	18672	4.01	4
7	16000	2.55	6
27	13640	20.86	12
46	10600	152.88	7
53	13860	59.01	5
64	12788	64.42	10
36	13600	25.51	8
91	13600	37.68	4
80	13840	6.31	8
24	12000	66.02	12
98	13200	34.99	8
47	12000	2.49	5
83	12000	3.66	4
96	11520	2.49	6
45	9112	68.04	8
28	9204	42.81	10
34	8300	69.17	12
60	8712	88.76	8
14	10000	34.3	8
55	10000	35.46	8
30	6000	129.94	10
70	5280	152.88	12
62	8000	3.51	12
86	7608	76.78	10
93	6408	103.66	12
72	3860	165.29	4
82	8000	3.66	10
100	7200	70.76	6
94	7560	69.59	8
40	6000	67	12
43	8000	2.42	8
81	6152	87.98	8
77	8000	3.66	6
52	6000	26.64	12
26	6000	65.24	8
88	6080	34.99	10
97	7440	2.12	8
73	3820	112.32	12
8	5652	41.09	8
39	5600	3.51	10
54	6000	34.99	8
61	4000	104.38	8
38	4400	72.31	8
71	4460	72.56	8

75	4960	68.11	6
56	6400	11.55	8
95	4200	74.31	12
78	4080	64.24	10
31	4000	31.02	10
63	3900	39.37	8
58	4000	48.25	6
37	4000	3.51	10
99	4880	8.51	4
74	3708	36.36	4
87	4000	2.04	8
67	4000	3.66	7
29	4000	3.66	6
33	4000	3.66	6

#### TOPSIS:

	Annual Requirement	Average Unit Cost (Dollars)	Lead Time (Weeks)
V+	0.151502	0.000003	0.000003
V-	0.004681	0.000216	0.00001

#### TOPSIS DATA

Item	Annual Requirement	Average Unit Cost (Dollars)	Lead Time (Weeks)	S+	S-	S+ + S-	p
1	0.056131538	4.96E-05	7.58E-06	0.095370601	0.004419418	0.099790019	0.044287177
2	0.113121589	3.14E-06	7.58E-06	0.038380539	0.003215617	0.041596156	0.077305629
3	0.035603	0.000102832	3.79E-06	0.115899171	0.008753859	0.12465303	0.070225799
4	0.143351313	3.20E-05	3.79E-06	0.008150868	0.004620035	0.012770903	0.361762606
5	0.025755362	4.81E-05	7.58E-06	0.125746774	0.01113293	0.136879704	0.081333681
6	0.072418017	8.88E-05	2.53E-06	0.079084158	0.001587651	0.080671808	0.019680364
7	0.020200284	3.22E-06	3.79E-06	0.131301844	0.012560617	0.143862461	0.087309899
8	0.00713575	5.19E-05	5.05E-06	0.144366386	0.016161679	0.160528065	0.100678217
9	0.151502127	2.79E-06	5.05E-06	2.53E-06	0.004686399	0.004688933	0.999459549
10	0.05555078	0.000119977	6.31E-06	0.095951419	0.0045304	0.100481819	0.045086762
11	0.037875532	4.42E-05	3.79E-06	0.113626603	0.008232423	0.121859027	0.067556943
12	0.045450638	3.14E-06	5.05E-06	0.106051489	0.006569057	0.112620546	0.058329116
13	0.026452271	4.67E-05	5.05E-06	0.125049864	0.010958181	0.136008045	0.080570094
14	0.012625177	4.33E-05	5.05E-06	0.138876956	0.01460699	0.153483946	0.095169495
15	0.030300425	4.44E-05	5.05E-06	0.121201709	0.010010769	0.131212478	0.076294335
16	0.023735333	2.68E-06	5.05E-06	0.127766794	0.011644943	0.139411737	0.083529141
17	0.023573731	5.06E-06	2.53E-06	0.127928396	0.011686256	0.139614653	0.083703653

18	0.025452357	8.80E-05	3.79E-06	0.126049799	0.011209211	0.13725901	0.081664666
19	0.030300425	3.23E-05	2.53E-06	0.121201706	0.010010769	0.131212474	0.076294337
20	0.036360511	4.42E-05	3.79E-06	0.115141624	0.008578897	0.123720522	0.069340941
21	0.02424034	2.85E-06	6.31E-06	0.127261787	0.011516174	0.138777961	0.082982728
22	0.023705033	4.64E-05	7.58E-06	0.127797102	0.011652685	0.139449787	0.083561869
23	0.030300425	0.000122035	7.58E-06	0.121201761	0.010010768	0.131212529	0.076294303
24	0.015150213	8.34E-05	7.58E-06	0.136351939	0.013912107	0.150264045	0.092584401
25	0.077528689	7.43E-05	1.01E-05	0.073973474	0.000819643	0.074793117	0.010958804
26	0.007575106	8.24E-05	5.05E-06	0.143927043	0.016035027	0.159962071	0.100242684
27	0.017220742	2.63E-05	7.58E-06	0.134281388	0.013351823	0.147633211	0.090439157
28	0.011620213	5.40E-05	6.31E-06	0.139881924	0.014887102	0.154769026	0.096189157
29	0.005050071	4.62E-06	3.79E-06	0.146452057	0.016768181	0.163220238	0.102733469
30	0.007575106	0.000164052	6.31E-06	0.143927112	0.016035027	0.159962139	0.10024264
31	0.005050071	3.92E-05	6.31E-06	0.146452061	0.016768181	0.163220242	0.102733466
32	0.044440624	4.42E-05	6.31E-06	0.107061512	0.006784191	0.113845703	0.059591105
33	0.005050071	4.62E-06	3.79E-06	0.146452057	0.016768181	0.163220238	0.102733469
34	0.010478897	8.73E-05	7.58E-06	0.141023256	0.015207671	0.156230926	0.097340974
35	0.025250355	8.13E-05	5.05E-06	0.126251797	0.011260167	0.137511965	0.081885001
36	0.017170241	3.22E-05	5.05E-06	0.13433189	0.013365386	0.147697276	0.09049176
37	0.005050071	4.43E-06	6.31E-06	0.146452057	0.016768181	0.163220238	0.102733469
38	0.005555078	9.13E-05	5.05E-06	0.145947076	0.01662053	0.162567606	0.102237649
39	0.007070099	4.43E-06	6.31E-06	0.144432028	0.016180638	0.160612666	0.100743223
40	0.007575106	8.46E-05	7.58E-06	0.143927045	0.016035027	0.159962072	0.100242683
41	0.029542915	4.42E-05	2.53E-06	0.12195922	0.010194924	0.132154143	0.077144184
42	0.033229467	8.42E-05	5.05E-06	0.118272689	0.009309514	0.127582203	0.072968751
43	0.010100142	3.06E-06	5.05E-06	0.141401986	0.01531463	0.156716616	0.097721802
44	0.026310869	2.98E-06	5.05E-06	0.125191258	0.010993559	0.136184817	0.08072529
45	0.011504062	8.59E-05	5.05E-06	0.139998091	0.014919607	0.154917698	0.096306667
46	0.013382688	0.000193014	4.42E-06	0.138119571	0.014397185	0.152516756	0.094397397
47	0.015150213	3.14E-06	3.16E-06	0.136351915	0.013912107	0.150264022	0.092584417
48	0.121201702	2.79E-06	5.05E-06	0.030300426	0.003769497	0.034069923	0.110640031
49	0.070988847	7.87E-05	7.58E-06	0.080513317	0.001813886	0.082327203	0.022032648
50	0.060949306	4.81E-05	5.05E-06	0.090552833	0.003525026	0.094077859	0.037469237
51	0.074236042	4.42E-05	5.05E-06	0.077266096	0.00130662	0.078572716	0.016629435
52	0.007575106	3.36E-05	7.58E-06	0.143927025	0.016035027	0.159962052	0.100242696
53	0.017498496	7.45E-05	3.16E-06	0.134003651	0.013277316	0.147280967	0.090149569
54	0.007575106	4.42E-05	5.05E-06	0.143927027	0.016035027	0.159962055	0.100242695
55	0.012625177	4.48E-05	5.05E-06	0.138876957	0.01460699	0.153483946	0.095169495
56	0.008080113	1.46E-05	5.05E-06	0.143422015	0.015889927	0.159311942	0.099740969
57	0.025250355	3.14E-06	3.79E-06	0.126251773	0.011260168	0.137511194	0.081885017
58	0.005050071	6.09E-05	3.79E-06	0.146452068	0.016768181	0.163220249	0.102733461
59	0.0427236	8.72E-05	5.05E-06	0.10877856	0.007154615	0.115933176	0.061713269
60	0.010999054	0.000112061	5.05E-06	0.140503116	0.015061247	0.155564363	0.096816823
61	0.005050071	0.000131782	5.05E-06	0.146452114	0.016768181	0.163220295	0.102733432
62	0.010100142	4.43E-06	7.58E-06	0.141401986	0.01531463	0.156716616	0.097721802
63	0.004923819	4.97E-05	5.05E-06	0.146578316	0.016805174	0.16338349	0.102857233
64	0.016145077	8.13E-05	6.31E-06	0.135357074	0.013641827	0.1489989	0.091556558
65	0.04343061	2.68E-06	5.05E-06	0.108071518	0.007001372	0.115072889	0.060842931
66	0.026260369	0.000215827	6.31E-06	0.12524194	0.011006202	0.136248143	0.080780569

67	0.005050071	4.62E-06	4.42E-06	0.146452057	0.016768181	0.163220238	0.102733469
68	0.097986526	6.78E-05	7.58E-06	0.053515641	0.001830293	0.055345935	0.03307006
69	0.050500709	3.14E-06	3.79E-06	0.101001418	0.005524098	0.106525516	0.051857039
70	0.006666094	0.000193014	7.58E-06	0.144836159	0.016297493	0.161133652	0.101142701
71	0.005630829	9.16E-05	5.05E-06	0.145871326	0.016598426	0.162469752	0.102163178
72	0.004873318	0.000208682	2.53E-06	0.146628954	0.016819979	0.163448933	0.102906632
73	0.004822818	0.000141806	7.58E-06	0.146679376	0.016834791	0.163514166	0.102956159
74	0.004681416	4.59E-05	2.53E-06	0.146820718	0.016876289	0.163697007	0.103094669
75	0.006262088	8.60E-05	3.79E-06	0.145240064	0.016414675	0.161654739	0.101541566
76	0.047273714	4.42E-05	3.79E-06	0.104228422	0.006185921	0.110414343	0.056024614
77	0.010100142	4.62E-06	3.79E-06	0.141401986	0.01531463	0.156716616	0.097721802
78	0.005151072	8.11E-05	6.31E-06	0.146351076	0.01673861	0.163089686	0.102634388
79	0.093027356	9.42E-05	5.05E-06	0.058474843	0.001280476	0.059755319	0.021428654
80	0.017473245	7.97E-06	5.05E-06	0.134028882	0.013284083	0.147312965	0.090175924
81	0.007767009	0.000111076	5.05E-06	0.143735159	0.015979829	0.159714989	0.100052157
82	0.010100142	4.62E-06	6.31E-06	0.141401986	0.01531463	0.156716616	0.097721802
83	0.015150213	4.62E-06	2.53E-06	0.136351915	0.013912107	0.150264022	0.092584417
84	0.025250355	4.71E-05	2.53E-06	0.126251781	0.011260168	0.137511948	0.081885012
85	0.028785404	5.38E-05	5.05E-06	0.122716734	0.010380227	0.133096961	0.077989965
86	0.009605235	9.69E-05	6.31E-06	0.141896924	0.015454823	0.157351747	0.09821831
87	0.005050071	2.58E-06	5.05E-06	0.146452057	0.016768181	0.163220238	0.102733469
88	0.007676108	4.42E-05	6.31E-06	0.143826026	0.016005967	0.159831992	0.100142445
89	0.024871599	4.42E-05	7.58E-06	0.126630535	0.011355931	0.137986466	0.082297423
90	0.03848154	8.76E-05	5.05E-06	0.113020619	0.008095121	0.121111574	0.066837895
91	0.017170241	4.76E-05	2.53E-06	0.134331894	0.013365386	0.14769728	0.090491757
92	0.030451928	4.42E-05	5.05E-06	0.121050207	0.009974076	0.131024283	0.076123871
93	0.008090214	0.000130873	7.58E-06	0.143411971	0.01588703	0.159299002	0.099730885
94	0.009544634	8.79E-05	5.05E-06	0.141957519	0.015472023	0.157429542	0.098279031
95	0.005302574	9.38E-05	7.58E-06	0.146199582	0.016694292	0.162893873	0.102485694
96	0.014544204	3.14E-06	3.79E-06	0.136957923	0.014077715	0.151035638	0.093207903
97	0.009393132	2.68E-06	5.05E-06	0.142108996	0.015515055	0.157624051	0.098430762
98	0.016665234	4.42E-05	5.05E-06	0.1348369	0.013501301	0.148338201	0.09101702
99	0.006161087	1.07E-05	2.53E-06	0.145341041	0.016444022	0.161785063	0.101641163
100	0.009090128	8.93E-05	3.79E-06	0.142412026	0.015601258	0.158013284	0.098733838

#### CLASSED DATA

Item	Annual Requirement	Average Unit Cost (Dollars)	Lead Time (Weeks)	p	Cumulative Sum	Cumulative Percentage	Class
9	120000	2.21	8	0.999459549	0.999459549	10.38895344	A
4	113544	25.32	6	0.361762606	1.361222154	14.1493206	A

48	96000	2.21	8	0.110640031	1.471862185	15.29937628	A
74	3708	36.36	4	0.103094669	1.574956854	16.37100116	A
73	3820	112.32	12	0.102956159	1.677913013	17.44118629	A
72	3860	165.29	4	0.102906632	1.780819645	18.5108566	A
63	3900	39.37	8	0.102857233	1.883676878	19.58001343	A
29	4000	3.66	6	0.102733469	1.986410347	20.64788379	B
33	4000	3.66	6	0.102733469	2.089143816	21.71575415	B
87	4000	2.04	8	0.102733469	2.191877285	22.7836245	B
67	4000	3.66	7	0.102733469	2.294610754	23.85149486	B
37	4000	3.51	10	0.102733469	2.397344223	24.91936522	B
31	4000	31.02	10	0.102733466	2.500077688	25.98723554	B
58	4000	48.25	6	0.102733461	2.60281115	27.05510582	B
61	4000	104.38	8	0.102733432	2.705544582	28.12297579	B
78	4080	64.24	10	0.102634388	2.808178969	29.18981624	B
95	4200	74.31	12	0.102485694	2.910664663	30.25511109	B
38	4400	72.31	8	0.102237649	3.012902312	31.31782761	B
71	4460	72.56	8	0.102163178	3.11506549	32.37977004	B
99	4880	8.51	4	0.101641163	3.216706653	33.43628634	B
75	4960	68.11	6	0.101541566	3.318248219	34.49176738	B
70	5280	152.88	12	0.101142701	3.41939092	35.54310239	B
39	5600	3.51	10	0.100743223	3.520134144	36.590285	B
8	5652	41.09	8	0.100678217	3.620812361	37.6367919	B
52	6000	26.64	12	0.100242696	3.721055057	38.67877174	B
54	6000	34.99	8	0.100242695	3.821297752	39.72075157	B
26	6000	65.24	8	0.100242684	3.921540436	40.76273128	B
40	6000	67	12	0.100242683	4.02178312	41.80471099	B
30	6000	129.94	10	0.10024264	4.122025759	42.84669025	B
88	6080	34.99	10	0.100142445	4.222168205	43.88762803	B
81	6152	87.98	8	0.100052157	4.322220362	44.9276273	B
56	6400	11.55	8	0.099740969	4.42196133	45.9643919	B
93	6408	103.66	12	0.099730885	4.521692215	47.00105168	B
100	7200	70.76	6	0.098733838	4.620426054	48.0273476	B
97	7440	2.12	8	0.098430762	4.718856815	49.05049316	B
94	7560	69.59	8	0.098279031	4.817135846	50.07206154	C
86	7608	76.78	10	0.09821831	4.915354156	51.09299876	C
77	8000	3.66	6	0.097721802	5.013075958	52.10877499	C
43	8000	2.42	8	0.097721802	5.11079776	53.12455121	C
82	8000	3.66	10	0.097721802	5.208519561	54.14032744	C
62	8000	3.51	12	0.097721802	5.306241363	55.15610366	C
34	8300	69.17	12	0.097340974	5.403582337	56.16792135	C
60	8712	88.76	8	0.096816823	5.500399161	57.17429071	C
45	9112	68.04	8	0.096306667	5.596705828	58.17535722	C
28	9204	42.81	10	0.096189157	5.692894985	59.17520227	C
14	10000	34.3	8	0.095169495	5.78806448	60.16444836	C
55	10000	35.46	8	0.095169495	5.883233975	61.15369445	C
46	10600	152.88	7	0.094397397	5.977631371	62.13491491	C
96	11520	2.49	6	0.093207903	6.070839275	63.10377109	C
47	12000	2.49	5	0.092584417	6.163423692	64.06614641	C

83	12000	3.66	4	0.092584417	6.256008108	65.02852172	C
24	12000	66.02	12	0.092584401	6.34859251	65.99089687	C
64	12788	64.42	10	0.091556558	6.440149068	66.94258804	C
98	13200	34.99	8	0.09101702	6.531166089	67.88867094	C
36	13600	25.51	8	0.09049176	6.621657849	68.82929398	C
91	13600	37.68	4	0.090491757	6.712149606	69.769917	C
27	13640	20.86	12	0.090439157	6.802588763	70.70999325	C
80	13840	6.31	8	0.090175924	6.892764687	71.64733331	C
53	13860	59.01	5	0.090149569	6.982914256	72.58439943	C
7	16000	2.55	6	0.087309899	7.070224155	73.49194839	C
17	18672	4.01	4	0.083703653	7.153927807	74.36201197	C
22	18776	36.73	12	0.083561869	7.237489677	75.23060177	C
16	18800	2.12	8	0.083529141	7.321018818	76.09885137	C
21	19200	2.26	10	0.082982728	7.404001545	76.96142124	C
89	19700	34.99	12	0.082297423	7.486298969	77.81686767	C
57	20000	2.49	6	0.081885017	7.568183985	78.6680273	C
84	20000	37.29	4	0.081885012	7.650068997	79.51918689	C
35	20000	64.36	8	0.081885001	7.731953999	80.37034637	C
18	20160	69.69	6	0.081664666	7.813618665	81.21921555	C
5	20400	38.1	12	0.081333681	7.894952345	82.06464429	C
66	20800	170.95	10	0.080780569	7.975732914	82.90432366	C
44	20840	2.36	8	0.08072529	8.056458204	83.74342843	C
13	20952	36.95	8	0.080570094	8.137028298	84.58092002	C
85	22800	42.62	8	0.077989965	8.215018263	85.39159225	C
2	89600	2.49	12	0.077305629	8.292323892	86.19515112	C
41	23400	34.99	4	0.077144184	8.369468076	86.99703184	C
19	24000	25.56	4	0.076294337	8.445762413	87.79007876	C
15	24000	35.17	8	0.076294335	8.522056748	88.58312565	C
23	24000	96.66	12	0.076294303	8.598351051	89.37617222	C
92	24120	34.99	8	0.076123871	8.674474922	90.16744722	C
42	26320	66.69	8	0.072968751	8.747443674	90.9259261	C
3	28200	81.45	6	0.070225799	8.817669473	91.65589317	C
20	28800	34.99	6	0.069340941	8.887010414	92.37666252	C
11	30000	34.99	6	0.067556943	8.954567357	93.07888797	C
90	30480	69.36	8	0.066837895	9.021405252	93.77363923	C
59	33840	69.04	8	0.061713269	9.083118521	94.4151222	C
65	34400	2.12	8	0.060842931	9.143961452	95.04755838	C
32	35200	34.99	10	0.059591105	9.203552557	95.66698236	C
12	36000	2.49	8	0.058329116	9.261881673	96.27328851	C
76	37444	34.99	6	0.056024614	9.317906287	96.85564035	C
69	40000	2.49	6	0.051857039	9.369763325	97.39467203	C
10	44000	95.03	10	0.045086762	9.414850087	97.86332958	C
1	44460	39.25	12	0.044287177	9.459137264	98.3236758	C
50	48276	38.1	8	0.037469237	9.496606501	98.71315245	C
68	77612	53.67	12	0.03307006	9.529676561	99.05690154	C
49	56228	62.34	12	0.022032648	9.551709209	99.28592147	C
79	73684	74.59	8	0.021428654	9.573137862	99.50866313	C
6	57360	70.32	4	0.019680364	9.592818226	99.71323208	C

51	58800	34.99	8	0.016629435	9.609447662	99.88608793	C
25	61408	58.87	16	0.010958804	9.620406466	100	C

**Classes:** A - 7, B - 28 & C - 65 (for Original Dataset of 100 rows)

For KNN: neighbor = 3, p = 1, this is equivalent to using Manhattan Distance (l1)

For SVC: “poly” Kernel is used.

Training Data: 70%

Model	Training Accuracy	Testing Accuracy
KNN	99.7%	98%
SVC	73.4%	68.6%

After Random Over Sampling

Dataset Row: 1000, Class: A-200, B-300, C-500

Training Data: 80%

Model	Training Accuracy	Testing Accuracy	Cross Validation (K=10)
KNN	100%	100%	100%
SVC	69.1%	72%	68.7%