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#### 1.) Project Information:

In this project we will study the impact of gap open penalty and alignment score threshold on alignment accuracy.

We are using 10 datasets of simulated sequences of human, chimpanzee, dog, and mouse. Datasets are located at /home/turing/mhou/csci652fall2019/data/Project3/simulation

Each dataset contains four genomics sequences and three true alignment files: human vs. chimpanzee, human vs. dog, and human vs. mouse. You will use a pipeline of pairwise alignment tools to produce computed pairwise alignment, and then compare such alignment with true alignment file to determine accuracy of the computed alignment. Alignment accuracy is defined by sensitivity and specificity.

#### 2.) Introduction:

So far in project 1 and 2, we have learned what is Genome. Genome is encoded into four types of DNA bases and we use the first letter of each to represent them. The four Alphabets are A, C, G and T. So, genomes are long strings containing these four alphabets.

We have learnt that all species have experienced a long history of evolution. And couple of these evolutionary events have occurred because of insertion / deletion (indel; as we cannot establish for a fact whether there was an insertion or deletion and hence, we call it indel) substitution and few more like duplication, translocation and transposition. But in this project, we are just concentrating on substitution.

Substitution is a type where one base is transformed to another (A - G, A - T, A - C, G - A, G - C, G - T, C - A, C - G, C - T, T - A, T - C and T - G). There are two types in substitution:

Transition: When substitution between A - G and C - T occurs.

Transversion: Rest all the types of substitution.

Also, we have learnt that an indel is often referred as a gap and it is represented using '-'.

A sequence of contiguous '-' characters is counted as one gap. The gap length refers to the number of '-' characters in the gap.

We have learnt there are 7 regions Exon, Intron, Intergenic, Coding, 5'UTR, 3'UTR and Promotor. And how based on Promotor base the values of match, mismatch, gap rate varies.

In this project what we are concentrating is the position information of each "letter" (i.e., a base) in the alignment block, rather than what the letter is.

The pair of input sequences are X and Y, and each sequence has m and n bases respectively:

Suppose xi is aligned to yj in true alignment, and xi is aligned to yj' in computed alignment. If  $|j - j'| \le c$ , where c is a constant (default value is 5), we consider xi and yj' correctly aligned.

Let F be the file of computed alignment, and T be the file of true alignment. An aligned position in a pairwise alignment refers to a match or mismatch. We then have:

Sensitivity = correctly-aligned-positions-in-F/all-aligned-positions-in-T

Specificity = correctly-aligned-positions-in-F/all-aligned-positions-in-F

Also, in this project we are using two parameters 'K' i.e. "Alignment Score Cut off" (values being 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000) and 'O' i.e. "Gap Open Penalty" (Values being 100, 150, 200, 250, 300, 350, 400, 450, 500) and comparing the sensitivity and specificity.

#### 3.) Programming Language Used:

For this project I have used C++ as my programming language. I took around 6 hours to code and around 2 - 3 hours to debug and modify. I took around an hour to write the shell script and around another 3 hours to write the report.

Used the Command g++ -o <execution file name> compile the program.

I have modified the provided shell script so, I can execute for all the parameters at a time, instead of compiling it every time, by changing the parameter. I will attach the shell script as well when uploading the source code.

#### 4.) Findings:

When I executed the following findings were made:

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct Match	Sensitivity	Specificity
K=3000,	52948	52944	52941	0.999868	0.999943
O=400, C=5					
K=3000,	52948	52944	52824	0.997658	0.997733
O=400, C=0					
K=3000,	52948	52944	52941	0.999868	0.999943
O=300, C=5					
K=3000,	52948	52944	52824	0.997658	0.997733
O=300, C=0					
K=3000,	52948	52944	52941	0.999868	0.999943
O=500, C=5					
K=3000,	52948	52944	52824	0.997658	0.997733
O=500, C=0					
K=5000,	52948	52944	52941	0.999868	0.999943
O=400, C=5					
K=5000,	52948	52944	52824	0.997658	0.997733
O=400, C=0					
K=5000,	52948	52944	52941	0.999868	0.999943
O=300,C=5					
K=5000,	52948	52944	52824	0.997658	0.997733
O=300,C=0					
K=5000,	52948	52944	52941	0.999868	0.999943
O=500, C=5					
K=5000,	52948	52944	52824	0.997658	0.997733
O=500, C=0					
K=2000,	52948	52944	52941	0.999868	0.999943
O=400, C=5				0.00=	0.00====
K=2000,	52948	52944	52824	0.997658	0.997733
O=400, C=0				0.0055555	0.00
K=2000,	52948	52944	52941	0.999868	0.999943
O=300, C=5					
K=2000,	52948	52944	52824	0.997658	0.997733
O=300, C=0					
K=2000,	52948	52944	52941	0.999868	0.999943
O=500, C=5					
K=2000,	52948	52944	52824	0.997658	0.997733
O=500, C=0					
Average	52948	52944	52882.5	0.998763	0.998838

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
Computation	Count	Water Count	Match		
K=3000,	52948	44253	38708	0.731057	0.874698
O=400, C=5					
K=3000,	52948	44253	33046	0.624122	0.746752
O=400, C=0					
K=3000,	52948	50885	37768	0.713304	0.742223
O=300, C=5					
K=3000,	52948	50885	32450	0.612865	0.637712
O=300, C=0					
K=3000,	52948	42563	39296	0.742162	0.923243
O=500, C=5					
K=3000,	52948	42563	33452	0.63179	0.785941
O=500, C=0					
K=5000,	52948	44156	38611	0.729225	0.874422
O=400, C=5					
K=5000,	52948	44156	32955	0.622403	0.746331
O=400, C=0					
K=5000,	52948	50560	37768	0.713304	0.746994
O=300,C=5	<b>70</b> 0.40	<b>70.7</b> 60	22172	0.61006	0.644040
K=5000,	52948	50560	32450	0.612865	0.641812
O=300,C=0	50040	40017	26047	0.605000	0.02002
K=5000,	52948	40015	36847	0.695909	0.92083
O=500, C=5	52040	40015	21405	0.504920	0.70700
K=5000,	52948	40015	31495	0.594829	0.78708
O=500, C=0	52948	44942	39377	0.743692	0.876174
K=2000, O=400, C=5	32948	44942	39377	0.743092	0.8/01/4
K=2000,	52948	44942	33505	0.632791	0.745516
O=400, C=0	32340	77774	33303	0.032/91	0.773310
K=2000,	52948	52168	38334	0.723993	0.734818
O=300, C=5	52770	32100	JUJJT	0.723773	0.757010
K=2000,	52948	52168	32796	0.6194	0.628661
O=300, C=0	22710	32100	52750	0.0171	0.020001
K=2000,	52948	43038	39765	0.75102	0.923951
O=500, C=5		- 32 3	<del></del>		
K=2000,	52948	43038	33900	0.640251	0.787676
O=500, C=0					
Average	52948	45842.22	33648.67	0.674166	0.784713

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
_			Match		
K=3000,	52948	19277	15352	0.289945	0.796389
O=400, C=5					
K=3000,	52948	19277	12198	0.230377	0.632775
O=400, C=0					
K=3000,	52948	27327	17152	0.32394	0.627658
O=300, C=5					
K=3000,	52948	27327	13222	0.249717	0.483844
O=300, C=0					
K=3000,	52948	13787	12314	0.232568	0.89316
O=500, C=5					
K=3000,	52948	13787	9765	0.184426	0.708276
O=500, C=0					
K=5000,	52948	2268	1997	0.0377163	0.880511
O=400, C=5					
K=5000,	52948	2268	1599	0.0301994	0.705026
O=400, C=0					
K=5000,	52948	5554	2074	0.0391705	0.373425
O=300,C=5					
K=5000,	52948	5554	1666	0.0314648	0.299964
O=300,C=0		22.60			
K=5000,	52948	2268	2018	0.0381129	0.889771
O=500, C=5		22.60			0.71.71.60
K=5000,	52948	2268	1622	0.0306338	0.715168
O=500, C=0	<b>50</b> 040	20562	22000	0.422202	0.001251
K=2000,	52948	28563	22889	0.432292	0.801351
O=400, C=5	520.40	20562	10217	0.244055	0.627702
K=2000,	52948	28563	18217	0.344055	0.637783
O=400, C=0	52049	26494	22415	0.42224	0.614270
K=2000,	52948	36484	22415	0.42334	0.614379
O=300, C=5	52049	26101	17221	0.225422	0.472290
K=2000, O=300, C=0	52948	36484	17231	0.325433	0.472289
K=2000,	52948	23704	20549	0.388098	0.8669
N=2000, O=500, C=5	32948	23/04	20349	0.388098	0.8009
	52948	23704	16248	0.306867	0.685454
K=2000, O=500, C=0	J4740	23/04	10240	0.300007	0.063434
	52948	17692.44	11584.9	0.218798	0.67134
Average	34340	1/074.44	11304.7	0.410/90	0.0/134

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
-			Match		
K=3000,	58012	58006	58004	0.999862	0.999966
O=400, C=5					
K=3000,	58012	58006	57506	0.991278	0.99138
O=400, C=0					
K=3000,	58012	58006	58004	0.999862	0.999966
O=300, C=5					
K=3000,	58012	58006	57506	0.991278	0.99138
O=300, C=0					
K=3000,	58012	58006	58004	0.999862	0.999966
O=500, C=5					
K=3000,	58012	58006	57506	0.991278	0.99138
O=500, C=0					
K=5000,	58012	58006	58004	0.999862	0.999966
O=400, C=5					
K=5000,	58012	58006	57506	0.991278	0.99138
O=400, C=0					
K=5000,	58012	58006	58004	0.999862	0.999966
O=300,C=5					
K=5000,	58012	58006	57506	0.991278	0.99138
O=300,C=0	50010	<b>5</b> 0006	<b>5</b> 0004	0.00006	0.000066
K=5000,	58012	58006	58004	0.999862	0.999966
O=500, C=5	50010	50006	57506	0.001270	0.00120
K=5000,	58012	58006	57506	0.991278	0.99138
O=500, C=0	50010	50006	50004	0.000062	0.000066
K=2000,	58012	58006	58004	0.999862	0.999966
O=400, C=5	50012	50006	57506	0.001279	0.00129
K=2000,	58012	58006	57506	0.991278	0.99138
O=400, C=0 K=2000,	58012	58006	58004	0.999862	0.999966
O=300, C=5	30012	30000	3000 <del>4</del>	0.777002	0.222200
K=2000,	58012	58006	57506	0.991278	0.99138
O=300, C=0	J0012	36000	37300	0.771276	0.79130
K=2000,	58012	58006	58004	0.999862	0.999966
O=500, C=5	50012	30000	2000 <b>T</b>	0.777602	0.777700
K=2000,	58012	58006	57506	0.991278	0.99138
O=500, C=0	50012	30000	57500	0.771270	0.77130
Average	58012	58006	57755	0.99557	0.995673

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
			Match		
K=3000,	58012	42761	38045	0.655813	0.889713
O=400, C=5					
K=3000,	58012	42761	31974	0.551162	0.747737
O=400, C=0					
K=3000,	58012	49090	35800	0.617114	0.729273
O=300, C=5					
K=3000,	58012	49090	29800	0.513687	0.607048
O=300, C=0					
K=3000,	58012	41525	37679	0.649504	0.907381
O=500, C=5					
K=3000,	58012	41525	31864	0.549266	0.767345
O=500, C=0					
K=5000,	58012	34730	30827	0.53139	0.887619
O=400, C=5					
K=5000,	58012	34730	25608	0.441426	0.737345
O=400, C=0					
K=5000,	58012	43091	30288	0.522099	0.702885
O=300,C=5					
K=5000,	58012	43091	24983	0.430652	0.579773
O=300,C=0					
K=5000,	58012	31373	28177	0.48571	0.898129
O=500, C=5					
K=5000,	58012	31373	23534	0.405675	0.750135
O=500, C=0					
K=2000,	58012	42761	38044	0.655795	0.889689
O=400, C=5					
K=2000,	58012	42761	31963	0.550972	0.74748
O=400, C=0					
K=2000,	58012	49090	35799	0.617096	0.729252
O=300, C=5	-0	10555		0.515-55	0.00
K=2000,	58012	49090	29791	0.513532	0.606865
O=300, C=0					
K=2000,	58012	41640	37793	0.651469	0.907613
O=500, C=5					
K=2000,	58012	41640	31962	0.550955	0.767579
O=500, C=0					
Average	58012	41784.6	31885.1	0.549629	0.7696

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
			Match		
K=3000,	58012	22247	17152	0.295663	0.77098
O=400, C=5					
K=3000,	58012	22247	12967	0.223523	0.582865
O=400, C=0					
K=3000,	58012	30966	19333	0.333259	0.62433
O=300, C=5					
K=3000,	58012	30966	15095	0.260205	0.48747
O=300, C=0					
K=3000,	58012	20395	16372	0.282217	0.802746
O=500, C=5					
K=3000,	58012	23095	12624	0.21761	0.618975
O=500, C=0					
K=5000,	58012	12840	10692	0.184307	0.83271
O=400, C=5					
K=5000,	58012	12840	7891	0.136024	0.614564
O=400, C=0					
K=5000,	58012	18611	12116	0.208853	0.651013
O=300,C=5					
K=5000,	58012	18611	9332	0.160863	0.501424
O=300,C=0		0.7.60		0.10051	
K=5000,	58012	8568	7693	0.13261	0.897876
O=500, C=5	<b>5</b> 004 <b>0</b>	0.7.60		0.000=04	0.66044.
K=5000,	58012	8568	5727	0.098721	0.668417
O=500, C=0	50010	20070	22000	0.202155	0.762600
K=2000,	58012	29870	22809	0.393177	0.763609
O=400, C=5	50010	20070	17450	0.2000	0.504100
K=2000,	58012	29870	17450	0.3008	0.584198
O=400, C=0	50010	25(07	20711	0.257012	0.501/55
K=2000,	58012	35607	20711	0.357012	0.581655
O=300, C=5	50010	25(07	16075	0.200545	0.457072
K=2000,	58012	35607	16275	0.280545	0.457073
O=300, C=0	58012	26594	22059	0.380249	0.829473
K=2000, O=500, C=5	30012	20394	22039	0.300249	0.0494/3
K=2000,	58012	26594	17030	0.29356	0.64037
O=500, C=0	30012	20334	1/030	0.29330	0.0403/
	58012	23005.3	14629.3	0.252178	0.66165
Average	30012	<b>43003.3</b>	14047.3	U.4341/0	0.00103

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
V. 2000	55116	55110	Match	0.00002.5	0.000005
K=3000,	57116	57112	57106	0.999825	0.999895
O=400, C=5			- C C - O	0.002101	0.000064
K=3000,	57116	57112	56670	0.992191	0.992261
O=400, C=0	55116	55110	7.6101	0.002550	0.002640
K=3000,	57116	57112	56121	0.982579	0.982648
O=300, C=5	55116	57110	5.550.5	0.076607	0.056565
K=3000,	57116	57112	55785	0.976697	0.976765
O=300, C=0	55116	55110	<b>771</b> 06	0.000027	0.000005
K=3000,	57116	57112	57106	0.999825	0.999895
O=500, C=5	55116	55110	- C ( - C )	0.002101	0.002261
K=3000,	57116	57112	56670	0.992191	0.992261
O=500, C=0	55116	55110	<b>771</b> 06	0.000027	0.000005
K=5000,	57116	57112	57106	0.999825	0.999895
O=400, C=5				0.002101	0.000064
K=5000,	57116	57112	56670	0.992191	0.992261
O=400, C=0	55116	55110	7.6101	0.002550	0.002640
K=5000,	57116	57112	56121	0.982579	0.982648
O=300,C=5	55116	57110	5.550.5	0.076607	0.056565
K=5000,	57116	57112	55785	0.976697	0.976765
O=300,C=0	57116	57110	57106	0.000027	0.000007
K=5000,	57116	57112	57106	0.999825	0.999895
O=500, C=5	57117	57110	5.0070	0.002101	0.002261
K=5000,	57116	57112	56670	0.992191	0.992261
O=500, C=0	57116	57112	57106	0.000925	0.000005
K=2000,	3/116	57112	57106	0.999825	0.999895
O=400, C=5	57116	57112	56670	0.002101	0.002261
K=2000,	3/110	3/112	30070	0.992191	0.992261
O=400, C=0	57116	57112	56121	0.092570	0.002640
K=2000,	3/110	3/112	30121	0.982579	0.982648
O=300, C=5	57116	57112	55785	0.976697	0.976765
K=2000, O=300, C=0	3/110	3/112	33/83	0.9/009/	0.9/0/03
K=2000,	57116	57112	57106	0.999825	0.999895
· · · · · · · · · · · · · · · · · · ·	3/110	3/112	3/100	0.777843	U.777873
O=500, C=5	57116	57112	56670	0.002101	0.002261
K=2000,	57116	57112	56670	0.992191	0.992261
O=500, C=0	<i>5771(</i>	57112	E(E7( )	0.00055	0.000/21
Average	57716	57112	56576.3	0.99055	0.990621

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
_			Match		
K=3000,	57116	47318	41290	0.722915	0.872607
O=400, C=5					
K=3000,	57116	47318	34073	0.596558	0.720085
O=400, C=0					
K=3000,	57116	49711	39622	0.693711	0.797047
O=300, C=5					
K=3000,	57116	49711	32776	0.57385	0.659331
O=300, C=0					
K=3000,	57116	46727	41346	0.723895	0.884842
O=500, C=5					
K=3000,	57116	46727	34070	0.596505	0.729129
O=500, C=0					
K=5000,	57116	40551	35115	0.614801	0.865947
O=400, C=5		40.7.74	20044	0.505005	0.711202
K=5000,	57116	40551	28844	0.505007	0.711302
O=400, C=0	55116	47120	27120	0.650046	0.707010
K=5000,	57116	47128	37128	0.650046	0.787812
O=300,C=5	57116	47120	20716	0.527702	0.651757
K=5000,	57116	47128	30716	0.537783	0.651757
O=300,C=0	57116	20060	25150	0.615554	0.97092
K=5000, O=500, C=5	3/110	39960	35158	0.615554	0.87983
K=5000,	57116	39960	28840	0.504937	0.721722
O=500, C=0	3/110	39900	20040	0.304937	0.721722
K=2000,	57116	48222	42075	0.736659	0.872527
O=400, C=5	3/110	70222	72073	0.730037	0.672327
K=2000,	57116	48222	34729	0.608043	0.72019
O=400, C=0	37110	10222	31729	0.000015	0.72019
K=2000,	57116	51333	40410	0.707508	0.787213
O=300, C=5					
K=2000,	57116	51333	33508	0.586666	0.652757
O=300, C=0	•				
K=2000,	57116	47631	42116	0.737377	0.884214
O=500, C=5					
K=2000,	57116	47631	34701	0.607553	0.728538
O=500, C=0					
Average	57116	46509	35917.6	0.628854	0.77371

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
1			Match		
K=3000,	57116	17110	12085	0.211587	0.706312
O=400, C=5					
K=3000,	57116	17110	9545	0.167116	0.557861
O=400, C=0					
K=3000,	57116	26488	15305	0.267963	0.577809
O=300, C=5					
K=3000,	57116	26488	11564	0.202465	0.436575
O=300, C=0					
K=3000,	57116	11343	8658	0.151586	0.76329
O=500, C=5					
K=3000,	57116	11343	6942	0.121542	0.612007
O=500, C=0					
K=5000,	57116	0	0	0	0
O=400, C=5					
K=5000,	57116	0	0	0	0
O=400, C=0		_		_	
K=5000,	57116	0	0	0	0
O=300,C=5				_	
K=5000,	57116	0	0	0	0
O=300,C=0	55116	0			
K=5000,	57116	0	0	0	0
O=500, C=5	55116	0	0	0	0
K=5000,	57116	0	0	0	0
O=500, C=0	57116	25(00	10704	0.227124	0.727022
K=2000,	57116	25699	18684	0.327124	0.727032
O=400, C=5	57116	25.600	1 4 4 1 5	0.252291	0.560017
K=2000,	3/110	25699	14415	0.252381	0.560917
O=400, C=0 K=2000,	57116	29831	17713	0.310123	0.593778
O=300, C=5	3/110	27031	1//13	0.310123	0.393778
K=2000,	57116	29831	13317	0.233157	0.446415
O=300, C=0	3/110	29031	1331/	0.233137	0.770413
K=2000,	57116	18968	15178	0.26574	0.80019
O=500, C=5	5/110	10,000	131/0	0.203/7	0.00017
K=2000,	57116	18968	11857	0.207595	0.625105
O=500, C=0	2,110	10,00	11057	0.207373	0.023103
Average	57116	14382.1	8625.72	0.141662	0.41152

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
•			Match		
K=3000,	65160	65156	65151	0.999862	0.999923
O=400, C=5					
K=3000,	65160	65156	65036	0.998097	0.998158
O=400, C=0					
K=3000,	65160	65156	65126	0.999478	0.99954
O=300, C=5					
K=3000,	65160	65156	65011	0.997713	0.997775
O=300, C=0					
K=3000,	65160	65156	65151	0.999862	0.999923
O=500, C=5					
K=3000,	65160	65156	65036	0.998097	0.998158
O=500, C=0					
K=5000,	65160	65156	65151	0.999862	0.999923
O=400, C=5					
K=5000,	65160	65156	65036	0.998097	0.998158
O=400, C=0					
K=5000,	65160	65156	65126	0.999478	0.99954
O=300,C=5					
K=5000,	65160	65156	65011	0.997713	0.997775
O=300,C=0					
K=5000,	65160	65156	65151	0.999862	0.999923
O=500, C=5	C # 1 C O	C	67006		0.0004.50
K=5000,	65160	65156	65036	0.998097	0.998158
O=500, C=0	(51.60	(515)	65151	0.000062	0.000022
K=2000,	65160	65156	65151	0.999862	0.999923
O=400, C=5	(51(0	(515)	(502)	0.000007	0.000150
K=2000,	65160	65156	65036	0.998097	0.998158
O=400, C=0	65160	65156	65126	0.999478	0.99954
K=2000, O=300, C=5	05100	03130	03120	U.777 <del>4</del> /8	U.77734
K=2000,	65160	65156	65011	0.997713	0.997775
O=300, C=0	05100	03130	03011	0.77//13	U.77///3
K=2000,	65160	65156	65151	0.999862	0.999923
O=500, C=5	05100	03130	03131	0.777602	0.777723
K=2000,	65160	65156	65036	0.998097	0.998158
O=500, C=0	05100	03130	05050	0.770077	0.770130
Average	65160	65156	65085.2	0.99885	0.998913

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
1			Match		
K=3000,	65160	48351	43563	0.668554	0.900974
O=400, C=5					
K=3000,	65160	48351	35426	0.543677	0.732684
O=400, C=0					
K=3000,	65160	54386	41731	0.640439	0.767311
O=300, C=5					
K=3000,	65160	54386	34180	0.524555	0.628471
O=300, C=0					
K=3000,	65160	47744	43285	0.664288	0.906606
O=500, C=5					
K=3000,	65160	47744	35313	0.541943	0.739632
O=500, C=0					
K=5000,	65160	46480	41515	0.637124	0.89318
O=400, C=5					
K=5000,	65160	46480	33739	0.517787	0.725882
O=400, C=0	57150			0.50-0.1-	0.76440
K=5000,	65160	53490	40876	0.627317	0.76418
O=300,C=5	65160	52.400	22505	0.515555	0.620061
K=5000,	65160	53490	33595	0.515577	0.628061
O=300,C=0	65160	4.4701	41202	0.622702	0.000007
K=5000,	65160	44781	41292	0.633702	0.922087
O=500, C=5	(51(0)	44701	22666	0.516667	0.751702
K=5000,	65160	44781	33666	0.516667	0.751792
O=500, C=0	65160	48814	44014	0.675476	0.901668
K=2000, O=400, C=5	03100	40014	44014	0.073470	0.901008
K=2000,	65160	48814	35842	0.550061	0.734257
O=400, C=0	0.5100	70014	330 <del>4</del> 2	0.550001	0.734237
K=2000,	65160	56059	41874	0.642633	0.746963
O=300, C=5	0.5100	30037	710/7	0.042033	0.770703
K=2000,	65160	56059	34309	0.526535	0.612016
O=300, C=0	02100		2.307	0.02000	0.012010
K=2000,	65160	48197	43736	0.671209	0.907442
O=500, C=5			<del></del>		
K=2000,	65160	48197	35729	0.548327	0.741312
O=500, C=0					
Average	65160	49811.3	38538.1	0.594713	0.77803

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
			Match		
K=3000,	65160	13686	10153	0.155816	0.741853
O=400, C=5					
K=3000,	65160	13686	8223	0.126197	0.600833
O=400, C=0					
K=3000,	65160	29249	15769	0.242004	0.53913
O=300, C=5					
K=3000,	65160	29249	12363	0.189733	0.422681
O=300, C=0					
K=3000,	65160	10967	8426	0.129312	0.768305
O=500, C=5					
K=3000,	65160	10967	6859	0.105264	0.625422
O=500, C=0					
K=5000,	65160	2661	2222	0.0341007	0.835024
O=400, C=5					
K=5000,	65160	2661	1738	0.0266728	0.653138
O=400, C=0					
K=5000,	65160	6771	2038	0.0312769	0.30099
O=300,C=5					
K=5000,	65160	6771	1580	0.024248	0.233348
O=300,C=0					
K=5000,	65160	2661	2194	0.033671	0.824502
O=500, C=5					
K=5000,	65160	2661	1711	0.0262584	0.642991
O=500, C=0					
K=2000,	65160	25446	19810	0.304021	0.778511
O=400, C=5					
K=2000,	65160	25446	15834	0.243002	0.622259
O=400, C=0					
K=2000,	65160	34708	18066	0.277256	0.520514
O=300, C=5					
K=2000,	65160	34708	14062	0.215807	0.405152
O=300, C=0					
K=2000,	65160	22001	18270	0.280387	0.830417
O=500, C=5					
K=2000,	65160	22001	14630	0.224524	0.66497
O=500, C=0					
Average	65160	16461.1	9663.78	0.148308	0.61167

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
			Match		
K=3000,	62464	62460	62460	0.999936	1
O=400, C=5					
K=3000,	62464	62460	62304	0.997439	0.997502
O=400, C=0					
K=3000,	62464	62460	62460	0.999936	1
O=300, C=5					
K=3000,	62464	62460	62304	0.997439	0.997502
O=300, C=0					
K=3000,	62464	62460	62460	0.999936	1
O=500, C=5					
K=3000,	62464	62460	62304	0.997439	0.997502
O=500, C=0					
K=5000,	62464	62460	62460	0.999936	1
O=400, C=5					
K=5000,	62464	62460	62304	0.997439	0.997502
O=400, C=0					
K=5000,	62464	62460	62460	0.999936	1
O=300,C=5					
K=5000,	62464	62460	62304	0.997439	0.997502
O=300,C=0					
K=5000,	62464	62460	62460	0.999936	1
O=500, C=5					
K=5000,	62464	62460	62304	0.997439	0.997502
O=500, C=0					
K=2000,	62464	62460	62460	0.999936	1
O=400, C=5					
K=2000,	62464	62460	62304	0.997439	0.997502
O=400, C=0					
K=2000,	62464	62460	62460	0.999936	1
O=300, C=5				0.00=::::	0.00====
K=2000,	62464	62460	62304	0.997439	0.997502
O=300, C=0		60.153		0.00005	_
K=2000,	62464	62460	62460	0.999936	1
O=500, C=5					
K=2000,	62464	62460	62304	0.997439	0.997502
O=500, C=0					
Average	62464	62460	62382	0.99869	0.998751

Computation         Count         M           K=3000, O=400, C=5         62464         62464           K=3000, C=0         62464         62464           CO=300, C=5         62464         62464           CO=300, C=0         62464         62464           CO=500, C=5         62464         62464           CO=500, C=5         62464         62464	43021 43021 52912 52912 42600	Correct Match 36899 31542 36429 31061	0.590724 0.504963 0.5832	0.857697 0.733177 0.688483
O=400, C=5  K=3000, 62464 O=400, C=0  K=3000, 62464 O=300, C=5  K=3000, 62464 O=300, C=0  K=3000, 62464 O=500, C=5	43021 52912 52912	31542 36429	0.504963	0.733177
K=3000, 62464 O=400, C=0 K=3000, 62464 O=300, C=5 K=3000, 62464 O=300, C=0 K=3000, 62464 O=500, C=5	52912 52912	36429		
O=400, C=0  K=3000, 62464  O=300, C=5  K=3000, 62464  O=300, C=0  K=3000, 62464  O=500, C=5	52912 52912	36429		
K=3000, 62464 O=300, C=5  K=3000, 62464 O=300, C=0  K=3000, 62464 O=500, C=5	52912		0.5832	0.688483
O=300, C=5  K=3000, 62464 O=300, C=0  K=3000, 62464 O=500, C=5	52912		0.5832	0.688483
K=3000, 62464 O=300, C=0 K=3000, 62464 O=500, C=5		31061		
O=300, C=0 K=3000, 62464 O=500, C=5		31061		
K=3000, 62464 O=500, C=5	42600		0.497262	0.587031
O=500, C=5	42600			
	42000	37783	0.604876	0.886925
K=3000 62464				
, , ,	42600	31803	0.509141	0.746549
O=500, C=0				
K=5000, 62464	38436	32749	0.524286	0.85204
O=400, C=5				
K=5000, 62464	38436	27816	0.445312	0.723697
O=400, C=0				
K=5000, 62464	48860	31735	0.508053	0.649509
O=300,C=5				
K=5000, 62464	48860	26876	0.430264	0.550061
O=300,C=0				
K=5000, 62464	35116	30807	0.493196	0.877292
O=500, C=5	2.7.1.6	2.700.6	0.44.64.	0.740200
K=5000, 62464	35116	25996	0.416176	0.740289
O=500, C=0	45404	20100	0.600051	0.025655
K=2000, 62464	45484	38100	0.609951	0.837657
O=400, C=5	45404	22602	0.521040	0.71(002
K=2000, 62464	45484	32603	0.521949	0.716802
O=400, C=0	52012	27240	0.506227	0.70200
K=2000, O=300, C=5	52912	37249	0.596327	0.70398
K=2000, 62464	52912	31791	0.508949	0.600828
O=300, C=0	34714	31/91	U.JU8747	0.000828
K=2000, 62464	45063	38984	0.624103	0.8651
O=500, C=5	TJ003	3070 <del>1</del>	0.027103	0.0051
K=2000, 62464	45063	32862	0.526095	0.729246
O=500, C=0	7,003	32002	0.520075	0.727270
Average 62464	44933.8	32949.2	0.52749	0.74146

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
			Match		
K=3000,	62464	28325	23296	0.372951	0.822454
O=400, C=5					
K=3000,	62464	28325	17910	0.286725	0.632304
O=400, C=0					
K=3000,	62464	41766	26678	0.427094	0.638749
O=300, C=5					
K=3000,	62464	41766	19983	0.319912	0.478451
O=300, C=0					
K=3000,	62464	25826	21843	0.349689	0.845776
O=500, C=5					
K=3000,	62464	25826	17137	0.27435	0.663556
O=500, C=0					
K=5000,	62464	0	0	0	0
O=400, C=5					
K=5000,	62464	0	0	0	0
O=400, C=0					
K=5000,	62464	0	0	0	0
O=300,C=5					
K=5000,	62464	0	0	0	0
O=300,C=0		_		_	_
K=5000,	62464	0	0	0	0
O=500, C=5				_	_
K=5000,	62464	0	0	0	0
O=500, C=0			-1010		0.010.57.5
K=2000,	62464	38904	31849	0.509878	0.818656
O=400, C=5	60.464	20004	2.1555	0.20666	0.626077
K=2000,	62464	38904	24777	0.39666	0.636875
O=400, C=0	60.464	51254	21.421	0.502106	0.611000
K=2000,	62464	51374	31431	0.503186	0.611808
O=300, C=5	(2464	51274	22642	0.270506	0.460212
K=2000,	62464	51374	23643	0.378506	0.460213
O=300, C=0	(2464	20270	24211	0.2002	0.050000
K=2000,	62464	28269	24311	0.3892	0.859988
O=500, C=5	(2464	20270	10110	0.206064	0.676300
K=2000,	62464	28269	19118	0.306064	0.676288
O=500, C=0	(24/4	22020.2	15((5.2	0.25070	0.45351
Average	62464	23829.3	15665.3	0.25079	0.45251

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
1			Match		
K=3000,	49514	49510	49332	0.996324	0.996405
O=400, C=5					
K=3000,	49514	49510	49158	0.99281	0.99289
O=400, C=0					
K=3000,	49514	49510	49318	0.996042	0.996122
O=300, C=5					
K=3000,	49514	49510	49144	0.992527	0.992608
O=300, C=0					
K=3000,	49514	49510	49332	0.996324	0.996405
O=500, C=5					
K=3000,	49514	49510	49158	0.99281	0.99289
O=500, C=0					
K=5000,	49514	49510	49332	0.996324	0.996405
O=400, C=5					
K=5000,	49514	49510	49158	0.99281	0.99289
O=400, C=0					
K=5000,	49514	49510	49318	0.996042	0.996122
O=300,C=5					
K=5000,	49514	49510	49144	0.992527	0.992608
O=300,C=0					
K=5000,	49514	49510	49332	0.996324	0.996405
O=500, C=5					
K=5000,	49514	49510	49158	0.99281	0.99289
O=500, C=0					
K=2000,	49514	49510	49332	0.996324	0.996405
O=400, C=5	10.711	10.710		2 2 2 2 2 4	0.0000
K=2000,	49514	49510	49158	0.99281	0.99289
O=400, C=0	40.71.1	40.510	10010	0.005042	0.005122
K=2000,	49514	49510	49318	0.996042	0.996122
O=300, C=5	40714	40.510	40144	0.000.505	0.002.000
K=2000,	49514	49510	49144	0.992527	0.992608
O=300, C=0	40714	40710	40222	0.006224	0.006407
K=2000,	49514	49510	49332	0.996324	0.996405
O=500, C=5	40714	40510	40170	0.00201	0.00200
K=2000,	49514	49510	49158	0.99281	0.99289
O=500, C=0	40714	40510	402.40.2	0.00445	0.004553
Average	49514	49510	49240.3	0.99447	0.994553

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
Computation	Count	Watch Count	Match		
K=3000,	49514	37602	34194	0.690593	0.909367
O=400, C=5					
K=3000,	49514	37602	28446	0.574504	0.756502
O=400, C=0					
K=3000,	49514	40254	33708	0.680777	0.837383
O=300, C=5					
K=3000,	49514	40254	27836	0.562184	0.691509
O=300, C=0					
K=3000,	49514	36156	34131	0.68932	0.943993
O=500, C=5					
K=3000,	49514	36156	28398	0.573535	0.78543
O=500, C=0					
K=5000,	49514	25092	22580	0.456033	0.899888
O=400, C=5					
K=5000,	49514	25092	18667	0.377004	0.743942
O=400, C=0					
K=5000,	49514	30236	22599	0.456416	0.74742
O=300,C=5	40.74.4	20226	40740	0.2=444	0.6101=6
K=5000,	49514	30236	18540	0.37444	0.613176
O=300,C=0	40714	21024	20700	0.410041	0.052002
K=5000,	49514	21834	20788	0.419841	0.952093
O=500, C=5	40514	21024	17250	0.250406	0.704622
K=5000,	49514	21834	17350	0.350406	0.794632
O=500, C=0	49514	37602	34194	0.690593	0.909367
K=2000, O=400, C=5	49314	3/002	34194	0.090393	0.909307
K=2000,	49514	37602	28446	0.574504	0.756502
O=400, C=0	72314	37002	40 <del>11</del> 0	0.5/4504	0.730302
K=2000,	49514	40254	33708	0.680777	0.837383
O=300, C=5	7//17	TU23T	33700	0.000///	0.03/303
K=2000,	49514	40254	27836	0.562184	0.691509
O=300, C=0	1,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	.025	2,000	0.502101	0.001500
K=2000,	49514	36156	34131	0.68932	0.943993
O=500, C=5					
K=2000,	49514	36156	28398	0.573535	0.78543
O=500, C=0					
Average	49514	33909.6	27441.7	0.55422	0.81108

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
C		1 2 2 2 2 2	Match		
K=3000,	49514	7986	6520	0.13168	0.816429
O=400, C=5					
K=3000,	49514	7986	5162	0.104253	0.646381
O=400, C=0					
K=3000,	49514	12016	7602	0.153532	0.632656
O=300, C=5					
K=3000,	49514	12016	5895	0.119057	0.490596
O=300, C=0					
K=3000,	49514	7691	6556	0.132407	0.852425
O=500, C=5					
K=3000,	49514	7691	5091	0.102819	0.661943
O=500, C=0					
K=5000,	49514	0	0	0	0
O=400, C=5					
K=5000,	49514	0	0	0	0
O=400, C=0		_		_	
K=5000,	49514	0	0	0	0
O=300,C=5	40.74.4				
K=5000,	49514	0	0	0	0
O=300,C=0	10.71.1	0			
K=5000,	49514	0	0	0	0
O=500, C=5	40514	0	0	0	0
K=5000,	49514	0	0	0	0
O=500, C=0	49514	19395	14042	0.201702	0.770456
K=2000,	49314	19393	14943	0.301793	0.770436
O=400, C=5 K=2000,	49514	19395	11963	0.241608	0.616808
O=400, C=0	72314	19393	11703	0.271000	0.010000
K=2000,	49514	23762	15163	0.306237	0.63812
O=300, C=5	7/J1 <b>7</b>	25102	13103	0.500257	0.03012
K=2000,	49514	23762	11821	0.238741	0.497475
O=300, C=0	1,011	25702	11021	0.230711	0.157175
K=2000,	49514	17213	14256	0.287919	0.828211
O=500, C=5	.,,,,,,		1.200	0.20,717	0.020211
K=2000,	49514	17213	11259	0.22739	0.654099
O=500, C=0					
Average	49514	9784.78	6457.28	0.130413	0.45031

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct Match	Sensitivity	Specificity
K=3000,	51865	51861	51858	0.999865	0.999942
O=400, C=5					
K=3000,	51865	51861	51665	0.996144	0.996221
O=400, C=0					
K=3000,	51865	51861	51844	0.999595	0.999672
O=300, C=5					
K=3000,	51865	51861	51649	0.995835	0.995912
O=300, C=0					
K=3000,	51865	51861	51858	0.999865	0.999942
O=500, C=5					
K=3000,	51865	51861	51665	0.996144	0.996221
O=500, C=0					
K=5000,	51865	51861	51858	0.999865	0.999942
O=400, C=5					
K=5000,	51865	51861	51665	0.996144	0.996221
O=400, C=0					
K=5000,	51865	51861	51844	0.999595	0.999672
O=300,C=5					
K=5000,	51865	51861	51649	0.995835	0.995912
O=300,C=0					
K=5000,	51865	51861	51858	0.999865	0.999942
O=500, C=5					
K=5000,	51865	51861	51665	0.996144	0.996221
O=500, C=0					
K=2000,	51865	51861	51858	0.999865	0.999942
O=400, C=5					
K=2000,	51865	51861	51665	0.996144	0.996221
O=400, C=0					
K=2000,	51865	51861	51844	0.999595	0.999672
O=300, C=5					
K=2000,	51865	51861	51649	0.995835	0.995912
O=300, C=0					
K=2000,	51865	51861	51858	0.999865	0.999942
O=500, C=5					
K=2000,	51865	51861	51665	0.996144	0.996221
O=500, C=0					
Average	51865	51861	51756.5	0.99791	0.997985

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
•			Match		
K=3000,	51865	43240	37391	0.720929	0.864732
O=400, C=5					
K=3000,	51865	43240	31444	0.606266	0.727197
O=400, C=0					
K=3000,	51865	50894	34152	0.658479	0.671042
O=300, C=5					
K=3000,	51865	50894	28632	0.552049	0.562581
O=300, C=0					
K=3000,	51865	40962	36599	0.705659	0.893487
O=500, C=5					
K=3000,	51865	40962	30750	0.592885	0.750696
O=500, C=0		2=152		0.5100.50	
K=5000,	51865	37469	32118	0.619262	0.857189
O=400, C=5	51065	27460	26724	0.515061	0.71222
K=5000,	51865	37469	26724	0.515261	0.71323
O=400, C=0	51065	40542	22502	0.620227	0.671222
K=5000,	51865	48542	32583	0.628227	0.671233
O=300,C=5 K=5000,	51865	48542	27328	0.526906	0.562976
O=300,C=0	31803	46342	2/328	0.320900	0.362976
K=5000,	51865	35098	31193	0.601427	0.88874
O=500, C=5	31603	33096	31193	0.001427	0.88874
K=5000,	51865	35098	25946	0.50026	0.739244
O=500, C=0	31003	33070	23740	0.30020	0.737244
K=2000,	51865	43691	37804	0.728892	0.865258
O=400, C=5	21002	13071	27001	0.720032	0.00220
K=2000,	51865	43691	31823	0.613574	0.728365
O=400, C=0					
K=2000,	51865	50124	33581	0.647469	0.669959
O=300, C=5					
K=2000,	51865	50124	28159	0.542929	0.561787
O=300, C=0					
K=2000,	51865	39101	35024	0.675292	0.895732
O=500, C=5					
K=2000,	51865	39101	29925	0.576979	0.765326
O=500, C=0					
Average	51865	43235.7	31732	0.611819	0.74382

K=3000,	51865		N/a 4 - 1-		
	51865		Match		
		23143	17253	0.332652	0.745495
O=400, C=5					
K=3000,	51865	23143	13451	0.259346	0.581212
O=400, C=0					
K=3000,	51865	29040	18710	0.360744	0.644284
O=300, C=5					
K=3000,	51865	29040	14552	0.280575	0.501102
O=300, C=0					
K=3000,	51865	17214	13891	0.26783	0.806959
O=500, C=5					
K=3000,	51865	17214	10843	0.209062	0.629894
O=500, C=0					
K=5000,	51865	9452	6682	0.128834	0.70694
O=400, C=5					
K=5000,	51865	9452	5223	0.100704	0.552581
O=400, C=0					
K=5000,	51865	19511	12433	0.239718	0.63723
O=300,C=5		10-11	2.405		
K=5000,	51865	19511	9492	0.183014	0.486495
O=300,C=0	-10CF	20.45	• • • • • • • • • • • • • • • • • • • •	0.0710161	0.000.00
K=5000,	51865	3047	2689	0.0518461	0.882507
O=500, C=5	-10CF	20.45	0.1.0.0	0.0400.	0.710.110
K=5000,	51865	3047	2189	0.0422057	0.718412
O=500, C=0	51065	20102	22014	0.441001	0.761107
K=2000,	51865	30103	22914	0.441801	0.761187
O=400, C=5	51065	20102	17002	0.24470	0.504027
K=2000,	51865	30103	17882	0.34478	0.594027
O=400, C=0	<b>51065</b>	24064	22121	0.426704	0.640690
K=2000, O=300, C=5	51865	34064	22131	0.426704	0.649689
K=2000,	51865	34064	17266	0.332903	0.506869
O=300, C=0	31003	34004	1/200	0.332903	0.500809
K=2000,	51865	26599	22076	0.425644	0.829956
O=500, C=5	51005	20333	22070	U.423U44	0.029930
K=2000,	51865	26599	17429	0.336046	0.65525
O=500, C=0	21003	20333	1 / サムブ	0.330040	0.03323
Average	51865	21352.6	13728.1	0.264689	0.66056

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
_			Match		
K=3000,	49201	48680	48679	0.98939	0.999979
O=400, C=5					
K=3000,	49201	48680	48394	0.983598	0.994125
O=400, C=0					
K=3000,	49201	49197	48165	0.978944	0.979023
O=300, C=5					
K=3000,	49201	49197	47855	0.972643	0.972722
O=300, C=0					
K=3000,	49201	48680	48679	0.98939	0.999979
O=500, C=5					
K=3000,	49201	48680	48394	0.983598	0.994125
O=500, C=0					
K=5000,	49201	48680	48679	0.98939	0.999979
O=400, C=5					
K=5000,	49201	48680	48394	0.983598	0.994125
O=400, C=0					
K=5000,	49201	49197	48165	0.978944	0.979023
O=300,C=5	10001	4040=	4=0==	0.070640	0.07070
K=5000,	49201	49197	47855	0.972643	0.972722
O=300,C=0	40201	40,000	40.670	0.00020	0.000070
K=5000,	49201	48680	48679	0.98939	0.999979
O=500, C=5	40201	40,000	49204	0.002500	0.004125
K=5000,	49201	48680	48394	0.983598	0.994125
O=500, C=0 K=2000,	49201	48680	48679	0.98939	0.999979
O=400, C=5	49201	40000	400/9	0.98939	0.999979
K=2000,	49201	48680	48394	0.983598	0.994125
O=400, C=0	47201	70000	70377	0.765576	0.777123
K=2000,	49201	49197	48165	0.978944	0.979023
O=300, C=5	<b>T/201</b>	7717/	70103	0.770777	0.777023
K=2000,	49201	49197	47855	0.972643	0.972722
O=300, C=0	1,201	1,71,71	1,055	0.572015	0.572722
K=2000,	49201	48680	48679	0.98939	0.999979
O=500, C=5	.,,		.00,7		
K=2000,	49201	48680	48394	0.983598	0.994125
O=500, C=0	-2-01				
Average	49201	48852.3	48361	0.982927	0.98999

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
Computation	Count	Water Count	Match		
K=3000,	49201	42145	36993	0.751875	0.877755
O=400, C=5					
K=3000,	49201	42145	30753	0.625048	0.729695
O=400, C=0					
K=3000,	49201	43610	36359	0.738989	0.833731
O=300, C=5					
K=3000,	49201	43610	30397	0.617813	0.697019
O=300, C=0					
K=3000,	49201	40134	36741	0.746753	0.915458
O=500, C=5					
K=3000,	49201	40134	30619	0.622325	0.762919
O=500, C=0					
K=5000,	49201	37755	34471	0.700616	0.913018
O=400, C=5					
K=5000,	49201	37755	28944	0.588281	0.766627
O=400, C=0					
K=5000,	49201	42264	35261	0.716672	0.834303
O=300,C=5					
K=5000,	49201	42264	29638	0.602386	0.701259
O=300,C=0	10001	22000	21020	0.6404.50	0.044.002
K=5000,	49201	33909	31939	0.649153	0.941903
O=500, C=5	10201	22000	26040	0.545522	0.704745
K=5000,	49201	33909	26949	0.547733	0.794745
O=500, C=0	40201	42274	27000	0.752046	0.077271
K=2000,	49201	42274	37090	0.753846	0.877371
O=400, C=5	40201	42274	20044	0.626909	0.720621
K=2000,	49201	42274	30844	0.626898	0.729621
O=400, C=0 K=2000,	49201	43739	36456	0.740961	0.8334
O=300, C=5	<del>4</del> 7201	43/39	30 <del>4</del> 30	0./ <del>4</del> 0901	0.0334
K=2000,	49201	43739	30488	0.619662	0.697044
O=300, C=0	7/201	T3/37	30 <del>1</del> 00	0.019002	0.07/044
K=2000,	49201	40230	36837	0.748704	0.91566
O=500, C=5	1,201	10230	50051	0.7 10701	0.51500
K=2000,	49201	40230	30714	0.624256	0.76346
O=500, C=0	., 201	.0250	20/11	0.02 1230	0.70510
Average	49201	40673.3	32860.7	0.667887	0.81028

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct Match	Sensitivity	Specificity
K=3000,	49201	22428	17810	0.361985	0.794097
O=400, C=5					
K=3000,	49201	22428	13647	0.277372	0.60848
O=400, C=0					
K=3000,	49201	28323	19168	0.389586	0.676764
O=300, C=5					
K=3000,	49201	28323	14666	0.298083	0.517812
O=300, C=0					
K=3000,	49201	17501	15646	0.318002	0.894006
O=500, C=5					
K=3000,	49201	17501	12110	0.246133	0.69196
O=500, C=0					
K=5000,	49201	8350	7428	0.150973	0.889581
O=400, C=5					
K=5000,	49201	8350	5672	0.115282	0.679281
O=400, C=0					
K=5000,	49201	9607	7140	0.145119	0.743208
O=300,C=5					
K=5000,	49201	9607	5515	0.112091	0.574061
O=300,C=0					
K=5000,	49201	8131	7510	0.152639	0.923626
O=500, C=5					
K=5000,	49201	8131	5668	0.115201	0.697085
O=500, C=0					
K=2000,	49201	24525	19762	0.401659	0.80579
O=400, C=5					
K=2000,	49201	24525	15192	0.308774	0.61945
O=400, C=0					
K=2000,	49201	33396	20036	0.407227	0.599952
O=300, C=5					
K=2000,	49201	33396	15375	0.312494	0.460384
O=300, C=0					
K=2000,	49201	19378	17436	0.354383	0.899783
O=500, C=5					
K=2000,	49201	19378	13540	0.275198	0.698731
O=500, C=0					
Average	49201	19071	12962.3	0.26456	0.70967

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct Match	Sensitivity	Specificity
K=3000,	56031	56027	55997	0.999393	0.999465
O=400, C=5	30031	30027	33991	0.999393	0.999403
K=3000,	56031	56027	55677	0.993682	0.993753
O=400, C=0	30031	30027	33077	0.993062	0.993733
K=3000,	56031	56027	55065	0.98276	0.98283
O=300, C=5	30031	30027	33003	0.76270	0.76263
K=3000,	56031	56027	54746	0.977066	0.977136
O=300, C=0	30031	30027	31710	0.577000	0.577130
K=3000,	56031	56027	56027	0.999929	1
O=500, C=5	00001	00027	00027	0.33332	_
K=3000,	56031	56027	55707	0.994218	0.994288
O=500, C=0					
K=5000,	56031	56027	55997	0.999393	0.999465
O=400, C=5					
K=5000,	56031	56027	55677	0.993682	0.993753
O=400, C=0					
K=5000,	56031	56027	55065	0.98276	0.98283
O=300,C=5					
K=5000,	56031	56027	54746	0.977066	0.977136
O=300,C=0					
K=5000,	56031	56027	56027	0.999929	1
O=500, C=5					
K=5000,	56031	56027	55707	0.994218	0.994288
O=500, C=0	7.0004	T.CO.D.T.		0.000202	0.000467
K=2000,	56031	56027	55997	0.999393	0.999465
O=400, C=5	7.6021	5.6027	55677	0.002602	0.002752
K=2000,	56031	56027	55677	0.993682	0.993753
O=400, C=0	56031	56027	55065	0.09276	0.98283
K=2000, O=300, C=5	30031	36027	33003	0.98276	0.98283
	56031	56027	54746	0.977066	0.977136
K=2000, O=300, C=0	30031	30027	J4/40	0.57/000	0.5//130
K=2000,	56031	56027	56027	0.999929	1
O=500, C=5	50051	30027	50021	0.777727	1
K=2000,	56031	56027	55707	0.994218	0.994288
O=500, C=0	20021	30027	22701	0.221210	0.551200
Average	56031	56027	55536.5	0.99117	0.991245

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
			Match		
K=3000,	56031	42272	36025	0.642948	0.852219
O=400, C=5					
K=3000,	56031	42272	29964	0.534775	0.708838
O=400, C=0					
K=3000,	56031	47068	34821	0.62146	0.739802
O=300, C=5					
K=3000,	56031	47068	28935	0.516411	0.614749
O=300, C=0					
K=3000,	56031	40947	35612	0.635577	0.86971
O=500, C=5					
K=3000,	56031	40947	29824	0.532277	0.728356
O=500, C=0					
K=5000,	56031	34767	29004	0.517642	0.834239
O=400, C=5					
K=5000,	56031	34767	24231	0.432457	0.696954
O=400, C=0					
K=5000,	56031	45325	33467	0.597294	0.738378
O=300,C=5	7.0004	45005	2=2=1	0.40=404	0.64.404.4
K=5000,	56031	45325	27871	0.497421	0.614914
O=300,C=0	7.0021	22500	20.672	0.511505	0.050.000
K=5000,	56031	33708	28673	0.511735	0.850629
O=500, C=5	5.0021	22700	2.4002	0.420076	0.71.472.6
K=5000,	56031	33708	24092	0.429976	0.714726
O=500, C=0	7.602.1	42561	27050	0.661204	0.050715
K=2000,	56031	43561	37058	0.661384	0.850715
O=400, C=5	56021	12561	20076	0.551052	0.709700
K=2000,	56031	43561	30876	0.551052	0.708799
O=400, C=0 K=2000,	56031	48447	35037	0.625315	0.723203
O=300, C=5	30031	4044/	3303/	0.023313	0.723203
K=2000,	56031	48447	29118	0.519677	0.601028
O=300, C=0	30031	4044/	27110	0.3190//	0.001028
K=2000,	56031	42220	36638	0.653888	0.867788
O=500, C=5	50051	72220	30030	0.023000	0.007700
K=2000,	56031	42220	30735	0.548536	0.727973
O=500, C=0	50051	72220	30733	0.5-0550	0.121713
Average	56031	42035	31221.2	0.557213	0.74683

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
			Match		
K=3000,	56031	17209	13706	0.244615	0.796444
O=400, C=5					
K=3000,	56031	17209	10787	0.192518	0.626823
O=400, C=0					
K=3000,	56031	29768	15571	0.2779	0.523079
O=300, C=5					
K=3000,	56031	29768	12050	0.21506	0.404797
O=300, C=0					
K=3000,	56031	13761	11404	0.20353	0.828719
O=500, C=5					
K=3000,	56031	13761	9118	0.162731	0.662597
O=500, C=0					
K=5000,	56031	5878	4518	0.0806339	0.768629
O=400, C=5					
K=5000,	56031	5878	3403	0.0607342	0.578938
O=400, C=0					
K=5000,	56031	10332	4808	0.0858096	0.46535
O=300,C=5					
K=5000,	56031	10332	3628	0.0647499	0.351142
O=300,C=0					
K=5000,	56031	2950	2237	0.0399243	0.758305
O=500, C=5					
K=5000,	56031	2950	1841	0.0328568	0.624068
O=500, C=0					
K=2000,	56031	29654	22973	0.410005	0.774702
O=400, C=5					
K=2000,	56031	29654	17886	0.319216	0.603156
O=400, C=0					
K=2000,	56031	40193	21118	0.376898	0.525415
O=300, C=5					
K=2000,	56031	40193	16213	0.289358	0.403379
O=300, C=0					
K=2000,	56031	24802	20243	0.361282	0.816184
O=500, C=5					
K=2000,	56031	24802	15856	0.282986	0.639303
O=500, C=0					
Average	56031	19394.1	11520	0.2056	0.6195

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
Computation	Count	Water Count	Match		
K=3000,	49532	49054	49025	0.989764	0.999409
O=400, C=5					
K=3000,	49532	49054	48529	0.97975	0.989298
O=400, C=0					
K=3000,	49532	49528	47855	0.966143	0.966221
O=300, C=5					
K=3000,	49532	49528	47568	0.960349	0.960426
O=300, C=0					
K=3000,	49532	49054	49025	0.989764	0.999409
O=500, C=5					
K=3000,	49532	49054	48529	0.97975	0.989298
O=500, C=0					
K=5000,	49532	49054	49025	0.989764	0.999409
O=400, C=5					
K=5000,	49532	49054	48529	0.97975	0.989298
O=400, C=0					
K=5000,	49532	49528	47855	0.966143	0.966221
O=300,C=5					
K=5000,	49532	49528	47568	0.960349	0.960426
O=300,C=0		100 7 1			
K=5000,	49532	49054	49025	0.989764	0.999409
O=500, C=5	10.722	40074	40.500	0.05055	0.000000
K=5000,	49532	49054	48529	0.97975	0.989298
O=500, C=0	10.522	40074	40025	0.000764	0.000400
K=2000,	49532	49054	49025	0.989764	0.999409
O=400, C=5	40522	40054	40.520	0.07075	0.000200
K=2000,	49532	49054	48529	0.97975	0.989298
O=400, C=0	40522	40529	17055	0.066142	0.066221
K=2000, O=300, C=5	49532	49528	47855	0.966143	0.966221
K=2000,	49532	49528	47568	0.960349	0.960426
O=300, C=0	79334	79340	7/300	0.300343	0.300420
K=2000,	49532	49054	49025	0.989764	0.999409
O=500, C=5	7/334	7703 <b>7</b>	T/U23	0.707/07	0.777707
K=2000,	49532	49054	48529	0.97975	0.989298
O=500, C=0	17552	17051	1032)	0.57575	0.707270
Average	49532	49212	48421.83	0.977587	0.98401

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
Computation	Count	Water Count	Match		
K=3000,	49532	44719	40482	0.81729	0.905253
O=400, C=5					
K=3000,	49532	44719	33710	0.68057	0.753818
O=400, C=0					
K=3000,	49532	45736	38281	0.772854	0.836999
O=300, C=5					
K=3000,	49532	45736	32005	0.646148	0.699777
O=300, C=0					
K=3000,	49532	43538	40873	0.825184	0.938789
O=500, C=5					
K=3000,	49532	43538	40873	0.825184	0.938789
O=500, C=0					
K=5000,	49532	43736	38742	0.782161	0.885815
O=400, C=5					
K=5000,	49532	43736	32261	0.651316	0.73763
O=400, C=0					
K=5000,	49532	44738	38093	0.769058	0.851469
O=300,C=5					
K=5000,	49532	44738	31831	0.642635	0.711498
O=300,C=0	10.722	10.7.57	20100	0.700.7.7	0.010=1
K=5000,	49532	42567	39108	0.78955	0.91874
O=500, C=5	10.533	12565	22551	0.655151	0.5645
K=5000,	49532	42567	32551	0.657171	0.7647
O=500, C=0	40.522	4.4710	40.400	0.01720	0.005252
K=2000,	49532	44719	40482	0.81729	0.905253
O=400, C=5	40522	44710	33710	0.69057	0.752010
K=2000,	49532	44719	33/10	0.68057	0.753818
O=400, C=0 K=2000,	49532	45736	38281	0.772854	0.836999
O=300, C=5	47334	45/30	30201	0.772834	0.030777
K=2000,	49532	45736	32005	0.646148	0.699777
O=300, C=0	7/334	T3/30	32003	0.070170	0.073111
K=2000,	49532	43538	40873	0.825184	0.938789
O=500, C=5	17552	13330	10075	0.023101	0.750707
K=2000,	49532	43538	34037	0.687172	0.781777
O=500, C=0	., 552	.5550	2.35,	0.00,1,2	0.,01,,,
Average	49532	44336.33	36566.56	0.738241	0.825538

Parameter / Computation	True Match Count	Computed Match Count	Computed Correct	Sensitivity	Specificity
Computation	Count	Water Count	Match		
K=3000,	49532	19617	16376	0.330615	0.834786
O=400, C=5					
K=3000,	49532	19617	12640	0.255189	0.644339
O=400, C=0					
K=3000,	49532	25452	16928	0.341759	0.665095
O=300, C=5					
K=3000,	49532	25452	12634	0.255067	0.496385
O=300, C=0					
K=3000,	49532	17731	15363	0.310163	0.866449
O=500, C=5					
K=3000,	49532	17731	11792	0.238068	0.66505
O=500, C=0					
K=5000,	49532	2927	2486	0.0501898	0.849334
O=400, C=5					
K=5000,	49532	2927	1936	0.0390858	0.661428
O=400, C=0					
K=5000,	49532	3004	2505	0.0505734	0.833888
O=300,C=5	10.522	2004	1000	0.0200224	0.640146
K=5000,	49532	3004	1923	0.0388234	0.640146
O=300,C=0	10.522	2000	2274	0.0470206	0.045141
K=5000,	49532	2809	2374	0.0479286	0.845141
O=500, C=5	40522	2000	1072	0.0277027	0.666420
K=5000,	49532	2809	1872	0.0377937	0.666429
O=500, C=0	49532	24537	20088	0.405556	0.818682
K=2000, O=400, C=5	49332	24337	20088	0.403330	0.818082
K=2000,	49532	24537	15516	0.313252	0.632351
O=400, C=0	79334	27331	13310	0.313232	0.032331
K=2000,	49532	33034	19929	0.402346	0.603288
O=300, C=5	7/334	33037	1//4/	0.702370	0.003200
K=2000,	49532	33034	14959	0.302007	0.452836
O=300, C=0	1,552	33031	11707	0.502007	0.152050
K=2000,	49532	20993	18476	0.373011	0.880103
O=500, C=5					
K=2000,	49532	20993	14428	0.291286	0.687277
O=500, C=0	<del></del>				
Average	49532	16678.22	11234.72	0.226817	0.707945

#### 5.) Observation / Summary:

- Across all the datasets we observe that when 'C' value is assigned to '5', we can see that the sensitivity and specificity value is more compared to when the 'C' is at '0'.
- We notice that comparing all the dataset the *Human-Chimp* files have the most sensitivity and specificity value and almost in all the dataset regardless of the "K = Alignment Score Cut off", "O = Gap Open Penalty" and "C" Parameters the sensitivity and specificity value is close to 1.
- For Dataset '3', '5' and '6' when 'K' i.e. "Alignment Score Cut off value" was increased to '5000', I could see that for **Human-Mouse** file the parameters (Computed Match Count, Computed Correct Match Count, Sensitivity and Specificity) had the value '0'.
- Across the datasets and all the genome files we can see that when the 'K'i.e. "Alignment Score Cut off Value" is less the parameters "Computed Match Count, Computed Correct Match Count" increases.
- Across the board we observe that for all the genome files the True match count remains the same throughout for that dataset.









