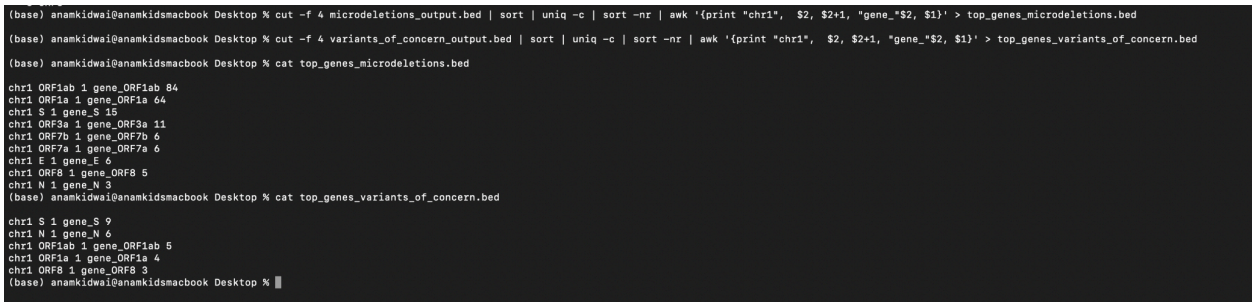
Week 2 Homework

2.COVID-19 UCSC genome browser and bedtools:

a. Get BED files from - NCBI genes annotations, microdeletions, variants of concern

b. Find which genes have the most microdeletions and variants of concern (intersectBed)

(base) anamkidwai@anamkidsmacbook Desktop % cut -f 4 microdeletions_output.bed | sort | uniq -c | sort -nr | awk '{print "chr1", $2, $2+1, "gene_"$2, $1}' > top_genes_microdeletions.bed
(base) anamkidwai@anamkidsmacbook Desktop % cut -f 4 variants_of_concern_output.bed | sort | uniq -c | sort -nr | awk '{print "chr1", $2, $2+1, "gene_"$2, $1}' > top_genes_variants_of_concern.bed
(base) anamkidwai@anamkidsmacbook Desktop % cat top_genes_microdeletions.bed
command line uses the intersectBed tool to find the overlapping regions between the "covid19.bed" file containing NCBI genes annotations and the "covid.part2" file containing microdeletions.
chr1 ORF1ab 1 gene_ORF1ab 84
chr1 ORF1a 1 gene_ORF1a 64
chr1 S 1 gene_S 15
chr1 ORF3a 1 gene_ORF3a 11
chr1 ORF7b 1 gene_ORF7b 6
chr1 ORF7a 1 gene_ORF7a 6
chr1 E 1 gene_E 6
chr1 ORF8 1 gene_ORF8 5
chr1 N 1 gene_N 3
(base) anamkidwai@anamkidsmacbook Desktop % cat top_genes_variants_of_concern.bed
command line uses the intersectBed tool to find the overlapping regions between the "covid19.bed" file containing NCBI genes annotations and the "covid.part3" file containing variants of concern.
chr1 S 1 gene_S 9
chr1 N 1 gene_N 6
chr1 ORF1ab 1 gene_ORF1ab 5
chr1 ORF1a 1 gene_ORF1a 4
chr1 ORF8 1 gene_ORF8 3

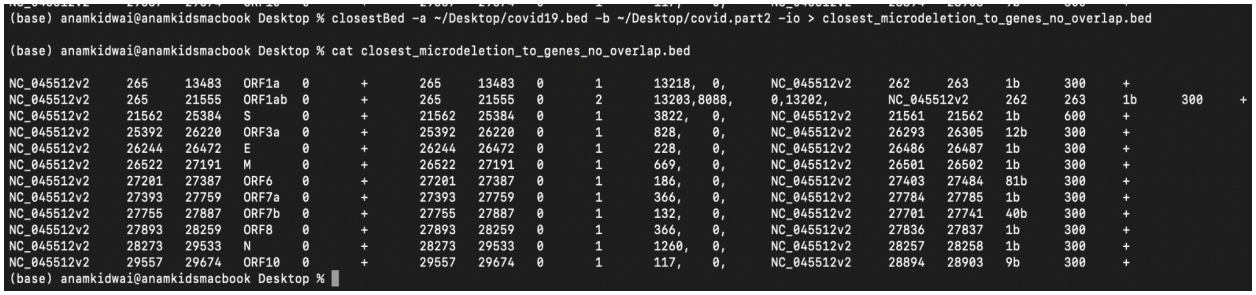


c. Find the closest microdeletion to each gene (closestBed).

(base) anamkidwai@anamkidsmacbook Desktop % closestBed -a ~/Desktop/covid19.bed -b ~/Desktop/covid.part2 -io > closest_microdeletion_to_genes_no_overlap.bed
(base) anamkidwai@anamkidsmacbook Desktop % cat closest_microdeletion_to_genes_no_overlap.bed

NC_045512v2	265	13483	ORF1a	0	+	265	13483	0	1	13218,	0,
NC_045512v2	262	263	1b	300	+						

NC_045512v2 265 21555 ORF1ab 0 + 265 21555 0 2 13203,8088,
0,13202, NC_045512v2 262 263 1b 300 +
NC_045512v2 21562 25384 S 0 + 21562 25384 0 1 3822, 0,
NC_045512v2 21561 21562 1b 600 +
NC_045512v2 25392 26220 ORF3a 0 + 25392 26220 0 1 828, 0,
NC_045512v2 26293 26305 12b 300 +
NC_045512v2 26244 26472 E 0 + 26244 26472 0 1 228, 0,
NC_045512v2 26486 26487 1b 300 +
NC_045512v2 26522 27191 M 0 + 26522 27191 0 1 669, 0,
NC_045512v2 26501 26502 1b 300 +
NC_045512v2 27201 27387 ORF6 0 + 27201 27387 0 1 186, 0,
NC_045512v2 27403 27484 81b 300 +
NC_045512v2 27393 27759 ORF7a 0 + 27393 27759 0 1 366, 0,
NC_045512v2 27784 27785 1b 300 +
NC_045512v2 27755 27887 ORF7b 0 + 27755 27887 0 1 132, 0,
NC_045512v2 27701 27741 40b 300 +
NC_045512v2 27893 28259 ORF8 0 + 27893 28259 0 1 366, 0,
NC_045512v2 27836 27837 1b 300 +
NC_045512v2 28273 29533 N 0 + 28273 29533 0 1 1260, 0,
NC_045512v2 28257 28258 1b 300 +
NC_045512v2 29557 29674 ORF10 0 + 29557 29674 0 1 117, 0,
NC_045512v2 28894 28903 9b 300 +



d. Get the parts of the genome that do NOT have a variant of concern.

(base) anamkidwai@anamkidsmacbook Desktop % subtractBed -a ~/Desktop/covid19.bed -b ~/Desktop/covid.part3 > genome_without_variants_of_concern.bed
(base) anamkidwai@anamkidsmacbook Desktop % cat genome_without_variants_of_concern.bed
NC_045512v2 265 3265 ORF1a 0 + 265 13483 0 1 13218, 0,
NC_045512v2 3268 5386 ORF1a 0 + 265 13483 0 1 13218, 0,
NC_045512v2 5389 6952 ORF1a 0 + 265 13483 0 1 13218, 0,
NC_045512v2 6955 11287 ORF1a 0 + 265 13483 0 1 13218, 0,
NC_045512v2 11296 13483 ORF1a 0 + 265 13483 0 1 13218, 0,
NC_045512v2 265 3265 ORF1ab 0 + 265 21555 0 2 13203,8088,
0,13202,
NC_045512v2 3268 5386 ORF1ab 0 + 265 21555 0 2 13203,8088,
0,13202,
NC_045512v2 5389 6952 ORF1ab 0 + 265 21555 0 2 13203,8088,
0,13202,
NC_045512v2 6955 11287 ORF1ab 0 + 265 21555 0 2 13203,8088,
0,13202,

NC_045512v2	11296	14406	ORF1ab	0	+	265	21555	0	2	13203,8088,	0,13202,
NC_045512v2	14409	21555	ORF1ab	0	+	265	21555	0	2	13203,8088,	0,13202,
NC_045512v2	21562	21764	S	0	+	21562	25384	0	1	3822,	0,
NC_045512v2	21770	21990	S	0	+	21562	25384	0	1	3822,	0,
NC_045512v2	21993	23062	S	0	+	21562	25384	0	1	3822,	0,
NC_045512v2	23065	23269	S	0	+	21562	25384	0	1	3822,	0,
NC_045512v2	23272	23401	S	0	+	21562	25384	0	1	3822,	0,
NC_045512v2	23404	23602	S	0	+	21562	25384	0	1	3822,	0,
NC_045512v2	23605	23707	S	0	+	21562	25384	0	1	3822,	0,
NC_045512v2	23710	24505	S	0	+	21562	25384	0	1	3822,	0,
NC_045512v2	24508	24913	S	0	+	21562	25384	0	1	3822,	0,
NC_045512v2	24916	25384	S	0	+	21562	25384	0	1	3822,	0,
NC_045512v2	25392	26220	ORF3a	0	+	25392	26220	0	1	828,	0,
NC_045512v2	26244	26472	E	0	+	26244	26472	0	1	228,	0,
NC_045512v2	26522	27191	M	0	+	26522	27191	0	1	669,	0,
NC_045512v2	27201	27387	ORF6	0	+	27201	27387	0	1	186,	0,
NC_045512v2	27393	27759	ORF7a	0	+	27393	27759	0	1	366,	0,
NC_045512v2	27755	27887	ORF7b	0	+	27755	27887	0	1	132,	0,
NC_045512v2	27893	27971	ORF8	0	+	27893	28259	0	1	366,	0,
NC_045512v2	27974	28046	ORF8	0	+	27893	28259	0	1	366,	0,
NC_045512v2	28049	28109	ORF8	0	+	27893	28259	0	1	366,	0,
NC_045512v2	28112	28259	ORF8	0	+	27893	28259	0	1	366,	0,
NC_045512v2	28273	28279	N	0	+	28273	29533	0	1	1260,	0,
NC_045512v2	28282	28879	N	0	+	28273	29533	0	1	1260,	0,
NC_045512v2	28885	28975	N	0	+	28273	29533	0	1	1260,	0,
NC_045512v2	28978	29533	N	0	+	28273	29533	0	1	1260,	0,
NC_045512v2	29557	29674	ORF10	0	+	29557	29674	0	1	117,	0,

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(base) anamkidwai@anamkidsmacbook Desktop % subtractBed -a ~/Desktop/covid19.bed -b ~/Desktop/covid.part3 > genome_without_variants_of_concern.bed

(base) anamkidwai@anamkidsmacbook Desktop % cat genome_without_variants_of_concern.bed

NC_045512v2     265     3265    ORF1a   0       +       265     13483   0       1       13218,  0,
NC_045512v2     3268    5386    ORF1a   0       +       265     13483   0       1       13218,  0,
NC_045512v2     5389    6952    ORF1a   0       +       265     13483   0       1       13218,  0,
NC_045512v2     6955    11287   ORF1a   0       +       265     13483   0       1       13218,  0,
NC_045512v2     11296   13483   ORF1a   0       +       265     13483   0       1       13218,  0,
NC_045512v2     265     3265    ORF1ab  0       +       265     21555   0       2       13203,8088,     0,13202,
NC_045512v2     3268    5386    ORF1ab  0       +       265     21555   0       2       13203,8088,     0,13202,
NC_045512v2     5389    6952    ORF1ab  0       +       265     21555   0       2       13203,8088,     0,13202,
NC_045512v2     6955    11287   ORF1ab  0       +       265     21555   0       2       13203,8088,     0,13202,
NC_045512v2     11296   14406   ORF1ab  0       +       265     21555   0       2       13203,8088,     0,13202,
NC_045512v2     14409   21555   ORF1ab  0       +       265     21555   0       2       13203,8088,     0,13202,
NC_045512v2     21562   21764   S       0       +       21562   25384   0       1       3822,   0,
NC_045512v2     21770   21990   S       0       +       21562   25384   0       1       3822,   0,
NC_045512v2     21993   23062   S       0       +       21562   25384   0       1       3822,   0,
NC_045512v2     23065   23269   S       0       +       21562   25384   0       1       3822,   0,
NC_045512v2     23272   23401   S       0       +       21562   25384   0       1       3822,   0,
NC_045512v2     23404   23602   S       0       +       21562   25384   0       1       3822,   0,
NC_045512v2     23605   23707   S       0       +       21562   25384   0       1       3822,   0,
NC_045512v2     23710   24505   S       0       +       21562   25384   0       1       3822,   0,
NC_045512v2     24508   24913   S       0       +       21562   25384   0       1       3822,   0,
NC_045512v2     24916   25384   S       0       +       21562   25384   0       1       3822,   0,
NC_045512v2     25392   26220   ORF3a   0       +       25392   26220   0       1       828,    0,
NC_045512v2     26244   26472   E       0       +       26244   26472   0       1       228,    0,
NC_045512v2     26522   27191   M       0       +       26522   27191   0       1       669,    0,
NC_045512v2     27201   27387   ORF6    0       +       27201   27387   0       1       186,    0,
NC_045512v2     27393   27759   ORF7a   0       +       27393   27759   0       1       366,    0,
NC_045512v2     27755   27887   ORF7b   0       +       27755   27887   0       1       132,    0,
NC_045512v2     27893   27971   ORF8    0       +       27893   28259   0       1       366,    0,
NC_045512v2     27974   28046   ORF8    0       +       27893   28259   0       1       366,    0,
NC_045512v2     28049   28109   ORF8    0       +       27893   28259   0       1       366,    0,
NC_045512v2     28112   28259   ORF8    0       +       27893   28259   0       1       366,    0,
NC_045512v2     28273   28279   N       0       +       28273   29533   0       1       1260,   0,
NC_045512v2     28282   28879   N       0       +       28273   29533   0       1       1260,   0,
NC_045512v2     28885   28975   N       0       +       28273   29533   0       1       1260,   0,
NC_045512v2     28978   29533   N       0       +       28273   29533   0       1       1260,   0,
NC_045512v2     29557   29674   ORF10   0       +       29557   29674   0       1       117,    0,
(base) anamkidwai@anamkidsmacbook Desktop % cut -f 1,2,3 genome_without_variants_of_concern.bed
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