Project 2

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Programming language: Java

Approximate programming time: 3 hours

Contribution: Liz – report writing 25 %

Kleo - design of the program, implementation/debugging/documentation 25 %

Chris - design of the program, implementation/debugging/documentation 25 %

Roberto - report writing 25 %

From the low gap rate (0.00177636) in the chimpanzee vs. human we can see that the indel rate between the two sequences is very low. This indicates again that these sequences have a high similarity. Similar statements can be made about the cat and the rat. The cat vs. human results has the second lowest gap rate at 0.02716908. This shows while they are similar, they are not as similar as chimpanzee vs. human chromosomes. The rat vs. human sequences has the highest gap rate (0.03364576) indicating that the rat and human are distantly related but not closely related like the chimpanzee and human.

Human vs. Cat

|  |  |  |
| --- | --- | --- |
| Gap Length (Bases) | Gap Count | Gap count / total gap count |
| 1 | 161399 | 0.333988623 |
| 2 | 69354 | 0.14351667 |
| 3 | 46019 | 0.095228734 |
| 4 | 36418 | 0.075361047 |
| 5 | 23761 | 0.049169472 |
| 6 | 18444 | 0.038166817 |
| 7 | 14520 | 0.030046746 |
| 8 | 12498 | 0.025862551 |
| 9 | 10707 | 0.022156371 |
| 10 | 9254 | 0.019149627 |
| 11 | 7860 | 0.016264974 |
| 12 | 7107 | 0.014706765 |
| 13 | 6296 | 0.013028534 |
| 14 | 5474 | 0.011327541 |
| 15 | 4992 | 0.010330121 |
| 16 | 4307 | 0.008912626 |
| 17 | 3851 | 0.00796901 |
| 18 | 3504 | 0.00725095 |
| 19 | 2956 | 0.006116955 |
| 20 | 2680 | 0.005545818 |
| 21 | 2435 | 0.005038831 |
| 22 | 2112 | 0.004370436 |
| 23 | 1893 | 0.003917251 |
| 24 | 1783 | 0.003689625 |
| 25 | 1641 | 0.003395779 |
| 26 | 1435 | 0.002969496 |
| 27 | 1316 | 0.002723245 |
| 28 | 1286 | 0.002661165 |
| 29 | 1101 | 0.002278338 |
| 30 | 1018 | 0.002106583 |
| 31 | 859 | 0.001777559 |
| 32 | 841 | 0.001740311 |
| 33 | 750 | 0.001552001 |
| 34 | 675 | 0.001396801 |
| 35 | 664 | 0.001374039 |
| 36 | 631 | 0.00130575 |
| 37 | 540 | 0.001117441 |
| 38 | 519 | 0.001073985 |
| 39 | 466 | 0.00096431 |
| 40 | 428 | 0.000885675 |
| 41 | 404 | 0.000836011 |
| 42 | 430 | 0.000889814 |
| 43 | 419 | 0.000867051 |
| 44 | 371 | 0.000767723 |
| 45 | 346 | 0.00071599 |
| 46 | 336 | 0.000695297 |
| 47 | 316 | 0.00065391 |
| 48 | 322 | 0.000666326 |
| 49 | 288 | 0.000595969 |
| 50 | 254 | 0.000525611 |
| 51 | 266 | 0.000550443 |
| 52 | 227 | 0.000469739 |
| 53 | 253 | 0.000523542 |
| 54 | 224 | 0.000463531 |
| 55 | 208 | 0.000430422 |
| 56 | 214 | 0.000442838 |
| 57 | 192 | 0.000397312 |
| 58 | 198 | 0.000409728 |
| 59 | 155 | 0.000320747 |
| 60 | 152 | 0.000314539 |
| 61 | 161 | 0.000333163 |
| 62 | 151 | 0.00031247 |
| 63 | 172 | 0.000355926 |
| 64 | 137 | 0.000283499 |
| 65 | 130 | 0.000269014 |
| 66 | 132 | 0.000273152 |
| 67 | 142 | 0.000293846 |
| 68 | 145 | 0.000300054 |
| 69 | 118 | 0.000244182 |
| 70 | 133 | 0.000275222 |
| 71 | 122 | 0.000252459 |
| 72 | 109 | 0.000225558 |
| 73 | 119 | 0.000246251 |
| 74 | 115 | 0.000237974 |
| 75 | 105 | 0.00021728 |
| 76 | 89 | 0.000184171 |
| 77 | 113 | 0.000233835 |
| 78 | 106 | 0.00021935 |
| 79 | 95 | 0.000196587 |
| 80 | 87 | 0.000180032 |
| 81 | 83 | 0.000171755 |
| 82 | 84 | 0.000173824 |
| 83 | 91 | 0.000188309 |
| 84 | 79 | 0.000163477 |
| 85 | 71 | 0.000146923 |
| 86 | 76 | 0.000157269 |
| 87 | 78 | 0.000161408 |
| 88 | 58 | 0.000120021 |
| 89 | 77 | 0.000159339 |
| 90 | 75 | 0.0001552 |
| 91 | 70 | 0.000144853 |
| 92 | 66 | 0.000136576 |
| 93 | 52 | 0.000107605 |
| 94 | 81 | 0.000167616 |
| 95 | 70 | 0.000144853 |
| 96 | 52 | 0.000107605 |
| 97 | 58 | 0.000120021 |
| 98 | 59 | 0.000122091 |
| 99 | 67 | 0.000138645 |
| 100 | 50 | 0.000103467 |
|  |  |  |
| Total Gaps | 483247 |  |
| Gap rate | 0.02716908 |  |

Human vs. Chimpanzee

|  |  |  |
| --- | --- | --- |
| Gap Length (Bases) | Gap Count | Gap count / total gap count |
| 1 | 24435 | 0.418214182 |
| 2 | 9072 | 0.15527068 |
| 3 | 5397 | 0.092371677 |
| 4 | 5393 | 0.092303216 |
| 5 | 2419 | 0.041402091 |
| 6 | 1895 | 0.032433635 |
| 7 | 1219 | 0.020863642 |
| 8 | 1387 | 0.023739025 |
| 9 | 805 | 0.013777877 |
| 10 | 778 | 0.013315762 |
| 11 | 495 | 0.00847211 |
| 12 | 677 | 0.011587109 |
| 13 | 368 | 0.006298458 |
| 14 | 423 | 0.007239804 |
| 15 | 271 | 0.004638267 |
| 16 | 397 | 0.006794804 |
| 17 | 215 | 0.003679806 |
| 18 | 257 | 0.004398651 |
| 19 | 185 | 0.003166344 |
| 20 | 214 | 0.00366269 |
| 21 | 140 | 0.002396152 |
| 22 | 159 | 0.002721345 |
| 23 | 108 | 0.00184846 |
| 24 | 163 | 0.002789806 |
| 25 | 107 | 0.001831345 |
| 26 | 82 | 0.001403461 |
| 27 | 68 | 0.001163845 |
| 28 | 71 | 0.001215192 |
| 29 | 51 | 0.000872884 |
| 30 | 74 | 0.001266538 |
| 31 | 55 | 0.000941346 |
| 32 | 66 | 0.001129615 |
| 33 | 38 | 0.000650384 |
| 34 | 49 | 0.000838653 |
| 35 | 34 | 0.000581923 |
| 36 | 37 | 0.000633269 |
| 37 | 32 | 0.000547692 |
| 38 | 33 | 0.000564807 |
| 39 | 32 | 0.000547692 |
| 40 | 36 | 0.000616153 |
| 41 | 16 | 0.000273846 |
| 42 | 38 | 0.000650384 |
| 43 | 21 | 0.000359423 |
| 44 | 40 | 0.000684615 |
| 45 | 24 | 0.000410769 |
| 46 | 25 | 0.000427884 |
| 47 | 24 | 0.000410769 |
| 48 | 27 | 0.000462115 |
| 49 | 17 | 0.000290961 |
| 50 | 20 | 0.000342307 |
| 51 | 16 | 0.000273846 |
| 52 | 10 | 0.000171154 |
| 53 | 14 | 0.000239615 |
| 54 | 20 | 0.000342307 |
| 55 | 12 | 0.000205384 |
| 56 | 17 | 0.000290961 |
| 57 | 10 | 0.000171154 |
| 58 | 14 | 0.000239615 |
| 59 | 9 | 0.000154038 |
| 60 | 19 | 0.000325192 |
| 61 | 11 | 0.000188269 |
| 62 | 12 | 0.000205384 |
| 63 | 12 | 0.000205384 |
| 64 | 17 | 0.000290961 |
| 65 | 9 | 0.000154038 |
| 66 | 16 | 0.000273846 |
| 67 | 9 | 0.000154038 |
| 68 | 11 | 0.000188269 |
| 69 | 7 | 0.000119808 |
| 70 | 4 | 6.84615E-05 |
| 71 | 12 | 0.000205384 |
| 72 | 8 | 0.000136923 |
| 73 | 7 | 0.000119808 |
| 74 | 10 | 0.000171154 |
| 75 | 7 | 0.000119808 |
| 76 | 6 | 0.000102692 |
| 77 | 7 | 0.000119808 |
| 78 | 11 | 0.000188269 |
| 79 | 6 | 0.000102692 |
| 80 | 11 | 0.000188269 |
| 81 | 7 | 0.000119808 |
| 82 | 8 | 0.000136923 |
| 83 | 2 | 3.42307E-05 |
| 84 | 8 | 0.000136923 |
| 85 | 1 | 1.71154E-05 |
| 86 | 11 | 0.000188269 |
| 87 | 4 | 6.84615E-05 |
| 88 | 6 | 0.000102692 |
| 89 | 8 | 0.000136923 |
| 90 | 9 | 0.000154038 |
| 91 | 7 | 0.000119808 |
| 92 | 9 | 0.000154038 |
| 93 | 3 | 5.13461E-05 |
| 94 | 3 | 5.13461E-05 |
| 95 | 4 | 6.84615E-05 |
| 96 | 2 | 3.42307E-05 |
| 97 | 2 | 3.42307E-05 |
| 98 | 5 | 8.55769E-05 |
| 99 | 3 | 5.13461E-05 |
| 100 | 2 | 3.42307E-05 |
|  |  |  |
| Total Gaps | 58427 |  |
| Gap Rate | 0.00177636 |  |

Human vs. Rat

|  |  |  |
| --- | --- | --- |
| Gap Length (Bases) | Gap Count | Gap count / total gap count |
| 1 | 95717 | 0.288214801 |
| 2 | 49749 | 0.149799911 |
| 3 | 34545 | 0.104018934 |
| 4 | 25821 | 0.077749975 |
| 5 | 18314 | 0.055145542 |
| 6 | 14464 | 0.043552753 |
| 7 | 11746 | 0.035368545 |
| 8 | 9936 | 0.029918429 |
| 9 | 8229 | 0.024778457 |
| 10 | 6836 | 0.020583975 |
| 11 | 6016 | 0.018114862 |
| 12 | 5257 | 0.015829426 |
| 13 | 4451 | 0.013402469 |
| 14 | 4098 | 0.012339545 |
| 15 | 3560 | 0.010719566 |
| 16 | 3167 | 0.009536198 |
| 17 | 2740 | 0.008250452 |
| 18 | 2640 | 0.007949341 |
| 19 | 2156 | 0.006491962 |
| 20 | 1869 | 0.005627772 |
| 21 | 1844 | 0.005552494 |
| 22 | 1533 | 0.004616038 |
| 23 | 1371 | 0.004128237 |
| 24 | 1315 | 0.003959615 |
| 25 | 1092 | 0.003288137 |
| 26 | 1002 | 0.003017136 |
| 27 | 909 | 0.002737103 |
| 28 | 784 | 0.002360713 |
| 29 | 792 | 0.002384802 |
| 30 | 694 | 0.002089713 |
| 31 | 613 | 0.001845813 |
| 32 | 568 | 0.001710313 |
| 33 | 521 | 0.00156879 |
| 34 | 499 | 0.001502546 |
| 35 | 437 | 0.001315857 |
| 36 | 405 | 0.001219501 |
| 37 | 392 | 0.001180357 |
| 38 | 358 | 0.001077979 |
| 39 | 348 | 0.001047868 |
| 40 | 303 | 0.000912368 |
| 41 | 275 | 0.000828056 |
| 42 | 265 | 0.000797945 |
| 43 | 242 | 0.00072869 |
| 44 | 216 | 0.000650401 |
| 45 | 225 | 0.000677501 |
| 46 | 194 | 0.000584156 |
| 47 | 212 | 0.000638356 |
| 48 | 169 | 0.000508878 |
| 49 | 152 | 0.000457689 |
| 50 | 151 | 0.000454678 |
| 51 | 150 | 0.000451667 |
| 52 | 131 | 0.000394456 |
| 53 | 140 | 0.000421556 |
| 54 | 123 | 0.000370367 |
| 55 | 116 | 0.000349289 |
| 56 | 110 | 0.000331223 |
| 57 | 102 | 0.000307134 |
| 58 | 94 | 0.000283045 |
| 59 | 86 | 0.000258956 |
| 60 | 93 | 0.000280034 |
| 61 | 93 | 0.000280034 |
| 62 | 68 | 0.000204756 |
| 63 | 79 | 0.000237878 |
| 64 | 65 | 0.000195722 |
| 65 | 82 | 0.000246911 |
| 66 | 87 | 0.000261967 |
| 67 | 74 | 0.000222822 |
| 68 | 53 | 0.000159589 |
| 69 | 58 | 0.000174645 |
| 70 | 62 | 0.000186689 |
| 71 | 52 | 0.000156578 |
| 72 | 53 | 0.000159589 |
| 73 | 43 | 0.000129478 |
| 74 | 62 | 0.000186689 |
| 75 | 37 | 0.000111411 |
| 76 | 36 | 0.0001084 |
| 77 | 43 | 0.000129478 |
| 78 | 35 | 0.000105389 |
| 79 | 36 | 0.0001084 |
| 80 | 49 | 0.000147545 |
| 81 | 42 | 0.000126467 |
| 82 | 38 | 0.000114422 |
| 83 | 46 | 0.000138511 |
| 84 | 43 | 0.000129478 |
| 85 | 34 | 0.000102378 |
| 86 | 37 | 0.000111411 |
| 87 | 27 | 8.13001E-05 |
| 88 | 33 | 9.93668E-05 |
| 89 | 36 | 0.0001084 |
| 90 | 20 | 6.02223E-05 |
| 91 | 31 | 9.33445E-05 |
| 92 | 19 | 5.72112E-05 |
| 93 | 20 | 6.02223E-05 |
| 94 | 21 | 6.32334E-05 |
| 95 | 24 | 7.22667E-05 |
| 96 | 27 | 8.13001E-05 |
| 97 | 19 | 5.72112E-05 |
| 98 | 33 | 9.93668E-05 |
| 99 | 25 | 7.52779E-05 |
| 100 | 24 | 7.22667E-05 |
|  |  |  |
| Total Gaps | 332103 |  |
| Gap Rate | 0.03364576 |  |