Project 1

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Programming language: Java

Approximate programming time:

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 %

Rat

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | A | T | C | G | - |
| Human | A | 1641613 | 139457 | 158974 | 420983 | 355666 |
| T | 138895 | 1637968 | 418407 | 158531 | 353909 |
| C | 155283 | 454576 | 1661408 | 139773 | 376838 |
| G | 455544 | 155086 | 140146 | 1661828 | 376545 |
| - | 171456 | 173351 | 162285 | 159916 | 0 |

Cat

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | A | T | C | G | - |
| Human | A | 3263350 | 181420 | 258066 | 753715 | 447392 |
| T | 180412 | 3248333 | 754327 | 256705 | 445946 |
| C | 207697 | 619058 | 3160212 | 217869 | 448210 |
| G | 616529 | 206417 | 217943 | 3161651 | 447427 |
| - | 315999 | 315381 | 338147 | 338646 | 0 |

Chimpanzee

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | A | T | C | G | - |
| Human | A | 8437370 | 15009 | 21194 | 87237 | 42827 |
| T | 14967 | 8396958 | 86950 | 20966 | 42552 |
| C | 20030 | 89700 | 7746245 | 25035 | 24932 |
| G | 90437 | 19690 | 25159 | 7736116 | 24075 |
| - | 42239 | 42074 | 25390 | 25430 | 0 |

Based on the results it is simple to say that humans and chimpanzees have a closer evolutionary relationship than humans compared to rats or cats. That is because based on the alignment there are a higher number of matches over mismatches. If we are comparing evolutionary closeness the next closest species would be cat and human followed by rat and human.

Additionally, the substitution rate shows that humans have less differences in bases with chimpanzees, which further supports that they are homologous. Humans and chimpanzees have a substitution rate of 1.57%, which is considerably less than humans and rats 30.78% and humans and cats 25.83% respectively.

The transition over transversion rates for substitutions shows humans and chimpanzees have ~2.18 times the number of transitions compared to transversions. Transitions are substitutions of similar shaped bases, while transversions are substitutions of different shaped bases. This means humans and chimpanzees have many more similar base substitutions than different base substitutions. This is followed by transition over transversion rates of humans and cats with ~1.59 and humans and rats with ~1.47.