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**Assignment 1**

**Programming Language Used**: Python (3.9.6). I also used the version on the server to view the results (version 2.7.16).

**Time Spent:** I spent about 11 hours completing this assignment. I used about 6 hours to write the code and spent the remaining time writing documentation and the final report for project.

**Results:**

**Human and Chimpanzee**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Chimp** | | | | |
| **Human** |  | A | C | T | G |
| A | 3433847 | 7202 | 4616 | 32967 |
| C | 7464 | 3443972 | 31664 | 9997 |
| T | 4515 | 32973 | 3431529 | 6948 |
| G | 31979 | 9916 | 7512 | 3457570 |

Number of transitions: 129583

Number of transversions: 58170

Substitution Rate: 0.013454491331253886

ti/tv: 2.227660305999656

**Human and Mouse:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Mouse** | | | | |
| **Human** |  | A | C | T | G |
| A | 1091232 | 118694 | 105952 | 343010 |
| C | 118519 | 1125759 | 301722 | 112616 |
| T | 106300 | 342378 | 1089768 | 119675 |
| G | 304301 | 111566 | 118890 | 1134315 |

Number of transitions: 1291411

Number of transversions: 912212

Substitution Rate: 0.33163634097988215

ti/tv: 1.4156917470938772

**Human and Dog:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Dog** | | | | |
| **Human** |  | A | C | T | G |
| A | 3246783 | 211638 | 190921 | 642231 |
| C | 250952 | 3087212 | 715028 | 217087 |
| T | 190950 | 643460 | 3233947 | 210262 |
| G | 715211 | 217507 | 249859 | 3087705 |

Number of transitions: 2715930

Number of transversions: 1739176

Substitution Rate: 0.26036878680909015

ti/tv: 1.5616188355865077

From the results, humans and chimpanzee had the most matches between their respective sequences. This might indicate that humans and chimpanzee are closely related. There also shared matches between human, dog and mouse. However, the matches between human and dog were more than that between human and mouse. This might show that humans are more related to dogs than to mice. In general, the number of transitions were also greater than the number of transversions which indicate transitions have a higher probability than transversion in nature. The transition to transversion ratio between human and chimpanzee was the greatest of all three. This might be an indication of more genetic similarity between the two species. The transition to transversion ratio was the lowest between human and mouse. Finally the substitution rate between human and chimpanzee was the lowest of all three which would be an indication of genetic similarity and recent common ancestor.