

Gorilla–Sea Cucumber Hash Report

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Results

Below table gives the similarity between each pair of species as a number between 0 and 1, higher values meaning “more similar.”. First table is with each profile being constructed with an array (d) of length 1000 and k-grams of length (20). Second table has lower granularity with a k = 10 and d = 10000.

We have used java’s `String.hashCode() % d` as our hash function which works really well as long as the length of the profile array (d) is sufficiently large so that “conflicts” between non-related k-grams does not occur frequently and skews the result. As it can be seen Humans are very closely related to Gorillas and very far apart from Trouts (suprise suprise).

Our simple tests of our static methods `calculateVectorLength` and `CalculateDotProduct`:

```
// tests
System.err.println(calculateDotProduct(new int[] {0,1}, new int[] {0,1})); // returns 1
System.err.println(calculateDotProduct(new int[] {0,1}, new int[] {0,2})); // returns 2
System.err.println(calculateDotProduct(new int[] {0,1}, new int[] {1, 0})); // returns 0
System.err.println(calculateDotProduct(new int[] {0,1}, new int[] {0, -1})); // returns -1
System.err.println(calculateDotProduct(new int[] {0,1,1,1,0}, new int[] {0,1,1,0,0})); // returns 2
System.err.println(calculateVectorLength(new int[] {0,0,0,1})); // returns 1.0
System.err.println(calculateVectorLength(new int[] {0,0,1,0,1,0,1,1})); // returns 2.0
System.err.println(calculateVectorLength(new int[] {-1,0,-2,0})); // returns 2.23606797749979
System.err.println(calculateVectorLength(new int[] {1,-1,3,0,-2,0,1})); // returns 4.0
```

We have not made a method for calculating cos (the angle between the two entities) but used the two other methods directly in a computational expression as follows:

```
(float) (calculateDotProduct(left,right)) / (float) (calculateVectorLength(left) *
calculateVectorLength(right))
```

Our implementation computes the likeness using the `bigdata.txt` input in 66,91s according to the unix “time” command.

Comparing Deer with Deer likeness: 1.000000
Comparing Deer with Horse likeness: 0.125562
Comparing Deer with Spider-Monkey likeness: 0.136320
Comparing Deer with Trout likeness: 0.088113
Comparing Deer with Pig likeness: 0.102240
Comparing Deer with Human likeness: 0.102658
Comparing Deer with Lamprey likeness: 0.116927
Comparing Deer with Rockcod likeness: 0.096925
Comparing Deer with Gull likeness: 0.150925
Comparing Deer with Sea-Cucumber likeness: 0.141431
Comparing Deer with Cow likeness: 0.067884
Comparing Deer with Gorilla likeness: 0.069007

Comparing Horse with Deer likeness: 0.125562
Comparing Horse with Horse likeness: 1.000000
Comparing Horse with Spider-Monkey likeness: 0.119816
Comparing Horse with Trout likeness: 0.141615
Comparing Horse with Pig likeness: 0.128374
Comparing Horse with Human likeness: 0.137492
Comparing Horse with Lamprey likeness: 0.075505
Comparing Horse with Rockcod likeness: 0.150466
Comparing Horse with Gull likeness: 0.058957
Comparing Horse with Sea-Cucumber likeness: 0.108639
Comparing Horse with Cow likeness: 0.093761
Comparing Horse with Gorilla likeness: 0.095310

Comparing Spider-Monkey with Deer likeness: 0.136320
Comparing Spider-Monkey with Horse likeness: 0.119816
Comparing Spider-Monkey with Spider-Monkey likeness: 1.000000
Comparing Spider-Monkey with Trout likeness: 0.067265
Comparing Spider-Monkey with Pig likeness: 0.235772
Comparing Spider-Monkey with Human likeness: 0.571433
Comparing Spider-Monkey with Lamprey likeness: 0.095637
Comparing Spider-Monkey with Rockcod likeness: 0.126122
Comparing Spider-Monkey with Gull likeness: 0.176023
Comparing Spider-Monkey with Sea-Cucumber likeness: 0.079388
Comparing Spider-Monkey with Cow likeness: 0.226723
Comparing Spider-Monkey with Gorilla likeness: 0.460940

Comparing Trout with Deer likeness: 0.088113
Comparing Trout with Horse likeness: 0.141615
Comparing Trout with Spider-Monkey likeness: 0.067265
Comparing Trout with Trout likeness: 1.000000
Comparing Trout with Pig likeness: 0.134530
Comparing Trout with Human likeness: 0.075983
Comparing Trout with Lamprey likeness: 0.090665
Comparing Trout with Rockcod likeness: 0.095652
Comparing Trout with Gull likeness: 0.099296
Comparing Trout with Sea-Cucumber likeness: 0.098523
Comparing Trout with Cow likeness: 0.133986
Comparing Trout with Gorilla likeness: 0.076613

Comparing Pig with Deer likeness: 0.102240
Comparing Pig with Horse likeness: 0.128374
Comparing Pig with Spider-Monkey likeness: 0.235772
Comparing Pig with Trout likeness: 0.134530
Comparing Pig with Pig likeness: 1.000000
Comparing Pig with Human likeness: 0.244900
Comparing Pig with Lamprey likeness: 0.079697
Comparing Pig with Rockcod likeness: 0.100897
Comparing Pig with Gull likeness: 0.128016
Comparing Pig with Sea-Cucumber likeness: 0.095265
Comparing Pig with Cow likeness: 0.186236
Comparing Pig with Gorilla likeness: 0.271626

Comparing Human with Deer likeness: 0.102658
Comparing Human with Horse likeness: 0.137492
Comparing Human with Spider-Monkey likeness: 0.571433
Comparing Human with Trout likeness: 0.075983
Comparing Human with Pig likeness: 0.244900
Comparing Human with Human likeness: 1.000000
Comparing Human with Lamprey likeness: 0.080023
Comparing Human with Rockcod likeness: 0.143523
Comparing Human with Gull likeness: 0.112472
Comparing Human with Sea-Cucumber likeness: 0.111597
Comparing Human with Cow likeness: 0.227650
Comparing Human with Gorilla likeness: 0.834739

Comparing Lamprey with Deer likeness: 0.116927
Comparing Lamprey with Horse likeness: 0.075505
Comparing Lamprey with Spider-Monkey likeness: 0.095637
Comparing Lamprey with Trout likeness: 0.090665
Comparing Lamprey with Pig likeness: 0.079697
Comparing Lamprey with Human likeness: 0.080023
Comparing Lamprey with Lamprey likeness: 1.000000
Comparing Lamprey with Rockcod likeness: 0.123634
Comparing Lamprey with Gull likeness: 0.117648
Comparing Lamprey with Sea-Cucumber likeness: 0.116732
Comparing Lamprey with Cow likeness: 0.071438
Comparing Lamprey with Gorilla likeness: 0.072618

Comparing Rockcod with Deer likeness: 0.096925
Comparing Rockcod with Horse likeness: 0.150466
Comparing Rockcod with Spider-Monkey likeness: 0.126122
Comparing Rockcod with Trout likeness: 0.095652
Comparing Rockcod with Pig likeness: 0.100897
Comparing Rockcod with Human likeness: 0.143523
Comparing Rockcod with Lamprey likeness: 0.123634
Comparing Rockcod with Rockcod likeness: 1.000000
Comparing Rockcod with Gull likeness: 0.057922
Comparing Rockcod with Sea-Cucumber likeness: 0.106733
Comparing Rockcod with Cow likeness: 0.100490
Comparing Rockcod with Gorilla likeness: 0.110663

Comparing Gull with Deer likeness: 0.150925
Comparing Gull with Horse likeness: 0.058957
Comparing Gull with Spider-Monkey likeness: 0.176023
Comparing Gull with Trout likeness: 0.099296
Comparing Gull with Pig likeness: 0.128016
Comparing Gull with Human likeness: 0.112472
Comparing Gull with Lamprey likeness: 0.117648
Comparing Gull with Rockcod likeness: 0.057922
Comparing Gull with Gull likeness: 1.000000
Comparing Gull with Sea-Cucumber likeness: 0.070315
Comparing Gull with Cow likeness: 0.071718
Comparing Gull with Gorilla likeness: 0.121506

Comparing Sea-Cucumber with Deer likeness: 0.141431
Comparing Sea-Cucumber with Horse likeness: 0.108639
Comparing Sea-Cucumber with Spider-Monkey likeness: 0.079388
Comparing Sea-Cucumber with Trout likeness: 0.098523
Comparing Sea-Cucumber with Pig likeness: 0.095265
Comparing Sea-Cucumber with Human likeness: 0.111597
Comparing Sea-Cucumber with Lamprey likeness: 0.116732
Comparing Sea-Cucumber with Rockcod likeness: 0.106733
Comparing Sea-Cucumber with Gull likeness: 0.070315
Comparing Sea-Cucumber with Sea-Cucumber likeness: 1.000000
Comparing Sea-Cucumber with Cow likeness: 0.102787
Comparing Sea-Cucumber with Gorilla likeness: 0.128598

Comparing Cow with Deer likeness: 0.067884
Comparing Cow with Horse likeness: 0.093761
Comparing Cow with Spider-Monkey likeness: 0.226723
Comparing Cow with Trout likeness: 0.133986
Comparing Cow with Pig likeness: 0.186236
Comparing Cow with Human likeness: 0.227650
Comparing Cow with Lamprey likeness: 0.071438
Comparing Cow with Rockcod likeness: 0.100490
Comparing Cow with Gull likeness: 0.071718
Comparing Cow with Sea-Cucumber likeness: 0.102787
Comparing Cow with Cow likeness: 1.000000
Comparing Cow with Gorilla likeness: 0.254133

Comparing Gorilla with Deer likeness: 0.069007
Comparing Gorilla with Horse likeness: 0.095310
Comparing Gorilla with Spider-Monkey likeness: 0.460940
Comparing Gorilla with Trout likeness: 0.076613
Comparing Gorilla with Pig likeness: 0.271626
Comparing Gorilla with Human likeness: 0.834739
Comparing Gorilla with Lamprey likeness: 0.072618
Comparing Gorilla with Rockcod likeness: 0.110663
Comparing Gorilla with Gull likeness: 0.121506
Comparing Gorilla with Sea-Cucumber likeness: 0.128598
Comparing Gorilla with Cow likeness: 0.254133
Comparing Gorilla with Gorilla likeness: 1.000000


```
Comparing Deer with Deer likeness: 1.000000
Comparing Deer with Horse likeness: 0.063242
Comparing Deer with Spider-Monkey likeness: 0.079052
Comparing Deer with Trout likeness: 0.000000
Comparing Deer with Pig likeness: 0.071147
Comparing Deer with Human likeness: 0.070868
Comparing Deer with Lamprey likeness: 0.030784
Comparing Deer with Rockcod likeness: 0.023531
Comparing Deer with Gull likeness: 0.015810
Comparing Deer with Sea-Cucumber likeness: 0.014797
Comparing Deer with Cow likeness: 0.111111
Comparing Deer with Gorilla likeness: 0.070868

Comparing Horse with Deer likeness: 0.063242
Comparing Horse with Horse likeness: 1.000000
Comparing Horse with Spider-Monkey likeness: 0.251969
Comparing Horse with Trout likeness: 0.015748
Comparing Horse with Pig likeness: 0.204724
Comparing Horse with Human likeness: 0.282355
Comparing Horse with Lamprey likeness: 0.030662
Comparing Horse with Rockcod likeness: 0.023438
Comparing Horse with Gull likeness: 0.094488
Comparing Horse with Sea-Cucumber likeness: 0.022107
Comparing Horse with Cow likeness: 0.284587
Comparing Horse with Gorilla likeness: 0.219610

Comparing Spider-Monkey with Deer likeness: 0.079052
Comparing Spider-Monkey with Horse likeness: 0.251969
Comparing Spider-Monkey with Spider-Monkey likeness: 1.000000
Comparing Spider-Monkey with Trout likeness: 0.007874
Comparing Spider-Monkey with Pig likeness: 0.291339
Comparing Spider-Monkey with Human likeness: 0.682358
Comparing Spider-Monkey with Lamprey likeness: 0.007666
Comparing Spider-Monkey with Rockcod likeness: 0.007813
Comparing Spider-Monkey with Gull likeness: 0.157480
Comparing Spider-Monkey with Sea-Cucumber likeness: 0.007369
Comparing Spider-Monkey with Cow likeness: 0.260872
Comparing Spider-Monkey with Gorilla likeness: 0.611769
```

```
Comparing Lamprey with Deer likeness: 0.030784
Comparing Lamprey with Horse likeness: 0.030662
Comparing Lamprey with Spider-Monkey likeness: 0.007666
Comparing Lamprey with Trout likeness: 0.007666
Comparing Lamprey with Pig likeness: 0.007666
Comparing Lamprey with Human likeness: 0.007636
Comparing Lamprey with Lamprey likeness: 1.000000
Comparing Lamprey with Rockcod likeness: 0.015212
Comparing Lamprey with Gull likeness: 0.007666
Comparing Lamprey with Sea-Cucumber likeness: 0.014348
Comparing Lamprey with Cow likeness: 0.000000
Comparing Lamprey with Gorilla likeness: 0.007636
```

```
Comparing Rockcod with Deer likeness: 0.023531
Comparing Rockcod with Horse likeness: 0.023438
Comparing Rockcod with Spider-Monkey likeness: 0.007813
Comparing Rockcod with Trout likeness: 0.023438
Comparing Rockcod with Pig likeness: 0.007813
Comparing Rockcod with Human likeness: 0.007782
Comparing Rockcod with Lamprey likeness: 0.015212
Comparing Rockcod with Rockcod likeness: 1.000000
Comparing Rockcod with Gull likeness: 0.000000
Comparing Rockcod with Sea-Cucumber likeness: 0.029247
Comparing Rockcod with Cow likeness: 0.023531
Comparing Rockcod with Gorilla likeness: 0.007782
```

```
Comparing Gull with Deer likeness: 0.015810
Comparing Gull with Horse likeness: 0.094488
Comparing Gull with Spider-Monkey likeness: 0.157480
Comparing Gull with Trout likeness: 0.007874
Comparing Gull with Pig likeness: 0.023622
Comparing Gull with Human likeness: 0.133334
Comparing Gull with Lamprey likeness: 0.007666
Comparing Gull with Rockcod likeness: 0.000000
Comparing Gull with Gull likeness: 1.000000
Comparing Gull with Sea-Cucumber likeness: 0.014738
Comparing Gull with Cow likeness: 0.063242
Comparing Gull with Gorilla likeness: 0.094118
```

```
Comparing Trout with Deer likeness: 0.000000
Comparing Trout with Horse likeness: 0.015748
Comparing Trout with Spider-Monkey likeness: 0.007874
Comparing Trout with Trout likeness: 1.000000
Comparing Trout with Pig likeness: 0.015748
Comparing Trout with Human likeness: 0.023530
Comparing Trout with Lamprey likeness: 0.007666
Comparing Trout with Rockcod likeness: 0.023438
Comparing Trout with Gull likeness: 0.007874
Comparing Trout with Sea-Cucumber likeness: 0.000000
Comparing Trout with Cow likeness: 0.007905
Comparing Trout with Gorilla likeness: 0.023530
```

```
Comparing Pig with Deer likeness: 0.071147
Comparing Pig with Horse likeness: 0.204724
Comparing Pig with Spider-Monkey likeness: 0.291339
Comparing Pig with Trout likeness: 0.015748
Comparing Pig with Pig likeness: 1.000000
Comparing Pig with Human likeness: 0.345101
Comparing Pig with Lamprey likeness: 0.007666
Comparing Pig with Rockcod likeness: 0.007813
Comparing Pig with Gull likeness: 0.023622
Comparing Pig with Sea-Cucumber likeness: 0.007369
Comparing Pig with Cow likeness: 0.205535
Comparing Pig with Gorilla likeness: 0.305885
```

```
Comparing Human with Deer likeness: 0.070868
Comparing Human with Horse likeness: 0.282355
Comparing Human with Spider-Monkey likeness: 0.682358
Comparing Human with Trout likeness: 0.023530
Comparing Human with Pig likeness: 0.345101
Comparing Human with Human likeness: 1.000000
Comparing Human with Lamprey likeness: 0.007636
Comparing Human with Rockcod likeness: 0.007782
Comparing Human with Gull likeness: 0.133334
Comparing Human with Sea-Cucumber likeness: 0.022021
Comparing Human with Cow likeness: 0.259851
Comparing Human with Gorilla likeness: 0.921875
```

```
Comparing Sea-Cucumber with Deer likeness: 0.014797
Comparing Sea-Cucumber with Horse likeness: 0.022107
Comparing Sea-Cucumber with Spider-Monkey likeness: 0.007369
Comparing Sea-Cucumber with Trout likeness: 0.000000
Comparing Sea-Cucumber with Pig likeness: 0.007369
Comparing Sea-Cucumber with Human likeness: 0.022021
Comparing Sea-Cucumber with Lamprey likeness: 0.014348
Comparing Sea-Cucumber with Rockcod likeness: 0.029247
Comparing Sea-Cucumber with Gull likeness: 0.014738
Comparing Sea-Cucumber with Sea-Cucumber likeness: 1.000000
Comparing Sea-Cucumber with Cow likeness: 0.014797
Comparing Sea-Cucumber with Gorilla likeness: 0.022021
```

```
Comparing Cow with Deer likeness: 0.111111
Comparing Cow with Horse likeness: 0.284587
Comparing Cow with Spider-Monkey likeness: 0.260872
Comparing Cow with Trout likeness: 0.007905
Comparing Cow with Pig likeness: 0.205535
Comparing Cow with Human likeness: 0.259851
Comparing Cow with Lamprey likeness: 0.000000
Comparing Cow with Rockcod likeness: 0.023531
Comparing Cow with Gull likeness: 0.063242
Comparing Cow with Sea-Cucumber likeness: 0.014797
Comparing Cow with Cow likeness: 1.000000
Comparing Cow with Gorilla likeness: 0.322845
```

```
Comparing Gorilla with Deer likeness: 0.070868
Comparing Gorilla with Horse likeness: 0.219610
Comparing Gorilla with Spider-Monkey likeness: 0.611769
Comparing Gorilla with Trout likeness: 0.023530
Comparing Gorilla with Pig likeness: 0.305885
Comparing Gorilla with Human likeness: 0.921875
Comparing Gorilla with Lamprey likeness: 0.007636
Comparing Gorilla with Rockcod likeness: 0.007782
Comparing Gorilla with Gull likeness: 0.094118
Comparing Gorilla with Sea-Cucumber likeness: 0.022021
Comparing Gorilla with Cow likeness: 0.322845
Comparing Gorilla with Gorilla likeness: 1.000000
```

