

Alliance Network Generator: Results

1 Baruya CLANS

$m = 87.000000; n = 1936.000000$

$\epsilon_0 = 0.079545; c_x = 0.003338; c_{x_0} = 0.080283; s_x = 0.871643; \Pi = 1682.000000; \chi = 1346.000000; \Delta = 181684.000000; \Delta' = 188979.000000$

1.1 1

Fitness: 0.0726

$\epsilon_0 = 0.074380; c_x = 0.003091; c_{x_0} = 0.079572; s_x = 0.849646; \Pi = 1606.000000; \chi = 1206.000000; \Delta = 206259.000000; \Delta' = 212875.666667$

```
# Prog
(==
  (EXP
    (ABS
      (MAX $origInDeg 5.0)))
  (LOG
    (>
      (MAX $origId $origOutStren) 0.056198294387258096 $origOutDeg 2.0))
  (MIN
    (+
      (- 0.5264366283390507 $dirDist) 0.0) 1.0) $targOutDeg)
```

1.2 2

Fitness: 0.1332

$\epsilon_0 = 0.055785; c_x = 0.002703; c_{x_0} = 0.065329; s_x = 0.823727; \Pi = 1834.000000; \chi = 1406.000000; \Delta = 196006.000000; \Delta' = 194999.333333$

```
# Prog
(ZER
  (ABS
    (== $origInDeg $targInDeg $origInDeg $targId)) $origOutDeg
  (MIN $targOutStren $origInStren))
```

1.3 3

Fitness: 0.1296

$\epsilon_0 = 0.084711$; $c_x = 0.003737$; $c_{x_0} = 0.084250$; $s_x = 0.782379$; $\Pi = 1372.000000$; $\chi = 842.000000$; $\Delta = 183311.000000$; $\Delta' = 193435.000000$

```
# Prog
(+
  (== 1.6094379124341003
    (MIN 0.8604019670359725 $dirStren) 0.2283965038630592
    (- $targOutDeg 0.9921624021508662))
  (+
    (>
      (< 1.0 $origOutStren $targInDeg 7.0)
      (* $targId $revDist) $origOutDeg
      (< 0.871841516020279 $origInStren $dirDist $targId))
    (==
      (ZER $targId 4.0 0.2835358671989946)
      (==
        (/ $revStren 8.0) $targInDeg
        (+ $dirDist $origOutDeg) $undirDist) -0.681783416634013
        (- 5.0 $origId))))
```

1.4 4

Fitness: 0.0618

$\epsilon_0 = 0.073864$; $c_x = 0.003435$; $c_{x_0} = 0.080053$; $s_x = 0.965906$; $\Pi = 1587.000000$; $\chi = 1623.000000$; $\Delta = 186147.000000$; $\Delta' = 185834.333333$

```
# Prog
(-
  (- 8.0
    (*
      (> $dirDist 0.29845651991794386 $revDist $revStren)
      (MAX
        (==
          (+ $revStren 0.3281499535082798) $dirDist
          (+ 0.2124612818402516 $origId) $dirStren) $undirDist))))
  (/ $dirDist $targOutDeg))
```

1.5 5

Fitness: 0.0855

$\epsilon_0 = 0.057335$; $c_x = 0.002693$; $c_{x_0} = 0.079945$; $s_x = 0.813454$; $\Pi = 1691.000000$; $\chi = 1291.000000$; $\Delta = 184884.000000$; $\Delta' = 188262.000000$

```
# Prog
(+ 0.09830689904242096
```

```
(*
(MAX $targInDeg
(-
(MIN
(- $dirStren 0.0)
(/ $targId 8.0)) $origInStren)) $origInStren))
```

2 Bassari CLANS

$m = 9.000000; n = 1036.000000$

$\epsilon_0 = 0.130309; c_x = 0.043229; c_{x_0} = 0.595830; s_x = 0.961356; \Pi = 1034.000000; \chi = 873.000000; \Delta = 777366.000000; \Delta' = 831904.666667$

2.1 1

Fitness: 0.0518

$\epsilon_0 = 0.128378; c_x = 0.044552; c_{x_0} = 0.506247; s_x = 0.988686; \Pi = 1026.000000; \chi = 963.000000; \Delta = 796421.000000; \Delta' = 792448.000000$

Prog

(LOG

(< \$origOutStren \$targId \$origInStren \$revStren))

2.2 2

Fitness: 0.0407

$\epsilon_0 = 0.134170; c_x = 0.046733; c_{x_0} = 0.573935; s_x = 0.984629; \Pi = 1036.000000; \chi = 939.000000; \Delta = 765577.000000; \Delta' = 777863.666667$

Prog

(+ \$revStren

(- 3.0 \$origId))

2.3 3

Fitness: 0.1071

$\epsilon_0 = 0.176641; c_x = 0.043207; c_{x_0} = 0.469796; s_x = 0.973843; \Pi = 1036.000000; \chi = 909.000000; \Delta = 707073.000000; \Delta' = 705896.333333$

Prog

(/ \$origInStren \$targId)

2.4 4

Fitness: 0.022

$\epsilon_0 = 0.122587$; $c_x = 0.043500$; $c_{x_0} = 0.569719$; $s_x = 0.952386$; $\Pi = 1020.000000$; $\chi = 889.000000$; $\Delta = 780694.000000$; $\Delta' = 816434.666667$

Prog

```
(*
(< 0.782153960288672 $origInStren
  (MAX
    (/ 0.8269491460761663
      (* $undirDist 0.42731965606049394))
    (- 9.0 $origId))
  (- $origOutDeg
    (EXP $targInStren)))
(>
  (MAX
    (MAX
      (== $origId $origId 1.0 0.861169751400947) $targId) $revDist)
  (MAX
    (EXP $revStren)
    (+ $dirDist 0.0))
  (/
    (<
      (EXP $origInDeg) 9.0 1.0 0.6785430707906974)
    (* $origInDeg 7.0))
  (MIN
    (MAX $targOutDeg 0.2857142857142857)
    (EXP $revStren))))
```

2.5 5

Fitness: 0.0517

$\epsilon_0 = 0.167954$; $c_x = 0.043865$; $c_{x_0} = 0.545713$; $s_x = 0.972090$; $\Pi = 1032.000000$; $\chi = 882.000000$; $\Delta = 785523.000000$; $\Delta' = 812710.666667$

Prog

```
(ZER $origOutStren $revStren
(+
  (MIN $origOutStren $revStren)
  (- 5.0 $origId)))
```

3 Bwa DIAMOU

$m = 20.000000$; $n = 3570.000000$

$\epsilon_0 = 0.098319$; $c_x = 0.031602$; $c_{x_0} = 0.384761$; $s_x = 0.966901$; $\Pi = 3524.000000$; $\chi = 3009.000000$; $\Delta = 1.497606$; $\Delta' = 1.531398$

3.1 1

Fitness: 0.1343

$\epsilon_0 = 0.089356$; $c_{\mathbf{x}} = 0.048856$; $c_{\mathbf{x}_0} = 0.415297$; $s_{\mathbf{x}} = 0.867401$; $\Pi = 3479.000000$; $\chi = 2481.000000$; $\Delta = 1.326678$; $\Delta' = 1.579315$

Prog

```
(/  
(MAX 0.7446817679761205 $revStren) $origId)
```

3.2 2

Fitness: 0.1059

$\epsilon_0 = 0.092437$; $c_{\mathbf{x}} = 0.031400$; $c_{\mathbf{x}_0} = 0.422296$; $s_{\mathbf{x}} = 0.837497$; $\Pi = 3568.000000$; $\chi = 2612.000000$; $\Delta = 1.754971$; $\Delta' = 1.926563$

Prog

```
(*  
(EXP  
(< $dirDist $origId $targOutDeg $origInDeg)) $targOutDeg)
```

3.3 3

Fitness: 0.0984

$\epsilon_0 = 0.080952$; $c_{\mathbf{x}} = 0.030911$; $c_{\mathbf{x}_0} = 0.461956$; $s_{\mathbf{x}} = 0.996825$; $\Pi = 3524.000000$; $\chi = 3367.000000$; $\Delta = 1.339920$; $\Delta' = 1.339998$

Prog

```
(MAX  
(MIN $targInDeg 0.0904511672498145)  
(ZER $targId 0.0  
(ABS $revStren)))
```

3.4 4

Fitness: 0.1096

$\epsilon_0 = 0.178151$; $c_{\mathbf{x}} = 0.026959$; $c_{\mathbf{x}_0} = 0.379722$; $s_{\mathbf{x}} = 0.991682$; $\Pi = 3467.000000$; $\chi = 3140.000000$; $\Delta = 1.494842$; $\Delta' = 1.494167$

Prog

```
(< $origInStren $origOutStren 0.040162552696239695  
(- $targInDeg $targOutDeg))
```

3.5 5

Fitness: 0.03

$\epsilon_0 = 0.085994$; $c_x = 0.032096$; $c_{x_0} = 0.373277$; $s_x = 0.986298$; $\Pi = 3565.000000$; $\chi = 3003.000000$; $\Delta = 1.480929$; $\Delta' = 1.507653$

```
# Prog
(>
  (- 6.0 $revStren)
  (EXP
    (EXP
      (- 6.0 $origOutStren))) 0.09259179288450614
  (EXP
    (MIN
      (* 0.9660594611137273 $origInDeg)
      (LOG
        (MIN $origInDeg $origOutDeg))))))
```

4 Chimane AGNATES

$m = 136.000000$; $n = 505.000000$

$\epsilon_0 = 0.001980$; $c_x = 0.016489$; $c_{x_0} = 1.000000$; $s_x = 0.801189$; $\Pi = 367.000000$; $\chi = 241.000000$; $\Delta = 66.000000$; $\Delta' = 158.000000$

4.1 1

Fitness: 0.2109

$\epsilon_0 = 0.001980$; $c_x = 0.007674$; $c_{x_0} = 1.000000$; $s_x = 0.745529$; $\Pi = 393.000000$; $\chi = 315.000000$; $\Delta = 63.000000$; $\Delta' = 99.000000$

```
# Prog
(==
  (LOG
    (<
      (- $origInStren $revStren)
      (/ 0.7105722303550973 $origInStren) $origInStren $targOutDeg))
  (ABS $revStren) 0.17617969247780563
  (+ 0.5798897661534349 $origId))
```

4.2 2

Fitness: 0.2261

$\epsilon_0 = 0.001980$; $c_x = 0.015634$; $c_{x_0} = 1.000000$; $s_x = 0.957361$; $\Pi = 389.000000$; $\chi = 393.000000$; $\Delta = 61.000000$; $\Delta' = 61.000000$

```
# Prog
(>
  (EXP $targInDeg) $targOutStren $revStren 8.0)
```

4.3 3

Fitness: 0.1822

$\epsilon_0 = 0.001980$; $c_x = 0.013657$; $c_{x_0} = 1.000000$; $s_x = 0.780075$; $\Pi = 248.000000$; $\chi = 267.000000$; $\Delta = 63.000000$; $\Delta' = 78.333333$

```
# Prog
(MAX
  (MIN
    (-
      (MAX
        (EXP $undirDist) $dirDist)
        (- 7.0 $targOutDeg))
      (-
        (/ $targOutStren $revStren)
        (> $undirDist
          (MIN $undirDist $targInStren) $origOutDeg 6.0)))
    (LOG
      (* 0.29196767377529953 $revStren)))
```

4.4 4

Fitness: 0.2211

$\epsilon_0 = 0.001980$; $c_x = 0.014285$; $c_{x_0} = 1.000000$; $s_x = 0.863299$; $\Pi = 474.000000$; $\chi = 383.000000$; $\Delta = 126.000000$; $\Delta' = 131.333333$

```
# Prog
(ZER
  (ABS
    (MIN 2980.9579870417283
      (* -0.9916377648885168
        (/ $revStren 0.43732567527687694))))
  (ABS
    (/ 2.0 $targInStren))
  (*
    (LOG
      (ABS $origInStren)) 148.4131591025766))
```

4.5 5

Fitness: 0.1857

$\epsilon_0 = 0.001980$; $c_x = 0.013752$; $c_{x_0} = 1.000000$; $s_x = 0.931565$; $\Pi = 421.000000$; $\chi = 397.000000$; $\Delta = 60.000000$; $\Delta' = 103.666667$

```

# Prog
(+ $revStren
  (/ 0.16660028616480183
    (ABS
      (EXP
        (ABS
          (+
            (> 7.0 $origOutStren $targId 2.0)
            (MIN $origOutStren 0.16100548688338812)))))))

```

5 Chimane UTERINES

$m = 152.000000$; $n = 534.000000$

$\epsilon_0 = 0.000000$; $c_x = 0.010142$; $c_{x_0} = 0.000000$; $s_x = 0.756570$; $\Pi = 346.000000$; $\chi = 234.000000$; $\Delta = 13.000000$; $\Delta' = 13.333333$

5.1 1

Fitness: 0.1171

$\epsilon_0 = 0.000000$; $c_x = 0.014511$; $c_{x_0} = 0.000000$; $s_x = 0.755921$; $\Pi = 210.000000$; $\chi = 234.000000$; $\Delta = 13.000000$; $\Delta' = 12.333333$

```

# Prog
(< $revStren
  (LOG $origOutStren)
  (*
    (MAX
      (/
        (ABS $revStren) 2.0) $dirStren) $origOutDeg)
  (MAX 0.0
    (EXP $targOutStren)))

```

5.2 2

Fitness: 0.1328

$\epsilon_0 = 0.000000$; $c_x = 0.009777$; $c_{x_0} = 0.000000$; $s_x = 0.931851$; $\Pi = 403.000000$; $\chi = 398.000000$; $\Delta = 13.000000$; $\Delta' = 11.666667$

```

# Prog
(<
  (- $origOutStren $revDist)
  (MIN $dirStren $origInStren)
  (- 0.5117704507004727
    (ABS $targInStren)) $revStren)

```


5.3 3

Fitness: 0.0707

$\epsilon_0 = 0.000000$; $c_x = 0.008999$; $c_{x_0} = 0.000000$; $s_x = 0.713952$; $\Pi = 399.000000$; $\chi = 240.000000$; $\Delta = 12.000000$; $\Delta' = 15.333333$

```
# Prog
(MIN
  (*
    (+ $revStren $origOutDeg)
    (ABS
      (MIN $origId $undirDist)))
  (* $origInStren
    (> 5.0 $origOutStren
      (==
        (ABS
          (/ 0.5312023733775071 $targInDeg)) $origId
        (*
          (EXP
            (+ 0.007836943079844283
              (< 0.0 $targInStren 8.0 0.0)))
            (LOG $targInStren))
          (>
            (ABS $targInStren) 0.9894221171229669
            (MIN 0.9749896852738016 $targOutStren) $targId)) $dirStren)))
```

5.4 4

Fitness: 0.1484

$\epsilon_0 = 0.000000$; $c_x = 0.006263$; $c_{x_0} = 0.000000$; $s_x = 0.876820$; $\Pi = 365.000000$; $\chi = 378.000000$; $\Delta = 13.000000$; $\Delta' = 13.666667$

```
# Prog
(==
  (<
    (- $targOutStren $undirDist) 0.0 9.0
    (/ $dirDist 2.0))
  (*
    (< 0.0 $origInStren $targInStren 0.6138287459145898)
    (* $origId 0.49098918664317204)) 0.13566339573899977 $revStren)
```

5.5 5

Fitness: 0.1429

$\epsilon_0 = 0.000000$; $c_x = 0.006249$; $c_{x_0} = 0.000000$; $s_x = 0.429854$; $\Pi = 345.000000$; $\chi = 244.000000$; $\Delta = 13.000000$; $\Delta' = 14.000000$

```

# Prog
(>
  (-
    (+ 0.19018663471520758
      (MAX $origInStren 0.0))
    (ZER
      (ABS
        (MIN
          (== $targOutDeg
            (ABS $targId) 0.8738544275458319
            (LOG $targInDeg))
          (< 0.7468566359395307 $origOutStren
            (> $revDist $origId 0.0 $undirDist)
            (+ $origInStren 0.41247645469946725)))) 1.223038448952258 2980.9579870417283))
  (MIN
    (+ 0.0 $targOutDeg)
    (-
      (- 0.7862945057407486 $origInStren) $targInStren)) $targOutStren
  (*
    (< 7.0
      (+ $origId 0.25058346008081367)
      (ABS
        (> 1.0 $origInStren 0.2564730389155706 $targOutDeg))
      (EXP $origId))
    (+ 0.4695811835049726
      (< 0.7085157103977336 $targOutStren $origId $origOutStren))))

```

6 Dogon QUARTERS

$m = 45.000000; n = 3255.000000$

$\epsilon_0 = 0.335177; c_x = 0.016997; c_{x_0} = 0.130157; s_x = 0.986651; \Pi = 3076.000000; \chi = 2673.000000; \Delta = 449930.000000; \Delta' = 455417.333333$

6.1 1

Fitness: 0.0797

$\epsilon_0 = 0.229493; c_x = 0.016268; c_{x_0} = 0.142992; s_x = 0.987955; \Pi = 3028.000000; \chi = 2777.000000; \Delta = 430582.000000; \Delta' = 445523.000000$

```

# Prog
(+ $targInStren
  (EXP
    (ABS
      (MIN 9.0
        (*
          (MAX
            (LOG
              (ZER $undirDist 2.0 4.0))
              (== 8103.083927575384 $revDist 8.0 2.233156946269029)) $revStren))))))

```

6.2 2

Fitness: 0.0988

$\epsilon_0 = 0.329954$; $c_x = 0.017307$; $c_{x_0} = 0.130094$; $s_x = 0.929775$; $\Pi = 3168.000000$; $\chi = 2320.000000$; $\Delta = 328876.000000$; $\Delta' = 563218.000000$

```
# Prog
(<
  (ZER $revDist
    (< 1.0
      (LOG
        (ZER
          (- 1.0 $origInStren) 0.0 $targOutDeg)) $targId 0.3624516752161412) $origId)
    (* $origOutStren 0.08444084296887977)
    (MAX $origId $undirDist)
    (== $origOutDeg 0.45194885812008667 $origInDeg $revStren))
```

6.3 3

Fitness: 0.6932

$\epsilon_0 = 0.047926$; $c_x = 0.001721$; $c_{x_0} = 0.053912$; $s_x = 0.793593$; $\Pi = 3088.000000$; $\chi = 2256.000000$; $\Delta = 457531.000000$; $\Delta' = 464878.000000$

```
# Prog
(LOG
  (ABS
    (MAX
      (ZER $origInDeg 0.2613719844176229
        (> 0.6127876559647867 $targInStren 0.0 $targOutStren))
      (>
        (+
          (MAX $targInDeg
            (< 2.0 $undirDist $undirDist 0.09537802122194128))
            (LOG $targId))
          (- 0.824139927061056
            (MAX
              (LOG $origInDeg)
              (MAX 0.5682175297942679
                (EXP
                  (- 0.0 $revDist)))))) $revStren $targOutDeg))))
```

6.4 4

Fitness: 0.1172

$\epsilon_0 = 0.323195; c_x = 0.016707; c_{x_0} = 0.108846; s_x = 0.921964; \Pi = 2709.000000; \chi = 2036.000000; \Delta = 361936.000000; \Delta' = 464661.666667$

```
# Prog
(<
  (ABS
    (EXP
      (<
        (MAX
          (MIN $dirStren 0.21341136146527695) $dirStren) $targId $dirDist 0.0))) 2.0
  (> $targOutDeg
    (- 0.25605182019050554
      (> $origOutDeg $origId 0.4199219236119788 $origOutDeg))
    (MAX $origInStren 8.22926957310281) 0.0)
  (>
    (< $origOutStren 0.5888267512150974 0.3652221672752519 $origId)
    (> $origOutDeg $origInDeg $dirDist $targInDeg) 0.36492734909264735
    (MAX $revStren $undirDist)))
```

6.5 5

Fitness: 0.1509

$\epsilon_0 = 0.485407; c_x = 0.017265; c_{x_0} = 0.067264; s_x = 0.990417; \Pi = 3255.000000; \chi = 2910.000000; \Delta = 453476.000000; \Delta' = 459019.333333$

```
# Prog
(< $origInDeg 0.21742140194823134 $origOutStren
  (>
    (MIN $dirDist $targInDeg)
    (ZER $targId 0.08423714093774348 0.09777830915586216) 0.9059217194357386 $targOutDeg))
```

7 Kei HOUSES

$m = 35.000000; n = 381.000000$

$\epsilon_0 = 0.015748; c_x = 0.004237; c_{x_0} = 0.222222; s_x = 0.289431; \Pi = 162.000000; \chi = 100.000000; \Delta = 723.000000; \Delta' = 756.000000$

7.1 1

Fitness: 0.0384

$\epsilon_0 = 0.015748; c_x = 0.004264; c_{x_0} = 0.222222; s_x = 0.287561; \Pi = 161.000000; \chi = 100.000000; \Delta = 642.000000; \Delta' = 895.666667$

```
# Prog
(< $targOutDeg $targInStren $targInDeg
  (+ $dirStren
    (EXP
```

```
(ABS
  (ZER $targOutDeg $dirDist $revStren))))))
```

7.2 2

Fitness: 0.0151

$\epsilon_0 = 0.015748$; $c_x = 0.004264$; $c_{x_0} = 0.222222$; $s_x = 0.297254$; $\Pi = 164.000000$; $\chi = 100.000000$; $\Delta = 713.000000$; $\Delta' = 711.000000$

```
# Prog
(LOG
  (+
    (>
      (* $targOutStren $targOutStren)
      (MAX $origId 0.8077271136347488) $origInDeg
      (/ $origOutDeg $targId))
    (<
      (/ $origInStren $dirDist)
      (MIN 3.0 $targInDeg)
      (/ 0.39911472739165776
        (< $targOutDeg $dirDist $targOutDeg 1.0)) 7.0)))
```

7.3 3

Fitness: 0.0216

$\epsilon_0 = 0.015748$; $c_x = 0.004237$; $c_{x_0} = 0.222222$; $s_x = 0.276423$; $\Pi = 154.000000$; $\chi = 100.000000$; $\Delta = 763.000000$; $\Delta' = 739.333333$

```
# Prog
(LOG
  (MAX $targOutDeg
    (MAX 0.26503872801337136 $origOutStren)))
```

7.4 4

Fitness: 0.0283

$\epsilon_0 = 0.015748$; $c_x = 0.004002$; $c_{x_0} = 0.222222$; $s_x = 0.285714$; $\Pi = 156.000000$; $\chi = 96.000000$; $\Delta = 700.000000$; $\Delta' = 791.333333$

```
# Prog
(+
  (MAX -0.1852069180773287
    (>
      (MAX $undirDist $origInStren)
      (LOG $dirDist)
```

```

      (- $origOutDeg 6.0)
      (MIN $origId 7.0)))
(MIN
  (LOG
    (* $targOutStren
      (MAX 0.0646830286672897 $origId))) $targInDeg))

```

7.5 5

Fitness: 0.0347

$\epsilon_0 = 0.015748$; $c_x = 0.004333$; $c_{x_0} = 0.222222$; $s_x = 0.289348$; $\Pi = 154.000000$; $\chi = 104.000000$; $\Delta = 633.000000$; $\Delta' = 732.333333$

```

# Prog
(== 0.0
  (==
    (LOG $targOutStren)
    (/ 2.7182818284590455
      (* $origInDeg 2.0))
    (> $origId 9.0
      (MIN $dirDist 7.0)
      (MIN $targOutDeg $dirDist))
    (/ -2.2678714963187847 $targOutStren)) 0.0
  (< $origInDeg 2.1972245773362196
    (+ 1.085459008745837 $targOutDeg)
    (+
      (/ $dirStren 7.0) $origId)))

```

8 Kel Kummer MAJOR LINEAGES

$m = 17.000000$; $n = 1056.000000$

$\epsilon_0 = 0.475379$; $c_x = 0.048410$; $c_{x_0} = 0.183465$; $s_x = 0.951504$; $\Pi = 1033.000000$; $\chi = 792.000000$; $\Delta = 37691.000000$; $\Delta' = 55280.000000$

8.1 1

Fitness: 0.0887

$\epsilon_0 = 0.428030$; $c_x = 0.038546$; $c_{x_0} = 0.173898$; $s_x = 0.948353$; $\Pi = 1055.000000$; $\chi = 820.000000$; $\Delta = 35440.000000$; $\Delta' = 45157.333333$

```

# Prog
(ZER
  (+ $undirDist 0.0)
  (MAX
    (ABS $targOutStren) $origInStren)
  (ABS
    (ABS

```

```
(> $origOutStren $origInStren $origId
  (ABS $revStren))))))
```

8.2 2

Fitness: 0.2578

$\epsilon_0 = 0.282197$; $c_x = 0.024098$; $c_{x_0} = 0.252894$; $s_x = 0.923266$; $\Pi = 994.000000$; $\chi = 716.000000$; $\Delta = 31263.000000$; $\Delta' = 46814.333333$

```
# Prog
(EXP
 (/
 (+ $targOutDeg 6.0)
 (LOG
 (*
 (EXP
 (ZER $dirDist
 (LOG
 (ZER $dirStren 0.07862605330942551
 (MIN
 (* $revStren 0.8344734676287607) 9.0))))
 (<
 (/ $revDist
 (EXP
 (ABS
 (EXP $targOutDeg)))) 0.8017642620893833
 (* $origOutDeg $targId) $origOutStren))) $targId))))
```

8.3 3

Fitness: 0.1858

$\epsilon_0 = 0.230114$; $c_x = 0.036674$; $c_{x_0} = 0.184237$; $s_x = 0.949799$; $\Pi = 1051.000000$; $\chi = 899.000000$; $\Delta = 47092.000000$; $\Delta' = 49476.000000$

```
# Prog
(/
 (+
 (MIN
 (== $origOutDeg $origOutDeg
 (ZER
 (ZER $revStren $targOutStren 0.2229377304579344) 1.0 -0.022328140722795334) $targOutDeg
 (* $revStren $origOutStren)) 0.0047383584515194865)
 (== $targOutStren $dirDist 0.9313148943044213 0.9203745940722327)))
```

8.4 4

Fitness: 0.0186

$\epsilon_0 = 0.460227$; $c_x = 0.048396$; $c_{x_0} = 0.184313$; $s_x = 0.930218$; $\Pi = 1024.000000$; $\chi = 814.000000$; $\Delta = 36780.000000$; $\Delta' = 53759.333333$

Prog

```
(<
(MIN $dirDist $targId)
(==
(MAX 4.0 $origOutStren) $origInStren $targOutDeg 0.05584052273063156)
(ABS
(+ 5.0
(MAX $origInStren 0.2084296348569874)))) $revStren)
```

8.5 5

Fitness: 0.2017

$\epsilon_0 = 0.331439$; $c_x = 0.046367$; $c_{x_0} = 0.289927$; $s_x = 0.984180$; $\Pi = 1054.000000$; $\chi = 958.000000$; $\Delta = 35428.000000$; $\Delta' = 35375.666667$

Prog

```
(+
(MAX
(/
(- 2.0 $origOutStren)
(MAX 1.0
(MAX $targInStren $targInDeg)))) $revStren) $dirStren)
```

9 Kel Kummer MINOR LINEAGES

$m = 21.000000$; $n = 1056.000000$

$\epsilon_0 = 0.329545$; $c_x = 0.019886$; $c_{x_0} = 0.110517$; $s_x = 0.880862$; $\Pi = 1011.000000$; $\chi = 734.000000$; $\Delta = 37624.000000$; $\Delta' = 53473.666667$

9.1 1

Fitness: 0.1347

$\epsilon_0 = 0.309659$; $c_x = 0.020928$; $c_{x_0} = 0.117246$; $s_x = 0.600608$; $\Pi = 984.000000$; $\chi = 531.000000$; $\Delta = 38969.000000$; $\Delta' = 46660.000000$

Prog

```
(+
(/ $targInStren
(> 9.0 $dirStren 0.0 6.0))
(< $targInStren
(> 0.6479188461470192 $revDist 0.0 7.0) 0.0 0.9813990962181108))
```


9.2 2

Fitness: 0.1251

$\epsilon_0 = 0.262311$; $c_x = 0.021457$; $c_{x_0} = 0.150934$; $s_x = 0.888457$; $\Pi = 944.000000$; $\chi = 741.000000$; $\Delta = 43924.000000$; $\Delta' = 46341.000000$

```
# Prog
(ABS
 (/
  (-
    (MAX 2.0 $targOutDeg)
    (> $dirDist 0.0 $origOutDeg $targId))
  (-
    (< 3.0 $dirStren 0.9736527655296805 9.0) 0.0)))
```

9.3 3

Fitness: 0.4575

$\epsilon_0 = 0.067235$; $c_x = 0.004412$; $c_{x_0} = 0.104146$; $s_x = 0.677439$; $\Pi = 985.000000$; $\chi = 637.000000$; $\Delta = 38992.000000$; $\Delta' = 51423.333333$

```
# Prog
(== 2.048696779879021
 (ZER $origOutDeg
  (- $targInStren 0.0)
  (> $dirDist 0.6681361155730328 $targOutDeg 0.4928989901411478)) $targInDeg $origId)
```

9.4 4

Fitness: 0.0826

$\epsilon_0 = 0.348485$; $c_x = 0.019687$; $c_{x_0} = 0.109419$; $s_x = 0.970028$; $\Pi = 1004.000000$; $\chi = 896.000000$; $\Delta = 44764.000000$; $\Delta' = 47971.666667$

```
# Prog
(MAX
 (/ $revStren 0.17900011509864489)
 (> $origOutStren
  (* 4.0 $origInDeg) $targId
  (< $dirDist 0.13330322136381545 $targId $dirStren)))
```

9.5 5

Fitness: 0.104

$\epsilon_0 = 0.269886$; $c_x = 0.025561$; $c_{x_0} = 0.115716$; $s_x = 0.856476$; $\Pi = 969.000000$; $\chi = 727.000000$; $\Delta = 44395.000000$; $\Delta' = 48886.333333$

```
# Prog
(ZER
(MIN $revStren $dirStren) 0.3051292110921554
(MAX $targInStren $targOutStren))
```

10 Samo LIGNEES

$m = 94.000000$; $n = 900.000000$

$\epsilon_0 = 0.000000$; $c_x = 0.001738$; $c_{x_0} = 0.000000$; $s_x = 0.467330$; $\Pi = 335.000000$; $\chi = 324.000000$; $\Delta = 2200.000000$; $\Delta' = 2270.333333$

10.1 1

Fitness: 0.0078

$\epsilon_0 = 0.000000$; $c_x = 0.001733$; $c_{x_0} = 0.000000$; $s_x = 0.465812$; $\Pi = 328.000000$; $\chi = 332.000000$; $\Delta = 2194.000000$; $\Delta' = 2289.000000$

```
# Prog
(ABS
(<
(MAX $undirDist $targOutDeg)
(* $origId $revDist) 0.06926538581476438 $dirDist))
```

10.2 2

Fitness: 0.0498

$\epsilon_0 = 0.000000$; $c_x = 0.001815$; $c_{x_0} = 0.000000$; $s_x = 0.540136$; $\Pi = 296.000000$; $\chi = 330.000000$; $\Delta = 2187.000000$; $\Delta' = 2132.000000$

```
# Prog
(<
(/ $targInDeg
(< $targOutDeg 0.7558680413050674
(+
(MIN 0.15032048633848255
(> 6.0 $origInDeg $origId 9.99999999E8)) 0.820212610817737) $targOutDeg)) $revStren
(+
(< $origOutStren 0.6757374452635685 1.0
(MAX $origInStren $targOutDeg)) $targOutStren) $dirDist)
```

10.3 3

Fitness: 0.1269

$\epsilon_0 = 0.000000$; $c_x = 0.002042$; $c_{x_0} = 0.000000$; $s_x = 0.650544$; $\Pi = 328.000000$; $\chi = 444.000000$; $\Delta = 2081.000000$; $\Delta' = 2590.000000$

```
# Prog
(/
(-
(>
(+ $targOutStren $targOutDeg)
(/ $undirDist
(ZER $origId $revStren 0.8380708867004738)) $revStren $targId) 0.4028910657014495)
(<
(MIN
(< $origInStren $revDist 5.0 $origOutStren)
(/ 1.0 $targOutStren))
(EXP
(/
(< $targInStren 1.0 $revDist 0.5865878042830039)
(LOG $revStren)))
(EXP
(+
(MIN 6.0 $targOutStren) 0.11865445070535696)) 0.09157711289130854))
```

10.4 4

Fitness: 0.0349

$\epsilon_0 = 0.000000$; $c_x = 0.001825$; $c_{x_0} = 0.000000$; $s_x = 0.496617$; $\Pi = 337.000000$; $\chi = 312.000000$; $\Delta = 2049.000000$; $\Delta' = 2398.666667$

```
# Prog
(+ $revStren
(>
(+ $origOutDeg $revDist) $origOutDeg
(/ 2.1972245773362196
(ABS
(ABS
(LOG $targInStren)))) 0.0))
```

10.5 5

Fitness: 0.3339

$\epsilon_0 = 0.000000$; $c_x = 0.001778$; $c_{x_0} = 0.000000$; $s_x = 0.215278$; $\Pi = 310.000000$; $\chi = 162.000000$; $\Delta = 997.000000$; $\Delta' = 1663.000000$

```
# Prog
(<
```

```

(EXP
  (+ $undirDist
    (*
      (LOG
        (+ $dirDist $revDist))
      (ZER
        (MIN $targId 0.5390667628223542)
        (- $dirDist $origOutDeg) -0.009731885623006087)))) $origInDeg $targInStren $undirDist)

```

11 Watchi Residents LINEAGES

$m = 96.000000$; $n = 2636.000000$

$\epsilon_0 = 0.084219$; $c_x = 0.002466$; $c_{x_0} = 0.116387$; $s_x = 0.844071$; $\Pi = 1915.000000$; $\chi = 1500.000000$; $\Delta = 161730.000000$; $\Delta' = 168772.000000$

11.1 1

Fitness: 0.1613

$\epsilon_0 = 0.045903$; $c_x = 0.001789$; $c_{x_0} = 0.122328$; $s_x = 0.794899$; $\Pi = 1641.000000$; $\chi = 1425.000000$; $\Delta = 156933.000000$; $\Delta' = 171587.666667$

Prog

```

(MAX
  (* 7.0
    (*
      (+
        (MIN $revStren $origId)
        (> $targInDeg $origOutDeg $origInStren 0.45029148822061704))
      (MAX 2.7182818284590455
        (-
          (== 0.7552620311564908
            (* $revStren 2.0)
            (/ 1.0 $revDist) 9.0)
          (MIN $revDist 1.0)))))) $dirDist)

```

11.2 2

Fitness: 0.2489

$\epsilon_0 = 0.042868$; $c_x = 0.001939$; $c_{x_0} = 0.165322$; $s_x = 0.708847$; $\Pi = 1616.000000$; $\chi = 1161.000000$; $\Delta = 151714.000000$; $\Delta' = 179165.000000$

Prog

```

(ABS
  (/
    (MAX $targOutDeg 0.0) $origId))

```

11.3 3

Fitness: 0.0564

$\epsilon_0 = 0.072838$; $c_x = 0.002532$; $c_{x_0} = 0.102756$; $s_x = 0.876648$; $\Pi = 1896.000000$; $\chi = 1620.000000$; $\Delta = 163341.000000$; $\Delta' = 165389.000000$

```
# Prog
(< 7.0
  (< $revStren 4.0 $targInDeg 0.8832792523817156)
  (MIN $origInStren
    (- 7.0
      (- $revDist 0.7009655588670215))))
  (MAX $targInStren $revStren))
```

11.4 4

Fitness: 0.2521

$\epsilon_0 = 0.028073$; $c_x = 0.003214$; $c_{x_0} = 0.122717$; $s_x = 0.797850$; $\Pi = 2064.000000$; $\chi = 1126.000000$; $\Delta = 140024.000000$; $\Delta' = 162427.333333$

```
# Prog
(+ $revDist
  (EXP
    (<
      (< 0.3128645959362262 $revStren $targInStren 0.8997390085752401) 6.0
      (/
        (<
          (ABS
            (+ $origInStren 0.0))
          (/
            (MIN $targOutDeg 4.0) $origInStren) 1096.6331584284585
            (- 1.0
              (* 0.003309595326598802 $origOutStren))))
        (<
          (ZER
            (* $targInDeg 5.0)
            (MAX $undirDist $undirDist)
            (* $dirStren -1.080171505902857)) 0.44368670618241235
          (MIN $origId
            (LOG $origOutStren)) 0.0))
      (MAX $origInDeg $targInDeg))))
```

11.5 5

Fitness: 0.7016

$\epsilon_0 = 0.011760; c_x = 0.004541; c_{x_0} = 0.354839; s_x = 0.346403; \Pi = 2402.000000; \chi = 837.000000; \Delta = 157470.000000; \Delta' = 204373.666667$

```
# Prog
(EXP
  (<
    (==
      (MIN
        (+
          (/ $targInStren $targInStren) 0.510422865121714)
          (* 0.33382227754140326
            (* $origInStren $origId)))
        (-
          (< 0.551547103757041
            (/ $targInDeg 7.0) $revStren
            (-
              (EXP $origOutStren) $origId)) 0.0)
          (+
            (EXP
              (/
                (> $targInStren
                  (< 0.05305919328726094 $targInDeg 0.09522960678596726 0.0) 0.41720585658704 $revDist)
                (< $origInStren
                  (+ $dirDist 4.0) $dirDist
                  (MAX $targOutDeg 2.0))))
            (MIN
              (LOG
                (+ $origInStren 0.0))
              (ABS
                (ZER $targOutStren $targInStren 5.9180924104636805)))) $targInStren $targId $revDist))
```

12 Watchi Total LINEAGES

$m = 155.000000; n = 4528.000000$

$\epsilon_0 = 0.099161; c_x = 0.002054; c_{x_0} = 0.085183; s_x = 0.894391; \Pi = 3455.000000; \chi = 2797.000000; \Delta = 619715.000000; \Delta' = 628378.333333$

12.1 1

Fitness: 0.4743

$\epsilon_0 = 0.017889; c_x = 0.002492; c_{x_0} = 0.024234; s_x = 0.772788; \Pi = 4324.000000; \chi = 3131.000000; \Delta = 551400.000000; \Delta' = 648437.000000$

```
# Prog
(ZER
  (ABS
    (LOG $revDist))
  (MAX $targId 1.0)
  (MIN
```

```
(ABS
  (ZER $revDist 5.0
    (* $origInDeg $targInStren))) 1.791759469228055))
```

12.2 2

Fitness: 0.1293

$\epsilon_0 = 0.087898$; $c_x = 0.003217$; $c_{x_0} = 0.083533$; $s_x = 0.795737$; $\Pi = 4322.000000$; $\chi = 2820.000000$; $\Delta = 563734.000000$; $\Delta' = 627515.000000$

```
# Prog
(MIN
  (+ 0.10527722644509363
    (MAX
      (> $undirDist 0.7075780307166767 0.0 3.0)
      (-
        (LOG $origInDeg) $dirDist)))
  (< $origOutDeg
    (/ $targInDeg $targOutStren)
    (MAX
      (ABS
        (/ 0.4426753026748625
          (ZER $revDist $targId 2.0))) $origInDeg) $revStren))
```

12.3 3

Fitness: 0.2549

$\epsilon_0 = 0.030035$; $c_x = 0.001382$; $c_{x_0} = 0.090830$; $s_x = 0.812773$; $\Pi = 3045.000000$; $\chi = 2556.000000$; $\Delta = 617580.000000$; $\Delta' = 673295.000000$

```
# Prog
(ABS
  (> 3.0
    (== $revStren
      (/
        (- 0.3986557736539539 $targInDeg)
        (* $targInStren $dirStren)) $targId $revStren) $targOutDeg
    (> $targId $origInStren $revStren $origInStren)))
```

12.4 4

Fitness: 0.3875

$\epsilon_0 = 0.036219$; $c_x = 0.001040$; $c_{x_0} = 0.035098$; $s_x = 0.791749$; $\Pi = 4379.000000$; $\chi = 3230.000000$; $\Delta = 631750.000000$; $\Delta' = 631091.666667$

```
# Prog
(LOG
  (*
    (MIN 4.0 $targOutStren)
    (< $origInDeg 0.751950963085985 0.0 0.3629632512698312)))
```

12.5 5

Fitness: 0.2557

$\epsilon_0 = 0.039311$; $c_x = 0.001337$; $c_{x_0} = 0.081997$; $s_x = 0.701985$; $\Pi = 3859.000000$; $\chi = 2834.000000$; $\Delta = 649418.000000$; $\Delta' = 798723.000000$

```
# Prog
(+
  (<
    (ZER
      (/ 0.2611929796403928 $targId) 0.28796076408686966 $targOutDeg) $origId 0.0 $targOutDeg)
    (/ $undirDist
      (/ $targOutStren $origOutDeg)))
```

13 Ancien Regime DYNASTIES

$m = 961.000000$; $n = 2181.000000$

$\epsilon_0 = 0.098579$; $c_x = 0.001263$; $c_{x_0} = 0.052980$; $s_x = 0.683369$; $\Pi = 813.000000$; $\chi = 695.000000$; $\Delta = 9002.000000$; $\Delta' = 9401.666667$

13.1 1

Fitness: 0.0705

$\epsilon_0 = 0.103164$; $c_x = 0.001196$; $c_{x_0} = 0.051496$; $s_x = 0.614830$; $\Pi = 883.000000$; $\chi = 699.000000$; $\Delta = 7663.000000$; $\Delta' = 10192.000000$

```
# Prog
(/ 0.5214632452637397
  (MAX
    (< $origId $targInStren 0.30713829444735363
      (MAX 0.0 $revDist))
    (/ 0.7412869275682753 $origInDeg)))
```

13.2 2

Fitness: 0.4266

$\epsilon_0 = 0.037597$; $c_x = 7.944482$; $c_{x_0} = 0.034503$; $s_x = 0.329188$; $\Pi = 859.000000$; $\chi = 528.000000$; $\Delta = 10000.000000$; $\Delta' = 13902.666667$


```

# Prog
(< 0.9516904597677606
  (== $origId
    (LOG
      (EXP
        (>
          (ABS $targInStren)
          (> $revDist $targInStren $origOutStren $revDist) $origInDeg
          (> $revDist $targInStren 0.04828426812276043
            (- $origInStren
              (* $revDist 6.0)))))) 0.0 8.0) $targInDeg 0.4808399777289827)

```

13.3 3

Fitness: 0.2183

$\epsilon_0 = 0.089867$; $c_x = 0.001467$; $c_{x_0} = 0.054352$; $s_x = 0.527447$; $\Pi = 467.000000$; $\chi = 688.000000$; $\Delta = 12952.000000$; $\Delta' = 12576.666667$

```

# Prog
(MAX
  (-
    (ABS $origInStren)
    (ZER
      (> 8.0 $targOutStren $dirStren $targOutDeg) $revDist
      (ABS $targId))) -1.6969188168218108)

```

13.4 4

Fitness: 0.2958

$\epsilon_0 = 0.081614$; $c_x = 8.793799$; $c_{x_0} = 0.017485$; $s_x = 0.550323$; $\Pi = 1027.000000$; $\chi = 880.000000$; $\Delta = 9175.000000$; $\Delta' = 9381.333333$

```

# Prog
(MAX
  (EXP
    (== $undirDist
      (MIN $targInDeg $targOutDeg)
      (> 0.9682771101540344
        (LOG $targOutDeg)
        (- 0.0 $origInDeg) $origInStren)
      (> $undirDist
        (MIN $revDist $origInStren) 0.4848695227210713 9.0))) $revStren)

```

13.5 5

Fitness: 0.4363

$\epsilon_0 = 0.021550$; $c_x = 7.149823$; $c_{x_0} = 0.079221$; $s_x = 0.326669$; $\Pi = 826.000000$; $\chi = 621.000000$; $\Delta = 9293.000000$; $\Delta' = 10394.666667$

```
# Prog
(> $origInStren
(*
  (> 0.4260964074970389 $origId 0.8018724866671683 $revStren)
  (* 3.0 $targInDeg)) $targOutStren $origOutStren)
```

14 Meri MAJOR LINEAGES

$m = 9.000000$; $n = 882.000000$

$\epsilon_0 = 0.363946$; $c_x = 0.054769$; $c_{x_0} = 0.319087$; $s_x = 0.981669$; $\Pi = 873.000000$; $\chi = 763.000000$; $\Delta = 161203.000000$; $\Delta' = 161522.000000$

14.1 1

Fitness: 0.0262

$\epsilon_0 = 0.382086$; $c_x = 0.054941$; $c_{x_0} = 0.302486$; $s_x = 0.975222$; $\Pi = 879.000000$; $\chi = 761.000000$; $\Delta = 150425.000000$; $\Delta' = 164693.666667$

```
# Prog
(+
  (< $origOutStren
    (ZER $undirDist $targInStren
      (*
        (> $revDist 8.0 0.8717209187284916 $dirDist)
        (EXP $dirDist))) $dirStren
      (MAX 0.4759119167036515 $dirDist))
    (- $targId
      (+ 0.8397780120610804
        (ZER $origInDeg
          (ABS
            (* 7.0 $targInStren)) 0.4286926167882028))))))
```

14.2 2

Fitness: 0.3024

$\epsilon_0 = 0.251701$; $c_x = 0.020236$; $c_{x_0} = 0.181844$; $s_x = 0.957947$; $\Pi = 882.000000$; $\chi = 768.000000$; $\Delta = 128468.000000$; $\Delta' = 129125.333333$

```
# Prog
(<
  (/
    (MAX $revDist
```

```

(< $targInDeg $origInDeg $targInDeg $targInStren)) $revDist) 6.0 $origId
(< $origInDeg
(+ $targOutStren $targOutDeg) 1.3862943611198906
(+ 0.942205169210278 $targOutStren)))

```

14.3 3

Fitness: 0.1112

$\epsilon_0 = 0.214286$; $c_x = 0.049707$; $c_{x_0} = 0.330814$; $s_x = 0.991285$; $\Pi = 881.000000$; $\chi = 789.000000$; $\Delta = 148104.000000$; $\Delta' = 147667.666667$

```

# Prog
(> $revStren
(> $revStren $targInDeg $dirDist
(ZER
(/ $origInStren
(MAX 5.0
(< $dirStren $origOutDeg 2.0
(EXP $revDist)))) $origInDeg $origOutStren)) $origInDeg 0.3487397578760789)

```

14.4 4

Fitness: 0.4569

$\epsilon_0 = 0.145125$; $c_x = 0.013662$; $c_{x_0} = 0.121094$; $s_x = 0.938464$; $\Pi = 882.000000$; $\chi = 764.000000$; $\Delta = 189243.000000$; $\Delta' = 189872.333333$

```

# Prog
0.0

```

14.5 5

Fitness: 0.0625

$\epsilon_0 = 0.311791$; $c_x = 0.047470$; $c_{x_0} = 0.322340$; $s_x = 0.993474$; $\Pi = 881.000000$; $\chi = 825.000000$; $\Delta = 153816.000000$; $\Delta' = 154264.666667$

```

# Prog
(<
(< 0.3232282477634504 $revDist 2.0 $targId) 1.9459101490553132 11.622265199289567
(MAX
(MAX
(* 0.4106290474164225
(- $revStren 3.0)) 0.0)
(< $origInStren $origId 7.0 0.4794720112840113)))

```

15 Meri MINOR LINEAGES

$m = 31.000000; n = 738.000000$

$\epsilon_0 = 0.166667; c_x = 0.007227; c_{x_0} = 0.111640; s_x = 0.805640; \Pi = 557.000000; \chi = 417.000000; \Delta = 11954.000000; \Delta' = 10831.333333$

15.1 1

Fitness: 0.2407

$\epsilon_0 = 0.075881; c_x = 0.004517; c_{x_0} = 0.114158; s_x = 0.685366; \Pi = 536.000000; \chi = 352.000000; \Delta = 11267.000000; \Delta' = 13464.000000$

```
# Prog
(ABS
(<
(+ $targInDeg 0.6772809332857562)
(- $origId 0.4353148633928965) 0.3643927267261444
(== 0.0 $dirStren 9.0 $targOutDeg)))
```

15.2 2

Fitness: 0.1417

$\epsilon_0 = 0.082656; c_x = 0.007109; c_{x_0} = 0.112604; s_x = 0.777118; \Pi = 613.000000; \chi = 431.000000; \Delta = 12378.000000; \Delta' = 13335.333333$

```
# Prog
(EXP
(MAX $origInDeg
(ZER
(* $targInDeg $targInDeg)
(EXP
(> $undirDist 0.0 0.11100244644727641 $targId))
(< 4.0 $targOutStren $targId 1.0))))
```

15.3 3

Fitness: 0.1294

$\epsilon_0 = 0.153117; c_x = 0.006735; c_{x_0} = 0.075260; s_x = 0.758179; \Pi = 597.000000; \chi = 397.000000; \Delta = 9972.000000; \Delta' = 12273.333333$

```
# Prog
(<
(+ $revDist 2.0) $targInStren 5.0
(- 0.89984644446869686
(*
(EXP $targId)
(* $origOutDeg $origId))))
```

15.4 4

Fitness: 0.0955

$\epsilon_0 = 0.159892$; $c_x = 0.008204$; $c_{x_0} = 0.106866$; $s_x = 0.829006$; $\Pi = 653.000000$; $\chi = 460.000000$; $\Delta = 10610.000000$; $\Delta' = 12547.000000$

Prog

```
(== 5.284913114854943E8
(+ $targId $origInStren)
(ZER
(== 3.885430210573062 $undirDist
(+ 0.0 $targOutStren) 0.0) 0.6070439598719612
(+
(MIN 6389.918420199837
(MAX $origOutStren $targOutStren)) $origOutStren))
(*
(+
(== $origInDeg $origInStren 0.5833292024700016 2.0)
(- $revStren $dirDist))
(MIN $targInStren
(- $targOutDeg 3.0))))
```

15.5 5

Fitness: 0.0488

$\epsilon_0 = 0.181572$; $c_x = 0.007554$; $c_{x_0} = 0.113166$; $s_x = 0.776373$; $\Pi = 572.000000$; $\chi = 418.000000$; $\Delta = 10430.000000$; $\Delta' = 10359.333333$

Prog

```
(-
(>
(+ 0.0 $targInDeg)
(*
(MIN $targOutDeg $dirDist)
(MIN $origInDeg $revDist)) $origInStren
(-
(+ 0.28165483593688856 $dirStren) 0.5381580636141812))
(+
(== 3.0 $targId $targInDeg $origOutStren)
(>
(* $origOutStren 0.9074503410574196)
(- $origId 0.1601751140208596)
(MAX
(ABS
(> $origId 0.7904869427038254 4.0 $targOutStren)) $dirStren) 0.7686512867460593))))
```

16 Udalen MATRILINEAGES

$m = 8.000000; n = 207.000000$

$\epsilon_0 = 0.256039; c_{\mathbf{x}} = 0.033723; c_{\mathbf{x}_0} = 0.234603; s_{\mathbf{x}} = 0.846367; \Pi = 195.000000; \chi = 153.000000; \Delta = 2693.000000; \Delta' = 2352.000000$

16.1 1

Fitness: 0.0329

$\epsilon_0 = 0.251208; c_{\mathbf{x}} = 0.030409; c_{\mathbf{x}_0} = 0.244822; s_{\mathbf{x}} = 0.839601; \Pi = 198.000000; \chi = 150.000000; \Delta = 2602.000000; \Delta' = 2400.333333$

```
# Prog
(==
(<
(* 0.09349315103775069 $revDist)
(ABS $undirDist)
(* 0.695187638126806 $origInDeg) 0.0)
(MAX
(- $targId $revStren)
(ZER $origInDeg 0.0 $undirDist)) $origInDeg 0.8180063066536816)
```

16.2 2

Fitness: 0.0379

$\epsilon_0 = 0.260870; c_{\mathbf{x}} = 0.029989; c_{\mathbf{x}_0} = 0.239369; s_{\mathbf{x}} = 0.866926; \Pi = 194.000000; \chi = 150.000000; \Delta = 2553.000000; \Delta' = 2459.333333$

```
# Prog
(/
(*
(LOG $origInDeg) 1.9459101490553132)
(ZER
(< 0.18830727946263648 $targOutDeg $dirDist $dirStren)
(< $origOutDeg $origId 0.3371288049883243 6.0)
(< $targInStren 0.570158899737311 5.0 7.0)))
```

16.3 3

Fitness: 0.0409

$\epsilon_0 = 0.217391; c_{\mathbf{x}} = 0.033770; c_{\mathbf{x}_0} = 0.241481; s_{\mathbf{x}} = 0.824464; \Pi = 190.000000; \chi = 151.000000; \Delta = 2598.000000; \Delta' = 2278.000000$

```
# Prog
(>
(EXP
(/ $revStren
(EXP $dirDist)))
```

```
(MIN $targOutStren 2.0) $targId 0.908311967099103)
```

16.4 4

Fitness: 0.1026

$\epsilon_0 = 0.236715$; $c_x = 0.024481$; $c_{x_0} = 0.185339$; $s_x = 0.847474$; $\Pi = 197.000000$; $\chi = 155.000000$; $\Delta = 2403.000000$; $\Delta' = 2466.666667$

Prog

```
(==
(*
  (== 2.0 $dirDist 2.1972245773362196 0.8039384234347086)
  (ZER $targOutDeg 9.0 0.47606374831807885))
(>
  (> $revStren 3.0 $dirDist 0.8609731342258087) 0.935587594433485
  (EXP $dirStren)
  (ABS $targOutDeg)) 0.0
(LOG
  (ABS $targOutStren)))
```

16.5 5

Fitness: 0.0385

$\epsilon_0 = 0.260870$; $c_x = 0.031109$; $c_{x_0} = 0.239369$; $s_x = 0.855214$; $\Pi = 192.000000$; $\chi = 146.000000$; $\Delta = 2597.000000$; $\Delta' = 2547.333333$

Prog

```
(-
(MIN 0.6943088647875846
  (< 2.9225525966578165
    (LOG $targInStren)
    (+ 0.0 $targInStren)
    (* 0.6527091379048365
      (MAX
        (+
          (/ $origId $origOutStren) 0.0)
          (LOG
            (LOG $targOutStren))))))
(== 0.0
  (LOG $undirDist) 0.36486405930135457
  (LOG
    (> $origInStren $targId 0.8749965402706152 $targInStren))))
```

17 Udalen PATRILINEAGES

$m = 10.000000; n = 191.000000$

$\epsilon_0 = 0.109948; c_x = 0.017461; c_{x_0} = 0.206349; s_x = 0.786499; \Pi = 164.000000; \chi = 135.000000; \Delta = 1980.000000; \Delta' = 1933.333333$

17.1 1

Fitness: 0.03

$\epsilon_0 = 0.109948; c_x = 0.016474; c_{x_0} = 0.201814; s_x = 0.790349; \Pi = 160.000000; \chi = 131.000000; \Delta = 1867.000000; \Delta' = 1856.000000$

```
# Prog
$targOutStren
```

17.2 2

Fitness: 0.0283

$\epsilon_0 = 0.104712; c_x = 0.016913; c_{x_0} = 0.200000; s_x = 0.764992; \Pi = 162.000000; \chi = 132.000000; \Delta = 1975.000000; \Delta' = 1839.333333$

```
# Prog
$origInStren
```

17.3 3

Fitness: 0.022

$\epsilon_0 = 0.115183; c_x = 0.016803; c_{x_0} = 0.206612; s_x = 0.809135; \Pi = 162.000000; \chi = 136.000000; \Delta = 1933.000000; \Delta' = 1899.666667$

```
# Prog
$targOutStren
```

17.4 4

Fitness: 0.0194

$\epsilon_0 = 0.109948; c_x = 0.017790; c_{x_0} = 0.188209; s_x = 0.787365; \Pi = 164.000000; \chi = 137.000000; \Delta = 1932.000000; \Delta' = 1941.666667$

```
# Prog
(+
(> 0.16809421160179383 0.8337090191344083 0.6941674464349523
(ABS
(MAX $targOutStren $targInDeg)))
(- $origOutStren 0.5357763846489716))
```


17.5 5

Fitness: 0.0486

$\epsilon_0 = 0.104712$; $c_x = 0.015323$; $c_{x_0} = 0.210000$; $s_x = 0.779964$; $\Pi = 158.000000$; $\chi = 136.000000$; $\Delta = 1902.000000$; $\Delta' = 1751.666667$

```
# Prog
$targOutStren
```

18 Xerente CLANS

$m = 16.000000$; $n = 664.000000$

$\epsilon_0 = 0.170181$; $c_x = 0.051563$; $c_{x_0} = 0.343880$; $s_x = 0.964239$; $\Pi = 648.000000$; $\chi = 559.000000$; $\Delta = 337381.000000$; $\Delta' = 346348.333333$

18.1 1

Fitness: 0.0638

$\epsilon_0 = 0.191265$; $c_x = 0.051568$; $c_{x_0} = 0.438651$; $s_x = 0.917356$; $\Pi = 661.000000$; $\chi = 561.000000$; $\Delta = 340468.000000$; $\Delta' = 370748.333333$

```
# Prog
(/
  (/ $origInStren
    (LOG $targOutDeg))
  (> 5.0 $targInDeg 8.0 $dirStren))
```

18.2 2

Fitness: 0.1028

$\epsilon_0 = 0.227410$; $c_x = 0.045761$; $c_{x_0} = 0.255647$; $s_x = 0.948999$; $\Pi = 664.000000$; $\chi = 593.000000$; $\Delta = 338879.000000$; $\Delta' = 341946.000000$

```
# Prog
(== $targId $origOutDeg $origInStren $targOutStren)
```

18.3 3

Fitness: 0.0526

$\epsilon_0 = 0.207831$; $c_x = 0.052974$; $c_{x_0} = 0.349821$; $s_x = 0.943826$; $\Pi = 648.000000$; $\chi = 490.000000$; $\Delta = 342055.000000$; $\Delta' = 342805.666667$

```

# Prog
(-
  (+
    (-
      (ZER $targId $origOutStren
        (- $dirStren 0.06696053342839992))
      (< $origOutStren $targInStren 0.08153396632802956 $dirDist))
      (> 0.2864920225998143 4.0 9.0 $undirDist))
    (- 0.5470291647640831
      (MAX 1.0 $origInStren)))

```

18.4 4

Fitness: 0.0652

$\epsilon_0 = 0.195783$; $c_x = 0.048592$; $c_{x_0} = 0.309231$; $s_x = 0.965646$; $\Pi = 636.000000$; $\chi = 518.000000$; $\Delta = 362076.000000$; $\Delta' = 363834.666667$

```

# Prog
(<
  (ABS
    (== $origOutDeg $origInDeg 5.0
      (LOG $origOutStren))) 1.0 0.0
    (+ $dirStren $targOutStren))

```

18.5 5

Fitness: 0.0791

$\epsilon_0 = 0.191265$; $c_x = 0.042718$; $c_{x_0} = 0.261083$; $s_x = 0.925613$; $\Pi = 651.000000$; $\chi = 557.000000$; $\Delta = 338006.000000$; $\Delta' = 345998.000000$

```

# Prog
(< $origOutDeg $targInDeg 0.07939494866614172 $targOutStren)

```