# Using x\_squared\_minus\_y.csv

Experiment 1

> result <- cgp(dataset = x\_squared\_minus\_y,

+ model = output ~ x + y,

+ maxGenerations = 1000,

+ rowsFuncNodes = 5,

+ colsFuncNodes = 5,

+ levelsBack = 2,

+ updateFreq = 100)

Generation: 1 / 1000

Fitness of best solution so far: 3310.504

Average fitness of population: 3.473594e+40

Generation: 101 / 1000

Fitness of best solution so far: 3118.098

Average fitness of population: 3273.095

Generation: 201 / 1000

Fitness of best solution so far: 52.16118

Average fitness of population: 705.1304

Generation: 301 / 1000

Fitness of best solution so far: 51.5747

Average fitness of population: NaN

Generation: 401 / 1000

Fitness of best solution so far: 51.5747

Average fitness of population: NaN

Generation: 501 / 1000

Fitness of best solution so far: 51.5747

Average fitness of population: 704.5511

Generation: 601 / 1000

Fitness of best solution so far: 51.5747

Average fitness of population: 2034.725

Generation: 701 / 1000

Fitness of best solution so far: 51.5747

Average fitness of population: 704.4237

Generation: 801 / 1000

Fitness of best solution so far: 51.5747

Average fitness of population: 695.0668

Generation: 901 / 1000

Fitness of best solution so far: 51.5747

Average fitness of population: 2009.669

Generation: 950 / 1000

Fitness of best solution so far: 0

Average fitness of population: 662.9605

Best solution found as text:

(c + ((a \* a) - ((a - a) + (b - c))))

> result$bestSolution

$inputNodes

chromoID value

1 1 NA

2 2 NA

3 3 0

$functionNodes

chromoID value funcID inputs

1 4 NA 2 2, 3

2 5 NA 3 1, 1

4 7 NA 2 1, 1

6 9 NA 1 7, 4

11 14 NA 2 5, 9

23 26 NA 1 3, 14

$outputNodes

chromoID value inputs

1 29 NA 26

Experiment 2

Generation: 1 / 1000

Fitness of best solution so far: 3313.437

Average fitness of population: 3.473594e+40

Generation: 101 / 1000

Fitness of best solution so far: 3249.593

Average fitness of population: 3288.252

Generation: 201 / 1000

Fitness of best solution so far: 3042.805

Average fitness of population: 3141.657

Generation: 301 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 2272.519

Generation: 401 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 1348.829

Generation: 501 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 689.4439

Generation: 601 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 696.4921

Generation: 701 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 704.496

Generation: 801 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 1327.862

Generation: 901 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 704.5986

Generation: 1000 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 52.159

Best solution found as text:

(abs(a) \* abs(a))

$inputNodes

chromoID value

1 1 NA

2 2 NA

3 3 1

$functionNodes

chromoID value funcID inputs

9 12 NA 9 1

11 14 NA 9 1

20 23 NA 3 14, 12

$outputNodes

chromoID value inputs

1 29 NA 23

Experiment 3

Generation: 1 / 1000

Fitness of best solution so far: 3314.571

Average fitness of population: 3318.35

Generation: 101 / 1000

Fitness of best solution so far: 3306.755

Average fitness of population: 3310.135

Generation: 201 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: NaN

Generation: 301 / 1000

Fitness of best solution so far: 52.035

Average fitness of population: 52.035

Generation: 347 / 1000

Fitness of best solution so far: 0

Average fitness of population: NaN

Best solution found as text:

ceiling(((a \* a) - b))

> result$bestSolution

$inputNodes

chromoID value

1 1 NA

2 2 NA

3 3 -9

$functionNodes

chromoID value funcID inputs

5 8 NA 3 1, 1

7 10 NA 2 8, 2

13 16 NA 11 10

$outputNodes

chromoID value inputs

1 29 NA 16

DIFFERENT PARAMETERS

EXPERIMENT 4

> result <- cgp(dataset = x\_squared\_minus\_y,

+ model = output ~ x + y,

+ maxGenerations = 1000,

+ rowsFuncNodes = 10,

+ colsFuncNodes = 10,

+ levelsBack = 2,

+ updateFreq = 100)

Generation: 1 / 1000

Fitness of best solution so far: 3141.627

Average fitness of population: 315173142

Generation: 101 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 1358.306

Generation: 201 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 854.9416

Generation: 301 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 2006.724

Generation: 401 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 704.783

Generation: 501 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: NaN

Generation: 601 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: NaN

Generation: 701 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 2723.157

Generation: 801 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 694.931

Generation: 901 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 52.159

Generation: 1000 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 694.931

Best solution found as text:

(floor(abs(a)) \* floor(abs(a)))

Experiment 5

Generation: 1 / 1000

Fitness of best solution so far: 3315.253

Average fitness of population: NaN

Generation: 101 / 1000

Fitness of best solution so far: 3266.019

Average fitness of population: 3266.019

Generation: 201 / 1000

Fitness of best solution so far: 3266.019

Average fitness of population: 3266.019

Generation: 301 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 1358.931

Generation: 401 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: NaN

Generation: 501 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: NaN

Generation: 601 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 704.8627

Generation: 701 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 704.6434

Generation: 801 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 1360.819

Generation: 901 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 705.0814

Generation: 1000 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 3.64103e+40

Best solution found as text:

(a \* a)

$inputNodes

chromoID value

1 1 NA

2 2 NA

3 3 -4

$functionNodes

chromoID value funcID inputs

4 7 NA 3 1, 1

$outputNodes

chromoID value inputs

1 104 NA 7

Experiment 6

Generation: 1 / 1000

Fitness of best solution so far: 3314.555

Average fitness of population: 3314.917

Generation: 101 / 1000

Fitness of best solution so far: 1225.414

Average fitness of population: NaN

Generation: 201 / 1000

Fitness of best solution so far: 1207.23

Average fitness of population: 4800.63

Generation: 301 / 1000

Fitness of best solution so far: 1078.49

Average fitness of population: NaN

Generation: 401 / 1000

Fitness of best solution so far: 3.176

Average fitness of population: 665.3775

Generation: 501 / 1000

Fitness of best solution so far: 3.176

Average fitness of population: NaN

Generation: 522 / 1000

Fitness of best solution so far: 0

Average fitness of population: 2.5408

Best solution found as text:

floor(floor(((a \* a) - floor(b))))

$inputNodes

chromoID value

1 1 NA

2 2 NA

3 3 -7

$functionNodes

chromoID value funcID inputs

8 11 NA 3 1, 1

10 13 NA 10 2

16 19 NA 2 11, 13

33 36 NA 10 19

59 62 NA 10 36

$outputNodes

chromoID value inputs

1 104 NA 62

NEW PARAMETERS

Experiment 7

> result <- cgp(dataset = x\_squared\_minus\_y,

+ model = output ~ x + y,

+ maxGenerations = 1000,

+ rowsFuncNodes = 10,

+ colsFuncNodes = 5,

+ levelsBack = 2,

+ updateFreq = 100)

Generation: 1 / 1000

Fitness of best solution so far: 3313.935

Average fitness of population: NaN

Generation: 101 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: NaN

Generation: 169 / 1000

Fitness of best solution so far: 0

Average fitness of population: 669.009

Best solution found as text:

((a \* a) - floor(b))

$inputNodes

chromoID value

1 1 NA

2 2 NA

3 3 -10

$functionNodes

chromoID value funcID inputs

3 6 NA 3 1, 1

4 7 NA 10 2

12 15 NA 2 6, 7

$outputNodes

chromoID value inputs

1 54 NA 15

Experiment 8

Generation: 1 / 1000

Fitness of best solution so far: 3313.888

Average fitness of population: 3315.084

Generation: 101 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 1443.6

Generation: 201 / 1000

Fitness of best solution so far: 9

Average fitness of population: 1323.108

Generation: 242 / 1000

Fitness of best solution so far: 0

Average fitness of population: 669.7932

Best solution found as text:

(floor((a \* a)) - floor(b))

$inputNodes

chromoID value

1 1 NA

2 2 NA

3 3 9

$functionNodes

chromoID value funcID inputs

4 7 NA 3 1, 1

9 12 NA 10 2

12 15 NA 10 7

30 33 NA 2 15, 12

$outputNodes

chromoID value inputs

1 54 NA 33

Experiment 9

Generation: 1 / 1000

Fitness of best solution so far: 3269.458

Average fitness of population: NaN

Generation: 101 / 1000

Fitness of best solution so far: 3266.019

Average fitness of population: 3285.891

Generation: 201 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 705.9518

Generation: 301 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: NaN

Generation: 401 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 791.1524

Generation: 501 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: NaN

Generation: 601 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 704.7754

Generation: 701 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 704.7362

Generation: 801 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: NaN

Generation: 901 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 704.7728

Generation: 1000 / 1000

Fitness of best solution so far: 52.159

Average fitness of population: 2011.528

Best solution found as text:

(a \* a)

$inputNodes

chromoID value

1 1 NA

2 2 NA

3 3 -1

$functionNodes

chromoID value funcID inputs

4 7 NA 3 1, 1

$outputNodes

chromoID value inputs

1 54 NA 7