

Evolution Strategy e Differential Evolution

CSI557 – Computação Evolucionária

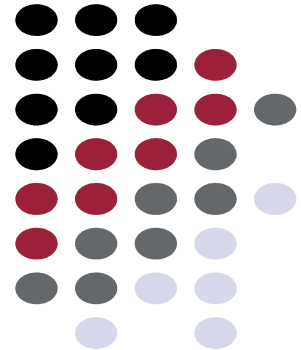
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DECSI / João Monlevade



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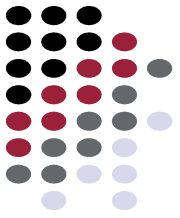


Evolution Strategy



- Foram utilizados os parâmetros:
 - Representação: Real;
 - Inicialização da população: aleatória;
 - Número de variáveis: 100;
 - Número de gerações: 300;
 - Função de Avaliação Rastrigin;
 - Valor Mínimo: -5,12;
 - Valor Máximo: 5,12;

Evolution Strategy



- ES 1:
 - μ : 20;
 - λ : 100;
 - p_{Mutacao} : 0,05.
- ES 2:
 - μ : 100;
 - λ : 200;
 - p_{Mutacao} : 0,019.

Evolution Strategy



	ES 1	ES 2
Melhor Indivíduo	2,27E-13	0,0249143197
Pior Indivíduo	2,39E-11	1,4413415445
Média	3,69482222595252E-12	2,79E-01
Desvio Padrão	5,81378306625749E-12	0,3877242382
Tempo Médio	1051,5	2510,5

Evolution Strategy

QuickCalcs



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Unpaired *t* test results

P value and statistical significance:

The two-tailed P value is less than 0.0001

By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval:

The mean of ES: 1 minus ES: 2 equals -0.398297731364

95% confidence interval of this difference: From -0.539996166234 to -0.256599296495

Intermediate values used in calculations:

$t = 5.6266$

$df = 58$

standard error of difference = 0.071

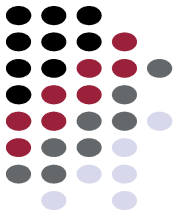
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GraphPad's web site includes portions of the manual for GraphPad Prism that can help you learn statistics. First, review the meaning of [P values](#) and [confidence intervals](#). Then learn how to interpret results from an [unpaired](#) or [paired](#) *t* test. These links include GraphPad's popular *analysis checklists*.

Review your data:

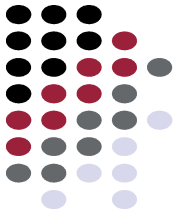
Group	ES: 1	ES: 2
Mean	0.0000000000006	0.398297731370
SD	0.0000000000006	0.387724238203
SEM	0.0000000000001	0.070788437118
N	30	30

Differential Evolution



- Foram utilizados os parâmetros:
 - Representação: Real;
 - Vetores: Aleatório;
 - Número de variáveis: 100;
 - Número de gerações: 300;
 - Função de Avaliação Rastrigin;
 - Valor Mínimo: -5,12;
 - Valor Máximo: 5,12;

Differential Evolution



- DE 1:
 - Np: 10;
 - Cr: 0.74;
 - F: 0,0002.
- DE 2:
 - Np: 40;
 - Cr: 0.9;
 - F: 0.00089.

Differential Evolution



	DE 1	DE 2
Melhor Indivíduo	4,91E-03	0,0155781843
Pior Indivíduo	2,17E+00	0,0283617171
Média	7,35E-03	2,03E-02
Desvio Padrão	0,3993672685	0,003059907
Tempo Médio	133,5	506,5

Differential Evolution

QuickCalcs

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Unpaired *t* test results

P value and statistical significance:

The two-tailed P value equals 0.3299

By conventional criteria, this difference is considered to be not statistically significant.

Confidence interval:

The mean of DE: 1 minus DE: 2 equals 0.071516547807

95% confidence interval of this difference: From -0.074193552196 to 0.217226647809

Intermediate values used in calculations:

$t = 0.9825$

$df = 58$

standard error of difference = 0.073

Learn more:

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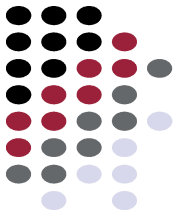


Review your data:

Group	DE: 1	DE: 2
Mean	0.091936666667	0.020420118860
SD	0.398689468508	0.003059907008
SEM	0.072790405114	0.000558660031
N	30	30

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Comparação: AG | ES



	Best AG	Best ES
Melhor Indivíduo	1,09614184395923E-09	2,27E-13
Pior Indivíduo	0,000009033	2,39E-11
Média	8,28862173977522E-07	3,69482222595252E-12
Desvio Padrão	2,00334645034922E-06	5,81378306625749E-12
Tempo Médio	18,7	1051,5

Comparação: AG | ES



QuickCalcs

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Unpaired *t* test results

P value and statistical significance:

The two-tailed P value equals 0.0272

By conventional criteria, this difference is considered to be statistically significant.

Confidence interval:

The mean of Best AG minus Best ES equals 0.00000083

95% confidence interval of this difference: From 0.00000010 to 0.00000156

Intermediate values used in calculations:

$t = 2.2663$

$df = 58$

standard error of difference = 0.000

Review your data:

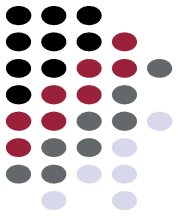
Group	Best AG	Best ES
Mean	0.00000083	0.00000000
SD	0.00000200	0.00000000
SEM	0.00000037	0.00000000
N	30	30

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Learn more:

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Comparação: AG | DE



	Best AG	Best DE
Melhor Indivíduo	1,09614184395923E-09	4,91E-03
Pior Indivíduo	0,000009033	2,17E+00
Média	8,28862173977522E-07	7,35E-03
Desvio Padrão	2,00334645034922E-06	0,3993672685
Tempo Médio	18,7	133,5

Comparação: AG | DE

QuickCalcs

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Unpaired *t* test results

P value and statistical significance:

The two-tailed P value equals 0.2116

By conventional criteria, this difference is considered to be not statistically significant.

Confidence interval:

The mean of Best AG minus Best DE equals -0.09193584

95% confidence interval of this difference: From -0.23764165 to 0.05376997

Intermediate values used in calculations:

$t = 1.2630$

$df = 58$

standard error of difference = 0.073

Learn more:

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Review your data:

Group	Best AG	Best DE
Mean	0.00000083	0.09193667
SD	0.00000200	0.39868947
SEM	0.00000037	0.07279041
N	30	30

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Comparação: ES | DE



	Best ES	Best DE
Melhor Indivíduo	2,27E-13	4,91E-03
Pior Indivíduo	2,39E-11	2,17E+00
Média	3,69482222595252E-12	7,35E-03
Desvio Padrão	5,81378306625749E-12	0,3993672685
Tempo Médio	1051,5	133,5



Comparação: ES | DE

QuickCalcs

[1. Select category](#)

[2. Choose calculator](#)

[3. Enter data](#)

4. View results

Unpaired t test results

P value and statistical significance:

The two-tailed P value equals 0.2116

By conventional criteria, this difference is considered to be not statistically significant.

Confidence interval:

The mean of Best ES minus Best DE equals -0.09193667

95% confidence interval of this difference: From -0.23764248 to 0.05376914

Intermediate values used in calculations:

$t = 1.2630$

$df = 58$

standard error of difference = 0.073

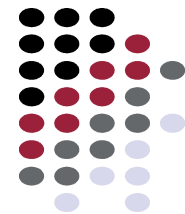
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Review your data:

Group	Best ES	Best DE
Mean	0.00000000	0.09193667
SD	0.00000000	0.39868947
SEM	0.00000000	0.07279041
N	30	30

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Obrigado!