

Output tables for 1xN statistical comparisons.

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# Chapter 1

## FP, noiseless, svi pojedinačni

### 1.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	6.2917
Arithmetic Simple	7.0417
Arithmetic Single	8.3333
Average	6.875
BGA	5.625
BLX-Alpha	8.3333
BLX-Alpha-Beta	7.8333
Discrete	6.625
Flat	8.4583
Heuristic	7.625
Local	5.9167
One point	7.2917
SBX	4.75

Table 1.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 12 degrees of freedom): 24.747253.

P-value computed by Friedman Test: 0.016067.

Iman and Davenport statistic (distributed according to F-distribution with 12 and 276 degrees of freedom): 2.162131.

P-value computed by Iman and Davenport Test: 0.013719181315.

## 1.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
12	Flat	3.298559	0.000972	0.004167
11	Arithmetic Single	3.187372	0.001436	0.004545
10	BLX-Alpha	3.187372	0.001436	0.005
9	BLX-Alpha-Beta	2.742622	0.006095	0.005556
8	Heuristic	2.55731	0.010549	0.00625
7	One point	2.26081	0.023771	0.007143
6	Arithmetic Simple	2.038436	0.041506	0.008333
5	Average	1.890186	0.058733	0.01
4	Discrete	1.667811	0.095353	0.0125
3	Arithmetic	1.371311	0.170278	0.016667
2	Local	1.037749	0.299387	0.025
1	BGA	0.778312	0.436385	0.05

Table 1.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004167$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005$ .



### 1.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Flat	0.000972	0.011662	0.011662
2	Arithmetic Single	0.001436	0.017229	0.014357
3	BLX-Alpha	0.001436	0.017229	0.014357
4	BLX-Alpha-Beta	0.006095	0.073141	0.054856
5	Heuristic	0.010549	0.126582	0.084388
6	One point	0.023771	0.285252	0.166397
7	Arithmetic Simple	0.041506	0.498077	0.249038
8	Average	0.058733	0.704797	0.293666
9	Discrete	0.095353	1.144239	0.381413
10	Arithmetic	0.170278	2.043335	0.436385
11	Local	0.299387	3.592643	0.436385
12	BGA	0.436385	5.236623	0.436385

Table 1.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	Flat	0.000972
2	Arithmetic Single	0.001436
3	BLX-Alpha	0.001436
4	BLX-Alpha-Beta	0.006095
5	Heuristic	0.010549
6	One point	0.023771
7	Arithmetic Simple	0.041506
8	Average	0.058733
9	Discrete	0.095353
10	Arithmetic	0.170278
11	Local	0.299387
12	BGA	0.436385

Table 1.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 2

# FP, noisy, svi pojedinačni

### 2.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	5
Arithmetic Simple	4.9167
Arithmetic Single	4.55
Average	6.6833
BGA	4.8
BLX-Alpha	11.1
BLX-Alpha-Beta	11.2333
Discrete	5.15
Flat	11.3667
Heuristic	11.3
Local	5.9833
One point	5.4
SBX	3.5167

Table 2.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 12 degrees of freedom): 219.00989.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 12 and 348 degrees of freedom): 45.047747.

P-value computed by Iman and Davenport Test: 0.

## 2.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
12	Flat	7.806749	0	0.004167
11	Heuristic	7.74045	0	0.004545
10	BLX-Alpha-Beta	7.67415	0	0.005
9	BLX-Alpha	7.541552	0	0.005556
8	Average	3.149219	0.001637	0.00625
7	Local	2.453076	0.014164	0.007143
6	One point	1.872957	0.061074	0.008333
5	Discrete	1.624334	0.104305	0.01
4	Arithmetic	1.475161	0.140169	0.0125
3	Arithmetic Simple	1.392286	0.163836	0.016667
2	BGA	1.276263	0.201863	0.025
1	Arithmetic Single	1.02764	0.304119	0.05

Table 2.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004167$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.00625$ .

## 2.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Flat	0	0	0
2	Heuristic	0	0	0
3	BLX-Alpha-Beta	0	0	0
4	BLX-Alpha	0	0	0
5	Average	0.001637	0.019645	0.013097
6	Local	0.014164	0.169968	0.099148
7	One point	0.061074	0.732892	0.304119
8	Discrete	0.104305	1.251654	0.304119
9	Arithmetic	0.140169	1.682032	0.304119
10	Arithmetic Simple	0.163836	1.966028	0.304119
11	BGA	0.201863	2.422353	0.304119
12	Arithmetic Single	0.304119	3.64943	0.304119

Table 2.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	Flat	0
2	Heuristic	0
3	BLX-Alpha-Beta	0
4	BLX-Alpha	0
5	Average	0.001637
6	Local	0.014164
7	One point	0.061074
8	Discrete	0.104305
9	Arithmetic	0.140169
10	Arithmetic Simple	0.163836
11	BGA	0.201863
12	Arithmetic Single	0.304119

Table 2.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 3

# FP, Noiseless unimodal, svi pojedinačni

### 3.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	4.2
Arithmetic Simple	6.6
Arithmetic Single	9.9
Average	5.4
BGA	3.8
BLX-Alpha	9.1
BLX-Alpha-Beta	9.4
Discrete	7.9
Flat	9.9
Heuristic	8.8
Local	4.2
One point	9.1
SBX	2.7

Table 3.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 12 degrees of freedom): 54.448352.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 12 and 108 degrees of freedom): 7.475558.

P-value computed by Iman and Davenport Test: 0.000000000712.

### 3.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
12	Arithmetic Single	4.134019	0.000036	0.004167
11	Flat	4.134019	0.000036	0.004545
10	BLX-Alpha-Beta	3.846934	0.00012	0.005
9	BLX-Alpha	3.674683	0.000238	0.005556
8	One point	3.674683	0.000238	0.00625
7	Heuristic	3.502432	0.000461	0.007143
6	Discrete	2.98568	0.002829	0.008333
5	Arithmetic Simple	2.23926	0.025139	0.01
4	Average	1.550257	0.12108	0.0125
3	Arithmetic	0.861254	0.389098	0.016667
2	Local	0.861254	0.389098	0.025
1	BGA	0.631586	0.527657	0.05

Table 3.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004167$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.008333$ .



### 3.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Arithmetic Single	0.000036	0.000428	0.000392
2	Flat	0.000036	0.000428	0.000392
3	BLX-Alpha-Beta	0.00012	0.001435	0.001196
4	BLX-Alpha	0.000238	0.002858	0.001905
5	One point	0.000238	0.002858	0.001905
6	Heuristic	0.000461	0.005532	0.003227
7	Discrete	0.002829	0.033954	0.016977
8	Arithmetic Simple	0.025139	0.301668	0.125695
9	Average	0.12108	1.452958	0.484319
10	Arithmetic	0.389098	4.669179	0.527657
11	Local	0.389098	4.669179	0.527657
12	BGA	0.527657	6.331888	0.527657

Table 3.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	Arithmetic Single	0.000036
2	Flat	0.000036
3	BLX-Alpha-Beta	0.00012
4	BLX-Alpha	0.000238
5	One point	0.000238
6	Heuristic	0.000461
7	Discrete	0.002829
8	Arithmetic Simple	0.025139
9	Average	0.12108
10	Arithmetic	0.389098
11	Local	0.389098
12	BGA	0.527657

Table 3.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 4

# FP, Noiseless multimodal, svi poedinacni

### 4.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	7.7857
Arithmetic Simple	7.3571
Arithmetic Single	7.2143
Average	7.9286
BGA	6.9286
BLX-Alpha	7.7857
BLX-Alpha-Beta	6.7143
Discrete	5.7143
Flat	7.4286
Heuristic	6.7857
Local	7.1429
One point	6
SBX	6.2143

Table 4.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 12 degrees of freedom): 5.425432.

P-value computed by Friedman Test: 0.942241.

Iman and Davenport statistic (distributed according to F-distribution with 12 and 156 degrees of freedom): 0.433835.

P-value computed by Iman and Davenport Test: 0.947831772118.

## 4.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
12	Average	1.504311	0.132501	0.004167
11	Arithmetic	1.407259	0.159351	0.004545
10	BLX-Alpha	1.407259	0.159351	0.005
9	Flat	1.164628	0.24417	0.005556
8	Arithmetic Simple	1.116102	0.264379	0.00625
7	Arithmetic Single	1.019049	0.30818	0.007143
6	Local	0.970523	0.331786	0.008333
5	BGA	0.824945	0.409403	0.01
4	Heuristic	0.727892	0.466679	0.0125
3	BLX-Alpha-Beta	0.679366	0.496906	0.016667
2	SBX	0.339683	0.734095	0.025
1	One point	0.194105	0.846094	0.05

Table 4.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004167$ .

### 4.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Average	0.132501	1.590016	0.846094
2	Arithmetic	0.159351	1.912209	0.846094
3	BLX-Alpha	0.159351	1.912209	0.846094
4	Flat	0.24417	2.930036	0.846094
5	Arithmetic Simple	0.264379	3.172544	0.846094
6	Arithmetic Single	0.30818	3.698155	0.846094
7	Local	0.331786	3.981429	0.846094
8	BGA	0.409403	4.912836	0.846094
9	Heuristic	0.466679	5.600154	0.846094
10	BLX-Alpha-Beta	0.496906	5.96287	0.846094
11	SBX	0.734095	8.809142	0.846094
12	One point	0.846094	10.153127	0.846094

Table 4.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	Average	0.132501
2	Arithmetic	0.159351
3	BLX-Alpha	0.159351
4	Flat	0.24417
5	Arithmetic Simple	0.264379
6	Arithmetic Single	0.30818
7	Local	0.331786
8	BGA	0.409403
9	Heuristic	0.466679
10	BLX-Alpha-Beta	0.496906
11	SBX	0.734095
12	One point	0.846094

Table 4.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 5

# FP, Noisy unimodal, svi pojedinačni

### 5.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	4.6
Arithmetic Simple	5.4
Arithmetic Single	4.8667
Average	6.4667
BGA	4.4
BLX-Alpha	11.0667
BLX-Alpha-Beta	11.0667
Discrete	5.7333
Flat	11.4667
Heuristic	11.2
Local	5.5333
One point	5.8
SBX	3.4

Table 5.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 12 degrees of freedom): 107.542857.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 12 and 168 degrees of freedom): 20.77918.

P-value computed by Iman and Davenport Test: 0.

## 5.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
12	Flat	5.672567	0	0.004167
11	Heuristic	5.485045	0	0.004545
10	BLX-Alpha	5.391283	0	0.005
9	BLX-Alpha-Beta	5.391283	0	0.005556
8	Average	2.156513	0.031044	0.00625
7	One point	1.687706	0.091468	0.007143
6	Discrete	1.640825	0.100834	0.008333
5	Local	1.500183	0.133567	0.01
4	Arithmetic Simple	1.406422	0.159599	0.0125
3	Arithmetic Single	1.031376	0.302365	0.016667
2	Arithmetic	0.843853	0.398752	0.025
1	BGA	0.703211	0.481924	0.05

Table 5.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004167$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005556$ .



### 5.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Flat	0	0	0
2	Heuristic	0	0	0
3	BLX-Alpha	0	0.000001	0.000001
4	BLX-Alpha-Beta	0	0.000001	0.000001
5	Average	0.031044	0.372523	0.248349
6	One point	0.091468	1.097612	0.481924
7	Discrete	0.100834	1.210004	0.481924
8	Local	0.133567	1.602804	0.481924
9	Arithmetic Simple	0.159599	1.915187	0.481924
10	Arithmetic Single	0.302365	3.628375	0.481924
11	Arithmetic	0.398752	4.785019	0.481924
12	BGA	0.481924	5.783092	0.481924

Table 5.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	Flat	0
2	Heuristic	0
3	BLX-Alpha	0
4	BLX-Alpha-Beta	0
5	Average	0.031044
6	One point	0.091468
7	Discrete	0.100834
8	Local	0.133567
9	Arithmetic Simple	0.159599
10	Arithmetic Single	0.302365
11	Arithmetic	0.398752
12	BGA	0.481924

Table 5.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 6

# FP, Noisy multimodal, svi pojedinačni

### 6.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	5.4
Arithmetic Simple	4.4333
Arithmetic Single	4.2333
Average	6.9
BGA	5.2
BLX-Alpha	11.1333
BLX-Alpha-Beta	11.4
Discrete	4.5667
Flat	11.2667
Heuristic	11.4
Local	6.4333
One point	5
SBX	3.6333

Table 6.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 12 degrees of freedom): 114.367033.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 12 and 168 degrees of freedom): 24.395339.

P-value computed by Iman and Davenport Test: 0.

## 6.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
12	BLX-Alpha-Beta	5.461604	0	0.004167
11	Heuristic	5.461604	0	0.004545
10	Flat	5.367843	0	0.005
9	BLX-Alpha	5.274081	0	0.005556
8	Average	2.297155	0.02161	0.00625
7	Local	1.96899	0.048954	0.007143
6	Arithmetic	1.242339	0.214111	0.008333
5	BGA	1.101697	0.270593	0.01
4	One point	0.961055	0.336525	0.0125
3	Discrete	0.65633	0.511612	0.016667
2	Arithmetic Simple	0.562569	0.573729	0.025
1	Arithmetic Single	0.421927	0.673079	0.05

Table 6.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004167$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005556$ .

### 6.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	BLX-Alpha-Beta	0	0.000001	0.000001
2	Heuristic	0	0.000001	0.000001
3	Flat	0	0.000001	0.000001
4	BLX-Alpha	0	0.000002	0.000001
5	Average	0.02161	0.259319	0.172879
6	Local	0.048954	0.58745	0.342679
7	Arithmetic	0.214111	2.569337	0.673079
8	BGA	0.270593	3.247121	0.673079
9	One point	0.336525	4.038295	0.673079
10	Discrete	0.511612	6.139341	0.673079
11	Arithmetic Simple	0.573729	6.884744	0.673079
12	Arithmetic Single	0.673079	8.076944	0.673079

Table 6.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	BLX-Alpha-Beta	0
2	Heuristic	0
3	Flat	0
4	BLX-Alpha	0
5	Average	0.02161
6	Local	0.048954
7	Arithmetic	0.214111
8	BGA	0.270593
9	One point	0.336525
10	Discrete	0.511612
11	Arithmetic Simple	0.573729
12	Arithmetic Single	0.673079

Table 6.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 7

# FP, Noiseless, svi operatori + kombinacija

### 7.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	7.2708
Arithmetic Simple	7.9792
Arithmetic Single	9.1042
Average	7.8125
BGA	6.3958
BLX-Alpha	9.0625
BLX-Alpha-Beta	8.5625
Discrete	7.3125
Flat	9.1875
Heuristic	8.3542
Local	6.8125
One point	8.0208
Combination	3.6042
SBX	5.5208

Table 7.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 13 degrees of freedom): 42.779762.

P-value computed by Friedman Test: 0.000049.

Iman and Davenport statistic (distributed according to F-distribution with 13 and 299 degrees of freedom): 3.654757.

P-value computed by Iman and Davenport Test: 0.000021810462.

## 7.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg	Finner	Li
13	Flat	4.623439	0.000004	0.003846	0.003938	0.046712
12	Arithmetic Single	4.554433	0.000005	0.004167	0.00786	0.046712
11	BLX-Alpha	4.519929	0.000006	0.004545	0.011767	0.046712
10	BLX-Alpha-Beta	4.10589	0.00004	0.005	0.015659	0.046712
9	Heuristic	3.933374	0.000084	0.005556	0.019535	0.046712
8	One point	3.657347	0.000255	0.00625	0.023396	0.046712
7	Arithmetic Simple	3.622844	0.000291	0.007143	0.027242	0.046712
6	Average	3.484831	0.000492	0.008333	0.031072	0.046712
5	Discrete	3.070792	0.002135	0.01	0.034888	0.046712
4	Arithmetic	3.036288	0.002395	0.0125	0.038688	0.046712
3	Local	2.656752	0.00789	0.016667	0.042474	0.046712
2	BGA	2.31172	0.020793	0.025	0.046244	0.046712
1	SBX	1.587151	0.112478	0.05	0.05	0.05

Table 7.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.003846$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.025$ .

Finner's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.05$ .

Li's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.046712$ .



### 7.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Flat	0.000004	0.000049	0.000049
2	Arithmetic Single	0.000005	0.000068	0.000063
3	BLX-Alpha	0.000006	0.00008	0.000068
4	BLX-Alpha-Beta	0.00004	0.000524	0.000403
5	Heuristic	0.000084	0.001089	0.000754
6	One point	0.000255	0.003313	0.002039
7	Arithmetic Simple	0.000291	0.003788	0.00204
8	Average	0.000492	0.006402	0.002955
9	Discrete	0.002135	0.027754	0.00958
10	Arithmetic	0.002395	0.031136	0.00958
11	Local	0.00789	0.102567	0.023669
12	BGA	0.020793	0.270311	0.041586
13	SBX	0.112478	1.46222	0.112478

Table 7.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$	$p_{Finner}$	$p_{Li}$
1	Flat	0.000004	0.000049	0.000004
2	Arithmetic Single	0.000005	0.000049	0.000006
3	BLX-Alpha	0.000006	0.000049	0.000007
4	BLX-Alpha-Beta	0.00004	0.000131	0.000045
5	Heuristic	0.000084	0.000218	0.000094
6	One point	0.000255	0.000552	0.000287
7	Arithmetic Simple	0.000291	0.000552	0.000328
8	Average	0.000492	0.0008	0.000555
9	Discrete	0.002135	0.003082	0.0024
10	Arithmetic	0.002395	0.003113	0.002691
11	Local	0.00789	0.009318	0.008811
12	BGA	0.020793	0.022506	0.022892
13	SBX	0.112478	0.112478	0.112478

Table 7.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 8

# FP, noisy, svi operatori + kombinacija

### 8.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	5.8
Arithmetic Simple	5.6833
Arithmetic Single	5.1167
Average	7.45
BGA	5.1667
BLX-Alpha	12.1
BLX-Alpha-Beta	12.2333
Discrete	5.75
Flat	12.3667
Heuristic	12.3
Local	6.9167
One point	6.0667
Combination	4.2
SBX	3.85

Table 8.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 13 degrees of freedom): 235.330476.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 13 and 377 degrees of freedom): 44.123649.

P-value computed by Iman and Davenport Test: 0.

## 8.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg	Finner	Li
13	Flat	7.884901	0	0.003846	0.003938	0.013373
12	Heuristic	7.82318	0	0.004167	0.00786	0.013373
11	BLX-Alpha-Beta	7.761459	0	0.004545	0.011767	0.013373
10	BLX-Alpha	7.638016	0	0.005	0.015659	0.013373
9	Average	3.332952	0.000859	0.005556	0.019535	0.013373
8	Local	2.839182	0.004523	0.00625	0.023396	0.013373
7	One point	2.052235	0.040147	0.007143	0.027242	0.013373
6	Arithmetic	1.805349	0.07102	0.008333	0.031072	0.013373
5	Discrete	1.759058	0.078568	0.01	0.034888	0.013373
4	Arithmetic Simple	1.697337	0.089633	0.0125	0.038688	0.013373
3	BGA	1.218996	0.222846	0.016667	0.042474	0.013373
2	Arithmetic Single	1.172705	0.240914	0.025	0.046244	0.013373
1	Combination	0.324037	0.74591	0.05	0.05	0.05

Table 8.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.003846$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.00625$ .

Finner's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.027242$ .

Li's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.013373$ .

### 8.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Flat	0	0	0
2	Heuristic	0	0	0
3	BLX-Alpha-Beta	0	0	0
4	BLX-Alpha	0	0	0
5	Average	0.000859	0.011171	0.007734
6	Local	0.004523	0.058798	0.036184
7	One point	0.040147	0.521909	0.281028
8	Arithmetic	0.07102	0.923261	0.358532
9	Discrete	0.078568	1.021379	0.358532
10	Arithmetic Simple	0.089633	1.165229	0.358532
11	BGA	0.222846	2.896992	0.481828
12	Arithmetic Single	0.240914	3.131881	0.481828
13	Combination	0.74591	9.69683	0.74591

Table 8.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$	$p_{Finner}$	$p_{Li}$
1	Flat	0	0	0
2	Heuristic	0	0	0
3	BLX-Alpha-Beta	0	0	0
4	BLX-Alpha	0	0	0
5	Average	0.000859	0.002233	0.00337
6	Local	0.004523	0.009774	0.017489
7	One point	0.040147	0.073273	0.136444
8	Arithmetic	0.07102	0.112823	0.218449
9	Discrete	0.078568	0.112823	0.236182
10	Arithmetic Simple	0.089633	0.114922	0.260771
11	BGA	0.222846	0.257666	0.467245
12	Arithmetic Single	0.240914	0.258151	0.486691
13	Combination	0.74591	0.74591	0.74591

Table 8.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 9

# FP, noiseless unimodal, svi operatori + kombinacija

### 9.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	5.1
Arithmetic Simple	7.55
Arithmetic Single	10.95
Average	6.35
BGA	4.55
BLX-Alpha	10.05
BLX-Alpha-Beta	10.35
Discrete	8.95
Flat	10.85
Heuristic	9.75
Local	5.2
One point	10.15
Random	14.7
SBX	3.5
No crx	16
Combination	2

Table 9.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 15 degrees of freedom): 100.303676.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 15 and 135 degrees of freedom): 18.164987.

P-value computed by Iman and Davenport Test: 0.

## 9.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm Hochberg
15	No crx	6.575355	0	0.003333
14	Random	5.964786	0	0.003571
13	Arithmetic Single	4.203531	0.000026	0.003846
12	Flat	4.156564	0.000032	0.004167
11	BLX-Alpha-Beta	3.92173	0.000088	0.004545
10	One point	3.827796	0.000129	0.005
9	BLX-Alpha	3.780829	0.000156	0.005556
8	Heuristic	3.639929	0.000273	0.00625
7	Discrete	3.264194	0.001098	0.007143
6	Arithmetic Simple	2.606659	0.009143	0.008333
5	Average	2.043057	0.041047	0.01
4	Local	1.502938	0.132855	0.0125
3	Arithmetic	1.455971	0.145401	0.016667
2	BGA	1.197654	0.231052	0.025
1	SBX	0.704502	0.48112	0.05

Table 9.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.003333$ .

Holm's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.008333$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.007143$ .



### 9.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hochberg}$
1	No crx	0	0	0	0
2	Random	0	0	0	0
3	Arithmetic Single	0.000026	0.000394	0.000342	0.000342
4	Flat	0.000032	0.000485	0.000388	0.000388
5	BLX-Alpha-Beta	0.000088	0.001319	0.000967	0.000967
6	One point	0.000129	0.001939	0.001293	0.001293
7	BLX-Alpha	0.000156	0.002345	0.001407	0.001407
8	Heuristic	0.000273	0.004091	0.002182	0.002182
9	Discrete	0.001098	0.016466	0.007684	0.007684
10	Arithmetic Simple	0.009143	0.137146	0.054858	0.054858
11	Average	0.041047	0.615702	0.205234	0.205234
12	Local	0.132855	1.992824	0.53142	0.436202
13	Arithmetic	0.145401	2.181008	0.53142	0.436202
14	BGA	0.231052	3.465776	0.53142	0.462104
15	SBX	0.48112	7.2168	0.53142	0.48112

Table 9.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	No crx	0
2	Random	0
3	Arithmetic Single	0.000026
4	Flat	0.000032
5	BLX-Alpha-Beta	0.000088
6	One point	0.000129
7	BLX-Alpha	0.000156
8	Heuristic	0.000273
9	Discrete	0.001098
10	Arithmetic Simple	0.009143
11	Average	0.041047
12	Local	0.132855
13	Arithmetic	0.145401
14	BGA	0.231052
15	SBX	0.48112

Table 9.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 10

# FP, noisy unimodal, svi operatori + kombinacija

### 10.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	5.4
Arithmetic Simple	6.2
Arithmetic Single	5.4
Average	7.1333
BGA	4.6667
BLX-Alpha	12.0667
BLX-Alpha-Beta	12.0667
Discrete	6.3333
Flat	12.4667
Heuristic	12.2
Local	6.4
One point	6.4667
Random	15
SBX	3.7333
No crx	16
Combination	4.4667

Table 10.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 15 degrees of freedom): 163.235294.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 15 and 210 degrees of freedom): 37.

P-value computed by Iman and Davenport Test: -0.

## 10.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm Hochberg
15	No crx	7.056078	0	0.003333
14	Random	6.480854	0	0.003571
13	Flat	5.023621	0.000001	0.003846
12	Heuristic	4.870228	0.000001	0.004167
11	BLX-Alpha-Beta	4.793531	0.000002	0.004545
10	BLX-Alpha	4.793531	0.000002	0.005
9	Average	1.955761	0.050493	0.005556
8	One point	1.572278	0.115886	0.00625
7	Local	1.53393	0.125047	0.007143
6	Discrete	1.495582	0.134763	0.008333
5	Arithmetic Simple	1.418885	0.155932	0.01
4	Arithmetic	0.958706	0.337707	0.0125
3	Arithmetic Single	0.958706	0.337707	0.016667
2	BGA	0.536875	0.591354	0.025
1	Combination	0.421831	0.673149	0.05

Table 10.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.003333$ .

Holm's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005556$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005$ .

### 10.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hochberg}$
1	No crx	0	0	0	0
2	Random	0	0	0	0
3	Flat	0.000001	0.000008	0.000007	0.000007
4	Heuristic	0.000001	0.000017	0.000013	0.000013
5	BLX-Alpha-Beta	0.000002	0.000025	0.000018	0.000016
6	BLX-Alpha	0.000002	0.000025	0.000018	0.000016
7	Average	0.050493	0.7574	0.45444	0.45444
8	One point	0.115886	1.738291	0.927088	0.673149
9	Local	0.125047	1.875703	0.927088	0.673149
10	Discrete	0.134763	2.02144	0.927088	0.673149
11	Arithmetic Simple	0.155932	2.338987	0.927088	0.673149
12	Arithmetic	0.337707	5.065601	1.350827	0.673149
13	Arithmetic Single	0.337707	5.065601	1.350827	0.673149
14	BGA	0.591354	8.870304	1.350827	0.673149
15	Combination	0.673149	10.097228	1.350827	0.673149

Table 10.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	No crx	0
2	Random	0
3	Flat	0.000001
4	Heuristic	0.000001
5	BLX-Alpha-Beta	0.000002
6	BLX-Alpha	0.000002
7	Average	0.050493
8	One point	0.115886
9	Local	0.125047
10	Discrete	0.134763
11	Arithmetic Simple	0.155932
12	Arithmetic	0.337707
13	Arithmetic Single	0.337707
14	BGA	0.591354
15	Combination	0.673149

Table 10.4: Adjusted  $p$ -values (FRIEDMAN) (II)



# Chapter 11

## FP, noiseless multimodal, svi operatori + kombinacija

### 11.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	8.7857
Arithmetic Simple	8.2857
Arithmetic Single	7.8571
Average	8.8571
BGA	7.7143
BLX-Alpha	8.3571
BLX-Alpha-Beta	7.2857
Discrete	6.2143
Flat	8
Heuristic	7.3571
Local	8
One point	6.5714
Random	15
SBX	6.9286
No crx	16
Combination	4.7857

Table 11.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 15 degrees of freedom): 79.241597.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 15 and 195 degrees of freedom): 7.878199.

P-value computed by Iman and Davenport Test: 0.

## 11.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm Hochberg
15	No crx	6.231991	0	0.003333
14	Random	5.676272	0	0.003571
13	Average	2.26257	0.023662	0.003846
12	Arithmetic	2.222876	0.026224	0.004167
11	BLX-Alpha	1.98471	0.047177	0.004545
10	Arithmetic Simple	1.945016	0.051773	0.005
9	Flat	1.786239	0.074061	0.005556
8	Local	1.786239	0.074061	0.00625
7	Arithmetic Single	1.706851	0.08785	0.007143
6	BGA	1.627463	0.103639	0.008333
5	Heuristic	1.428992	0.153007	0.01
4	BLX-Alpha-Beta	1.389297	0.164742	0.0125
3	SBX	1.190826	0.233722	0.016667
2	One point	0.992355	0.321024	0.025
1	Discrete	0.793884	0.427263	0.05

Table 11.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.003333$ .

Holm's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.003846$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.003571$ .



### 11.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hochberg}$
1	No crx	0	0	0	0
2	Random	0	0	0	0
3	Average	0.023662	0.354933	0.307609	0.307609
4	Arithmetic	0.026224	0.393363	0.31469	0.31469
5	BLX-Alpha	0.047177	0.70765	0.518944	0.427263
6	Arithmetic Simple	0.051773	0.776595	0.518944	0.427263
7	Flat	0.074061	1.110908	0.666545	0.427263
8	Local	0.074061	1.110908	0.666545	0.427263
9	Arithmetic Single	0.08785	1.317746	0.666545	0.427263
10	BGA	0.103639	1.554583	0.666545	0.427263
11	Heuristic	0.153007	2.2951	0.765033	0.427263
12	BLX-Alpha-Beta	0.164742	2.471135	0.765033	0.427263
13	SBX	0.233722	3.505827	0.765033	0.427263
14	One point	0.321024	4.815364	0.765033	0.427263
15	Discrete	0.427263	6.408943	0.765033	0.427263

Table 11.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	No crx	0
2	Random	0
3	Average	0.023662
4	Arithmetic	0.026224
5	BLX-Alpha	0.047177
6	Arithmetic Simple	0.051773
7	Flat	0.074061
8	Local	0.074061
9	Arithmetic Single	0.08785
10	BGA	0.103639
11	Heuristic	0.153007
12	BLX-Alpha-Beta	0.164742
13	SBX	0.233722
14	One point	0.321024
15	Discrete	0.427263

Table 11.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 12

# FP, noisy multimodal, svi operatori + kombinacija

### 12.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	6.2
Arithmetic Simple	5.1667
Arithmetic Single	4.8333
Average	7.7667
BGA	5.6667
BLX-Alpha	12.1333
BLX-Alpha-Beta	12.4
Discrete	5.1667
Flat	12.2667
Heuristic	12.4
Local	7.4333
One point	5.6667
Random	15
SBX	3.9667
No crx	16
Combination	3.9333

Table 12.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 15 degrees of freedom): 169.677941.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 15 and 210 degrees of freedom): 42.939313.

P-value computed by Iman and Davenport Test: 0.

## 12.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm Hochberg
15	No crx	6.941033	0	0.003333
14	Random	6.365809	0	0.003571
13	BLX-Alpha-Beta	4.870228	0.000001	0.003846
12	Heuristic	4.870228	0.000001	0.004167
11	Flat	4.793531	0.000002	0.004545
10	BLX-Alpha	4.716835	0.000002	0.005
9	Average	2.205024	0.027452	0.005556
8	Local	2.013283	0.044085	0.00625
7	Arithmetic	1.30384	0.192288	0.007143
6	BGA	0.997054	0.318738	0.008333
5	One point	0.997054	0.318738	0.01
4	Arithmetic Simple	0.709443	0.47805	0.0125
3	Discrete	0.709443	0.47805	0.016667
2	Arithmetic Single	0.517701	0.604667	0.025
1	SBX	0.019174	0.984702	0.05

Table 12.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.003333$ .

Holm's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005556$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005$ .

## 12.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hochberg}$
1	No crx	0	0	0	0
2	Random	0	0	0	0
3	BLX-Alpha-Beta	0.000001	0.000017	0.000014	0.000013
4	Heuristic	0.000001	0.000017	0.000014	0.000013
5	Flat	0.000002	0.000025	0.000018	0.000018
6	BLX-Alpha	0.000002	0.000036	0.000024	0.000024
7	Average	0.027452	0.411786	0.247071	0.247071
8	Local	0.044085	0.661273	0.352679	0.352679
9	Arithmetic	0.192288	2.88432	1.346016	0.984702
10	BGA	0.318738	4.781071	1.912428	0.984702
11	One point	0.318738	4.781071	1.912428	0.984702
12	Arithmetic Simple	0.47805	7.170748	1.912428	0.984702
13	Discrete	0.47805	7.170748	1.912428	0.984702
14	Arithmetic Single	0.604667	9.07	1.912428	0.984702
15	SBX	0.984702	14.770533	1.912428	0.984702

Table 12.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	No crx	0
2	Random	0
3	BLX-Alpha-Beta	0.000001
4	Heuristic	0.000001
5	Flat	0.000002
6	BLX-Alpha	0.000002
7	Average	0.027452
8	Local	0.044085
9	Arithmetic	0.192288
10	BGA	0.318738
11	One point	0.318738
12	Arithmetic Simple	0.47805
13	Discrete	0.47805
14	Arithmetic Single	0.604667
15	SBX	0.984702

Table 12.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 13

# FP, noiseless, svi + podskupovi kombinacija

### 13.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	12.4792
Arithmetic Simple	13.4792
Arithmetic Single	13.7708
Average	12.8958
BGA	11.0625
BLX-Alpha	13.3958
BLX-Alpha-Beta	12.9375
Discrete	11.3125
Flat	13.6458
Heuristic	12.6042
Local	11.8125
One point	12.0625
SBX	9.6875
Combination	7.6042
1	6.2708
2	6.0625
3	9.9375
4	6.7292
5	5.8958
6	6.3542

Table 13.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 19 degrees of freedom): 111.475.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 19 and 437 degrees of freedom): 7.441913.  
P-value computed by Iman and Davenport Test: 0.



## 13.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg	Finner	Li
19	Arithmetic Single	4.611128	0.000004	0.002632	0.002696	0.004092
18	Flat	4.537935	0.000006	0.002778	0.005385	0.004092
17	Arithmetic Simple	4.440345	0.000009	0.002941	0.008066	0.004092
16	BLX-Alpha	4.39155	0.000011	0.003125	0.01074	0.004092
15	BLX-Alpha-Beta	4.123178	0.000037	0.003333	0.013408	0.004092
14	Average	4.09878	0.000042	0.003571	0.016067	0.004092
13	Heuristic	3.927998	0.000086	0.003846	0.01872	0.004092
12	Arithmetic	3.854805	0.000116	0.004167	0.021366	0.004092
11	One point	3.61083	0.000305	0.004545	0.024004	0.004092
10	Local	3.464445	0.000531	0.005	0.026635	0.004092
9	Discrete	3.171675	0.001516	0.005556	0.02926	0.004092
8	BGA	3.02529	0.002484	0.00625	0.031877	0.004092
7	3	2.366558	0.017954	0.007143	0.034487	0.004092
6	SBX	2.220173	0.026407	0.008333	0.03709	0.004092
5	Combination	1.000298	0.317167	0.01	0.039686	0.004092
4	4	0.48795	0.625585	0.0125	0.042275	0.004092
3	6	0.268373	0.788413	0.016667	0.044857	0.004092
2	1	0.219578	0.8262	0.025	0.047432	0.004092
1	2	0.09759	0.922258	0.05	0.05	0.05

Table 13.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.002632$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.00625$ .

Finner's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.039686$ .

Li's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004092$ .

### 13.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Arithmetic Single	0.000004	0.000076	0.000076
2	Flat	0.000006	0.000108	0.000102
3	Arithmetic Simple	0.000009	0.000171	0.000153
4	BLX-Alpha	0.000011	0.000214	0.00018
5	BLX-Alpha-Beta	0.000037	0.00071	0.000561
6	Average	0.000042	0.000789	0.000581
7	Heuristic	0.000086	0.001627	0.001114
8	Arithmetic	0.000116	0.002201	0.00139
9	One point	0.000305	0.005799	0.003357
10	Local	0.000531	0.010095	0.005313
11	Discrete	0.001516	0.028797	0.013641
12	BGA	0.002484	0.047195	0.019872
13	3	0.017954	0.341133	0.125681
14	SBX	0.026407	0.501734	0.158442
15	Combination	0.317167	6.026164	0.922258
16	4	0.625585	11.886119	0.922258
17	6	0.788413	14.979839	0.922258
18	1	0.8262	15.697804	0.922258
19	2	0.922258	17.522899	0.922258

Table 13.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$	$p_{Finner}$	$p_{Li}$
1	Arithmetic Single	0.000004	0.000076	0.000052
2	Flat	0.000006	0.000076	0.000073
3	Arithmetic Simple	0.000009	0.000076	0.000116
4	BLX-Alpha	0.000011	0.000076	0.000145
5	BLX-Alpha-Beta	0.000037	0.000142	0.00048
6	Average	0.000042	0.000142	0.000534
7	Heuristic	0.000086	0.000232	0.001101
8	Arithmetic	0.000116	0.000275	0.001488
9	One point	0.000305	0.000644	0.003911
10	Local	0.000531	0.001009	0.006788
11	Discrete	0.001516	0.002616	0.019123
12	BGA	0.002484	0.00393	0.030962
13	3	0.017954	0.026132	0.187618
14	SBX	0.026407	0.035668	0.25355
15	Combination	0.317167	0.383217	0.803139
16	4	0.625585	0.688573	0.889465
17	6	0.788413	0.823747	0.910245
18	1	0.8262	0.842301	0.913997
19	2	0.922258	0.922258	0.922258

Table 13.4: Adjusted  $p$ -values (FRIEDMAN) (II)

## Chapter 14

# FP, noisy, svi + podskupovi kombinacija

### 14.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Arithmetic	10.4
Arithmetic Simple	10.3333
Arithmetic Single	10
Average	12.35
BGA	10.2333
BLX-Alpha	18.1
BLX-Alpha-Beta	18.2333
Discrete	10.4167
Flat	18.3667
Heuristic	18.3
Local	11.8833
One point	10.9333
SBX	8.75
Combination	8.7333
11	4.4667
12	5.95
13	4.8
14	6.5833
15	5.0333
16	6.1333

Table 14.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 19 degrees of freedom): 348.212857.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 19 and 551 degrees of freedom): 45.530921.  
P-value computed by Iman and Davenport Test: 0.

## 14.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg	Finner	Li
19	Flat	9.099686	0	0.002632	0.002696	0.009092
18	Heuristic	9.056042	0	0.002778	0.005385	0.009092
17	BLX-Alpha-Beta	9.012399	0	0.002941	0.008066	0.009092
16	BLX-Alpha	8.925112	0	0.003125	0.01074	0.009092
15	Average	5.160853	0	0.003333	0.013408	0.009092
14	Local	4.855348	0.000001	0.003571	0.016067	0.009092
13	One point	4.233427	0.000023	0.003846	0.01872	0.009092
12	Discrete	3.895189	0.000098	0.004167	0.021366	0.009092
11	Arithmetic	3.884278	0.000103	0.004545	0.024004	0.009092
10	Arithmetic Simple	3.840635	0.000123	0.005	0.026635	0.009092
9	BGA	3.77517	0.00016	0.005556	0.02926	0.009092
8	Arithmetic Single	3.622417	0.000292	0.00625	0.031877	0.009092
7	SBX	2.8041	0.005046	0.007143	0.034487	0.009092
6	Combination	2.793189	0.005219	0.008333	0.03709	0.009092
5	14	1.385684	0.165844	0.01	0.039686	0.009092
4	16	1.091089	0.275234	0.0125	0.042275	0.009092
3	12	0.97107	0.331514	0.016667	0.044857	0.009092
2	15	0.37097	0.71066	0.025	0.047432	0.009092
1	13	0.218218	0.827259	0.05	0.05	0.05

Table 14.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.002632$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.008333$ .

Finner's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.039686$ .

Li's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.009092$ .

### 14.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Flat	0	0	0
2	Heuristic	0	0	0
3	BLX-Alpha-Beta	0	0	0
4	BLX-Alpha	0	0	0
5	Average	0	0.000005	0.000004
6	Local	0.000001	0.000023	0.000017
7	One point	0.000023	0.000437	0.000299
8	Discrete	0.000098	0.001864	0.001129
9	Arithmetic	0.000103	0.00195	0.001129
10	Arithmetic Simple	0.000123	0.002332	0.001227
11	BGA	0.00016	0.003038	0.001439
12	Arithmetic Single	0.000292	0.005545	0.002335
13	SBX	0.005046	0.095869	0.031315
14	Combination	0.005219	0.099163	0.031315
15	14	0.165844	3.151027	0.827259
16	16	0.275234	5.229437	0.827259
17	12	0.331514	6.298759	0.827259
18	15	0.71066	13.502532	0.827259
19	13	0.827259	15.717928	0.827259

Table 14.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$	$p_{Finner}$	$p_{Li}$
1	Flat	0	0	0
2	Heuristic	0	0	0
3	BLX-Alpha-Beta	0	0	0
4	BLX-Alpha	0	0	0
5	Average	0	0.000001	0.000001
6	Local	0.000001	0.000004	0.000007
7	One point	0.000023	0.000062	0.000133
8	Discrete	0.000098	0.000233	0.000568
9	Arithmetic	0.000103	0.000233	0.000594
10	Arithmetic Simple	0.000123	0.000233	0.00071
11	BGA	0.00016	0.000276	0.000925
12	Arithmetic Single	0.000292	0.000462	0.001687
13	SBX	0.005046	0.007366	0.028381
14	Combination	0.005219	0.007366	0.029328
15	14	0.165844	0.20522	0.489815
16	16	0.275234	0.317684	0.614396
17	12	0.331514	0.362449	0.657433
18	15	0.71066	0.729923	0.804459
19	13	0.827259	0.827259	0.827259

Table 14.4: Adjusted  $p$ -values (FRIEDMAN) (II)

## Chapter 15

# Bin, noiseless, svi pojedinačni

### 15.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	5.375
Masked	6.9167
Non-Geometric	9.6667
One Point	3.0417
Random Respectful	5.6667
Reduced Surrogate	3.5
Segmented	3.5
Shuffle	8.2917
Two Point	3.25
Uniform	5.7917

Table 15.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 9 degrees of freedom): 121.472727.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 9 and 207 degrees of freedom): 29.556261.

P-value computed by Iman and Davenport Test: 0.

## 15.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
9	Non-Geometric	7.580028	0	0.005556
8	Shuffle	6.006814	0	0.00625
7	Masked	4.433601	0.000009	0.007143
6	Uniform	3.146427	0.001653	0.008333
5	Random Respectful	3.003407	0.00267	0.01
4	Half Uniform	2.669695	0.007592	0.0125
3	Segmented	0.524404	0.599997	0.016667
2	Reduced Surrogate	0.524404	0.599997	0.025
1	Two Point	0.238366	0.811598	0.05

Table 15.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005556$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.0125$ .



### 15.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Non-Geometric	0	0	0
2	Shuffle	0	0	0
3	Masked	0.000009	0.000083	0.000065
4	Uniform	0.001653	0.014875	0.009917
5	Random Respectful	0.00267	0.024028	0.013349
6	Half Uniform	0.007592	0.068328	0.030368
7	Segmented	0.599997	5.399976	0.811598
8	Reduced Surrogate	0.599997	5.399976	0.811598
9	Two Point	0.811598	7.304378	0.811598

Table 15.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	Non-Geometric	0
2	Shuffle	0
3	Masked	0.000009
4	Uniform	0.001653
5	Random Respectful	0.00267
6	Half Uniform	0.007592
7	Segmented	0.599997
8	Reduced Surrogate	0.599997
9	Two Point	0.811598

Table 15.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 16

# Bin, noisy, svi pojedinačni

### 16.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	3.4333
Masked	8.1667
Non-Geometric	9.8667
One Point	3.7833
Random Respectful	3.9167
Reduced Surrogate	4.1667
Segmented	4.5167
Shuffle	8.8333
Two Point	3.9167
Uniform	4.4

Table 16.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 9 degrees of freedom): 175.014545.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 9 and 261 degrees of freedom): 53.433674.

P-value computed by Iman and Davenport Test: 0.

## 16.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
9	Non-Geometric	8.229548	0	0.005556
8	Shuffle	6.907703	0	0.00625
7	Masked	6.0549	0	0.007143
6	Segmented	1.385805	0.165807	0.008333
5	Uniform	1.236564	0.216249	0.01
4	Reduced Surrogate	0.938083	0.348202	0.0125
3	Two Point	0.618282	0.536389	0.016667
2	Random Respectful	0.618282	0.536389	0.025
1	One Point	0.447722	0.654354	0.05

Table 16.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005556$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.007143$ .

### 16.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Non-Geometric	0	0	0
2	Shuffle	0	0	0
3	Masked	0	0	0
4	Segmented	0.165807	1.492259	0.654354
5	Uniform	0.216249	1.94624	0.654354
6	Reduced Surrogate	0.348202	3.133815	0.654354
7	Two Point	0.536389	4.827505	0.654354
8	Random Respectful	0.536389	4.827505	0.654354
9	One Point	0.654354	5.889188	0.654354

Table 16.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	Non-Geometric	0
2	Shuffle	0
3	Masked	0
4	Segmented	0.165807
5	Uniform	0.216249
6	Reduced Surrogate	0.348202
7	Two Point	0.536389
8	Random Respectful	0.536389
9	One Point	0.654354

Table 16.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 17

# Bin, noiseless unimodal, svi pojedinačni

### 17.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	6
Masked	7.4
Non-Geometric	9.2
One Point	2.8
Random Respectful	6.1
Reduced Surrogate	3.9
Segmented	3.3
Shuffle	7.3
Two Point	2.7
Uniform	6.3

Table 17.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 9 degrees of freedom): 48.349091.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 9 and 81 degrees of freedom): 10.447355.

P-value computed by Iman and Davenport Test: 0.000000000151.

## 17.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
9	Non-Geometric	4.800568	0.000002	0.005556
8	Masked	3.47118	0.000518	0.00625
7	Shuffle	3.397325	0.00068	0.007143
6	Uniform	2.658776	0.007843	0.008333
5	Random Respectful	2.511066	0.012037	0.01
4	Half Uniform	2.437212	0.014801	0.0125
3	Reduced Surrogate	0.886259	0.375478	0.016667
2	Segmented	0.443129	0.657672	0.025
1	One Point	0.073855	0.941126	0.05

Table 17.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005556$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.008333$ .



### 17.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Non-Geometric	0.000002	0.000014	0.000014
2	Masked	0.000518	0.004664	0.004145
3	Shuffle	0.00068	0.006124	0.004763
4	Uniform	0.007843	0.070583	0.047055
5	Random Respectful	0.012037	0.10833	0.059204
6	Half Uniform	0.014801	0.133209	0.059204
7	Reduced Surrogate	0.375478	3.379303	0.941126
8	Segmented	0.657672	5.919049	0.941126
9	One Point	0.941126	8.470133	0.941126

Table 17.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	Non-Geometric	0.000002
2	Masked	0.000518
3	Shuffle	0.00068
4	Uniform	0.007843
5	Random Respectful	0.012037
6	Half Uniform	0.014801
7	Reduced Surrogate	0.375478
8	Segmented	0.657672
9	One Point	0.941126

Table 17.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 18

# Bin, noiseless multimodal, svi pojedinačni

### 18.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	4.9286
Masked	6.5714
Non-Geometric	10
One Point	3.2143
Random Respectful	5.3571
Reduced Surrogate	3.2143
Segmented	3.6429
Shuffle	9
Two Point	3.6429
Uniform	5.4286

Table 18.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 9 degrees of freedom): 78.420779.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 9 and 117 degrees of freedom): 21.426793.

P-value computed by Iman and Davenport Test: 0.

## 18.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
9	Non-Geometric	5.929784	0	0.005556
8	Shuffle	5.055921	0	0.00625
7	Masked	2.933683	0.00335	0.007143
6	Uniform	1.934982	0.052992	0.008333
5	Random Respectful	1.872563	0.061129	0.01
4	Half Uniform	1.498051	0.13412	0.0125
3	Two Point	0.374513	0.708023	0.016667
2	Segmented	0.374513	0.708023	0.025
1	Reduced Surrogate	0	1	0.05

Table 18.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005556$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.007143$ .

### 18.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Non-Geometric	0	0	0
2	Shuffle	0	0.000004	0.000003
3	Masked	0.00335	0.030147	0.023448
4	Uniform	0.052992	0.476932	0.305644
5	Random Respectful	0.061129	0.550158	0.305644
6	Half Uniform	0.13412	1.207081	0.53648
7	Two Point	0.708023	6.372206	1
8	Segmented	0.708023	6.372206	1
9	Reduced Surrogate	1	9	1

Table 18.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	Non-Geometric	0
2	Shuffle	0
3	Masked	0.00335
4	Uniform	0.052992
5	Random Respectful	0.061129
6	Half Uniform	0.13412
7	Two Point	0.708023
8	Segmented	0.708023
9	Reduced Surrogate	1

Table 18.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 19

# Bin, noisy unimodal, svi pojedinačni

### 19.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	3.9333
Masked	8.0667
Non-Geometric	9.8667
One Point	3.5333
Random Respectful	4.1333
Reduced Surrogate	4.6
Segmented	4
Shuffle	8.8
Two Point	3.4
Uniform	4.6667

Table 19.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 9 degrees of freedom): 86.563636.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 9 and 126 degrees of freedom): 25.02027.

P-value computed by Iman and Davenport Test: -0.

## 19.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
9	Non-Geometric	5.84932	0	0.005556
8	Shuffle	4.884484	0.000001	0.00625
7	Masked	4.221159	0.000024	0.007143
6	Uniform	1.145743	0.251901	0.008333
5	Reduced Surrogate	1.085441	0.277726	0.01
4	Random Respectful	0.663325	0.507122	0.0125
3	Segmented	0.54272	0.587322	0.016667
2	Half Uniform	0.482418	0.629509	0.025
1	One Point	0.120605	0.904004	0.05

Table 19.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005556$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.007143$ .



### 19.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Non-Geometric	0	0	0
2	Shuffle	0.000001	0.000009	0.000008
3	Masked	0.000024	0.000219	0.00017
4	Uniform	0.251901	2.267113	0.904004
5	Reduced Surrogate	0.277726	2.499538	0.904004
6	Random Respectful	0.507122	4.564102	0.904004
7	Segmented	0.587322	5.285901	0.904004
8	Half Uniform	0.629509	5.66558	0.904004
9	One Point	0.904004	8.136038	0.904004

Table 19.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	Non-Geometric	0
2	Shuffle	0.000001
3	Masked	0.000024
4	Uniform	0.251901
5	Reduced Surrogate	0.277726
6	Random Respectful	0.507122
7	Segmented	0.587322
8	Half Uniform	0.629509
9	One Point	0.904004

Table 19.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 20

# Bin, noisy multimodal, svi pojedinačni

### 20.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	2.9333
Masked	8.2667
Non-Geometric	9.8667
One Point	4.0333
Random Respectful	3.7
Reduced Surrogate	3.7333
Segmented	5.0333
Shuffle	8.8667
Two Point	4.4333
Uniform	4.1333

Table 20.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 9 degrees of freedom): 92.258182.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 9 and 126 degrees of freedom): 30.218989.

P-value computed by Iman and Davenport Test: -0.

## 20.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
9	Non-Geometric	6.271436	0	0.005556
8	Shuffle	5.366902	0	0.00625
7	Masked	4.824182	0.000001	0.007143
6	Segmented	1.899521	0.057496	0.008333
5	Two Point	1.356801	0.174844	0.01
4	Uniform	1.085441	0.277726	0.0125
3	One Point	0.994987	0.319742	0.016667
2	Reduced Surrogate	0.723627	0.469295	0.025
1	Random Respectful	0.693476	0.488011	0.05

Table 20.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005556$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.007143$ .

## 20.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Non-Geometric	0	0	0
2	Shuffle	0	0.000001	0.000001
3	Masked	0.000001	0.000013	0.00001
4	Segmented	0.057496	0.517464	0.344976
5	Two Point	0.174844	1.5736	0.488011
6	Uniform	0.277726	2.499538	0.488011
7	One Point	0.319742	2.877681	0.488011
8	Reduced Surrogate	0.469295	4.223652	0.488011
9	Random Respectful	0.488011	4.392097	0.488011

Table 20.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	Non-Geometric	0
2	Shuffle	0
3	Masked	0.000001
4	Segmented	0.057496
5	Two Point	0.174844
6	Uniform	0.277726
7	One Point	0.319742
8	Reduced Surrogate	0.469295
9	Random Respectful	0.488011

Table 20.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 21

# Bin, noiseless, svi + kombinacija

### 21.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	5.5208
Masked	7.1042
Non-Geometric	10.6667
One Point	3.1458
Random Respectful	5.8125
Reduced Surrogate	3.6042
Segmented	3.5625
Shuffle	8.9792
Combination	8.3542
Two Point	3.3542
Uniform	5.8958

Table 21.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 10 degrees of freedom): 140.767045.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 10 and 230 degrees of freedom): 32.626682.

P-value computed by Iman and Davenport Test: 0.

## 21.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg	Finner	Li
10	Non-Geometric	7.855254	0	0.005	0.005116	0.009066
9	Shuffle	6.092718	0	0.005556	0.010206	0.009066
8	Combination	5.439927	0	0.00625	0.01527	0.009066
7	Masked	4.134344	0.000036	0.007143	0.020308	0.009066
6	Uniform	2.872281	0.004075	0.008333	0.025321	0.009066
5	Random Respectful	2.785242	0.005349	0.01	0.030307	0.009066
4	Half Uniform	2.480607	0.013116	0.0125	0.035268	0.009066
3	Reduced Surrogate	0.478714	0.632142	0.016667	0.040204	0.009066
2	Segmented	0.435194	0.663422	0.025	0.045115	0.009066
1	Two Point	0.217597	0.827743	0.05	0.05	0.05

Table 21.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.01$ .

Finner's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.040204$ .

Li's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.009066$ .



### 21.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Non-Geometric	0	0	0
2	Shuffle	0	0	0
3	Combination	0	0.000001	0
4	Masked	0.000036	0.000356	0.000249
5	Uniform	0.004075	0.040752	0.024451
6	Random Respectful	0.005349	0.053488	0.026744
7	Half Uniform	0.013116	0.131159	0.052464
8	Reduced Surrogate	0.632142	6.321424	0.827743
9	Segmented	0.663422	6.634215	0.827743
10	Two Point	0.827743	8.277431	0.827743

Table 21.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$	$p_{Finner}$	$p_{Li}$
1	Non-Geometric	0	0	0
2	Shuffle	0	0	0
3	Combination	0	0	0
4	Masked	0.000036	0.000089	0.000207
5	Uniform	0.004075	0.008134	0.023111
6	Random Respectful	0.005349	0.008899	0.030116
7	Half Uniform	0.013116	0.018684	0.070754
8	Reduced Surrogate	0.632142	0.713516	0.785856
9	Segmented	0.663422	0.713516	0.793872
10	Two Point	0.827743	0.827743	0.827743

Table 21.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 22

# Bin, noisy, svi + kombinacija

### 22.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	3.4333
Masked	8.3
Non-Geometric	10.8667
One Point	3.7833
Random Respectful	3.9167
Reduced Surrogate	4.1667
Segmented	4.5167
Shuffle	9.6333
Combination	9.0667
Two Point	3.9167
Uniform	4.4

Table 22.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 10 degrees of freedom): 217.863636.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 10 and 290 degrees of freedom): 76.921417.

P-value computed by Iman and Daveport Test: 0.

## 22.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg	Finner	Li
10	Non-Geometric	8.680263	0	0.005	0.005116	0.016697
9	Shuffle	7.24004	0	0.005556	0.010206	0.016697
8	Combination	6.578316	0	0.00625	0.01527	0.016697
7	Masked	5.683042	0	0.007143	0.020308	0.016697
6	Segmented	1.265061	0.20585	0.008333	0.025321	0.016697
5	Uniform	1.128823	0.258972	0.01	0.030307	0.016697
4	Reduced Surrogate	0.856349	0.391805	0.0125	0.035268	0.016697
3	Two Point	0.564412	0.572474	0.016667	0.040204	0.016697
2	Random Respectful	0.564412	0.572474	0.025	0.045115	0.016697
1	One Point	0.408712	0.682751	0.05	0.05	0.05

Table 22.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.007143$ .

Finner's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.025321$ .

Li's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.016697$ .

## 22.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Non-Geometric	0	0	0
2	Shuffle	0	0	0
3	Combination	0	0	0
4	Masked	0	0	0
5	Segmented	0.20585	2.058495	0.682751
6	Uniform	0.258972	2.589723	0.682751
7	Reduced Surrogate	0.391805	3.918049	0.682751
8	Two Point	0.572474	5.72474	0.682751
9	Random Respectful	0.572474	5.72474	0.682751
10	One Point	0.682751	6.827511	0.682751

Table 22.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$	$p_{Finner}$	$p_{Li}$
1	Non-Geometric	0	0	0
2	Shuffle	0	0	0
3	Combination	0	0	0
4	Masked	0	0	0
5	Segmented	0.20585	0.369325	0.39352
6	Uniform	0.258972	0.393183	0.449432
7	Reduced Surrogate	0.391805	0.508538	0.552574
8	Two Point	0.572474	0.654297	0.64343
9	Random Respectful	0.572474	0.654297	0.64343
10	One Point	0.682751	0.682751	0.682751

Table 22.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 23

# Bin, noiseless unimodal, svi + kombinacija

### 23.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	6.45
Masked	7.95
Non-Geometric	10.2
One Point	3.15
Random Respectful	6.55
Reduced Surrogate	4.25
Segmented	3.55
Shuffle	7.85
Combination	7.15
Two Point	3.05
Uniform	6.65
No crx	11.2

Table 23.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 11 degrees of freedom): 59.265385.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 11 and 99 degrees of freedom): 10.513305.

P-value computed by Iman and Davenport Test: 0.000000000002.

## 23.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm Hochberg
11	No crx	5.054415	0	0.004545
10	Non-Geometric	4.434242	0.000009	0.005
9	Masked	3.038851	0.002375	0.005556
8	Shuffle	2.976834	0.002912	0.00625
7	Combination	2.542712	0.011	0.007143
6	Uniform	2.232625	0.025574	0.008333
5	Random Respectful	2.170608	0.029961	0.01
4	Half Uniform	2.10859	0.03498	0.0125
3	Reduced Surrogate	0.744208	0.45675	0.016667
2	Segmented	0.310087	0.756495	0.025
1	One Point	0.062017	0.950549	0.05

Table 23.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004545$ .

Holm's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.007143$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.00625$ .



### 23.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hochberg}$
1	No crx	0	0.000005	0.000005	0.000005
2	Non-Geometric	0.000009	0.000102	0.000092	0.000092
3	Masked	0.002375	0.026123	0.021373	0.021373
4	Shuffle	0.002912	0.032037	0.023299	0.023299
5	Combination	0.011	0.120995	0.076997	0.076997
6	Uniform	0.025574	0.28131	0.153442	0.13992
7	Random Respectful	0.029961	0.329569	0.153442	0.13992
8	Half Uniform	0.03498	0.384779	0.153442	0.13992
9	Reduced Surrogate	0.45675	5.024254	1.370251	0.950549
10	Segmented	0.756495	8.321444	1.51299	0.950549
11	One Point	0.950549	10.456039	1.51299	0.950549

Table 23.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	No crx	0
2	Non-Geometric	0.000009
3	Masked	0.002375
4	Shuffle	0.002912
5	Combination	0.011
6	Uniform	0.025574
7	Random Respectful	0.029961
8	Half Uniform	0.03498
9	Reduced Surrogate	0.45675
10	Segmented	0.756495
11	One Point	0.950549

Table 23.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 24

# Bin, noisy unimodal, svi + kombinacija

### 24.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	3.9333
Masked	8.3333
Non-Geometric	10.8667
One Point	3.5333
Random Respectful	4.1333
Reduced Surrogate	4.6
Segmented	4
Shuffle	9.5333
Combination	9.1333
Two Point	3.4
Uniform	4.6667
No crx	11.8667

Table 24.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 11 degrees of freedom): 128.292308.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 11 and 154 degrees of freedom): 48.929589.

P-value computed by Iman and Davenport Test: 0.

## 24.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm Hochberg
11	No crx	6.430895	0	0.004545
10	Non-Geometric	5.67134	0	0.005
9	Shuffle	4.658601	0.000003	0.005556
8	Combination	4.354779	0.000013	0.00625
7	Masked	3.747136	0.000179	0.007143
6	Uniform	0.962102	0.335998	0.008333
5	Reduced Surrogate	0.911465	0.36205	0.01
4	Random Respectful	0.557007	0.577523	0.0125
3	Segmented	0.455733	0.648582	0.016667
2	Half Uniform	0.405096	0.685407	0.025
1	One Point	0.101274	0.919333	0.05

Table 24.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004545$ .

Holm's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.008333$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.007143$ .

## 24.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hochberg}$
1	No crx	0	0	0	0
2	Non-Geometric	0	0	0	0
3	Shuffle	0.000003	0.000035	0.000029	0.000029
4	Combination	0.000013	0.000147	0.000107	0.000107
5	Masked	0.000179	0.001968	0.001252	0.001252
6	Uniform	0.335998	3.69598	2.015989	0.919333
7	Reduced Surrogate	0.36205	3.982552	2.015989	0.919333
8	Random Respectful	0.577523	6.352752	2.310092	0.919333
9	Segmented	0.648582	7.134404	2.310092	0.919333
10	Half Uniform	0.685407	7.539478	2.310092	0.919333
11	One Point	0.919333	10.112663	2.310092	0.919333

Table 24.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	No crx	0
2	Non-Geometric	0
3	Shuffle	0.000003
4	Combination	0.000013
5	Masked	0.000179
6	Uniform	0.335998
7	Reduced Surrogate	0.36205
8	Random Respectful	0.577523
9	Segmented	0.648582
10	Half Uniform	0.685407
11	One Point	0.919333

Table 24.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 25

# Bin, noseless multimodal, svi + kombinacija

### 25.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	4.9286
Masked	6.5714
Non-Geometric	11
One Point	3.2143
Random Respectful	5.3571
Reduced Surrogate	3.2143
Segmented	3.6429
Shuffle	9.7857
Combination	9.2143
Two Point	3.6429
Uniform	5.4286
No crx	12

Table 25.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 11 degrees of freedom): 120.087912.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 11 and 143 degrees of freedom): 46.034997.

P-value computed by Iman and Davenport Test: 0.

## 25.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm Hochberg
11	No crx	6.446952	0	0.004545
10	Non-Geometric	5.713152	0	0.005
9	Shuffle	4.82211	0.000001	0.005556
8	Combination	4.402796	0.000011	0.00625
7	Masked	2.463469	0.01376	0.007143
6	Uniform	1.624841	0.104196	0.008333
5	Random Respectful	1.572427	0.115851	0.01
4	Half Uniform	1.257942	0.208413	0.0125
3	Two Point	0.314485	0.753152	0.016667
2	Segmented	0.314485	0.753152	0.025
1	Reduced Surrogate	0	1	0.05

Table 25.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004545$ .

Holm's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.007143$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.00625$ .



## 25.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hochberg}$
1	No crx	0	0	0	0
2	Non-Geometric	0	0	0	0
3	Shuffle	0.000001	0.000016	0.000013	0.000013
4	Combination	0.000011	0.000118	0.000085	0.000085
5	Masked	0.01376	0.15136	0.09632	0.09632
6	Uniform	0.104196	1.14616	0.625178	0.579257
7	Random Respectful	0.115851	1.274366	0.625178	0.579257
8	Half Uniform	0.208413	2.292541	0.833651	0.833651
9	Two Point	0.753152	8.284676	2.259457	1
10	Segmented	0.753152	8.284676	2.259457	1
11	Reduced Surrogate	1	11	2.259457	1

Table 25.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	No crx	0
2	Non-Geometric	0
3	Shuffle	0.000001
4	Combination	0.000011
5	Masked	0.01376
6	Uniform	0.104196
7	Random Respectful	0.115851
8	Half Uniform	0.208413
9	Two Point	0.753152
10	Segmented	0.753152
11	Reduced Surrogate	1

Table 25.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 26

# Bin, noisy multimodal, svi + kombinacija

### 26.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	2.9333
Masked	8.5333
Non-Geometric	10.8667
One Point	4.0333
Random Respectful	3.7
Reduced Surrogate	3.7333
Segmented	5.0333
Shuffle	9.7333
Combination	9
Two Point	4.4333
Uniform	4.1333
No crx	11.8667

Table 26.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 11 degrees of freedom): 132.728205.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 11 and 154 degrees of freedom): 57.579533.

P-value computed by Iman and Davenport Test: -0.

## 26.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm Hochberg
11	No crx	6.785354	0	0.004545
10	Non-Geometric	6.025799	0	0.005
9	Shuffle	5.164971	0	0.005556
8	Combination	4.607964	0.000004	0.00625
7	Masked	4.253505	0.000021	0.007143
6	Segmented	1.595065	0.110698	0.008333
5	Two Point	1.139332	0.254565	0.01
4	Uniform	0.911465	0.36205	0.0125
3	One Point	0.83551	0.403431	0.016667
2	Reduced Surrogate	0.607644	0.543424	0.025
1	Random Respectful	0.582325	0.560348	0.05

Table 26.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004545$ .

Holm's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.008333$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.007143$ .

## 26.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hochberg}$
1	No crx	0	0	0	0
2	Non-Geometric	0	0	0	0
3	Shuffle	0	0.000003	0.000002	0.000002
4	Combination	0.000004	0.000045	0.000033	0.000033
5	Masked	0.000021	0.000231	0.000147	0.000147
6	Segmented	0.110698	1.217676	0.664187	0.560348
7	Two Point	0.254565	2.800213	1.272824	0.560348
8	Uniform	0.36205	3.982552	1.448201	0.560348
9	One Point	0.403431	4.437737	1.448201	0.560348
10	Reduced Surrogate	0.543424	5.977662	1.448201	0.560348
11	Random Respectful	0.560348	6.163825	1.448201	0.560348

Table 26.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	No crx	0
2	Non-Geometric	0
3	Shuffle	0
4	Combination	0.000004
5	Masked	0.000021
6	Segmented	0.110698
7	Two Point	0.254565
8	Uniform	0.36205
9	One Point	0.403431
10	Reduced Surrogate	0.543424
11	Random Respectful	0.560348

Table 26.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 27

# Bin, noiseless, svi + podskupovi kombinacija

### 27.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	11.2708
Masked	12.8958
Non-Geometric	16.4167
One Point	8.6875
Random Respectful	11.6875
Reduced Surrogate	9.3542
Segmented	9.2708
Shuffle	14.6042
Combination	13.9792
Two Point	8.9792
Uniform	11.7292
1	4.0208
2	4.1458
3	4.6458
4	4.1875
5	3.5625
6	3.5625

Table 27.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 16 degrees of freedom): 278.696078.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 16 and 368 degrees of freedom): 60.87152.

P-value computed by Iman and Davenport Test: 0.





## 27.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg	Finner	Li
16	Non-Geometric	8.817886	0	0.003125	0.003201	0
15	Shuffle	7.574521	0	0.003333	0.006391	0
14	Combination	7.145774	0	0.003571	0.009571	0
13	Masked	6.402614	0	0.003846	0.012741	0
12	Uniform	5.602287	0	0.004167	0.015901	0
11	Random Respectful	5.573704	0	0.004545	0.019051	0
10	Half Uniform	5.287873	0	0.005	0.022191	0
9	Reduced Surrogate	3.973051	0.000071	0.005556	0.025321	0
8	Segmented	3.915884	0.00009	0.00625	0.02844	0
7	Two Point	3.715803	0.000203	0.007143	0.03155	0
6	One Point	3.515721	0.000439	0.008333	0.03465	0
5	3	0.743161	0.457384	0.01	0.037739	0
4	4	0.428746	0.668108	0.0125	0.040819	0
3	2	0.400163	0.689036	0.016667	0.043889	0
2	1	0.314414	0.753207	0.025	0.04695	0
1	6	0	1	0.05	0.05	0.05

Table 27.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.003125$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.008333$ .

Finner's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.037739$ .

Li's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0$ .

## 27.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Non-Geometric	0	0	0
2	Shuffle	0	0	0
3	Combination	0	0	0
4	Masked	0	0	0
5	Uniform	0	0	0
6	Random Respectful	0	0	0
7	Half Uniform	0	0.000002	0.000001
8	Reduced Surrogate	0.000071	0.001135	0.000639
9	Segmented	0.00009	0.001441	0.000721
10	Two Point	0.000203	0.003241	0.001418
11	One Point	0.000439	0.007017	0.002631
12	3	0.457384	7.318152	1
13	4	0.668108	10.689724	1
14	2	0.689036	11.024579	1
15	1	0.753207	12.051305	1
16	6	1	16	1

Table 27.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$	$p_{Finner}$	$p_{Li}$
1	Non-Geometric	0	0	0.005253
2	Shuffle	0	0	0.995919
3	Combination	0	0	0.999819
4	Masked	0	0	0.999999
5	Uniform	0	0	1
6	Random Respectful	0	0	1
7	Half Uniform	0	0	1
8	Reduced Surrogate	0.000071	0.000142	1
9	Segmented	0.00009	0.00016	1
10	Two Point	0.000203	0.000324	1
11	One Point	0.000439	0.000638	1
12	3	0.457384	0.557422	1
13	4	0.668108	0.742689	1
14	2	0.689036	0.742689	1
15	1	0.753207	0.775186	1
16	6	1	1	1

Table 27.4: Adjusted  $p$ -values (FRIEDMAN) (II)

## Chapter 28

# Bin, noisy, svi + podskupovi kombinacija

### 28.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
Half Uniform	8.35
Masked	14.2667
Non-Geometric	16.8667
One Point	9.1833
Random Respectful	8.7833
Reduced Surrogate	9.2167
Segmented	9.9167
Shuffle	15.6333
Combination	15.0667
Two Point	9.2833
Uniform	9.6
11	4.3
12	3.6667
13	5.6833
14	4.25
15	4.3333
16	4.6

Table 28.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 16 degrees of freedom): 349.992157.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 16 and 464 degrees of freedom): 78.070463.

P-value computed by Iman and Davenport Test: 0.



## 28.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg	Finner	Li
16	Non-Geometric	10.123938	0	0.003125	0.003201	0.01818
15	Shuffle	9.178014	0	0.003333	0.006391	0.01818
14	Combination	8.743401	0	0.003571	0.009571	0.01818
13	Masked	8.129829	0	0.003846	0.012741	0.01818
12	Segmented	4.793531	0.000002	0.004167	0.015901	0.01818
11	Uniform	4.550659	0.000005	0.004545	0.019051	0.01818
10	Two Point	4.307787	0.000016	0.005	0.022191	0.01818
9	Reduced Surrogate	4.256656	0.000021	0.005556	0.025321	0.01818
8	One Point	4.23109	0.000023	0.00625	0.02844	0.01818
7	Random Respectful	3.924304	0.000087	0.007143	0.03155	0.01818
6	Half Uniform	3.591953	0.000328	0.008333	0.03465	0.01818
5	13	1.546713	0.121933	0.01	0.037739	0.01818
4	16	0.715834	0.474094	0.0125	0.040819	0.01818
3	15	0.511131	0.609134	0.016667	0.043889	0.01818
2	11	0.485744	0.627148	0.025	0.04695	0.01818
1	14	0.447396	0.654589	0.05	0.05	0.05

Table 28.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.003125$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.008333$ .

Finner's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.037739$ .

Li's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.01818$ .

## 28.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	Non-Geometric	0	0	0
2	Shuffle	0	0	0
3	Combination	0	0	0
4	Masked	0	0	0
5	Segmented	0.000002	0.000026	0.00002
6	Uniform	0.000005	0.000086	0.000059
7	Two Point	0.000016	0.000264	0.000165
8	Reduced Surrogate	0.000021	0.000332	0.000186
9	One Point	0.000023	0.000372	0.000186
10	Random Respectful	0.000087	0.001392	0.000609
11	Half Uniform	0.000328	0.005251	0.001969
12	13	0.121933	1.950921	0.609663
13	16	0.474094	7.585502	0.654589
14	15	0.609134	9.746144	0.654589
15	11	0.627148	10.034373	0.654589
16	14	0.654589	10.473424	0.654589

Table 28.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$	$p_{Finner}$	$p_{Li}$
1	Non-Geometric	0	0	0
2	Shuffle	0	0	0
3	Combination	0	0	0
4	Masked	0	0	0
5	Segmented	0.000002	0.000005	0.000005
6	Uniform	0.000005	0.000014	0.000015
7	Two Point	0.000016	0.000038	0.000048
8	Reduced Surrogate	0.000021	0.000042	0.00006
9	One Point	0.000023	0.000042	0.000067
10	Random Respectful	0.000087	0.000139	0.000252
11	Half Uniform	0.000328	0.000477	0.000949
12	13	0.121933	0.159178	0.260906
13	16	0.474094	0.546578	0.578513
14	15	0.609134	0.65822	0.638141
15	11	0.627148	0.65822	0.644843
16	14	0.654589	0.65822	0.654589

Table 28.4: Adjusted  $p$ -values (FRIEDMAN) (II)

## Chapter 29

# Perm, svi problemi, svi pojedinačni

### 29.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
COSA	2
Cyclic2	8.8
DPX	9.775
OPX	4.25
OX	1.55
OX2	3.55
PBX	6.65
PMX	7.2
SPX	8.75
ULX	6.4
UPMX	7.075

Table 29.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 10 degrees of freedom): 141.270455.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 10 and 190 degrees of freedom): 45.703378.

P-value computed by Iman and Davenport Test: 0.

## 29.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg
10	DPX	7.84223	0	0.005
9	Cyclic2	6.912604	0	0.005556
8	SPX	6.864931	0	0.00625
7	PMX	5.387064	0	0.007143
6	UPMX	5.267881	0	0.008333
5	PBX	4.862659	0.000001	0.01
4	ULX	4.624294	0.000004	0.0125
3	OPX	2.574349	0.010043	0.016667
2	OX2	1.906925	0.05653	0.025
1	COSA	0.429058	0.667881	0.05

Table 29.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.016667$ .



### 29.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	DPX	0	0	0
2	Cyclic2	0	0	0
3	SPX	0	0	0
4	PMX	0	0.000001	0.000001
5	UPMX	0	0.000001	0.000001
6	PBX	0.000001	0.000012	0.000006
7	ULX	0.000004	0.000038	0.000015
8	OPX	0.010043	0.100429	0.030129
9	OX2	0.05653	0.565303	0.113061
10	COSA	0.667881	6.678809	0.667881

Table 29.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	DPX	0
2	Cyclic2	0
3	SPX	0
4	PMX	0
5	UPMX	0
6	PBX	0.000001
7	ULX	0.000004
8	OPX	0.010043
9	OX2	0.05653
10	COSA	0.667881

Table 29.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 30

# Perm, svi problemi, svi + kombinacija

### 30.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
COSA	2.2
Cyclic2	9.8
DPX	10.775
OPX	5.05
OX	1.9
OX2	4.3
PBX	7.65
PMX	8.1
SPX	9.75
Svi	3.3
ULX	7.25
UPMX	7.925

Table 30.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 11 degrees of freedom): 158.517308.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 11 and 209 degrees of freedom): 48.986613.

P-value computed by Iman and Davenport Test: 0.

## 30.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg	Finner	Li
11	DPX	7.78389	0	0.004545	0.004652	0.010923
10	Cyclic2	6.928758	0	0.005	0.009283	0.010923
9	SPX	6.884905	0	0.005556	0.013892	0.010923
8	PMX	5.43776	0	0.00625	0.018479	0.010923
7	UPMX	5.284275	0	0.007143	0.023045	0.010923
6	PBX	5.043084	0	0.008333	0.02759	0.010923
5	ULX	4.69226	0.000003	0.01	0.032114	0.010923
4	OPX	2.762733	0.005732	0.0125	0.036617	0.010923
3	OX2	2.104939	0.035297	0.016667	0.041099	0.010923
2	Svi	1.227881	0.219492	0.025	0.04556	0.010923
1	COSA	0.263117	0.79246	0.05	0.05	0.05

Table 30.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004545$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.0125$ .

Finner's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.04556$ .

Li's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.010923$ .

### 30.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	DPX	0	0	0
2	Cyclic2	0	0	0
3	SPX	0	0	0
4	PMX	0	0.000001	0
5	UPMX	0	0.000001	0.000001
6	PBX	0	0.000005	0.000003
7	ULX	0.000003	0.00003	0.000014
8	OPX	0.005732	0.063052	0.022928
9	OX2	0.035297	0.388263	0.10589
10	Svi	0.219492	2.414407	0.438983
11	COSA	0.79246	8.717061	0.79246

Table 30.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$	$p_{Finner}$	$p_{Li}$
1	DPX	0	0	0
2	Cyclic2	0	0	0
3	SPX	0	0	0
4	PMX	0	0	0
5	UPMX	0	0	0.000001
6	PBX	0	0.000001	0.000002
7	ULX	0.000003	0.000004	0.000013
8	OPX	0.005732	0.007873	0.026876
9	OX2	0.035297	0.04297	0.145351
10	Svi	0.219492	0.238596	0.513994
11	COSA	0.79246	0.79246	0.79246

Table 30.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 31

# Perm, mali problemi, svi + kombinacija

### 31.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
COSA	1.4
Cyclic2	11.4
DPX	10.7
OPX	5.4
OX	3
OX2	5
PBX	5.8
PMX	9.8
SPX	6
Svi	1.6
ULX	8.6
UPMX	9.3
No crx	13

Table 31.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 12 degrees of freedom): 56.12967.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 12 and 48 degrees of freedom): 58.010221.

P-value computed by Iman and Davenport Test: 0.

## 31.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm Hochberg
12	No crx	4.709588	0.000002	0.004167
11	Cyclic2	4.05999	0.000049	0.004545
10	DPX	3.77579	0.00016	0.005
9	PMX	3.410391	0.000649	0.005556
8	UPMX	3.207392	0.001339	0.00625
7	ULX	2.923193	0.003465	0.007143
6	SPX	1.867595	0.061819	0.008333
5	PBX	1.786395	0.074035	0.01
4	OPX	1.623996	0.104377	0.0125
3	OX2	1.461596	0.143852	0.016667
2	OX	0.649598	0.515952	0.025
1	Svi	0.0812	0.935283	0.05

Table 31.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004167$ .

Holm's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.008333$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.007143$ .



### 31.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hochberg}$
1	No crx	0.000002	0.00003	0.00003	0.00003
2	Cyclic2	0.000049	0.000589	0.00054	0.00054
3	DPX	0.00016	0.001914	0.001595	0.001595
4	PMX	0.000649	0.007784	0.005838	0.005838
5	UPMX	0.001339	0.016073	0.010716	0.010716
6	ULX	0.003465	0.041575	0.024252	0.024252
7	SPX	0.061819	0.741822	0.370911	0.370176
8	PBX	0.074035	0.888423	0.370911	0.370176
9	OPX	0.104377	1.25252	0.417507	0.417507
10	OX2	0.143852	1.726222	0.431556	0.431556
11	OX	0.515952	6.19142	1.031903	0.935283
12	Svi	0.935283	11.223397	1.031903	0.935283

Table 31.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	No crx	0.000002
2	Cyclic2	0.000049
3	DPX	0.00016
4	PMX	0.000649
5	UPMX	0.001339
6	ULX	0.003465
7	SPX	0.061819
8	PBX	0.074035
9	OPX	0.104377
10	OX2	0.143852
11	OX	0.515952
12	Svi	0.935283

Table 31.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 32

# Perm, srednji problemi, svi + kombinacija

### 32.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
COSA	1.1429
Cyclic2	9.4286
DPX	11
OPX	5
OX	2.1429
OX2	4.2857
PBX	5.8571
PMX	8.2857
SPX	10.4286
Svi	2.7143
ULX	8.7143
UPMX	9
No crx	13

Table 32.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 12 degrees of freedom): 77.161695.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 12 and 72 degrees of freedom): 67.702479.

P-value computed by Iman and Davenport Test: 0.

## 32.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm Hochberg
12	No crx	5.695987	0	0.004167
11	DPX	4.735218	0.000002	0.004545
10	SPX	4.460713	0.000008	0.005
9	Cyclic2	3.980328	0.000069	0.005556
8	UPMX	3.774449	0.00016	0.00625
7	ULX	3.637197	0.000276	0.007143
6	PMX	3.431318	0.000601	0.008333
5	PBX	2.26467	0.023533	0.01
4	OPX	1.852911	0.063895	0.0125
3	OX2	1.50978	0.1311	0.016667
2	Svi	0.75489	0.450315	0.025
1	OX	0.480384	0.630954	0.05

Table 32.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004167$ .

Holm's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.01$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.008333$ .

### 32.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hochberg}$
1	No crx	0	0	0	0
2	DPX	0.000002	0.000026	0.000024	0.000024
3	SPX	0.000008	0.000098	0.000082	0.000082
4	Cyclic2	0.000069	0.000826	0.000619	0.000619
5	UPMX	0.00016	0.001924	0.001283	0.001283
6	ULX	0.000276	0.003307	0.001929	0.001929
7	PMX	0.000601	0.007208	0.003604	0.003604
8	PBX	0.023533	0.282396	0.117665	0.117665
9	OPX	0.063895	0.766741	0.25558	0.25558
10	OX2	0.1311	1.573196	0.393299	0.393299
11	Svi	0.450315	5.403781	0.90063	0.630954
12	OX	0.630954	7.571448	0.90063	0.630954

Table 32.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	No crx	0
2	DPX	0.000002
3	SPX	0.000008
4	Cyclic2	0.000069
5	UPMX	0.00016
6	ULX	0.000276
7	PMX	0.000601
8	PBX	0.023533
9	OPX	0.063895
10	OX2	0.1311
11	Svi	0.450315
12	OX	0.630954

Table 32.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 33

# Perm, veliki problemi, svi + kombinacija

### 33.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
COSA	3.625
Cyclic2	9.125
DPX	10.625
OPX	4.875
OX	1
OX2	3.875
PBX	10.375
PMX	6.875
SPX	11.5
Svi	4.875
ULX	5.125
UPMX	6.125
No crx	13

Table 33.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 12 degrees of freedom): 82.17033.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 12 and 84 degrees of freedom): 41.59118.

P-value computed by Iman and Davenport Test: 0.

## 33.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm Hochberg
12	No crx	6.162631	0	0.004167
11	SPX	5.392302	0	0.004545
10	DPX	4.942944	0.000001	0.005
9	PBX	4.814556	0.000001	0.005556
8	Cyclic2	4.172615	0.00003	0.00625
7	PMX	3.017121	0.002552	0.007143
6	UPMX	2.631957	0.008489	0.008333
5	ULX	2.118404	0.034141	0.01
4	OPX	1.990016	0.046589	0.0125
3	Svi	1.990016	0.046589	0.016667
2	OX2	1.476464	0.139819	0.025
1	COSA	1.348076	0.177634	0.05

Table 33.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.004167$ .

Holm's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.008333$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.007143$ .



### 33.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hochberg}$
1	No crx	0	0	0	0
2	SPX	0	0.000001	0.000001	0.000001
3	DPX	0.000001	0.000009	0.000008	0.000008
4	PBX	0.000001	0.000018	0.000013	0.000013
5	Cyclic2	0.00003	0.000361	0.000241	0.000241
6	PMX	0.002552	0.030623	0.017863	0.017863
7	UPMX	0.008489	0.101874	0.050937	0.050937
8	ULX	0.034141	0.40969	0.170704	0.139767
9	OPX	0.046589	0.55907	0.186357	0.139767
10	Svi	0.046589	0.55907	0.186357	0.139767
11	OX2	0.139819	1.677833	0.279639	0.177634
12	COSA	0.177634	2.131609	0.279639	0.177634

Table 33.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$
1	No crx	0
2	SPX	0
3	DPX	0.000001
4	PBX	0.000001
5	Cyclic2	0.00003
6	PMX	0.002552
7	UPMX	0.008489
8	ULX	0.034141
9	OPX	0.046589
10	Svi	0.046589
11	OX2	0.139819
12	COSA	0.177634

Table 33.4: Adjusted  $p$ -values (FRIEDMAN) (II)



## Chapter 34

# Perm, svi problemi, svi + podskupovi kombinacija

### 34.1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Algorithm	Ranking
COSA	6.15
Cyclic2	15.8
DPX	16.775
OPX	10.9
OX	5.3
OX2	9.75
PBX	13.55
PMX	13.6
SPX	15.75
Svi	8.65
ULX	12.7
UPMX	13.375
1	5.3
2	5.1
3	3.9
4	8.65
5	4.4
6	1.35

Table 34.1: Average Rankings of the algorithms (Friedman)

Friedman statistic (distributed according to chi-square with 17 degrees of freedom): 268.960526.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 17 and 323 degrees of freedom): 71.935358.

P-value computed by Iman and Daveport Test: 0.

## 34.2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Hochberg	Finner	Li
17	DPX	9.136981	0	0.002941	0.003013	0.045741
16	Cyclic2	8.559441	0	0.003125	0.006016	0.045741
15	SPX	8.529824	0	0.003333	0.009011	0.045741
14	PMX	7.256274	0	0.003571	0.011996	0.045741
13	PBX	7.226656	0	0.003846	0.014973	0.045741
12	UPMX	7.122995	0	0.004167	0.017941	0.045741
11	ULX	6.72316	0	0.004545	0.020899	0.045741
10	OPX	5.656932	0	0.005	0.023849	0.045741
9	OX2	4.975731	0.000001	0.005556	0.02679	0.045741
8	4	4.324147	0.000015	0.00625	0.029722	0.045741
7	Svi	4.324147	0.000015	0.007143	0.032645	0.045741
6	COSA	2.843275	0.004465	0.008333	0.035559	0.045741
5	OX	2.339778	0.019295	0.01	0.038465	0.045741
4	1	2.339778	0.019295	0.0125	0.041362	0.045741
3	2	2.221308	0.02633	0.016667	0.04425	0.045741
2	5	1.806664	0.070815	0.025	0.047129	0.045741
1	3	1.51049	0.130919	0.05	0.05	0.05

Table 34.2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.002941$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.008333$ .

Finner's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.047129$ .

Li's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.045741$ .

### 34.3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Hochberg}$
1	DPX	0	0	0
2	Cyclic2	0	0	0
3	SPX	0	0	0
4	PMX	0	0	0
5	PBX	0	0	0
6	UPMX	0	0	0
7	ULX	0	0	0
8	OPX	0	0	0
9	OX2	0.000001	0.000011	0.000006
10	4	0.000015	0.00026	0.000107
11	Svi	0.000015	0.00026	0.000107
12	COSA	0.004465	0.075909	0.026792
13	OX	0.019295	0.328018	0.077181
14	1	0.019295	0.328018	0.077181
15	2	0.02633	0.447611	0.07899
16	5	0.070815	1.203849	0.130919
17	3	0.130919	2.225615	0.130919

Table 34.3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$	$p_{Finner}$	$p_{Li}$
1	DPX	0	0	0
2	Cyclic2	0	0	0
3	SPX	0	0	0
4	PMX	0	0	0
5	PBX	0	0	0
6	UPMX	0	0	0
7	ULX	0	0	0
8	OPX	0	0	0
9	OX2	0.000001	0.000001	0.000001
10	4	0.000015	0.000026	0.000018
11	Svi	0.000015	0.000026	0.000018
12	COSA	0.004465	0.00632	0.005112
13	OX	0.019295	0.025157	0.02172
14	1	0.019295	0.025157	0.02172
15	2	0.02633	0.029788	0.029406
16	5	0.070815	0.07507	0.075343
17	3	0.130919	0.130919	0.130919

Table 34.4: Adjusted  $p$ -values (FRIEDMAN) (II)