# Output tables for the test of Multiple comparisons.

December 26, 2016

## 1 Average rankings of Friedman test

Average ranks obtained by applying the Friedman procedure

| Algorithm | Ranking |
|---|---|
| SVRCC | 2.5417 |
| MORF | 7.3333 |
| ST | 5.7708 |
| MTS | 5.8125 |
| MTSC | 6.0625 |
| RC | 7.625 |
| ERC | 6.0208 |
| ERCC | 4.8542 |
| SVR | 5.0625 |
| SVRRC | 3.9167 |

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 9 degrees of freedom: 53.679545.
P-value computed by Friedman Test: 2.1753014944891902E-8.

Iman and Davenport statistic considering reduction performance (distributed according to F-distribution with 9 and 207 degrees of freedom: 7.606124.
P-value computed by Iman and Daveport Test: 1.2751365120826391E-9.

## 2 Post hoc comparisons

Results achieved on post hoc comparisons for $\alpha = 0.05$, $\alpha = 0.10$ and adjusted p-values.

### 2.1 P-values for $\alpha = 0.05$

Nemenyi's procedure rejects those hypotheses that have an unadjusted p-value $\leq 0.001111$.

Holm's procedure rejects those hypotheses that have an unadjusted p-value $\leq 0.001351$.

| $i$ | algorithms | $z = (R_0 - R_i)/SE$ | $p$ | Holm |
|---|---|---|---|---|
| 45 | SVRCC vs. RC | 5.816122 | 0 | 0.001111 |
| 44 | SVRCC vs. MORF | 5.48241 | 0 | 0.001136 |
| 43 | RC vs. SVRRC | 4.242909 | 0.000022 | 0.001163 |
| 42 | SVRCC vs. MTSC | 4.028379 | 0.000056 | 0.00119 |
| 41 | SVRCC vs. ERC | 3.980706 | 0.000069 | 0.00122 |
| 40 | MORF vs. SVRRC | 3.909197 | 0.000093 | 0.00125 |
| 39 | SVRCC vs. MTS | 3.742341 | 0.000182 | 0.001282 |
| 38 | SVRCC vs. ST | 3.694668 | 0.00022 | 0.001316 |
| 37 | RC vs. ERCC | 3.170263 | 0.001523 | 0.001351 |
| 36 | RC vs. SVR | 2.931897 | 0.003369 | 0.001389 |
| 35 | SVRCC vs. SVR | 2.884224 | 0.003924 | 0.001429 |
| 34 | MORF vs. ERCC | 2.836551 | 0.00456 | 0.001471 |
| 33 | SVRCC vs. ERCC | 2.645859 | 0.008148 | 0.001515 |
| 32 | MORF vs. SVR | 2.598186 | 0.009372 | 0.001563 |
| 31 | MTSC vs. SVRRC | 2.455166 | 0.014082 | 0.001613 |
| 30 | ERC vs. SVRRC | 2.407493 | 0.016062 | 0.001667 |
| 29 | MTS vs. SVRRC | 2.169127 | 0.030073 | 0.001724 |
| 28 | ST vs. SVRRC | 2.121454 | 0.033884 | 0.001786 |
| 27 | ST vs. RC | 2.121454 | 0.033884 | 0.001852 |
| 26 | MTS vs. RC | 2.073781 | 0.0381 | 0.001923 |
| 25 | RC vs. ERC | 1.835415 | 0.066444 | 0.002 |
| 24 | MORF vs. ST | 1.787742 | 0.073818 | 0.002083 |
| 23 | MTSC vs. RC | 1.787742 | 0.073818 | 0.002174 |
| 22 | MORF vs. MTS | 1.740069 | 0.081847 | 0.002273 |
| 21 | SVRCC vs. SVRRC | 1.573213 | 0.115669 | 0.002381 |
| 20 | MORF vs. ERC | 1.501704 | 0.133174 | 0.0025 |
| 19 | MORF vs. MTSC | 1.45403 | 0.145938 | 0.002632 |
| 18 | MTSC vs. ERCC | 1.382521 | 0.166812 | 0.002778 |
| 17 | ERC vs. ERCC | 1.334848 | 0.181926 | 0.002941 |
| 16 | SVR vs. SVRRC | 1.311011 | 0.189854 | 0.003125 |
| 15 | MTSC vs. SVR | 1.144155 | 0.252559 | 0.003333 |
| 14 | MTS vs. ERCC | 1.096482 | 0.272868 | 0.003571 |
| 13 | ERC vs. SVR | 1.096482 | 0.272868 | 0.003846 |
| 12 | ERCC vs. SVRRC | 1.072645 | 0.28343 | 0.004167 |
| 11 | ST vs. ERCC | 1.048809 | 0.294266 | 0.004545 |
| 10 | MTS vs. SVR | 0.858116 | 0.390828 | 0.005 |
| 9 | ST vs. SVR | 0.810443 | 0.417685 | 0.005556 |
| 8 | ST vs. MTSC | 0.333712 | 0.738597 | 0.00625 |
| 7 | MORF vs. RC | 0.333712 | 0.738597 | 0.007143 |
| 6 | ST vs. ERC | 0.286039 | 0.774848 | 0.008333 |
| 5 | MTS vs. MTSC | 0.286039 | 0.774848 | 0.01 |
| 4 | ERCC vs. SVR | 0.238366 | 0.811598 | 0.0125 |
| 3 | MTS vs. ERC | 0.238366 | 0.811598 | 0.016667 |
| 2 | ST vs. MTS | 0.047673 | 0.961977 | 0.025 |
| 1 | MTSC vs. ERC | 0.047673 | 0.961977 | 0.05 |

Table 2: P-values Table for $\alpha = 0.05$

## 2.2 P-values for $\alpha = 0.10$

Nemenyi's procedure rejects those hypotheses that have an unadjusted p-value $\leq 0.002222$.

Holm's procedure rejects those hypotheses that have an unadjusted p-value $\leq 0.002778$.

| $i$ | algorithms | $z = (R_0 - R_i)/SE$ | $p$ | Holm |
|---|---|---|---|---|
| 45 | SVRCC vs. RC | 5.816122 | 0 | 0.002222 |
| 44 | SVRCC vs. MORF | 5.48241 | 0 | 0.002273 |
| 43 | RC vs. SVRRC | 4.242909 | 0.000022 | 0.002326 |
| 42 | SVRCC vs. MTSC | 4.028379 | 0.000056 | 0.002381 |
| 41 | SVRCC vs. ERC | 3.980706 | 0.000069 | 0.002439 |
| 40 | MORF vs. SVRRC | 3.909197 | 0.000093 | 0.0025 |
| 39 | SVRCC vs. MTS | 3.742341 | 0.000182 | 0.002564 |
| 38 | SVRCC vs. ST | 3.694668 | 0.00022 | 0.002632 |
| 37 | RC vs. ERCC | 3.170263 | 0.001523 | 0.002703 |
| 36 | RC vs. SVR | 2.931897 | 0.003369 | 0.002778 |
| 35 | SVRCC vs. SVR | 2.884224 | 0.003924 | 0.002857 |
| 34 | MORF vs. ERCC | 2.836551 | 0.00456 | 0.002941 |
| 33 | SVRCC vs. ERCC | 2.645859 | 0.008148 | 0.00303 |
| 32 | MORF vs. SVR | 2.598186 | 0.009372 | 0.003125 |
| 31 | MTSC vs. SVRRC | 2.455166 | 0.014082 | 0.003226 |
| 30 | ERC vs. SVRRC | 2.407493 | 0.016062 | 0.003333 |
| 29 | MTS vs. SVRRC | 2.169127 | 0.030073 | 0.003448 |
| 28 | ST vs. SVRRC | 2.121454 | 0.033884 | 0.003571 |
| 27 | ST vs. RC | 2.121454 | 0.033884 | 0.003704 |
| 26 | MTS vs. RC | 2.073781 | 0.0381 | 0.003846 |
| 25 | RC vs. ERC | 1.835415 | 0.066444 | 0.004 |
| 24 | MORF vs. ST | 1.787742 | 0.073818 | 0.004167 |
| 23 | MTSC vs. RC | 1.787742 | 0.073818 | 0.004348 |
| 22 | MORF vs. MTS | 1.740069 | 0.081847 | 0.004545 |
| 21 | SVRCC vs. SVRRC | 1.573213 | 0.115669 | 0.004762 |
| 20 | MORF vs. ERC | 1.501704 | 0.133174 | 0.005 |
| 19 | MORF vs. MTSC | 1.45403 | 0.145938 | 0.005263 |
| 18 | MTSC vs. ERCC | 1.382521 | 0.166812 | 0.005556 |
| 17 | ERC vs. ERCC | 1.334848 | 0.181926 | 0.005882 |
| 16 | SVR vs. SVRRC | 1.311011 | 0.189854 | 0.00625 |
| 15 | MTSC vs. SVR | 1.144155 | 0.252559 | 0.006667 |
| 14 | MTS vs. ERCC | 1.096482 | 0.272868 | 0.007143 |
| 13 | ERC vs. SVR | 1.096482 | 0.272868 | 0.007692 |
| 12 | ERCC vs. SVRRC | 1.072645 | 0.28343 | 0.008333 |
| 11 | ST vs. ERCC | 1.048809 | 0.294266 | 0.009091 |
| 10 | MTS vs. SVR | 0.858116 | 0.390828 | 0.01 |
| 9 | ST vs. SVR | 0.810443 | 0.417685 | 0.011111 |
| 8 | ST vs. MTSC | 0.333712 | 0.738597 | 0.0125 |
| 7 | MORF vs. RC | 0.333712 | 0.738597 | 0.014286 |
| 6 | ST vs. ERC | 0.286039 | 0.774848 | 0.016667 |
| 5 | MTS vs. MTSC | 0.286039 | 0.774848 | 0.02 |
| 4 | ERCC vs. SVR | 0.238366 | 0.811598 | 0.025 |
| 3 | MTS vs. ERC | 0.238366 | 0.811598 | 0.033333 |
| 2 | ST vs. MTS | 0.047673 | 0.961977 | 0.05 |
| 1 | MTSC vs. ERC | 0.047673 | 0.961977 | 0.1 |

Table 3: P-values Table for $\alpha = 0.10$

## 2.3 Adjusted p-values

| i | hypothesis | unadjusted $p$ | $p_{Neme}$ | $p_{Holm}$ |
|---|---|---|---|---|
| 1 | SVRCC vs .RC | 0 | 0 | 0 |
| 2 | SVRCC vs .MORF | 0 | 0.000002 | 0.000002 |
| 3 | RC vs .SVRRC | 0.000022 | 0.000993 | 0.000949 |
| 4 | SVRCC vs .MTSC | 0.000056 | 0.002527 | 0.002359 |
| 5 | SVRCC vs .ERC | 0.000069 | 0.003092 | 0.002817 |
| 6 | MORF vs .SVRRC | 0.000093 | 0.004167 | 0.003704 |
| 7 | SVRCC vs .MTS | 0.000182 | 0.008204 | 0.00711 |
| 8 | SVRCC vs .ST | 0.00022 | 0.009908 | 0.008367 |
| 9 | RC vs .ERCC | 0.001523 | 0.068535 | 0.056351 |
| 10 | RC vs .SVR | 0.003369 | 0.151604 | 0.121283 |
| 11 | SVRCC vs .SVR | 0.003924 | 0.176571 | 0.137333 |
| 12 | MORF vs .ERCC | 0.00456 | 0.205216 | 0.155052 |
| 13 | SVRCC vs .ERCC | 0.008148 | 0.366677 | 0.268897 |
| 14 | MORF vs .SVR | 0.009372 | 0.42173 | 0.299897 |
| 15 | MTSC vs .SVRRC | 0.014082 | 0.633688 | 0.43654 |
| 16 | ERC vs .SVRRC | 0.016062 | 0.722811 | 0.481874 |
| 17 | MTS vs .SVRRC | 0.030073 | 1.353286 | 0.872117 |
| 18 | ST vs .SVRRC | 0.033884 | 1.524762 | 0.948741 |
| 19 | ST vs .RC | 0.033884 | 1.524762 | 0.948741 |
| 20 | MTS vs .RC | 0.0381 | 1.714484 | 0.990591 |
| 21 | RC vs .ERC | 0.066444 | 2.989987 | 1.661104 |
| 22 | MORF vs .ST | 0.073818 | 3.321791 | 1.771622 |
| 23 | MTSC vs .RC | 0.073818 | 3.321791 | 1.771622 |
| 24 | MORF vs .MTS | 0.081847 | 3.683109 | 1.800631 |
| 25 | SVRCC vs .SVRRC | 0.115669 | 5.205125 | 2.429058 |
| 26 | MORF vs .ERC | 0.133174 | 5.992816 | 2.663474 |
| 27 | MORF vs .MTSC | 0.145938 | 6.567204 | 2.772819 |
| 28 | MTSC vs .ERCC | 0.166812 | 7.506534 | 3.002614 |
| 29 | ERC vs .ERCC | 0.181926 | 8.18668 | 3.092746 |
| 30 | SVR vs .SVRRC | 0.189854 | 8.543431 | 3.092746 |
| 31 | MTSC vs .SVR | 0.252559 | 11.365169 | 3.78839 |
| 32 | MTS vs .ERCC | 0.272868 | 12.279056 | 3.820151 |
| 33 | ERC vs .SVR | 0.272868 | 12.279056 | 3.820151 |
| 34 | ERCC vs .SVRRC | 0.28343 | 12.754361 | 3.820151 |
| 35 | ST vs .ERCC | 0.294266 | 13.241975 | 3.820151 |
| 36 | MTS vs .SVR | 0.390828 | 17.58727 | 3.908282 |
| 37 | ST vs .SVR | 0.417685 | 18.795847 | 3.908282 |
| 38 | ST vs .MTSC | 0.738597 | 33.236863 | 5.908776 |
| 39 | MORF vs .RC | 0.738597 | 33.236863 | 5.908776 |
| 40 | ST vs .ERC | 0.774848 | 34.868179 | 5.908776 |
| 41 | MTS vs .MTSC | 0.774848 | 34.868179 | 5.908776 |
| 42 | ERCC vs .SVR | 0.811598 | 36.521888 | 5.908776 |
| 43 | MTS vs .ERC | 0.811598 | 36.521888 | 5.908776 |
| 44 | ST vs .MTS | 0.961977 | 43.288954 | 5.908776 |
| 45 | MTSC vs .ERC | 0.961977 | 43.288954 | 5.908776 |

Table 4: Adjusted $p$-values