Results

June 18, 2010

1 Tables of Friedman, Bonferroni-Dunn, Holm, Hochberg and Hommel Tests

Table 1: Average Rankings of the algorithms

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE</td>
<td>2.6578947368421058</td>
</tr>
<tr>
<td>CHC</td>
<td>0.9999999999999996</td>
</tr>
<tr>
<td>VXQR1</td>
<td>2.342105263157894</td>
</tr>
</tbody>
</table>

Friedman statistic considering reduction performance (distributed according to chi-square with 2 degrees of freedom: 29.44736842105258.
Iman and Davenport statistic considering reduction performance (distributed according to F-distribution with 2 and 36 degrees of freedom: 61.975384615384144.

Table 2: Holm / Hochberg Table for $\alpha = 0.05$

<table>
<thead>
<tr>
<th>i</th>
<th>algorithm</th>
<th>z = (R_i - R_o) / SE</th>
<th>Holm/Hochberg/Hommel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VXQR1</td>
<td>4.135464023834443</td>
<td>3.524187887096872R-5</td>
</tr>
<tr>
<td>2</td>
<td>DE</td>
<td>5.109974765619023</td>
<td>3.220184413784448R-7</td>
</tr>
</tbody>
</table>
Bonferroni-Dunn’s procedure rejects those hypotheses that have a p-value ≤ 0.025.
Hochberg’s procedure rejects those hypotheses that have a p-value ≤ 0.05.
Hommel’s procedure rejects all hypotheses.

### Table 3: Holm / Hochberg Table for α = 0.10

<table>
<thead>
<tr>
<th>i</th>
<th>algorithm</th>
<th>( z )</th>
<th>( (R_0 - R_i) / SE )</th>
<th>Holm/Hochberg/Hommel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VXQR1</td>
<td>4.13664623834443</td>
<td>3.52418787096871E-5</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Bonferroni-Dunn’s procedure rejects those hypotheses that have a p-value ≤ 0.05.
Hochberg’s procedure rejects those hypotheses that have a p-value ≤ 0.1.
Hommel’s procedure rejects all hypotheses.

### Table 4: Adjusted p-values

<table>
<thead>
<tr>
<th>i</th>
<th>algorithm</th>
<th>unadjusted p</th>
<th>( p_{Holm} )</th>
<th>( p_{Hoch} )</th>
<th>( p_{Homm} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DE</td>
<td>3.220184413784448E-7</td>
<td>6.440306282956286E-7</td>
<td>6.440306282956286E-7</td>
<td>6.440306282956286E-7</td>
</tr>
<tr>
<td>2</td>
<td>VXQR1</td>
<td>3.52418787096871E-5</td>
<td>3.52418787096871E-5</td>
<td>3.52418787096871E-5</td>
<td>3.52418787096871E-5</td>
</tr>
</tbody>
</table>

### Table 5: Holm / Shaffer Table for α = 0.05

<table>
<thead>
<tr>
<th>i</th>
<th>algorithm</th>
<th>( z )</th>
<th>( (R_0 - R_i) / SE )</th>
<th>Holm</th>
<th>Shaffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DE vs. CHC</td>
<td>5.1099747669629022</td>
<td>2.220184413784448E-7</td>
<td>0.016666666666666666</td>
<td>0.016666666666666666</td>
</tr>
<tr>
<td>2</td>
<td>CHC vs. VXQR1</td>
<td>4.13664623834443</td>
<td>3.52418787096871E-5</td>
<td>0.025</td>
<td>0.05</td>
</tr>
<tr>
<td>3</td>
<td>DE vs. VXQR1</td>
<td>0.9733285267845796</td>
<td>0.33039004884879203</td>
<td>0.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Nemenyi’s procedure rejects those hypotheses that have a p-value ≤ 0.016666666666666666.
Holm’s procedure rejects those hypotheses that have a p-value ≤ 0.05.
Shaffer’s procedure rejects those hypotheses that have a p-value ≤ 0.016666666666666666.
Bergmann’s procedure rejects these hypotheses:

- DE vs. CHC
• CHC vs. VXQR1

Table 6: Holm / Shaffer Table for $\alpha = 0.10$

<table>
<thead>
<tr>
<th>hypothesis</th>
<th>$z \equiv (R_0 - R_i) / SE$</th>
<th>$p$</th>
<th>Holm</th>
<th>Shaffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 DE vs. CHC</td>
<td>5.2321441574413613E-7</td>
<td>9.666055324135343E-7</td>
<td>9.666055324135343E-7</td>
<td>9.666055324135343E-7</td>
</tr>
<tr>
<td>2 CHC vs. VXQR1</td>
<td>3.524187859067165E-5</td>
<td>1.0572656120612061E-4</td>
<td>7.04875771193741E-5</td>
<td>3.524187859067165E-5</td>
</tr>
<tr>
<td>3 DE vs. VXQR1</td>
<td>0.3303900484848485E-3</td>
<td>0.9911701602160216E-1</td>
<td>0.3303900484848485E-3</td>
<td>0.3303900484848485E-3</td>
</tr>
</tbody>
</table>

Nemenyi’s procedure rejects those hypotheses that have a p-value $\leq 0.016666666666666666$.
Holm’s procedure rejects those hypotheses that have a p-value $\leq 0.1$.
Shaffer’s procedure rejects those hypotheses that have a p-value $\leq 0.03333333333333333$.
Bergmann’s procedure rejects these hypotheses:

• DE vs. CHC
• CHC vs. VXQR1

Table 7: Adjusted $p$-values

<table>
<thead>
<tr>
<th>hypothesis</th>
<th>unadjusted $p$</th>
<th>$P_{Nemenyi}$</th>
<th>$P_{Holm}$</th>
<th>$P_{Shaffer}$</th>
<th>$P_{Berg}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 DE vs. CHC</td>
<td>9.666055324135343E-7</td>
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