# Results

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



Table 1: Average Rankings of the algorithms

| Algorithm | Ranking |
|---|---|
| Ele07 | 6.538461538461538 |
| Bur08 | 4.3076923076923075 |
| Pil10 | 6.153846153846154 |
| Dem12 | 4.038461538461538 |
| Lei14 | 2.5 |
| Lei18 | 1.346153846153846 |
| FastTA100 | 3.115384615384615 |

Friedman statistic considering reduction performance (distributed according to chi-square with 6 degrees of freedom: 59.2087912087912.
P-value computed by Friedman Test: 9.803702294419736E-11.

Iman and Davenport statistic considering reduction performance (distributed according to F-distribution with 6 and 72 degrees of freedom: 37.810526315789446.

P-value computed by Iman and Daveport Test: 2.30118256477668E-20.

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

| $i$ | algorithm | $z = (R_0 - R_i)/SE$ | $p$ | Holm/Hochberg/Hommel |
|---|---|---|---|---|
| 6 | Ele07 | 6.127928768271625 | 8.903042532614947E-10 | 0.008333333333333333 |
| 5 | Pil10 | 5.674008118770024 | 1.394945163556328E-8 | 0.01 |
| 4 | Bur08 | 3.495189001162334 | 4.7372617062243556E-4 | 0.0125 |
| 3 | Dem12 | 3.177444546511213 | 0.0014857910042988679 | 0.016666666666666666 |
| 2 | FastTA100 | 2.088034987707368 | 0.036794678710544544 | 0.025 |
| 1 | Lei14 | 1.3617619485048056 | 0.17327302381922632 | 0.05 |

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value $\leq 0.008333333333333333$.
Holm's procedure rejects those hypotheses that have a p-value $\leq 0.025$.
Hochberg's procedure rejects those hypotheses that have a p-value $\leq 0.016666666666666666$.
Hommel's procedure rejects those hypotheses that have a p-value $\leq 0.025$.

Table 3: Holm / Hochberg Table for $\alpha = 0.10$

| $i$ | algorithm | $z = (R_0 - R_i)/SE$ | $p$ | Holm/Hochberg/Hommel |
|---|---|---|---|---|
| 6 | Ele07 | 6.127928768271625 | 8.903042532614947E-10 | 0.016666666666666666 |
| 5 | Pil10 | 5.674008118770024 | 1.394945163556328E-8 | 0.02 |
| 4 | Bur08 | 3.495189001162334 | 4.7372617062243556E-4 | 0.025 |
| 3 | Dem12 | 3.177444546511213 | 0.0014857910042988679 | 0.03333333333333333 |
| 2 | FastTA100 | 2.088034987707368 | 0.036794678710544544 | 0.05 |
| 1 | Lei14 | 1.3617619485048056 | 0.17327302381922632 | 0.1 |

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value $\leq 0.016666666666666666$.
Holm's procedure rejects those hypotheses that have a p-value $\leq 0.1$.
Hochberg's procedure rejects those hypotheses that have a p-value $\leq 0.05$.
Hommel's procedure rejects those hypotheses that have a p-value $\leq 0.05$.
Nemenyi's procedure rejects those hypotheses that have a p-value $\leq 0.002380952380952381$.
Holm's procedure rejects those hypotheses that have a p-value $\leq 0.004166666666666667$.

Table 4: Adjusted $p$-values

| i | algorithm | unadjusted $p$ | $p_{Bonf}$ | $p_{Holm}$ | $p_{Hoch}$ | $p_{Homm}$ |
|---|---|---|---|---|---|---|
| 1 | Ele07 | 8.903042532614947E-10 | 5.341825519568968E-9 | 5.341825519568968E-9 | 5.341825519568968E-9 | 5.341825519568968E-9 |
| 2 | Pil10 | 1.394945163556328E-8 | 8.369670981337968E-8 | 6.97472581778164E-8 | 6.97472581778164E-8 | 6.97472581778164E-8 |
| 3 | Bur08 | 4.7372617062243556E-4 | 0.0028423570237346134 | 0.0018949046824897422 | 0.0018949046824897422 | 0.0018949046824897422 |
| 4 | Dem12 | 0.0014857910042988679 | 0.008914746025793207 | 0.004457373012896604 | 0.004457373012896604 | 0.004457373012896604 |
| 5 | FastTA100 | 0.036794678710544544 | 0.22076807226326728 | 0.07358935742108909 | 0.07358935742108909 | 0.07358935742108909 |
| 6 | Lei14 | 0.17327302381922632 | 1.0396381429153578 | 0.17327302381922632 | 0.17327302381922632 | 0.17327302381922632 |

Table 5: Holm / Shaffer Table for $\alpha = 0.05$

| $i$ | algorithms | $z = (R_0 - R_i)/SE$ | $p$ | Holm | Shaffer |
|---|---|---|---|---|---|
| 21 | Ele07 vs. Lei18 | 6.127928768271625 | 8.903042532614947E-10 | 0.002380952380952381 | 0.002380952380952381 |
| 20 | Pil10 vs. Lei18 | 5.674008118770024 | 1.394945163556328E-8 | 0.0025 | 0.0033333333333333335 |
| 19 | Ele07 vs. Lei14 | 4.766166819766819 | 1.8776381638138645E-6 | 0.002631578947368421 | 0.0033333333333333335 |
| 18 | Pil10 vs. Lei14 | 4.312246170265218 | 1.616043596571718E-5 | 0.002777777777777778 | 0.0033333333333333335 |
| 17 | Ele07 vs. FastTA100 | 4.039893780564257 | 5.3475414340174596E-5 | 0.0029411764705882353 | 0.0033333333333333335 |
| 16 | Pil10 vs. FastTA100 | 3.5859731310626555 | 3.35823537288673E-4 | 0.003125 | 0.0033333333333333335 |
| 15 | Bur08 vs. Lei18 | 3.495189001162334 | 4.7372617062243556E-4 | 0.0033333333333333335 | 0.0033333333333333335 |
| 14 | Dem12 vs. Lei18 | 3.177444546511213 | 0.0014857910042988679 | 0.0035714285714285718 | 0.004545454545454546 |
| 13 | Ele07 vs. Dem12 | 2.9504842217604117 | 0.003172762493055345 | 0.0038461538461538464 | 0.004545454545454546 |
| 12 | Ele07 vs. Bur08 | 2.6327397671092907 | 0.008469921628468118 | 0.004166666666666667 | 0.004545454545454546 |
| 11 | Pil10 vs. Dem12 | 2.4965635722588106 | 0.012540318854963949 | 0.004545454545454546 | 0.004545454545454546 |
| 10 | Bur08 vs. Pil10 | 2.178819117607689 | 0.029345108174841875 | 0.005 | 0.005 |
| 9 | Bur08 vs. Lei14 | 2.1334270526575283 | 0.032889709817584635 | 0.005555555555555556 | 0.005555555555555556 |
| 8 | Lei18 vs. FastTA100 | 2.088034987707368 | 0.036794678710544544 | 0.00625 | 0.00625 |
| 7 | Dem12 vs. Lei14 | 1.815682598006407 | 0.06941907499936394 | 0.007142857142857143 | 0.007142857142857143 |
| 6 | Bur08 vs. FastTA100 | 1.4071540134549658 | 0.1593817245230317 | 0.008333333333333333 | 0.008333333333333333 |
| 5 | Lei14 vs. Lei18 | 1.3617619485048056 | 0.17327302381922632 | 0.01 | 0.01 |
| 4 | Dem12 vs. FastTA100 | 1.0894095588038446 | 0.275973318013738 | 0.0125 | 0.0125 |
| 3 | Lei14 vs. FastTA100 | 0.7262730392025625 | 0.46767140390417417 | 0.016666666666666666 | 0.016666666666666666 |
| 2 | Ele07 vs. Pil10 | 0.45392064950160127 | 0.6498859404583132 | 0.025 | 0.025 |
| 1 | Bur08 vs. Dem12 | 0.3177444546511212 | 0.7506787873918128 | 0.05 | 0.05 |

Shaffer's procedure rejects those hypotheses that have a p-value $\leq 0.002380952380952381$.
Bergmann's procedure rejects these hypotheses:

- Ele07 vs. Dem12
- Ele07 vs. Lei14
- Ele07 vs. Lei18
- Ele07 vs. FastTA100
- Bur08 vs. Lei18
- Pil10 vs. Lei14
- Pil10 vs. Lei18
- Pil10 vs. FastTA100
- Dem12 vs. Lei18

Nemenyi's procedure rejects those hypotheses that have a p-value $\leq 0.004761904761904762$.
Holm's procedure rejects those hypotheses that have a p-value $\leq 0.008333333333333333$.
Shaffer's procedure rejects those hypotheses that have a p-value $\leq 0.004761904761904762$.
Bergmann's procedure rejects these hypotheses:

- Ele07 vs. Bur08
- Ele07 vs. Dem12
- Ele07 vs. Lei14
- Ele07 vs. Lei18

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

| $i$ | algorithms | $z = (R_0 - R_i)/SE$ | $p$ | Holm | Shaffer |
|---|---|---|---|---|---|
| 21 | Ele07 vs. Lei18 | 6.127928768271625 | 8.903042532614947E-10 | 0.004761904761904762 | 0.004761904761904762 |
| 20 | Pil10 vs. Lei18 | 5.674008118770024 | 1.394945163556328E-8 | 0.005 | 0.006666666666666667 |
| 19 | Ele07 vs. Lei14 | 4.766166819766819 | 1.8776381638138645E-6 | 0.005263157894736842 | 0.006666666666666667 |
| 18 | Pil10 vs. Lei14 | 4.312246170265218 | 1.616043596571718E-5 | 0.005555555555555556 | 0.006666666666666667 |
| 17 | Ele07 vs. FastTA100 | 4.039893780564257 | 5.3475414340174596E-5 | 0.005882352941176471 | 0.006666666666666667 |
| 16 | Pil10 vs. FastTA100 | 3.5859731310626555 | 3.35823537288673E-4 | 0.00625 | 0.006666666666666667 |
| 15 | Bur08 vs. Lei18 | 3.495189001162334 | 4.737261706224356E-4 | 0.006666666666666667 | 0.006666666666666667 |
| 14 | Dem12 vs. Lei18 | 3.177444546511213 | 0.0014857910042988679 | 0.007142857142857143 | 0.009090909090909092 |
| 13 | Ele07 vs. Dem12 | 2.9504842217604117 | 0.003172762493055345 | 0.007692307692307693 | 0.009090909090909092 |
| 12 | Ele07 vs. Bur08 | 2.6327397671092907 | 0.008469921628468118 | 0.008333333333333333 | 0.009090909090909092 |
| 11 | Pil10 vs. Dem12 | 2.4965635722588106 | 0.012540318854963949 | 0.009090909090909092 | 0.009090909090909092 |
| 10 | Bur08 vs. Pil10 | 2.178819117607689 | 0.029345108174841875 | 0.01 | 0.01 |
| 9 | Bur08 vs. Lei14 | 2.1334270526575283 | 0.032889709817584635 | 0.011111111111111112 | 0.011111111111111112 |
| 8 | Lei18 vs. FastTA100 | 2.088034987707368 | 0.036794678710544544 | 0.0125 | 0.0125 |
| 7 | Dem12 vs. Lei14 | 1.815682598006407 | 0.06941907499936394 | 0.014285714285714287 | 0.014285714285714287 |
| 6 | Bur08 vs. FastTA100 | 1.4071540134549658 | 0.1593817245230317 | 0.016666666666666666 | 0.016666666666666666 |
| 5 | Lei14 vs. Lei18 | 1.3617619485048056 | 0.17327302381922632 | 0.02 | 0.02 |
| 4 | Dem12 vs. FastTA100 | 1.0894095588038446 | 0.275973318013738 | 0.025 | 0.025 |
| 3 | Lei14 vs. FastTA100 | 0.7262730392025625 | 0.46767140390417417 | 0.03333333333333333 | 0.03333333333333333 |
| 2 | Ele07 vs. Pil10 | 0.45392064950160127 | 0.6498859404583132 | 0.05 | 0.05 |
| 1 | Bur08 vs. Dem12 | 0.3177444546511212 | 0.7506787873918128 | 0.1 | 0.1 |

5

- Ele07 vs. FastTA100
- Bur08 vs. Lei18
- Pil10 vs. Dem12
- Pil10 vs. Lei14
- Pil10 vs. Lei18
- Pil10 vs. FastTA100
- Dem12 vs. Lei18

Table 7: Adjusted $p$-values

| i | hypothesis | unadjusted $p$ | $p_{Neme}$ | $p_{Holm}$ | $p_{Shaf}$ | $p_{Berg}$ |
|---|---|---|---|---|---|---|
| 1 | Ele07 vs .Lei18 | 8.903042532614947E-10 | 1.869638931849139E-8 | 1.869638931849139E-8 | 1.869638931849139E-8 | 1.869638931849139E-8 |
| 2 | Pil10 vs .Lei18 | 1.394945163556328E-8 | 2.929384843468289E-7 | 2.789890327112656E-7 | 2.092417745334492E-7 | 2.092417745334492E-7 |
| 3 | Ele07 vs .Lei14 | 1.8776381638138645E-6 | 3.943040144009116E-5 | 3.5675125112463426E-5 | 2.8164572457207966E-5 | 2.8164572457207966E-5 |
| 4 | Pil10 vs .Lei14 | 1.616043596571718E-5 | 3.3936915528006074E-4 | 2.908878473829092E-4 | 2.4240653948575769E-4 | 1.6160435965717178E-4 |
| 5 | Ele07 vs .FastTA100 | 5.3475414340174596E-5 | 0.0011229837011436665 | 9.0908204378296 81E-4 | 8.02131215102619E-4 | 5.882295577419206E-4 |
| 6 | Pil10 vs .FastTA100 | 3.35823537288673E-4 | 0.0070522942830621325 | 0.005373176596618768 | 0.005037353059330095 | 0.002350764761020711 |
| 7 | Bur08 vs .Lei18 | 4.7372617062243556E-4 | 0.009948249583071146 | 0.007105892559336534 | 0.007105892559336534 | 0.005210987876846791 |
| 8 | Dem12 vs .Lei18 | 0.0014857910042988679 | 0.031201611090276225 | 0.020801074060184152 | 0.016343701047287548 | 0.01337211903868981 |
| 9 | Ele07 vs .Dem12 | 0.003172762493055345 | 0.06662801235416224 | 0.04124591240971948 | 0.03490038742360879 | 0.028554862437498104 |
| 10 | Ele07 vs .Bur08 | 0.008469921628468118 | 0.17786835419783048 | 0.10163905954161742 | 0.09316913791314929 | 0.05081952977080871 |
| 11 | Pil10 vs .Dem12 | 0.012540318854963949 | 0.2633466959542429 | 0.13794350740460343 | 0.13794350740460343 | 0.07524191312978369 |
| 12 | Bur08 vs .Pil10 | 0.029345108174841875 | 0.6162472716716794 | 0.2934510817484188 | 0.2934510817484188 | 0.1173804326993675 |
| 13 | Bur08 vs .Lei14 | 0.032889709817584635 | 0.6906839061692773 | 0.29600738835826174 | 0.29600738835826174 | 0.23022796872309245 |
| 14 | Lei18 vs .FastTA100 | 0.036794678710544544 | 0.7726882529214354 | 0.29600738835826174 | 0.29600738835826174 | 0.23022796872309245 |
| 15 | Dem12 vs .Lei14 | 0.06941907499936394 | 1.4578005749866427 | 0.48593352499554754 | 0.48593352499554754 | 0.27767629999745574 |
| 16 | Bur08 vs .FastTA100 | 0.1593817245230317 | 3.347016214983666 | 0.9562903471381903 | 0.9562903471381903 | 0.7969086226151585 |
| 17 | Lei14 vs .Lei18 | 0.17327302381922632 | 3.638733500203753 | 0.9562903471381903 | 0.9562903471381903 | 0.7969086226151585 |
| 18 | Dem12 vs .FastTA100 | 0.275973318013738 | 5.795439678288497 | 1.103893272054952 | 1.103893272054952 | 0.7969086226151585 |
| 19 | Lei14 vs .FastTA100 | 0.46767140390417417 | 9.821099481987657 | 1.4030142117125224 | 1.4030142117125224 | 1.4030142117125224 |
| 20 | Ele07 vs .Pil10 | 0.6498859404583132 | 13.647604749624577 | 1.4030142117125224 | 1.4030142117125224 | 1.4030142117125224 |
| 21 | Bur08 vs .Dem12 | 0.7506787873918128 | 15.76425453522807 | 1.4030142117125224 | 1.4030142117125224 | 1.4030142117125224 |