Table

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **F** | **Metric** | **AOA** | **CS** | **PSO** | **BBO** | **GA** | **GSA** | **MFO** | **GWO** | **SSA** | **H5N1** |
| F1 | Ave | 0.00E+00 | 1.05E+00 | 3.94E-44 | 1.73E-04 | 1.00E-02 | 8.22E-18 | 3.31E-13 | 4.19E-57 | 1.01E-09 | 0.00E+00 |
|  | Rank | 1.5 | 10 | 4 | 8 | 9 | 5 | 6 | 3 | 7 | 1.5 |
|  | Std.dev | 0.00E+00 | 5.21E-01 | 1.89E-43 | 1.38E-04 | 1.90E-02 | 3.72E-18 | 7.94E-13 | 9.79E-57 | 4.13E-10 | 0.00E+00 |
| F2 | Ave | 0.00E+00 | 8.55E-01 | 6.82E-17 | 1.58E-03 | 2.27E-03 | 8.53E-09 | 6.67E-01 | 6.38E-33 | 5.37E-03 | 0.00E+00 |
|  | Rank | 1.5 | 10 | 4 | 6 | 7 | 5 | 9 | 3 | 8 | 1.5 |
|  | Std.dev | 0.00E+00 | 2.56E-01 | 3.59E-16 | 5.27E-04 | 3.18E-03 | 2.29E-09 | 2.54E+00 | 8.21E-33 | 2.57E-02 | 0.00E+00 |
| F3 | Ave | 0.00E+00 | 4.25E+01 | 8.04E-05 | 1.63E-01 | 1.41E+02 | 9.64E+00 | 3.33E+02 | 8.09E-26 | 8.70E-04 | 0.00E+00 |
|  | Rank | 1.5 | 8 | 4 | 6 | 9 | 7 | 10 | 3 | 5 | 1.5 |
|  | Std.dev | 0.00E+00 | 1.97E+01 | 1.93E-04 | 1.68E-01 | 1.07E+02 | 1.54E+01 | 1.27E+03 | 1.42E-25 | 4.76E-03 | 0.00E+00 |
| F4 | Ave | 8.18E-203 | 4.19E+00 | 5.49E-05 | 3.85E-02 | 5.86E-01 | 2.45E-09 | 3.43E+00 | 5.51E-18 | 3.67E-04 | 0.00E+00 |
|  | Rank | 2 | 10 | 5 | 7 | 8 | 4 | 9 | 3 | 6 | 1 |
|  | Std.dev | 0.00E+00 | 1.14E+00 | 9.53E-05 | 1.42E-02 | 2.17E-01 | 6.93E-10 | 5.98E+00 | 8.67E-18 | 1.89E-03 | 0.00E+00 |
| F5 | Ave | 6.64E+00 | 1.01E+02 | 5.89E+00 | 1.72E+01 | 2.80E+01 | 3.11E+01 | 3.13E+03 | 6.60E+00 | 1.47E+02 | 3.85E+00 |
|  | Rank | 4 | 8 | 2 | 5 | 6 | 7 | 10 | 3 | 9 | 1 |
|  | Std.dev | 3.58E-01 | 7.64E+01 | 4.61E+00 | 6.10E+01 | 2.78E+01 | 6.02E+01 | 1.64E+04 | 5.69E-01 | 4.50E+02 | 3.40E-01 |
| F6 | Ave | 2.45E-02 | 1.38E+00 | 1.37E-32 | 1.23E-04 | 7.12E-03 | 9.91E-18 | 3.37E-13 | 3.32E-06 | 8.57E-10 | 1.03E-22 |
|  | Rank | 9 | 10 | 1 | 7 | 8 | 3 | 4 | 6 | 5 | 2 |
|  | Std.dev | 1.16E-02 | 7.38E-01 | 4.25E-32 | 9.13E-05 | 1.41E-02 | 3.91E-18 | 4.86E-13 | 1.29E-06 | 2.85E-10 | 1.20E-12 |
| F7 | Ave | 7.88E-05 | 2.68E-02 | 3.55E-03 | 3.18E-03 | 3.70E-03 | 1.27E-02 | 9.50E-03 | 6.24E-04 | 1.32E-02 | 1.09E-04 |
|  | Rank | 1 | 10 | 5 | 4 | 6 | 8 | 7 | 3 | 9 | 2 |
|  | Std.dev | 8.51E-05 | 8.34E-03 | 2.10E-03 | 1.62E-03 | 1.92E-03 | 6.63E-03 | 6.98E-03 | 4.30E-04 | 1.21E-02 | 1.83E-04 |
| F8 | Ave | -2.82E+03 | -2.93E+03 | -3.18E+03 | -3.25E+03 | -3.70E+03 | -1.46E+03 | -3.32E+03 | -2.70E+03 | -2.78E+03 | -4.10E+03 |
|  | Rank | 7 | 6 | 5 | 4 | 2 | 10 | 3 | 9 | 8 | 1 |
|  | Std.dev | 2.52E+02 | 1.85E+02 | 2.42E+02 | 3.73E+02 | 1.78E+02 | 2.22E+02 | 3.52E+02 | 3.66E+02 | 3.95E+02 | 8.19E+01 |
| F9 | Ave | 0.00E+00 | 3.12E+01 | 6.27E+00 | 1.08E+01 | 4.30E-03 | 6.33E+00 | 2.53E+01 | 3.16E-01 | 1.50E+01 | 0.00E+00 |
|  | Rank | 1.5 | 10 | 5 | 7 | 3 | 6 | 9 | 4 | 8 | 1.5 |
|  | Std.dev | 0.00E+00 | 5.70E+00 | 3.09E+00 | 5.51E+00 | 5.20E-03 | 2.49E+00 | 1.62E+01 | 1.28E+00 | 6.83E+00 | 0.00E+00 |
| F10 | Ave | 4.44E-16 | 3.79E+00 | 5.54E-15 | 4.77E-03 | 2.03E-02 | 4.16E-09 | 1.57E-07 | 7.08E-15 | 7.61E-01 | 4.44E-16 |
|  | Rank | 1.5 | 10 | 3 | 7 | 8 | 5 | 6 | 4 | 9 | 1.5 |
|  | Std.dev | 0.00E+00 | 1.18E+00 | 1.79E-15 | 1.88E-03 | 1.38E-02 | 8.47E-10 | 1.53E-07 | 2.42E-15 | 9.89E-01 | 0.00E+00 |
| F11 | Ave | 3.92E-06 | 7.05E-01 | 1.02E-01 | 5.32E-02 | 5.92E-02 | 3.31E+00 | 1.83E-01 | 2.03E-02 | 2.12E-01 | 0.00E+00 |
|  | Rank | 2 | 9 | 6 | 4 | 5 | 10 | 7 | 3 | 8 | 1 |
|  | Std.dev | 2.14E-05 | 1.28E-01 | 5.09E-02 | 3.04E-02 | 3.10E-02 | 1.96E+00 | 1.03E-01 | 1.81E-02 | 1.10E-01 | 0.00E+00 |
| F12 | Ave | 7.28E-01 | 8.55E+03 | 1.91E+00 | 4.33E-01 | 2.05E-01 | 4.06E+00 | 1.89E+07 | 1.05E-01 | 1.21E+01 | 1.80E-07 |
|  | Rank | 5 | 9 | 6 | 4 | 3 | 7 | 10 | 2 | 8 | 1 |
|  | Std.dev | 2.77E-02 | 1.49E+04 | 1.17E+00 | 8.07E-01 | 2.01E-01 | 1.26E+00 | 6.48E+07 | 3.02E-02 | 4.27E+00 | 1.20E-03 |
| F13 | Ave | 8.46E-01 | 3.00E-01 | 7.32E-04 | 9.84E-06 | 8.85E-04 | 2.18E-04 | 5.13E-03 | 1.35E-02 | 5.10E-03 | 8.61E-24 |
|  | Rank | 10 | 9 | 4 | 2 | 5 | 3 | 7 | 8 | 6 | 1 |
|  | Std.dev | 1.43E-01 | 1.48E-01 | 2.79E-03 | 7.53E-06 | 2.81E-03 | 1.19E-03 | 9.00E-03 | 3.49E-02 | 6.19E-03 | 1.78E-02 |
| Mean | Rank | 3.65 | 9.15 | 4.15 | 5.46 | 6.08 | 6.15 | 7.46 | 4.15 | 7.38 | 1.35 |
| **Final** | **Rank** | **2** | **10** | **3** | **5** | **6** | **7** | **9** | **3** | **8** | **1** |

Table

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| F | Metric | AOA | CS | PSO | BBO | GA | GSA | MFO | GWO | SSA | H5N1 |
| F14 | Ave | 1.13E+01 | 9.98E-01 | 1.10E+00 | 5.80E+00 | 9.98E-01 | 5.57E+00 | 2.32E+00 | 4.59E+00 | 1.16E+00 | 1.06E+00 |
|  | Rank | 10 | 2 | 4 | 9 | 1 | 8 | 6 | 7 | 5 | 3 |
|  | Std.dev | 2.32E+00 | 1.77E-10 | 4.00E-01 | 4.13E+00 | 6.99E-11 | 3.97E+00 | 1.82E+00 | 4.36E+00 | 3.77E-01 | 1.83E+00 |
| F15 | Ave | 1.83E-02 | 7.64E-04 | 2.63E-03 | 5.38E-03 | 2.53E-03 | 5.19E-03 | 1.35E-03 | 3.81E-03 | 1.46E-03 | 3.43E-04 |
|  | Rank | 10 | 2 | 6 | 9 | 5 | 8 | 3 | 7 | 4 | 1 |
|  | Std.dev | 2.33E-02 | 1.82E-04 | 6.02E-03 | 7.56E-03 | 4.91E-03 | 3.89E-03 | 1.38E-03 | 7.53E-03 | 3.58E-03 | 2.62E-04 |
| F16 | Ave | -1.03E+00 | -1.03E+00 | -1.03E+00 | -1.03E+00 | -1.03E+00 | -1.03E+00 | -1.03E+00 | -1.03E+00 | -1.03E+00 | -1.03E+00 |
|  | Rank | 9 | 6 | 2 | 5 | 8 | 2 | 2 | 10 | 4 | 7 |
|  | Std.dev | 1.69E-07 | 6.88E-10 | 6.71E-16 | 5.10E-13 | 1.87E-07 | 4.88E-16 | 6.78E-16 | 4.68E-06 | 2.69E-14 | 7.05E-09 |
| F17 | Ave | 4.09E-01 | 3.98E-01 | 3.98E-01 | 3.98E-01 | 3.98E-01 | 3.98E-01 | 3.98E-01 | 3.98E-01 | 3.98E-01 | 3.98E-01 |
|  | Rank | 10 | 7 | 2 | 6 | 8 | 2 | 2 | 9 | 4 | 5 |
|  | Std.dev | 9.80E-03 | 1.46E-07 | 0.00E+00 | 6.44E-08 | 3.80E-07 | 0.00E+00 | 0.00E+00 | 9.21E-05 | 4.87E-14 | 7.44E-08 |
| F18 | Ave | 9.30E+00 | 3.00E+00 | 3.00E+00 | 1.11E+01 | 3.90E+00 | 3.00E+00 | 3.00E+00 | 3.00E+00 | 3.00E+00 | 3.00E+00 |
|  | Rank | 9 | 6 | 2 | 10 | 8 | 4 | 2 | 7 | 5 | 2 |
|  | Std.dev | 1.16E+01 | 2.21E-10 | 1.12E-15 | 1.76E+01 | 4.93E+00 | 3.86E-15 | 1.33E-15 | 2.88E-05 | 3.53E-13 | 6.85E-16 |
| F19 | Ave | -3.85E+00 | -3.86E+00 | -3.86E+00 | -3.86E+00 | -3.86E+00 | -3.86E+00 | -3.86E+00 | -3.86E+00 | -3.86E+00 | -3.86E+00 |
|  | Rank | 10 | 7 | 3 | 3 | 8 | 3 | 3 | 9 | 6 | 3 |
|  | Std.dev | 4.11E-03 | 4.74E-10 | 2.67E-15 | 2.16E-15 | 3.98E-07 | 2.34E-15 | 2.71E-15 | 1.82E-03 | 1.01E-10 | 2.71E-15 |
| F20 | Ave | -3.04E+00 | -3.32E+00 | -3.27E+00 | -3.29E+00 | -3.29E+00 | -3.32E+00 | -3.23E+00 | -3.25E+00 | -3.22E+00 | -3.29E+00 |
|  | Rank | 10 | 1 | 6 | 3 | 5 | 2 | 8 | 7 | 9 | 4 |
|  | Std.dev | 1.12E-01 | 3.04E-03 | 7.21E-02 | 5.11E-02 | 5.54E-02 | 2.17E-02 | 7.12E-02 | 1.09E-01 | 5.84E-02 | 3.63E-02 |
| F21 | Ave | -3.57E+00 | -1.01E+01 | -6.06E+00 | -4.32E+00 | -8.73E+00 | -5.42E+00 | -6.90E+00 | -9.06E+00 | -8.23E+00 | -6.36E+00 |
|  | Rank | 10 | 1 | 7 | 9 | 3 | 8 | 5 | 2 | 4 | 6 |
|  | Std.dev | 1.08E+00 | 1.76E-02 | 3.50E+00 | 2.80E+00 | 2.69E+00 | 3.66E+00 | 3.42E+00 | 2.26E+00 | 3.06E+00 | 2.55E+00 |
| F22 | Ave | -3.51E+00 | -1.04E+01 | -8.12E+00 | -6.63E+00 | -9.10E+00 | -1.02E+01 | -7.55E+00 | -1.02E+01 | -8.28E+00 | -8.08E+00 |
|  | Rank | 10 | 1 | 6 | 9 | 4 | 3 | 8 | 2 | 5 | 7 |
|  | Std.dev | 1.00E+00 | 1.32E-02 | 3.34E+00 | 3.62E+00 | 2.70E+00 | 1.33E+00 | 3.58E+00 | 9.70E-01 | 3.12E+00 | 2.52E+00 |
| F23 | Ave | -4.40E+00 | -1.05E+01 | -8.52E+00 | -5.92E+00 | -9.28E+00 | -9.58E+00 | -6.91E+00 | -1.01E+01 | -8.52E+00 | -9.55E+00 |
|  | Rank | 10 | 1 | 7 | 9 | 5 | 3 | 8 | 2 | 6 | 4 |
|  | Std.dev | 1.64E+00 | 1.92E-02 | 3.43E+00 | 3.62E+00 | 2.87E+00 | 2.51E+00 | 3.77E+00 | 1.75E+00 | 3.41E+00 | 2.32E+00 |
| F24 | Ave | 1.18E+03 | 4.48E+02 | 4.97E+02 | 5.16E+02 | 4.34E+02 | 4.17E+02 | 4.23E+02 | 3.99E+02 | 3.36E+02 | 3.86E+02 |
|  | Rank | 10 | 7 | 8 | 9 | 6 | 4 | 5 | 3 | 1 | 2 |
|  | Std.dev | 1.55E+02 | 4.58E+01 | 1.84E+02 | 1.29E+02 | 1.34E+02 | 2.03E+02 | 9.99E+01 | 1.61E+02 | 9.52E+01 | 9.77E+01 |
| F25 | Ave | 1.19E+03 | 4.97E+02 | 4.72E+02 | 4.70E+02 | 4.95E+02 | 4.56E+02 | 4.56E+02 | 4.92E+02 | 4.30E+02 | 4.34E+02 |
|  | Rank | 10 | 9 | 6 | 5 | 8 | 3 | 4 | 7 | 1 | 2 |
|  | Std.dev | 1.81E+02 | 5.99E+01 | 1.68E+02 | 1.19E+02 | 1.29E+02 | 2.43E+02 | 1.05E+02 | 1.76E+02 | 1.24E+02 | 1.09E+02 |
| F26 | Ave | 9.10E+02 | 9.27E+02 | 9.98E+02 | 1.03E+03 | 9.95E+02 | 9.76E+02 | 9.39E+02 | 9.55E+02 | 9.26E+02 | 9.10E+02 |
|  | Rank | 1.5 | 4 | 9 | 10 | 8 | 7 | 5 | 6 | 3 | 1.5 |
|  | Std.dev | 0.00E+00 | 3.76E+00 | 5.25E+01 | 5.79E+01 | 3.43E+01 | 3.67E+01 | 2.58E+01 | 1.72E+01 | 5.85E+00 | 0.00E+00 |
| F27 | Ave | 9.10E+02 | 9.26E+02 | 9.95E+02 | 1.03E+03 | 9.98E+02 | 9.75E+02 | 9.37E+02 | 9.70E+02 | 9.24E+02 | 9.10E+02 |
|  | Rank | 1.5 | 4 | 8 | 10 | 9 | 7 | 5 | 6 | 3 | 1.5 |
|  | Std.dev | 0.00E+00 | 3.22E+00 | 4.75E+01 | 4.11E+01 | 4.41E+01 | 5.81E+01 | 2.21E+01 | 2.61E+01 | 7.03E+00 | 0.00E+00 |
| F28 | Ave | 9.10E+02 | 9.27E+02 | 9.83E+02 | 1.01E+03 | 1.00E+03 | 9.51E+02 | 9.50E+02 | 9.67E+02 | 9.25E+02 | 9.10E+02 |
|  | Rank | 1.5 | 4 | 8 | 10 | 9 | 6 | 5 | 7 | 3 | 1.5 |
|  | Std.dev | 0.00E+00 | 3.45E+00 | 3.95E+01 | 4.32E+01 | 3.76E+01 | 6.86E+01 | 2.77E+01 | 1.96E+01 | 6.49E+00 | 0.00E+00 |
| F29 | Ave | 1.76E+03 | 1.09E+03 | 1.43E+03 | 1.04E+03 | 1.13E+03 | 1.16E+03 | 1.47E+03 | 1.33E+03 | 9.50E+02 | 8.92E+02 |
|  | Rank | 10 | 4 | 8 | 3 | 5 | 6 | 9 | 7 | 2 | 1 |
|  | Std.dev | 2.02E+01 | 1.58E+02 | 1.30E+02 | 3.04E+02 | 3.43E+02 | 3.31E+02 | 2.60E+01 | 1.96E+02 | 2.16E+02 | 1.31E+02 |
| F30 | Ave | 1.91E+03 | 1.34E+03 | 1.33E+03 | 1.52E+03 | 1.48E+03 | 1.31E+03 | 1.35E+03 | 1.40E+03 | 1.39E+03 | 1.30E+03 |
|  | Rank | 10 | 4 | 3 | 9 | 8 | 2 | 5 | 7 | 6 | 1 |
|  | Std.dev | 9.89E+01 | 3.45E+01 | 5.99E+01 | 6.85E+01 | 8.01E+01 | 2.54E+01 | 6.84E+01 | 4.77E+01 | 6.89E+01 | 2.24E+01 |
| F31 | Ave | 1.77E+03 | 1.26E+03 | 1.43E+03 | 1.15E+03 | 1.30E+03 | 1.33E+03 | 1.47E+03 | 1.28E+03 | 1.16E+03 | 9.30E+02 |
|  | Rank | 10 | 4 | 8 | 2 | 6 | 7 | 9 | 5 | 3 | 1 |
|  | Std.dev | 2.11E+01 | 1.48E+02 | 8.90E+01 | 3.21E+02 | 3.16E+02 | 2.70E+02 | 1.21E+01 | 1.73E+02 | 2.89E+02 | 1.42E+02 |
| F32 | Ave | 1.69E+03 | 1.21E+03 | 1.21E+03 | 1.17E+03 | 6.71E+02 | 6.59E+02 | 1.21E+03 | 1.12E+03 | 8.67E+02 | 4.60E+02 |
|  | Rank | 10 | 7 | 9 | 6 | 3 | 2 | 8 | 5 | 4 | 1 |
|  | Std.dev | 3.48E+01 | 8.83E+01 | 4.30E+01 | 5.08E+02 | 4.30E+02 | 3.97E+02 | 4.20E+01 | 3.14E+02 | 4.80E+02 | 7.59E-07 |
| F33 | Ave | 1.45E+03 | 1.40E+03 | 1.46E+03 | 1.58E+03 | 1.54E+03 | 1.55E+03 | 1.36E+03 | 1.51E+03 | 1.47E+03 | 1.27E+03 |
|  | Rank | 4 | 3 | 5 | 10 | 8 | 9 | 2 | 7 | 6 | 1 |
|  | Std.dev | 3.82E+01 | 3.57E+01 | 8.28E+01 | 2.15E+01 | 4.68E+01 | 1.07E+01 | 3.10E+01 | 6.31E+01 | 9.65E+01 | 4.67E+00 |
| Mean | Rank | 8.325 | 4.2 | 5.85 | 7.3 | 6.25 | 4.8 | 5.2 | 6.1 | 4.2 | 2.775 |
| **Final** | **Rank** | **10** | **2** | **6** | **9** | **8** | **4** | **5** | **7** | **2** | **1** |