**The following Algorithms results are present here:-**

**Bat**

**Camel Algorithm**

**Cuckoo Search**

**Fire Fly**

**Particle Swarm**

**Self Adaptive Bat**

**Bat**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Accuracy** | **Time Taken (s)** | **Energy Used (J)** | **Equivalent CO2 Emission (mg)** |
| BAT-0000 | 89.8 | 134 | 447.1999999999997 | 105.58888888888882 |
| BAT-0001 | 89.7 | 57 | 189.3 | 44.695833333333326 |
| BAT-0002 | 89.60000000000001 | 88 | 293.1999999999999 | 69.22777777777775 |
| BAT-0003 | 89.64999999999999 | 116 | 387.4999999999999 | 91.49305555555551 |
| BAT-0004 | 89.8 | 21 | 68.8 | 16.244444444444444 |
| BAT-0005 | 89.75 | 100 | 333.7000000000001 | 78.7902777777778 |
| BAT-0006 | 89.5 | 37 | 122.7 | 28.97083333333333 |
| BAT-0007 | 89.5 | 151 | 503.7999999999999 | 118.95277777777775 |
| BAT-0008 | 89.8 | 64 | 217.19999999999987 | 51.2833333333333 |
| BAT-0009 | 89.75 | 44 | 148.3 | 35.01527777777778 |
| BAT-0010 | 89.7 | 83 | 280.5999999999999 | 66.25277777777775 |
| BAT-0011 | 89.64999999999999 | 63 | 211.1 | 49.84305555555554 |
| BAT-0012 | 89.8 | 73 | 244.4999999999999 | 57.72916666666664 |
| BAT-0013 | 89.75 | 16 | 54.500000000000014 | 12.86805555555556 |
| BAT-0014 | 89.60000000000001 | 27 | 90.6 | 21.391666666666666 |
| BAT-0015 | 89.75 | 55 | 183.1 | 43.23194444444445 |
| BAT-0016 | 89.75 | 114 | 379.8000000000002 | 89.67500000000005 |
| BAT-0017 | 89.75 | 201 | 669.2000000000006 | 158.0055555555557 |
| BAT-0018 | 89.7 | 23 | 74.7 | 17.6375 |
| BAT-0019 | 89.7 | 95 | 319.6 | 75.46111111111111 |
| BAT-0020 | 89.4 | 11 | 37.2 | 8.783333333333333 |
| BAT-0021 | 89.75 | 91 | 304.89999999999986 | 71.99027777777775 |
| BAT-0022 | 89.60000000000001 | 114 | 383.6000000000003 | 90.5722222222223 |
| BAT-0023 | 89.45 | 192 | 640.6000000000008 | 151.25277777777796 |
| BAT-0024 | 89.5 | 57 | 190.6 | 45.00277777777776 |
| BAT-0025 | 89.60000000000001 | 193 | 645.4999999999999 | 152.4097222222222 |
| BAT-0026 | 89.60000000000001 | 183 | 611.0000000000001 | 144.2638888888889 |
| BAT-0027 | 89.60000000000001 | 200 | 683.800000000001 | 161.452777777778 |
| BAT-0028 | 89.55 | 55 | 187.2 | 44.2 |
| BAT-0029 | 89.64999999999999 | 85 | 287.29999999999995 | 67.83472222222221 |
| BAT-0030 | 89.8 | 32 | 105.99999999999996 | 25.02777777777777 |
| BAT-0031 | 89.7 | 36 | 121.8 | 28.758333333333333 |
| BAT-0032 | 89.7 | 30 | 101.7 | 24.0125 |
| BAT-0033 | 89.64999999999999 | 181 | 597.5 | 141.07638888888889 |
| BAT-0034 | 89.7 | 288 | 960.8000000000006 | 226.8555555555557 |
| BAT-0035 | 89.7 | 49 | 164.20000000000002 | 38.769444444444446 |
| BAT-0036 | 89.7 | 120 | 402.9000000000001 | 95.12916666666668 |
| BAT-0037 | 89.75 | 72 | 240.0999999999999 | 56.69027777777775 |
| BAT-0038 | 89.9 | 125 | 421.7000000000001 | 99.56805555555556 |
| BAT-0039 | 89.60000000000001 | 25 | 85.60000000000001 | 20.211111111111112 |
| BAT-0040 | 89.9 | 152 | 511.7000000000003 | 120.81805555555562 |
| BAT-0041 | 89.55 | 95 | 320.1 | 75.57916666666665 |
| BAT-0042 | 89.8 | 82 | 276.79999999999995 | 65.35555555555554 |
| BAT-0043 | 89.8 | 68 | 226.2 | 53.40833333333332 |
| BAT-0044 | 89.7 | 44 | 147.39999999999998 | 34.80277777777777 |
| BAT-0045 | 89.45 | 8 | 26.000000000000004 | 6.138888888888889 |
| BAT-0046 | 89.64999999999999 | 63 | 214.7 | 50.693055555555546 |
| BAT-0047 | 89.8 | 234 | 778.3000000000009 | 183.765277777778 |
| BAT-0048 | 89.8 | 128 | 429.6 | 101.43333333333332 |
| BAT-0049 | 89.5 | 12 | 40.2 | 9.491666666666667 |
| BAT-0050 | 89.55 | 84 | 280.5 | 66.22916666666667 |
| BAT-0051 | 89.7 | 76 | 258.19999999999993 | 60.96388888888888 |
| BAT-0052 | 89.9 | 105 | 351.6000000000001 | 83.01666666666668 |
| BAT-0053 | 89.55 | 63 | 210.6 | 49.725 |
| BAT-0054 | 89.8 | 80 | 264.69999999999993 | 62.498611111111096 |
| BAT-0055 | 89.5 | 8 | 27.200000000000003 | 6.422222222222223 |
| BAT-0056 | 89.7 | 20 | 68.00000000000001 | 16.055555555555557 |
| BAT-0057 | 89.75 | 123 | 413.1000000000002 | 97.53750000000004 |
| BAT-0058 | 89.9 | 33 | 109.19999999999996 | 25.783333333333324 |
| BAT-0059 | 89.60000000000001 | 33 | 111.4 | 26.302777777777777 |
| BAT-0060 | 89.45 | 5 | 16.7 | 3.943055555555555 |
| BAT-0061 | 89.8 | 113 | 375.8000000000001 | 88.73055555555558 |
| BAT-0062 | 89.75 | 18 | 61.8 | 14.591666666666669 |
| BAT-0063 | 89.8 | 71 | 236.6 | 55.86388888888888 |
| BAT-0064 | 89.85 | 14 | 45.10000000000001 | 10.648611111111112 |
| BAT-0065 | 89.8 | 94 | 316.50000000000017 | 74.7291666666667 |
| BAT-0066 | 89.60000000000001 | 209 | 699.2000000000007 | 165.08888888888904 |
| BAT-0067 | 89.7 | 181 | 600.6000000000001 | 141.80833333333337 |
| BAT-0068 | 89.9 | 246 | 848.1000000000014 | 200.24583333333365 |
| BAT-0069 | 89.7 | 56 | 188.2 | 44.43611111111111 |
| BAT-0070 | 89.7 | 11 | 40.9 | 9.656944444444443 |
| BAT-0071 | 89.60000000000001 | 50 | 170.0 | 40.138888888888886 |
| BAT-0072 | 89.8 | 25 | 85.2 | 20.116666666666667 |
| BAT-0073 | 89.60000000000001 | 46 | 155.99999999999994 | 36.83333333333332 |
| BAT-0074 | 89.85 | 80 | 268.3 | 63.34861111111111 |
| BAT-0075 | 89.85 | 126 | 423.3999999999999 | 99.96944444444442 |
| BAT-0076 | 89.95 | 26 | 88.5 | 20.89583333333333 |
| BAT-0077 | 89.8 | 35 | 116.40000000000002 | 27.48333333333333 |
| BAT-0078 | 89.75 | 91 | 306.4 | 72.34444444444443 |
| BAT-0079 | 89.75 | 147 | 497.70000000000033 | 117.51250000000007 |
| BAT-0080 | 89.85 | 49 | 166.79999999999995 | 39.38333333333332 |
| BAT-0081 | 89.60000000000001 | 87 | 292.8999999999999 | 69.15694444444442 |
| BAT-0082 | 89.60000000000001 | 125 | 423.1999999999999 | 99.9222222222222 |
| BAT-0083 | 89.9 | 259 | 869.6000000000007 | 205.3222222222224 |
| BAT-0084 | 89.85 | 39 | 130.0 | 30.694444444444443 |
| BAT-0085 | 89.75 | 20 | 67.7 | 15.984722222222222 |
| BAT-0086 | 89.75 | 33 | 111.3 | 26.279166666666665 |
| BAT-0087 | 89.60000000000001 | 169 | 563.1000000000001 | 132.9541666666667 |
| BAT-0088 | 89.8 | 113 | 407.7 | 96.2625 |
| BAT-0089 | 89.85 | 135 | 456.3999999999999 | 107.76111111111108 |
| BAT-0090 | 89.85 | 263 | 908.8000000000008 | 214.57777777777795 |
| BAT-0091 | 89.7 | 71 | 239.99999999999991 | 56.66666666666664 |
| BAT-0092 | 89.85 | 24 | 81.2 | 19.17222222222222 |
| BAT-0093 | 89.64999999999999 | 170 | 576.4000000000002 | 136.0944444444445 |
| BAT-0094 | 89.8 | 197 | 664.9000000000005 | 156.9902777777779 |
| BAT-0095 | 89.85 | 344 | 1131.4999999999998 | 267.1597222222222 |
| BAT-0096 | 89.85 | 141 | 457.1999999999998 | 107.94999999999996 |
| BAT-0097 | 89.75 | 68 | 218.00000000000009 | 51.47222222222224 |
| BAT-0098 | 89.85 | 66 | 213.2 | 50.33888888888889 |
| BAT-0099 | 89.85 | 89 | 287.3000000000001 | 67.83472222222225 |

**T#1.1 Bat Main Result**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **population\_size** | **loudness** | **pulse\_rate** | **gamma** | **alpha** | **min\_frequency** | **max\_frequency** | **n\_estimator** | **criterion** | **max\_feature** |
| BAT-0000 | 45 | 0.4953294691693303 | 0.6002920007053112 | 0.1574105080560471 | 0.8917689509621813 | 9.21422629852615 | 78.4827738814337 | 880 | entropy | sqrt |
| BAT-0001 | 95 | 0.8614281821799779 | 0.796477014594362 | 0.1622299134734751 | 0.1279079854004264 | 6.31227604521258 | 69.61764669660025 | 385 | entropy | sqrt |
| BAT-0002 | 46 | 0.469268967807294 | 0.5999621548448113 | 0.2252381068472883 | 0.1750446809671821 | 7.651571368248174 | 81.18505528441574 | 876 | gini | sqrt |
| BAT-0003 | 28 | 0.191723735630543 | 0.2647039138571946 | 0.6652693727626408 | 0.3493085843715032 | 8.610417751508262 | 88.6826965509445 | 325 | entropy | nan |
| BAT-0004 | 37 | 0.3743900780349997 | 0.5345462018375161 | 0.6931028571396962 | 0.7495520167868096 | 4.301354431109951 | 41.81352364467864 | 204 | gini | log2 |
| BAT-0005 | 42 | 0.2644644623596952 | 0.3095966358709754 | 0.9872249661735412 | 0.1327065391291453 | 0.8656813233197913 | 82.96179218092723 | 649 | entropy | log2 |
| BAT-0006 | 84 | 0.9075516816611184 | 0.3722566072179196 | 0.2240818464269461 | 0.956301394092128 | 2.953998425463765 | 63.50183494975716 | 379 | gini | log2 |
| BAT-0007 | 86 | 0.2745576897508995 | 0.7247456603025114 | 0.2334964509928879 | 0.847376332746871 | 3.2690122425907098 | 58.24871547638601 | 687 | gini | nan |
| BAT-0008 | 18 | 0.943559675266398 | 0.4550992941131689 | 0.4526998610624483 | 0.730451281833682 | 2.8940862906654496 | 10.2795592623251 | 402 | entropy | sqrt |
| BAT-0009 | 86 | 0.9313760525356022 | 0.9558268591464496 | 0.5356075977122547 | 0.5224503667152683 | 7.632338519020548 | 62.88804963998271 | 294 | entropy | sqrt |
| BAT-0010 | 30 | 0.8217451290912786 | 0.6766779538683375 | 0.2901886951261252 | 0.6059828307794728 | 6.46126341665839 | 94.1030930820384 | 810 | gini | sqrt |
| BAT-0011 | 24 | 0.9514379964172044 | 0.9552037985857992 | 0.954979481081112 | 0.9832290651111284 | 9.267307256274538 | 49.37099501970248 | 416 | entropy | sqrt |
| BAT-0012 | 58 | 0.9591395464133698 | 0.7408573137407606 | 0.3644356852168029 | 0.2967467442313971 | 1.998412489993605 | 73.26024074396044 | 484 | entropy | sqrt |
| BAT-0013 | 28 | 0.2133188744693481 | 0.9272489708535614 | 0.996518494429931 | 0.2886065558874167 | 7.501941247213017 | 42.5505689402025 | 145 | gini | log2 |
| BAT-0014 | 62 | 0.7278026364168874 | 0.3948473872865461 | 0.9309400307782966 | 0.8987533396817095 | 7.254370861165908 | 22.576738510818863 | 265 | gini | sqrt |
| BAT-0015 | 57 | 0.4279958124362516 | 0.3661934531039721 | 0.984428257858398 | 0.3244649557446211 | 1.9856261652856844 | 98.96539614378602 | 358 | entropy | sqrt |
| BAT-0016 | 66 | 0.1687960748614853 | 0.6611076113128105 | 0.7283612980269232 | 0.8016841188373117 | 9.490899170058189 | 84.74082131200986 | 741 | entropy | log2 |
| BAT-0017 | 42 | 0.6208195110875413 | 0.2649418632853156 | 0.5607603348986903 | 0.6666040383273526 | 3.109389058576816 | 55.69594158010473 | 567 | entropy | nan |
| BAT-0018 | 77 | 0.4434027834873446 | 0.2136016495205439 | 0.3872207589298518 | 0.1783390552515336 | 5.153788730438005 | 80.18130928889885 | 251 | gini | log2 |
| BAT-0019 | 18 | 0.5162230059330248 | 0.6644478861681289 | 0.6647033831174985 | 0.8390631936804084 | 1.8408124595895317 | 96.49468050716096 | 616 | entropy | log2 |
| BAT-0020 | 79 | 0.8295089967508756 | 0.2198340178255869 | 0.3962679129092186 | 0.6090452814909574 | 4.361669193659439 | 14.99869539380345 | 98 | gini | log2 |
| BAT-0021 | 38 | 0.1866942147781303 | 0.6800599092280869 | 0.6065996164688351 | 0.3245820304957759 | 6.853741091069763 | 61.49632082357167 | 913 | gini | log2 |
| BAT-0022 | 70 | 0.4261897009635769 | 0.5147014833649249 | 0.8794303093684457 | 0.4112341124769498 | 7.149174732910839 | 84.96864557194183 | 517 | gini | nan |
| BAT-0023 | 97 | 0.9438204041366876 | 0.396522923244772 | 0.4146905428757267 | 0.5522537806491677 | 2.7311627730694776 | 28.57121461763877 | 877 | gini | nan |
| BAT-0024 | 31 | 0.7834359412097152 | 0.6560579552300403 | 0.3513365922862705 | 0.389137313630459 | 6.986187724201986 | 40.74557088909562 | 161 | entropy | nan |
| BAT-0025 | 59 | 0.5113189889790577 | 0.8724472759760682 | 0.3442555897010584 | 0.4285103223276988 | 2.935810101656824 | 76.00583555874913 | 874 | gini | nan |
| BAT-0026 | 48 | 0.5510684224375982 | 0.9916425559013072 | 0.2850307278295682 | 0.493878374099693 | 1.9421330802475167 | 87.29566367063187 | 836 | gini | nan |
| BAT-0027 | 87 | 0.5514650862130996 | 0.4302035654023899 | 0.7519909622090749 | 0.1921541927960391 | 4.849942382453071 | 93.85206702237484 | 894 | gini | nan |
| BAT-0028 | 22 | 0.4471843203722451 | 0.9893366905166878 | 0.557994608463538 | 0.9789733323749332 | 7.985802467045852 | 95.5339012410722 | 247 | gini | nan |
| BAT-0029 | 34 | 0.5402185450894988 | 0.2257580187098109 | 0.5491954406464407 | 0.9317165861243726 | 7.794124570577695 | 86.87230045164576 | 240 | entropy | nan |
| BAT-0030 | 77 | 0.4050042914285511 | 0.8805672101028759 | 0.5678179196974483 | 0.7160913497937218 | 3.545830887564101 | 14.876206429419115 | 208 | entropy | sqrt |
| BAT-0031 | 51 | 0.8594035075272777 | 0.5766929570405519 | 0.6698730192198146 | 0.3326802884659725 | 8.333117161938947 | 18.096051831957595 | 226 | entropy | sqrt |
| BAT-0032 | 83 | 0.3263882179735297 | 0.618094862669746 | 0.9988797583649928 | 0.1305142770262983 | 8.035092387918034 | 57.02979122201562 | 194 | entropy | sqrt |
| BAT-0033 | 39 | 0.7154766811386368 | 0.59313855013097 | 0.8689894447143621 | 0.962996304447218 | 1.8461442142447737 | 18.68264629945117 | 512 | entropy | nan |
| BAT-0034 | 59 | 0.1045009312555751 | 0.954570441954226 | 0.3187595810321446 | 0.3443622237400129 | 7.394612003804263 | 52.76033902090396 | 816 | entropy | nan |
| BAT-0035 | 43 | 0.4008086187454959 | 0.7634873928283312 | 0.6478955208513529 | 0.6793373761615064 | 5.727610090599553 | 59.26329780815977 | 497 | gini | sqrt |
| BAT-0036 | 65 | 0.5152574067731476 | 0.5821280001876377 | 0.587595068237799 | 0.7619400210089619 | 1.6199968179224755 | 64.60604749074813 | 769 | entropy | sqrt |
| BAT-0037 | 91 | 0.8913680549015369 | 0.3756356840602375 | 0.5552988897118324 | 0.7983762811673834 | 5.041635035198087 | 64.35322747328385 | 474 | entropy | sqrt |
| BAT-0038 | 74 | 0.1543318041920763 | 0.6553812378048784 | 0.8689265937549328 | 0.3654588012770043 | 3.318600090692476 | 78.68686109833916 | 806 | entropy | log2 |
| BAT-0039 | 71 | 0.9026144847091192 | 0.542949983058037 | 0.1663012583787997 | 0.3577010490585364 | 4.764237138888693 | 88.94162521744933 | 253 | gini | sqrt |
| BAT-0040 | 18 | 0.8089776908366232 | 0.9038273843656044 | 0.404860211447162 | 0.8844349061713712 | 5.266911965588118 | 13.66342068222656 | 976 | entropy | log2 |
| BAT-0041 | 58 | 0.7453414454309494 | 0.5906065023865308 | 0.2276841298417471 | 0.8444603697216936 | 3.579237298356669 | 32.30850226210738 | 955 | gini | sqrt |
| BAT-0042 | 26 | 0.2116577168633995 | 0.1338017174949213 | 0.5132955650717262 | 0.4385770398507839 | 5.906439656740357 | 26.932789860419994 | 532 | entropy | sqrt |
| BAT-0043 | 98 | 0.1620250793876899 | 0.7148662079685199 | 0.5098202571739955 | 0.2766591676913609 | 1.833454870483072 | 56.605941637707154 | 453 | entropy | log2 |
| BAT-0044 | 65 | 0.2600000929071908 | 0.3513421243099005 | 0.3169772647360689 | 0.1174567250981445 | 5.561795853990093 | 82.85267792199589 | 429 | gini | log2 |
| BAT-0045 | 24 | 0.4496242594869295 | 0.6806630659350815 | 0.8052782780205264 | 0.9875157091402692 | 3.926773395485732 | 37.38012885481116 | 89 | gini | log2 |
| BAT-0046 | 53 | 0.4774751649615241 | 0.2034510190674378 | 0.8137366730155703 | 0.4635211741147196 | 3.969038743300066 | 43.26179928189517 | 610 | gini | sqrt |
| BAT-0047 | 39 | 0.8569248863083163 | 0.4997621312809945 | 0.8039239186906227 | 0.8124028325898209 | 6.8928096808732775 | 65.79864720940319 | 664 | entropy | nan |
| BAT-0048 | 41 | 0.9094800396763316 | 0.7450846003340303 | 0.3974039298668095 | 0.4064877301333206 | 3.779412612809452 | 12.87583832708724 | 837 | entropy | log2 |
| BAT-0049 | 35 | 0.7121235451887695 | 0.8394778524659626 | 0.4980097722491564 | 0.5658609040087879 | 4.073624445651803 | 86.1730213244021 | 69 | entropy | log2 |
| BAT-0050 | 53 | 0.7060382060324653 | 0.7423182792494778 | 0.738233128396876 | 0.2901688749433334 | 3.4288386937935265 | 86.95639175684266 | 845 | gini | log2 |
| BAT-0051 | 37 | 0.8115373042995474 | 0.313945028524679 | 0.2851973842773608 | 0.9188539508959888 | 5.106640026050231 | 38.95321413709903 | 754 | gini | sqrt |
| BAT-0052 | 15 | 0.3303882416257991 | 0.9087706029784816 | 0.1476823250579303 | 0.2756943096789107 | 0.4896923692683264 | 70.42687039122112 | 669 | entropy | sqrt |
| BAT-0053 | 76 | 0.4959719793986936 | 0.4951949806737646 | 0.7315304213223096 | 0.8392509986219212 | 0.1284127419675351 | 62.28305623017596 | 638 | gini | sqrt |
| BAT-0054 | 50 | 0.9599433402487516 | 0.5221767378165302 | 0.3747545673189643 | 0.46860119809314 | 0.963022292482436 | 22.963959685766536 | 522 | entropy | log2 |
| BAT-0055 | 22 | 0.1509928595702313 | 0.5545435470331151 | 0.6695649232016064 | 0.2175791307662964 | 6.2265353127102765 | 59.633213144516176 | 86 | gini | sqrt |
| BAT-0056 | 98 | 0.8421580891314715 | 0.3605844841917068 | 0.4229900265402229 | 0.8974353438812812 | 5.104054995589838 | 26.88854018667195 | 55 | entropy | nan |
| BAT-0057 | 12 | 0.2470713896198056 | 0.9358993342607604 | 0.6240044781395157 | 0.2789180554506439 | 1.00224364845517 | 58.27943139137404 | 781 | entropy | log2 |
| BAT-0058 | 89 | 0.5255060468618019 | 0.3091600552627522 | 0.3297814539135905 | 0.4137241534631133 | 0.3493985880808548 | 85.41123908056059 | 220 | entropy | log2 |
| BAT-0059 | 92 | 0.9771686234270696 | 0.7014162123723362 | 0.3997579841745089 | 0.7458109954413861 | 7.531525971878763 | 56.26746267024188 | 331 | gini | log2 |
| BAT-0060 | 16 | 0.6468944564485855 | 0.6733602186364458 | 0.4866180097242705 | 0.8244852978937154 | 9.722219733566282 | 62.71779412798678 | 25 | gini | nan |
| BAT-0061 | 91 | 0.1581551586117086 | 0.7638910483452004 | 0.4241385187634987 | 0.6775438321742909 | 8.739485687806013 | 90.66533038018946 | 734 | entropy | log2 |
| BAT-0062 | 15 | 0.2602919312115853 | 0.7007260299170404 | 0.4385478798996856 | 0.478553742649072 | 1.040785713805208 | 49.71182933556218 | 189 | gini | log2 |
| BAT-0063 | 53 | 0.8231400336175236 | 0.854874821346194 | 0.8404568283279721 | 0.8326649366788321 | 0.9354460083861392 | 99.81747769060205 | 450 | entropy | sqrt |
| BAT-0064 | 88 | 0.3081574373831685 | 0.4439532919879697 | 0.4743772902761275 | 0.1174473264493799 | 2.458706363894587 | 84.95766272803623 | 154 | gini | sqrt |
| BAT-0065 | 57 | 0.753219849661292 | 0.2737537192884438 | 0.2180846890275024 | 0.3520986492749799 | 1.7393554559538515 | 91.68645355871378 | 611 | entropy | sqrt |
| BAT-0066 | 59 | 0.8671196890643261 | 0.5148601382325616 | 0.403106323018197 | 0.1157241925263268 | 0.6949256696637474 | 86.34211905759184 | 944 | gini | nan |
| BAT-0067 | 66 | 0.6245598922488039 | 0.4606115985173323 | 0.445653408270376 | 0.4224910199197014 | 0.831158625479459 | 13.87508677969176 | 515 | entropy | nan |
| BAT-0068 | 61 | 0.7377704564326715 | 0.8629694517858639 | 0.2713198984120886 | 0.5451313069942475 | 5.526001930298927 | 72.87979484529373 | 685 | entropy | nan |
| BAT-0069 | 63 | 0.2360231548124958 | 0.7073193494477359 | 0.4486559226269244 | 0.3948797710682742 | 7.572429033703203 | 57.34244409647079 | 151 | entropy | nan |
| BAT-0070 | 99 | 0.6065806115722011 | 0.7300750229310955 | 0.5671611565357214 | 0.1637616726120959 | 0.2322140423626928 | 97.61762871372734 | 82 | entropy | sqrt |
| BAT-0071 | 17 | 0.7578217286216709 | 0.4133212414177477 | 0.2967875185354603 | 0.7215303484526817 | 0.1996266421855186 | 47.48784838548174 | 495 | gini | log2 |
| BAT-0072 | 87 | 0.9248194102773204 | 0.193743521567317 | 0.5848196333644237 | 0.2903943538479382 | 8.077852073999718 | 84.54840302184878 | 150 | entropy | sqrt |
| BAT-0073 | 23 | 0.8044019206375908 | 0.4007512790159616 | 0.1191342718723155 | 0.6610341313384649 | 0.1110554641991456 | 72.39580159890225 | 461 | gini | log2 |
| BAT-0074 | 36 | 0.6583538679356582 | 0.756399334754457 | 0.4777448237257666 | 0.5044218425672294 | 5.037713564357884 | 77.11699170873264 | 524 | entropy | log2 |
| BAT-0075 | 36 | 0.8811299331162006 | 0.3966265728065491 | 0.5059754510081504 | 0.9522321295855172 | 7.795267582402671 | 24.87843166718075 | 818 | entropy | sqrt |
| BAT-0076 | 17 | 0.1516925887574503 | 0.5698713403438859 | 0.5573754455061373 | 0.660058939464838 | 8.70228318244724 | 60.79185320158714 | 162 | entropy | log2 |
| BAT-0077 | 29 | 0.5254625131492557 | 0.4458945764427313 | 0.2578355526166823 | 0.5407838726805724 | 7.520328641462455 | 34.250949589967234 | 234 | entropy | sqrt |
| BAT-0078 | 11 | 0.6644170976983633 | 0.9554749133240712 | 0.1749638757310279 | 0.1062208845920935 | 2.035965650997802 | 85.29373882228879 | 912 | gini | log2 |
| BAT-0079 | 14 | 0.7856008901346472 | 0.5434264725044767 | 0.2797513408046699 | 0.1243464954611885 | 9.54999508355068 | 64.99581477805003 | 950 | entropy | log2 |
| BAT-0080 | 66 | 0.7837286998470895 | 0.8763490302344387 | 0.1974876266595359 | 0.1697790167156456 | 8.986915049870438 | 37.63833548645832 | 316 | entropy | sqrt |
| BAT-0081 | 72 | 0.2507239151339275 | 0.7507999495443041 | 0.7652826236548329 | 0.4757983569983448 | 2.884480704609569 | 37.56192236906945 | 399 | gini | nan |
| BAT-0082 | 35 | 0.3740760124326168 | 0.3802969329316403 | 0.9597558038635802 | 0.7104001347020777 | 9.149879099976646 | 13.156275744970358 | 567 | gini | nan |
| BAT-0083 | 80 | 0.7304421536595435 | 0.5535892297771986 | 0.654239470768123 | 0.7686536584824242 | 6.485529306004287 | 93.81174829147626 | 730 | entropy | nan |
| BAT-0084 | 81 | 0.4114940791389885 | 0.6236480390433379 | 0.7980036787960912 | 0.8726162443939908 | 8.992043636017561 | 26.790142656937206 | 245 | entropy | sqrt |
| BAT-0085 | 68 | 0.4415329231006244 | 0.7016012473656664 | 0.8905181004418284 | 0.4796291913076705 | 8.385826390415952 | 93.40667018707217 | 190 | gini | log2 |
| BAT-0086 | 64 | 0.3265190767459737 | 0.5828503774479533 | 0.6815555457304195 | 0.7003064843773115 | 8.04230426564428 | 53.149072716864026 | 220 | entropy | log2 |
| BAT-0087 | 63 | 0.8116684905370543 | 0.6415145655045936 | 0.3522734108906319 | 0.1757008371402425 | 0.0891071730036152 | 28.7777280808908 | 770 | gini | nan |
| BAT-0088 | 66 | 0.2182557112129233 | 0.5827480026935871 | 0.6251687861207678 | 0.2193686908785742 | 5.673761912033648 | 38.47917602148897 | 714 | entropy | log2 |
| BAT-0089 | 10 | 0.945902729538856 | 0.6986820871089848 | 0.3506020865704888 | 0.3997370647698092 | 6.690827859252169 | 97.65432740522792 | 863 | entropy | sqrt |
| BAT-0090 | 41 | 0.9336741276752591 | 0.89742184138444 | 0.7234881425939675 | 0.8309179398419299 | 9.404270713827875 | 17.24368157697202 | 733 | entropy | nan |
| BAT-0091 | 87 | 0.148182445770693 | 0.7333006219709101 | 0.6050100782550354 | 0.3759357595405886 | 9.301408175094124 | 83.16463615236827 | 684 | gini | log2 |
| BAT-0092 | 73 | 0.5316629403411873 | 0.6322126574791123 | 0.6479443570503287 | 0.3900770964454333 | 2.1840588346891066 | 28.441636063415284 | 154 | entropy | log2 |
| BAT-0093 | 56 | 0.2500893845811479 | 0.1911542613348616 | 0.364830496724601 | 0.4824701870902684 | 0.2374239544135836 | 96.81214452498146 | 470 | entropy | nan |
| BAT-0094 | 98 | 0.5805667496027078 | 0.7908295827629502 | 0.8605589896372443 | 0.7299708124859677 | 3.6293641988156766 | 95.87501351316344 | 556 | entropy | nan |
| BAT-0095 | 55 | 0.1718958557179842 | 0.5124545147992141 | 0.4793163563066421 | 0.5518062685123731 | 8.855031577009157 | 52.8320903726612 | 965 | entropy | nan |
| BAT-0096 | 53 | 0.2743519083401146 | 0.3534409251069351 | 0.8034200602528734 | 0.648173141033822 | 4.7588801822852345 | 98.92639530172836 | 909 | entropy | sqrt |
| BAT-0097 | 70 | 0.8160307786649496 | 0.1259869548496079 | 0.3797873293310129 | 0.3391455963484726 | 8.314163423573339 | 72.9927811099435 | 452 | entropy | log2 |
| BAT-0098 | 41 | 0.9361681871218324 | 0.3355669375664354 | 0.689218419263327 | 0.4028114317995649 | 3.941331214642881 | 49.28174858892902 | 418 | entropy | sqrt |
| BAT-0099 | 53 | 0.422282551268182 | 0.9673604818589048 | 0.5505692028187087 | 0.8096057705859845 | 5.454022036958561 | 70.82187227608877 | 569 | entropy | sqrt |

**T#1.2 Bat Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Time Taken(s)** | **Total Power(J)** | **CPU(J)** | **Monitor(J)** | **Disk(J)** | **Base(J)** |
| BAT-0000 | 134 | 447.1999999999997 | 252.39999999999975 | 0.0 | 0.0 | 201.0 |
| BAT-0001 | 57 | 189.3 | 106.70000000000002 | 0.0 | 0.0 | 85.5 |
| BAT-0002 | 88 | 293.1999999999999 | 164.99999999999997 | 0.0 | 0.0 | 132.0 |
| BAT-0003 | 116 | 387.4999999999999 | 219.10000000000005 | 0.0 | 0.0 | 174.0 |
| BAT-0004 | 21 | 68.8 | 38.3 | 0.0 | 0.0 | 31.5 |
| BAT-0005 | 100 | 333.7000000000001 | 188.2999999999999 | 0.0 | 0.0 | 150.0 |
| BAT-0006 | 37 | 122.7 | 68.4 | 0.0 | 0.0 | 55.5 |
| BAT-0007 | 151 | 503.7999999999999 | 284.39999999999986 | 0.0 | 0.0 | 226.5 |
| BAT-0008 | 64 | 217.19999999999987 | 124.19999999999996 | 0.0 | 0.0 | 96.0 |
| BAT-0009 | 44 | 148.3 | 84.10000000000001 | 0.0 | 0.0 | 66.0 |
| BAT-0010 | 83 | 280.5999999999999 | 159.0999999999999 | 0.0 | 0.0 | 124.5 |
| BAT-0011 | 63 | 211.1 | 119.8 | 0.0 | 0.0 | 94.5 |
| BAT-0012 | 73 | 244.4999999999999 | 138.00000000000006 | 0.0 | 0.0 | 109.5 |
| BAT-0013 | 16 | 54.500000000000014 | 31.3 | 0.0 | 0.0 | 24.0 |
| BAT-0014 | 27 | 90.6 | 51.2 | 0.0 | 0.0 | 40.5 |
| BAT-0015 | 55 | 183.1 | 103.0 | 0.0 | 0.0 | 82.5 |
| BAT-0016 | 114 | 379.8000000000002 | 213.4999999999998 | 0.0 | 0.0 | 171.0 |
| BAT-0017 | 201 | 669.2000000000006 | 376.5000000000003 | 0.0 | 0.0 | 301.5 |
| BAT-0018 | 23 | 74.7 | 41.2 | 0.0 | 0.0 | 34.5 |
| BAT-0019 | 95 | 319.6 | 181.29999999999987 | 0.0 | 0.0 | 142.5 |
| BAT-0020 | 11 | 37.2 | 21.3 | 0.0 | 0.0 | 16.5 |
| BAT-0021 | 91 | 304.89999999999986 | 172.9999999999999 | 0.0 | 0.0 | 136.5 |
| BAT-0022 | 114 | 383.6000000000003 | 217.8999999999999 | 0.0 | 0.0 | 171.0 |
| BAT-0023 | 192 | 640.6000000000008 | 360.40000000000015 | 0.0 | 0.0 | 288.0 |
| BAT-0024 | 57 | 190.59999999999997 | 107.4 | 0.0 | 0.0 | 85.5 |
| BAT-0025 | 193 | 645.4999999999999 | 365.7 | 0.0 | 0.0 | 289.5 |
| BAT-0026 | 183 | 611.0000000000001 | 344.09999999999985 | 0.0 | 0.0 | 274.5 |
| BAT-0027 | 200 | 683.800000000001 | 391.8 | 0.0 | 0.4 | 300.0 |
| BAT-0028 | 55 | 187.2 | 107.10000000000002 | 0.0 | 0.0 | 82.5 |
| BAT-0029 | 85 | 287.29999999999995 | 163.4 | 0.0 | 0.0 | 127.5 |
| BAT-0030 | 32 | 105.99999999999996 | 59.70000000000001 | 0.0 | 0.0 | 48.0 |
| BAT-0031 | 36 | 121.8 | 69.40000000000002 | 0.0 | 0.0 | 54.0 |
| BAT-0032 | 30 | 101.7 | 58.000000000000014 | 0.0 | 0.0 | 45.0 |
| BAT-0033 | 181 | 597.5 | 333.50000000000006 | 0.0 | 0.0 | 271.5 |
| BAT-0034 | 288 | 960.8000000000006 | 539.6000000000007 | 0.0 | 0.0 | 432.0 |
| BAT-0035 | 49 | 164.20000000000002 | 92.9 | 0.0 | 0.0 | 73.5 |
| BAT-0036 | 120 | 402.9000000000001 | 227.3999999999998 | 0.0 | 0.0 | 180.0 |
| BAT-0037 | 72 | 240.0999999999999 | 135.4 | 0.0 | 0.0 | 108.0 |
| BAT-0038 | 125 | 421.7000000000001 | 238.8999999999997 | 0.0 | 0.0 | 187.5 |
| BAT-0039 | 25 | 85.60000000000001 | 49.00000000000001 | 0.0 | 0.0 | 37.5 |
| BAT-0040 | 152 | 511.7000000000003 | 290.09999999999974 | 0.0 | 0.0 | 228.0 |
| BAT-0041 | 95 | 320.1 | 182.3 | 0.0 | 0.0 | 142.5 |
| BAT-0042 | 82 | 276.79999999999995 | 157.09999999999988 | 0.0 | 0.0 | 123.0 |
| BAT-0043 | 68 | 226.19999999999996 | 127.0 | 0.0 | 0.0 | 102.0 |
| BAT-0044 | 44 | 147.39999999999998 | 83.9 | 0.0 | 0.0 | 66.0 |
| BAT-0045 | 8 | 26.000000000000004 | 14.2 | 0.0 | 0.0 | 12.0 |
| BAT-0046 | 63 | 214.7 | 122.9 | 0.0 | 0.0 | 94.5 |
| BAT-0047 | 234 | 778.3000000000009 | 438.1 | 0.0 | 0.1 | 351.0 |
| BAT-0048 | 128 | 429.6 | 243.19999999999985 | 0.0 | 0.0 | 192.0 |
| BAT-0049 | 12 | 40.2 | 22.9 | 0.0 | 0.0 | 18.0 |
| BAT-0050 | 84 | 280.5 | 158.10000000000002 | 0.0 | 0.0 | 126.0 |
| BAT-0051 | 76 | 258.19999999999993 | 147.29999999999993 | 0.0 | 0.0 | 114.0 |
| BAT-0052 | 105 | 351.6000000000001 | 198.69999999999987 | 0.0 | 0.0 | 157.5 |
| BAT-0053 | 63 | 210.6 | 119.19999999999996 | 0.0 | 0.0 | 94.5 |
| BAT-0054 | 80 | 264.69999999999993 | 148.09999999999994 | 0.0 | 0.0 | 120.0 |
| BAT-0055 | 8 | 27.200000000000003 | 15.399999999999997 | 0.0 | 0.0 | 12.0 |
| BAT-0056 | 20 | 68.00000000000001 | 38.8 | 0.0 | 0.0 | 30.0 |
| BAT-0057 | 123 | 413.1000000000002 | 233.7999999999999 | 0.0 | 0.0 | 184.5 |
| BAT-0058 | 33 | 109.19999999999996 | 61.30000000000002 | 0.0 | 0.0 | 49.5 |
| BAT-0059 | 33 | 111.4 | 63.3 | 0.0 | 0.0 | 49.5 |
| BAT-0060 | 5 | 16.7 | 9.5 | 0.0 | 0.0 | 7.5 |
| BAT-0061 | 113 | 375.8000000000001 | 212.1999999999998 | 0.0 | 0.0 | 169.5 |
| BAT-0062 | 18 | 61.8 | 35.400000000000006 | 0.0 | 0.0 | 27.0 |
| BAT-0063 | 71 | 236.6 | 133.0 | 0.0 | 0.0 | 106.5 |
| BAT-0064 | 14 | 45.10000000000001 | 24.700000000000003 | 0.0 | 0.0 | 21.0 |
| BAT-0065 | 94 | 316.50000000000017 | 179.89999999999992 | 0.0 | 0.0 | 141.0 |
| BAT-0066 | 209 | 699.2000000000007 | 394.9000000000001 | 0.0 | 0.0 | 313.5 |
| BAT-0067 | 181 | 600.6000000000001 | 337.30000000000007 | 0.0 | 0.0 | 271.5 |
| BAT-0068 | 246 | 848.1000000000014 | 489.3000000000004 | 0.0 | 0.2 | 369.0 |
| BAT-0069 | 56 | 188.2 | 106.9 | 0.0 | 0.0 | 84.0 |
| BAT-0070 | 11 | 40.9 | 24.8 | 0.0 | 0.0 | 16.5 |
| BAT-0071 | 50 | 170.0 | 97.3 | 0.0 | 0.0 | 75.0 |
| BAT-0072 | 25 | 85.2 | 48.8 | 0.0 | 0.0 | 37.5 |
| BAT-0073 | 46 | 155.99999999999994 | 88.69999999999999 | 0.0 | 0.0 | 69.0 |
| BAT-0074 | 80 | 268.3 | 152.50000000000006 | 0.0 | 0.0 | 120.0 |
| BAT-0075 | 126 | 423.3999999999999 | 240.49999999999983 | 0.0 | 0.0 | 189.0 |
| BAT-0076 | 26 | 88.5 | 50.90000000000001 | 0.0 | 0.0 | 39.0 |
| BAT-0077 | 35 | 116.40000000000002 | 65.30000000000001 | 0.0 | 0.0 | 52.5 |
| BAT-0078 | 91 | 306.4 | 173.19999999999993 | 0.0 | 0.0 | 136.5 |
| BAT-0079 | 147 | 497.70000000000033 | 284.3999999999998 | 0.0 | 0.0 | 220.5 |
| BAT-0080 | 49 | 166.79999999999995 | 95.4 | 0.0 | 0.0 | 73.5 |
| BAT-0081 | 87 | 292.8999999999999 | 165.79999999999995 | 0.0 | 0.0 | 130.5 |
| BAT-0082 | 125 | 423.1999999999999 | 240.19999999999985 | 0.0 | 0.0 | 187.5 |
| BAT-0083 | 259 | 869.6000000000007 | 492.5000000000003 | 0.0 | 0.0 | 388.5 |
| BAT-0084 | 39 | 130.0 | 73.7 | 0.0 | 0.0 | 58.5 |
| BAT-0085 | 20 | 67.7 | 38.7 | 0.0 | 0.0 | 30.0 |
| BAT-0086 | 33 | 111.3 | 63.5 | 0.0 | 0.0 | 49.5 |
| BAT-0087 | 169 | 563.1000000000001 | 316.3999999999999 | 0.0 | 0.0 | 253.5 |
| BAT-0088 | 113 | 407.7 | 242.79999999999995 | 0.0 | 0.7 | 169.5 |
| BAT-0089 | 135 | 456.3999999999999 | 260.4999999999999 | 0.0 | 0.0 | 202.5 |
| BAT-0090 | 263 | 908.8000000000008 | 525.8000000000001 | 0.0 | 0.1 | 394.5 |
| BAT-0091 | 71 | 239.99999999999991 | 134.79999999999993 | 0.0 | 0.0 | 106.5 |
| BAT-0092 | 24 | 81.2 | 46.1 | 0.0 | 0.0 | 36.0 |
| BAT-0093 | 170 | 576.4000000000002 | 325.4 | 0.0 | 0.0 | 255.0 |
| BAT-0094 | 197 | 664.9000000000005 | 373.90000000000026 | 0.0 | 0.0 | 295.5 |
| BAT-0095 | 344 | 1131.4999999999998 | 626.7999999999994 | 0.0 | 0.1 | 516.0 |
| BAT-0096 | 141 | 457.1999999999998 | 250.39999999999992 | 0.0 | 0.0 | 211.5 |
| BAT-0097 | 68 | 218.00000000000009 | 119.70000000000005 | 0.0 | 0.0 | 102.0 |
| BAT-0098 | 66 | 213.2 | 117.3 | 0.0 | 0.0 | 99.0 |
| BAT-0099 | 89 | 287.3000000000001 | 157.7 | 0.0 | 0.0 | 133.5 |

**T#1.3 Bat Energy Distribution**

**Fig#1 Bat Iterations**

**Camel Algorithm**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Accuracy** | **Time Taken (s)** | **Energy Used (J)** | **Equivalent CO2 Emission (mg)** |
| CAM-0000 | 89.85 | 146 | 533.0999999999997 | 125.87083333333324 |
| CAM-0001 | 89.75 | 333 | 1172.2000000000007 | 276.7694444444446 |
| CAM-0002 | 89.64999999999999 | 94 | 323.20000000000016 | 76.31111111111115 |
| CAM-0003 | 89.75 | 244 | 837.1000000000006 | 197.64861111111125 |
| CAM-0004 | 89.55 | 24 | 81.30000000000001 | 19.195833333333336 |
| CAM-0005 | 89.55 | 75 | 258.9999999999999 | 61.15277777777775 |
| CAM-0006 | 89.5 | 61 | 210.9 | 49.79583333333333 |
| CAM-0007 | 89.75 | 87 | 297.39999999999986 | 70.2194444444444 |
| CAM-0008 | 89.64999999999999 | 16 | 55.00000000000001 | 12.986111111111112 |
| CAM-0009 | 89.9 | 102 | 348.1000000000001 | 82.1902777777778 |
| CAM-0010 | 89.55 | 199 | 677.2000000000005 | 159.89444444444456 |
| CAM-0011 | 89.60000000000001 | 12 | 41.5 | 9.79861111111111 |
| CAM-0012 | 89.60000000000001 | 85 | 287.59999999999985 | 67.90555555555552 |
| CAM-0013 | 89.5 | 42 | 143.3 | 33.834722222222226 |
| CAM-0014 | 89.7 | 56 | 192.2 | 45.38055555555554 |
| CAM-0015 | 89.9 | 145 | 496.80000000000007 | 117.3 |
| CAM-0016 | 89.7 | 113 | 388.1999999999999 | 91.6583333333333 |
| CAM-0017 | 89.60000000000001 | 84 | 286.79999999999995 | 67.71666666666665 |
| CAM-0018 | 89.8 | 97 | 331.89999999999986 | 78.36527777777775 |
| CAM-0019 | 89.60000000000001 | 54 | 185.1 | 43.70416666666665 |
| CAM-0020 | 89.60000000000001 | 94 | 316.70000000000005 | 74.7763888888889 |
| CAM-0021 | 89.8 | 89 | 301.1 | 71.09305555555555 |
| CAM-0022 | 89.64999999999999 | 20 | 69.00000000000001 | 16.291666666666668 |
| CAM-0023 | 89.60000000000001 | 34 | 118.7 | 28.02638888888889 |
| CAM-0024 | 89.60000000000001 | 86 | 290.9999999999999 | 68.7083333333333 |
| CAM-0025 | 89.85 | 109 | 391.6000000000001 | 92.46111111111112 |
| CAM-0026 | 89.60000000000001 | 92 | 313.99999999999994 | 74.13888888888887 |
| CAM-0027 | 89.64999999999999 | 93 | 319.19999999999993 | 75.36666666666665 |
| CAM-0028 | 89.64999999999999 | 85 | 290.70000000000005 | 68.6375 |
| CAM-0029 | 89.60000000000001 | 84 | 282.7 | 66.7486111111111 |
| CAM-0030 | 89.35 | 74 | 251.5 | 59.38194444444444 |
| CAM-0031 | 89.55 | 137 | 474.0000000000002 | 111.91666666666671 |
| CAM-0032 | 89.64999999999999 | 30 | 102.4 | 24.177777777777774 |
| CAM-0033 | 89.7 | 331 | 1123.8000000000006 | 265.3416666666668 |
| CAM-0034 | 89.85 | 24 | 81.8 | 19.313888888888886 |
| CAM-0035 | 89.5 | 215 | 742.9000000000002 | 175.4069444444445 |
| CAM-0036 | 89.9 | 126 | 436.0999999999999 | 102.96805555555552 |
| CAM-0037 | 89.9 | 350 | 1210.9999999999998 | 285.9305555555555 |
| CAM-0038 | 89.85 | 115 | 397.3999999999999 | 93.83055555555552 |
| CAM-0039 | 89.75 | 15 | 50.8 | 11.994444444444444 |
| CAM-0040 | 89.64999999999999 | 280 | 965.0000000000016 | 227.8472222222226 |
| CAM-0041 | 89.75 | 32 | 110.60000000000002 | 26.11388888888889 |
| CAM-0042 | 89.85 | 24 | 83.6 | 19.738888888888887 |
| CAM-0043 | 89.64999999999999 | 52 | 176.99999999999997 | 41.79166666666666 |
| CAM-0044 | 89.75 | 127 | 423.19999999999993 | 99.9222222222222 |
| CAM-0045 | 89.64999999999999 | 89 | 292.4000000000001 | 69.0388888888889 |
| CAM-0046 | 89.7 | 117 | 379.6999999999999 | 89.65138888888886 |
| CAM-0047 | 89.35 | 22 | 72.7 | 17.165277777777778 |
| CAM-0048 | 89.60000000000001 | 137 | 447.5999999999999 | 105.68333333333332 |
| CAM-0049 | 89.85 | 273 | 893.1999999999986 | 210.8944444444441 |
| CAM-0050 | 89.55 | 40 | 130.30000000000004 | 30.765277777777783 |
| CAM-0051 | 89.85 | 74 | 244.6 | 57.75277777777777 |
| CAM-0052 | 89.55 | 5 | 16.1 | 3.801388888888889 |
| CAM-0053 | 89.75 | 38 | 123.60000000000004 | 29.183333333333344 |
| CAM-0054 | 89.64999999999999 | 71 | 231.00000000000009 | 54.541666666666686 |
| CAM-0055 | 89.7 | 93 | 308.5 | 72.84027777777777 |
| CAM-0056 | 89.7 | 75 | 243.50000000000009 | 57.49305555555557 |
| CAM-0057 | 89.75 | 85 | 277.4000000000001 | 65.49722222222225 |
| CAM-0058 | 89.75 | 38 | 123.40000000000002 | 29.13611111111112 |
| CAM-0059 | 89.64999999999999 | 57 | 198.10000000000008 | 46.77361111111113 |
| CAM-0060 | 89.9 | 53 | 183.1 | 43.23194444444444 |
| CAM-0061 | 89.7 | 23 | 76.79999999999998 | 18.13333333333333 |
| CAM-0062 | 89.75 | 20 | 65.6 | 15.488888888888887 |
| CAM-0063 | 89.60000000000001 | 66 | 217.8 | 51.425 |
| CAM-0064 | 89.7 | 83 | 271.6000000000001 | 64.1277777777778 |
| CAM-0065 | 89.75 | 130 | 426.5 | 100.70138888888889 |
| CAM-0066 | 89.60000000000001 | 34 | 112.60000000000002 | 26.58611111111112 |
| CAM-0067 | 89.55 | 15 | 48.6 | 11.474999999999998 |
| CAM-0068 | 89.55 | 193 | 656.5000000000005 | 155.00694444444454 |
| CAM-0069 | 89.75 | 83 | 283.49999999999994 | 66.93749999999999 |
| CAM-0070 | 89.75 | 85 | 294.79999999999995 | 69.60555555555554 |
| CAM-0071 | 89.45 | 186 | 640.2000000000005 | 151.15833333333345 |
| CAM-0072 | 89.75 | 89 | 305.59999999999985 | 72.15555555555552 |
| CAM-0073 | 89.60000000000001 | 82 | 281.69999999999993 | 66.51249999999999 |
| CAM-0074 | 89.85 | 127 | 417.6999999999997 | 98.62361111111105 |
| CAM-0075 | 89.60000000000001 | 76 | 250.10000000000016 | 59.05138888888893 |
| CAM-0076 | 89.8 | 106 | 348.70000000000016 | 82.33194444444447 |
| CAM-0077 | 89.8 | 51 | 167.3 | 39.50138888888889 |
| CAM-0078 | 89.64999999999999 | 86 | 283.70000000000005 | 66.98472222222223 |
| CAM-0079 | 89.55 | 3 | 8.9 | 2.1013888888888888 |
| CAM-0080 | 89.64999999999999 | 236 | 777.7999999999996 | 183.64722222222213 |
| CAM-0081 | 89.85 | 175 | 571.4999999999999 | 134.93749999999997 |
| CAM-0082 | 89.85 | 150 | 495.2999999999996 | 116.94583333333324 |
| CAM-0083 | 89.60000000000001 | 52 | 169.90000000000006 | 40.11527777777779 |
| CAM-0084 | 89.5 | 46 | 151.3 | 35.72361111111111 |
| CAM-0085 | 89.5 | 220 | 727.3999999999994 | 171.7472222222221 |
| CAM-0086 | 89.75 | 93 | 303.4 | 71.6361111111111 |
| CAM-0087 | 89.55 | 60 | 197.2 | 46.56111111111111 |
| CAM-0088 | 89.85 | 290 | 951.299999999999 | 224.61249999999976 |
| CAM-0089 | 89.64999999999999 | 89 | 293.6 | 69.32222222222222 |
| CAM-0090 | 89.85 | 89 | 292.80000000000007 | 69.13333333333335 |
| CAM-0091 | 89.64999999999999 | 34 | 111.10000000000002 | 26.231944444444448 |
| CAM-0092 | 89.64999999999999 | 76 | 250.1 | 59.051388888888894 |
| CAM-0093 | 89.8 | 109 | 355.6 | 83.96111111111111 |
| CAM-0094 | 89.85 | 151 | 495.6999999999997 | 117.0402777777777 |
| CAM-0095 | 89.75 | 186 | 627.7999999999996 | 148.23055555555547 |
| CAM-0096 | 89.05 | 2 | 7.300000000000001 | 1.7236111111111112 |
| CAM-0097 | 89.85 | 86 | 283.90000000000003 | 67.03194444444445 |
| CAM-0098 | 89.7 | 11 | 36.1 | 8.52361111111111 |
| CAM-0099 | 89.60000000000001 | 23 | 73.3 | 17.306944444444444 |

**T#2.1 Camel Algorithm Main Result**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **population\_size** | **burden\_factor** | **death\_rate** | **visibility** | **supply\_init** | **endurance\_init** | **min\_temperature** | **max\_temperature** | **n\_estimator** | **criterion** | **max\_feature** |
| CAM-0000 | 45 | 0.8917689509621813 | 0.1574105080560471 | 0.3395135843376285 | 556.3241207828955 | 439.25496574370027 | -7.857737014738504 | 76.33105126957706 | 880 | entropy | sqrt |
| CAM-0001 | 29 | 0.2467377051902176 | 0.9056761446063374 | 0.6698120059714505 | 340.43479935024084 | 864.1309972100481 | -42.299384908307466 | 97.57636874894732 | 893 | entropy | nan |
| CAM-0002 | 83 | 0.3769517731710098 | 0.3689814633457428 | 0.5497261056577791 | 123.09406136530002 | 557.3159322079924 | -30.941571553040248 | 98.4836083645137 | 917 | gini | log2 |
| CAM-0003 | 87 | 0.591356058300558 | 0.9470820965935104 | 0.5062922581428781 | 613.7033269952211 | 968.051844395545 | -64.69682815818304 | 92.84586266135496 | 669 | entropy | nan |
| CAM-0004 | 66 | 0.7333906711591793 | 0.2642842917321878 | 0.9899317779444482 | 918.6727470542952 | 805.8262339193453 | -71.12474810357816 | 12.50535411115032 | 98 | gini | nan |
| CAM-0005 | 20 | 0.9502850914815713 | 0.5517841693321563 | 0.514481763996164 | 429.033302276099 | 923.103502815024 | -7.218378665341632 | 38.57734280161233 | 737 | gini | log2 |
| CAM-0006 | 34 | 0.7607996563043902 | 0.1593953398412659 | 0.2356659111712253 | 551.0287405546053 | 150.28863766980083 | -8.871211136353324 | 63.29805245469342 | 589 | gini | log2 |
| CAM-0007 | 47 | 0.9430898741023136 | 0.3627557721385803 | 0.1388757950015687 | 549.4647864539018 | 206.75805648692287 | -68.59711566965127 | 47.804686220099576 | 554 | entropy | sqrt |
| CAM-0008 | 86 | 0.580246621086023 | 0.4093601467559316 | 0.6768649565236758 | 299.9019008688672 | 850.2995943068054 | -8.675493798085554 | 82.37551959004898 | 95 | entropy | sqrt |
| CAM-0009 | 65 | 0.9047870661549404 | 0.5883129902785321 | 0.979440355310594 | 839.064754315762 | 809.5110023205153 | -98.2433558266894 | 29.882381521635917 | 641 | entropy | log2 |
| CAM-0010 | 95 | 0.4395267203270667 | 0.4400666676164132 | 0.3845304835023363 | 946.0961760230967 | 856.2969397052201 | -1.8634372098746184 | 91.10018901516533 | 873 | gini | nan |
| CAM-0011 | 33 | 0.7896095433203657 | 0.5891473581806405 | 0.5498069278009239 | 806.6840108641693 | 344.9548422283768 | -75.29060769299723 | 84.64952580044942 | 117 | gini | sqrt |
| CAM-0012 | 31 | 0.6854827573576056 | 0.9395326057953914 | 0.9897259912388008 | 89.32743963212671 | 200.08076066162997 | -28.69310723763141 | 2.470475349470092 | 802 | gini | sqrt |
| CAM-0013 | 75 | 0.816176066984891 | 0.6741978568462297 | 0.363980530308268 | 556.1959379795188 | 291.8057232511627 | -79.68292390912242 | 74.63437819979654 | 183 | gini | nan |
| CAM-0014 | 27 | 0.4123937722601745 | 0.9369378663694417 | 0.8184584456438545 | 674.2627260707087 | 440.9495823079437 | -29.260285045480927 | 40.12086301770953 | 524 | gini | log2 |
| CAM-0015 | 31 | 0.4187395524713073 | 0.295124474547312 | 0.4753433418767984 | 731.8825789534 | 906.2333121056502 | -60.62462726086303 | 51.15190070883384 | 910 | entropy | sqrt |
| CAM-0016 | 74 | 0.3730554577637117 | 0.2490520876958518 | 0.4972823920369027 | 262.3485504282263 | 213.69187918367928 | -87.93085003744272 | 83.67072114825568 | 489 | gini | nan |
| CAM-0017 | 11 | 0.9286589009744552 | 0.2389185576312431 | 0.1070458160521445 | 228.4407108553033 | 233.35364591361352 | -21.192374956532063 | 2.144705750722099 | 794 | gini | log2 |
| CAM-0018 | 13 | 0.2403213280299349 | 0.1454359611656469 | 0.9791180111349198 | 136.98025982926998 | 646.9494422074062 | -40.68291953045152 | 10.527146081384602 | 264 | entropy | nan |
| CAM-0019 | 99 | 0.2856341621587696 | 0.3325616586067756 | 0.7343557362388795 | 627.0229194826939 | 606.3648070506616 | -14.209726280085704 | 13.85648467950936 | 513 | gini | log2 |
| CAM-0020 | 27 | 0.2676837810476811 | 0.5449125748596525 | 0.3278068029376643 | 875.3708777209383 | 288.3317044132352 | -77.89927256179432 | 55.612526169862 | 909 | gini | log2 |
| CAM-0021 | 53 | 0.6395986568694544 | 0.3059803223158595 | 0.4558049940995878 | 798.8746035901117 | 52.31042164168498 | -14.041789330570069 | 86.80844591265479 | 558 | entropy | sqrt |
| CAM-0022 | 60 | 0.3644091733533651 | 0.6360367094436612 | 0.8034612547072137 | 867.6679943400783 | 825.7191844364302 | -84.06572446698506 | 25.81915809603864 | 191 | gini | log2 |
| CAM-0023 | 84 | 0.3077604420610202 | 0.6443946722898031 | 0.7366424288090097 | 91.53507797438328 | 606.1505033313621 | -70.90824851949449 | 45.70539205877513 | 315 | gini | log2 |
| CAM-0024 | 71 | 0.4604848929366398 | 0.9813481761021314 | 0.1569392479305228 | 182.88089394376453 | 923.3394522956472 | -90.48941652956287 | 75.19757177339068 | 234 | entropy | nan |
| CAM-0025 | 35 | 0.680739827110035 | 0.7074454863545705 | 0.9087797316334744 | 990.4355835542674 | 580.3327952965132 | -88.9855468065863 | 52.676067387327095 | 667 | entropy | sqrt |
| CAM-0026 | 16 | 0.4224115055461069 | 0.4423843689436527 | 0.5761976514244636 | 244.2205837588592 | 482.5951098580259 | -80.85770490140594 | 79.53619867610762 | 896 | gini | sqrt |
| CAM-0027 | 14 | 0.9950401295530116 | 0.7371741762356608 | 0.5985378624965391 | 585.931911934741 | 428.0963881186934 | -96.05983688191692 | 93.00053575255453 | 874 | gini | sqrt |
| CAM-0028 | 60 | 0.7944430747907847 | 0.1443581066649819 | 0.8906044166183108 | 516.1423412302189 | 325.193772526986 | -77.2040015946551 | 19.62337862322764 | 824 | gini | sqrt |
| CAM-0029 | 21 | 0.3101715073642999 | 0.8706008334526455 | 0.9728644244714748 | 743.5584086841657 | 276.9107653790146 | -78.14912270635166 | 14.699167007225826 | 810 | gini | log2 |
| CAM-0030 | 35 | 0.601313256583943 | 0.7114266746049118 | 0.9071422391820326 | 352.1644183080739 | 919.857071372821 | -7.434984315242389 | 10.375074788331034 | 329 | gini | nan |
| CAM-0031 | 82 | 0.6281175571275495 | 0.2691275231337721 | 0.6905259738850692 | 790.3009953987568 | 619.5232987512902 | -5.684483257638036 | 80.21547059916223 | 586 | gini | nan |
| CAM-0032 | 71 | 0.2249891533764577 | 0.6084060856067435 | 0.4268845694679861 | 184.01029772687812 | 476.4430904852582 | -64.32087417656152 | 6.791382682372594 | 294 | gini | log2 |
| CAM-0033 | 94 | 0.7798845240478768 | 0.1003793486376239 | 0.8545645402646658 | 813.3682768123901 | 281.59984435074136 | -95.47166140168136 | 10.756956098713813 | 907 | entropy | nan |
| CAM-0034 | 70 | 0.382911238142898 | 0.5484645849601852 | 0.1704539271049565 | 606.2089697173184 | 319.3331755688681 | -57.68600218657129 | 5.426450662730014 | 108 | gini | nan |
| CAM-0035 | 64 | 0.97170832288421 | 0.7932439775400973 | 0.6291832006565957 | 955.6611163362262 | 342.17022994408075 | -71.21002305390347 | 99.85873623642328 | 931 | gini | nan |
| CAM-0036 | 34 | 0.1186944153156435 | 0.5740664669040253 | 0.6985226279379863 | 278.4994292139168 | 773.6619901837016 | -46.48436714286126 | 1.9918635033143817 | 798 | entropy | sqrt |
| CAM-0037 | 97 | 0.8749921420687178 | 0.2962857359406272 | 0.2340023285871453 | 321.43337092909576 | 986.1071795817968 | -78.1833835969771 | 26.345390034239657 | 949 | entropy | nan |
| CAM-0038 | 84 | 0.2351569415987549 | 0.6555897858453605 | 0.711312383624066 | 216.95646157563797 | 633.9906236887061 | -46.87202720234331 | 6.127237002764722 | 725 | entropy | log2 |
| CAM-0039 | 65 | 0.7563914599536303 | 0.5123690061195515 | 0.8731840584236166 | 282.82357560754224 | 543.376846578537 | -41.9842721513482 | 10.27977027948683 | 133 | gini | log2 |
| CAM-0040 | 40 | 0.4904427148552368 | 0.8175587732206904 | 0.1503424474683955 | 525.4937942698891 | 708.7853176572105 | -39.54197613637637 | 18.437265302852555 | 770 | entropy | nan |
| CAM-0041 | 87 | 0.145381620593803 | 0.8507814906607828 | 0.1829170626835375 | 150.84075299389835 | 24.810346284198538 | -37.5892917920115 | 26.053324303014342 | 198 | entropy | sqrt |
| CAM-0042 | 56 | 0.2925350112001413 | 0.5318732851651565 | 0.5777533877083783 | 727.0266075748797 | 369.357707548431 | -91.3612442812333 | 42.84147362425472 | 108 | gini | nan |
| CAM-0043 | 43 | 0.6729723826580212 | 0.8444450824124794 | 0.8132990657298977 | 496.4343334921011 | 9.703478458913503 | -61.42897822273095 | 78.50782169823337 | 226 | gini | nan |
| CAM-0044 | 32 | 0.8236425062854004 | 0.2719713367896243 | 0.9918474318514252 | 444.0770180167378 | 577.2684486485081 | -95.08011829711708 | 98.37993793694208 | 353 | entropy | nan |
| CAM-0045 | 28 | 0.5412069803582148 | 0.6594055061330226 | 0.3808593796861865 | 903.0614939149224 | 591.9051793709859 | -37.74873343432833 | 56.85517996031078 | 389 | gini | nan |
| CAM-0046 | 39 | 0.8498143663556713 | 0.7650726552555416 | 0.9151323741334526 | 659.4163091879759 | 965.3959226786574 | -91.14604103034736 | 8.451608962632044 | 325 | entropy | nan |
| CAM-0047 | 97 | 0.1680363262557032 | 0.1381643853948666 | 0.89256575739282 | 665.8748656674042 | 531.8941378175209 | -88.63594963960317 | 8.815649450005365 | 208 | gini | sqrt |
| CAM-0048 | 46 | 0.5294833177005931 | 0.815579366157009 | 0.9715630744427872 | 980.2086703212478 | 958.6472491171372 | -80.06114484009763 | 8.770059908756771 | 620 | gini | nan |
| CAM-0049 | 83 | 0.611322627867953 | 0.1108088816433491 | 0.1852880857628611 | 835.3958130138794 | 283.5373438908974 | -97.1763860906489 | 75.28453466624765 | 757 | entropy | nan |
| CAM-0050 | 42 | 0.1212927259671797 | 0.8011976541778338 | 0.5503591153244557 | 913.289030167092 | 696.8523868838452 | -96.61063883041538 | 39.450864995979146 | 385 | gini | sqrt |
| CAM-0051 | 12 | 0.3500040767162236 | 0.6900461121089209 | 0.5012011261811767 | 813.1233976081771 | 53.22475376053282 | -56.316063406283725 | 13.690045982735253 | 469 | entropy | sqrt |
| CAM-0052 | 52 | 0.1409493455730648 | 0.8619884331936416 | 0.5639742174292457 | 357.1722715957454 | 361.8433478393469 | -54.2474027129046 | 71.9145824385016 | 31 | entropy | log2 |
| CAM-0053 | 90 | 0.1841772199898938 | 0.8139725778797211 | 0.447382955421081 | 299.3444521934667 | 147.7375118762644 | -84.9003663826697 | 35.085207342788536 | 364 | gini | sqrt |
| CAM-0054 | 33 | 0.4646068863362762 | 0.8593954912800145 | 0.7114585670153559 | 710.4647323934038 | 714.4310792108012 | -49.01578481391999 | 59.73608686664705 | 698 | gini | log2 |
| CAM-0055 | 36 | 0.9616626845557228 | 0.8400018432524541 | 0.9416691459146876 | 505.811059198173 | 254.6192530318009 | -31.843233963760355 | 15.456237767873311 | 900 | gini | sqrt |
| CAM-0056 | 96 | 0.798750229450795 | 0.4810673272944494 | 0.2065036541178271 | 971.43237400045 | 739.4368775062189 | -47.06029151258228 | 66.32037016957027 | 746 | gini | log2 |
| CAM-0057 | 81 | 0.2892585674090277 | 0.6389503626139771 | 0.851779919599792 | 342.6939445242187 | 271.15960731979493 | -26.676630965851217 | 4.310706723114711 | 829 | gini | log2 |
| CAM-0058 | 54 | 0.6574603970257968 | 0.8265004471130594 | 0.7999336073676928 | 8.521127840223023 | 45.5681441345932 | -21.130246641984783 | 5.470177213258817 | 364 | gini | sqrt |
| CAM-0059 | 74 | 0.5378439956653048 | 0.9869475042496696 | 0.3651285193245304 | 864.1614041124706 | 449.3063765622549 | -18.527506854906164 | 3.790055819733655 | 540 | gini | sqrt |
| CAM-0060 | 77 | 0.3171924635084269 | 0.5587362259305433 | 0.6189828694855803 | 444.3593100990363 | 584.077515948782 | -91.91815411443731 | 59.395678726577465 | 326 | entropy | log2 |
| CAM-0061 | 79 | 0.4924652985032052 | 0.9257420304107514 | 0.9199932490677344 | 689.3519474760104 | 760.8839808734134 | -68.96395866566351 | 36.14092445330257 | 211 | gini | sqrt |
| CAM-0062 | 18 | 0.2680672743071928 | 0.5059400724440287 | 0.2670000577099252 | 262.395334302013 | 677.3007064702904 | -21.655083065707743 | 94.78424461315316 | 210 | gini | log2 |
| CAM-0063 | 32 | 0.9565427004944148 | 0.8964504459785037 | 0.8874569317615684 | 852.9758925853885 | 787.0643615791859 | -99.28361330838632 | 39.831708643943166 | 626 | gini | sqrt |
| CAM-0064 | 99 | 0.6397131537588686 | 0.5942716367537121 | 0.7649336578928428 | 723.1542336452517 | 874.7822163510604 | -32.066470155396615 | 83.10893757393053 | 811 | gini | sqrt |
| CAM-0065 | 76 | 0.3352443070734479 | 0.7283313033203778 | 0.1164649921914863 | 127.61031350311646 | 617.8448972349908 | -11.22934620586264 | 12.275355247919414 | 834 | entropy | log2 |
| CAM-0066 | 77 | 0.9703978660901664 | 0.2420331049653739 | 0.7650556728125627 | 449.7973159836188 | 584.7232743712685 | -82.17131969352587 | 56.60054703003233 | 317 | gini | sqrt |
| CAM-0067 | 15 | 0.9407535561572956 | 0.5434805258756572 | 0.8283715012748359 | 160.7214065253707 | 129.86073158478416 | -20.763320351753663 | 78.8722920394653 | 44 | entropy | nan |
| CAM-0068 | 33 | 0.7713021932291373 | 0.3028411105433936 | 0.5403098786374472 | 932.6238263657488 | 569.7219891272255 | -46.25152608750874 | 6.300917730868159 | 845 | gini | nan |
| CAM-0069 | 66 | 0.3623646039347201 | 0.3796622091242128 | 0.2949023768789816 | 262.480449673602 | 459.595650334326 | -58.30873241589701 | 59.04767437888067 | 803 | gini | sqrt |
| CAM-0070 | 75 | 0.7600363871904736 | 0.7606900458559753 | 0.465025032999755 | 12.180719816030484 | 770.3176510997681 | -39.37059144800538 | 81.69883325985674 | 827 | gini | sqrt |
| CAM-0071 | 12 | 0.671803696618523 | 0.2837584339987096 | 0.9783586581153924 | 57.70123120058338 | 484.03792814101655 | -69.64180537579637 | 87.44533575409359 | 827 | gini | nan |
| CAM-0072 | 88 | 0.6855548769205401 | 0.9378448057187536 | 0.2206691452230947 | 369.091221345641 | 330.78086163289123 | -92.39159294297671 | 37.993249112150885 | 577 | entropy | sqrt |
| CAM-0073 | 55 | 0.7664386515809068 | 0.5029638671801483 | 0.1936329759335104 | 217.7992639227084 | 164.8534736914329 | -34.30385273999896 | 12.987720082393167 | 785 | gini | log2 |
| CAM-0074 | 85 | 0.5635736425736828 | 0.3240090387987208 | 0.2452783740456536 | 10.455735967608693 | 402.2396796057117 | -41.95595793515348 | 95.64008488410772 | 818 | entropy | log2 |
| CAM-0075 | 58 | 0.3852007616670898 | 0.111658286299866 | 0.5343652552965736 | 523.5618618192791 | 925.8427276488288 | -57.82390703245986 | 69.29976357400288 | 731 | gini | log2 |
| CAM-0076 | 71 | 0.3272583162424348 | 0.6183162629645759 | 0.9535910224774824 | 709.789507992648 | 973.733117492896 | -47.27812461840545 | 53.630190747775615 | 680 | entropy | log2 |
| CAM-0077 | 23 | 0.9661083267356264 | 0.8744909324099785 | 0.2301204230731396 | 667.528819566793 | 805.8028687800253 | -14.08247875792216 | 95.52038984566065 | 323 | entropy | log2 |
| CAM-0078 | 84 | 0.6833916677709567 | 0.5947624310679297 | 0.6629358012373552 | 81.37347458445399 | 413.5975633413504 | -22.41455771569981 | 97.90126612035932 | 852 | gini | sqrt |
| CAM-0079 | 25 | 0.3652906638175212 | 0.2784264972757573 | 0.7276020699107603 | 353.6863710593746 | 756.4088106013974 | -20.1926938139883 | 19.827035566795804 | 29 | gini | sqrt |
| CAM-0080 | 47 | 0.3626264564688275 | 0.4022608821064798 | 0.2855056545053528 | 448.34622889599166 | 955.5012748108225 | -32.15204792414458 | 79.58873497873361 | 650 | entropy | nan |
| CAM-0081 | 86 | 0.5350213602129938 | 0.1091516565590545 | 0.5070156538732287 | 348.0255518446129 | 147.80544227498785 | -93.48429262717048 | 95.41836320399034 | 491 | entropy | nan |
| CAM-0082 | 41 | 0.9106169847616404 | 0.2745414820462811 | 0.1979870179967587 | 256.9795593602672 | 748.3926532591477 | -19.8926631736836 | 58.63452581473613 | 964 | entropy | log2 |
| CAM-0083 | 58 | 0.4468303410631485 | 0.3621262302269556 | 0.4618546503463353 | 937.0673891006202 | 572.279907154208 | -64.77913114084805 | 67.46133250727944 | 487 | gini | sqrt |
| CAM-0084 | 42 | 0.7483737648801765 | 0.7721673376947008 | 0.7543283891431015 | 435.3318829360839 | 51.131706773487885 | -22.043249827877816 | 72.00012961109935 | 449 | gini | log2 |
| CAM-0085 | 55 | 0.7953576885663837 | 0.5840299417155003 | 0.945621224503832 | 344.325691760746 | 661.4486042738081 | -30.13313256615505 | 89.18997939145262 | 973 | gini | nan |
| CAM-0086 | 79 | 0.1846450703918878 | 0.7927894204562191 | 0.9894853779436652 | 91.35220072725716 | 378.3734430649525 | -34.52648868155188 | 68.88222105334548 | 595 | entropy | sqrt |
| CAM-0087 | 25 | 0.4303857747552825 | 0.296979394599123 | 0.6245896699332103 | 13.970019276108836 | 217.9679499605788 | -7.36152237801241 | 6.634212416829178 | 589 | gini | log2 |
| CAM-0088 | 82 | 0.7984759839018059 | 0.9541273158928718 | 0.473629128268925 | 398.40925109603273 | 520.3333309751845 | -48.89690006932226 | 97.24098103010476 | 809 | entropy | nan |
| CAM-0089 | 82 | 0.5513499266511107 | 0.1578727500216335 | 0.7959764144064128 | 397.3380377640704 | 751.5448902591062 | -75.0215004612378 | 46.07696499185637 | 876 | gini | sqrt |
| CAM-0090 | 77 | 0.9161331616586258 | 0.8970933776117275 | 0.5424651101171473 | 287.0426028413488 | 7.230923514912613 | -96.4633691008624 | 75.92199082374292 | 557 | entropy | log2 |
| CAM-0091 | 15 | 0.1977423886820395 | 0.4934295322521507 | 0.8362004410096374 | 844.4516034564111 | 924.5394602371346 | -82.29373182828255 | 56.798671822243925 | 341 | gini | sqrt |
| CAM-0092 | 59 | 0.8763698557096472 | 0.9708196070059494 | 0.4804297135390465 | 275.55127733183355 | 205.3471389501621 | -66.94488791716724 | 37.1190207416365 | 735 | gini | sqrt |
| CAM-0093 | 43 | 0.4134119473580694 | 0.8276773368650092 | 0.5210271509791444 | 996.865141732358 | 261.79030768762766 | -14.54483367509316 | 53.73181267452942 | 703 | entropy | log2 |
| CAM-0094 | 30 | 0.8612931970802248 | 0.2993338898908794 | 0.3520121461900518 | 189.63188761928612 | 296.10382109011124 | -2.906401305809112 | 88.72103042554693 | 961 | entropy | sqrt |
| CAM-0095 | 55 | 0.8097826237578515 | 0.670237995074037 | 0.3509145240793258 | 132.0250741855525 | 570.6495670815381 | -57.83461407187299 | 34.97233945348424 | 507 | entropy | nan |
| CAM-0096 | 39 | 0.3937526922840714 | 0.313567996353691 | 0.5629901156038454 | 655.0588604807202 | 741.2505617709053 | -59.43240680778251 | 33.7434136346922 | 10 | entropy | sqrt |
| CAM-0097 | 86 | 0.6410118659516174 | 0.8539326278951227 | 0.3881173961720816 | 262.41338064841995 | 883.483709415498 | -2.519437123324323 | 57.05479656195759 | 548 | entropy | sqrt |
| CAM-0098 | 39 | 0.6941583873275203 | 0.4074466599402798 | 0.4854534924150574 | 105.89897354505705 | 824.2746434312452 | -20.115775703866376 | 55.270793563110935 | 119 | gini | log2 |
| CAM-0099 | 57 | 0.2474843097542694 | 0.2616737521828252 | 0.4954957741220022 | 655.2546945771522 | 451.64353414354406 | -52.37947069759124 | 1.451651053502519 | 223 | gini | sqrt |

**T#2.2 Camel Algorithm Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Time Taken(s)** | **Total Power(J)** | **CPU(J)** | **Monitor(J)** | **Disk(J)** | **Base(J)** |
| CAM-0000 | 146 | 533.0999999999997 | 317.5999999999999 | 0.0 | 0.0 | 219.0 |
| CAM-0001 | 333 | 1172.2000000000007 | 683.800000000001 | 0.0 | 0.4 | 499.5 |
| CAM-0002 | 94 | 323.20000000000016 | 186.5 | 0.0 | 0.0 | 141.0 |
| CAM-0003 | 244 | 837.1000000000006 | 481.8 | 0.0 | 0.0 | 366.0 |
| CAM-0004 | 24 | 81.30000000000001 | 46.6 | 0.0 | 0.0 | 36.0 |
| CAM-0005 | 75 | 258.9999999999999 | 150.5 | 0.0 | 0.0 | 112.5 |
| CAM-0006 | 61 | 210.9 | 121.7 | 0.0 | 0.0 | 91.5 |
| CAM-0007 | 87 | 297.39999999999986 | 170.29999999999995 | 0.0 | 0.0 | 130.5 |
| CAM-0008 | 16 | 55.00000000000001 | 31.8 | 0.0 | 0.0 | 24.0 |
| CAM-0009 | 102 | 348.1000000000001 | 199.69999999999985 | 0.0 | 0.1 | 153.0 |
| CAM-0010 | 199 | 677.2000000000005 | 388.6000000000003 | 0.0 | 0.0 | 298.5 |
| CAM-0011 | 12 | 41.5 | 24.200000000000003 | 0.0 | 0.0 | 18.0 |
| CAM-0012 | 85 | 287.59999999999985 | 164.19999999999996 | 0.0 | 0.0 | 127.5 |
| CAM-0013 | 42 | 143.3 | 82.50000000000003 | 0.0 | 0.0 | 63.0 |
| CAM-0014 | 56 | 192.19999999999996 | 110.09999999999998 | 0.0 | 0.0 | 84.0 |
| CAM-0015 | 145 | 496.80000000000007 | 286.1 | 0.0 | 0.0 | 217.5 |
| CAM-0016 | 113 | 388.1999999999999 | 223.9 | 0.0 | 0.0 | 169.5 |
| CAM-0017 | 84 | 286.79999999999995 | 164.2 | 0.0 | 0.0 | 126.0 |
| CAM-0018 | 97 | 331.89999999999986 | 190.1 | 0.0 | 0.0 | 145.5 |
| CAM-0019 | 54 | 185.09999999999997 | 106.19999999999996 | 0.0 | 0.0 | 81.0 |
| CAM-0020 | 94 | 316.70000000000005 | 179.79999999999995 | 0.0 | 0.0 | 141.0 |
| CAM-0021 | 89 | 301.1 | 171.29999999999995 | 0.0 | 0.0 | 133.5 |
| CAM-0022 | 20 | 69.00000000000001 | 39.50000000000001 | 0.0 | 0.0 | 30.0 |
| CAM-0023 | 34 | 118.7 | 68.9 | 0.0 | 0.0 | 51.0 |
| CAM-0024 | 86 | 290.9999999999999 | 165.2999999999999 | 0.0 | 0.0 | 129.0 |
| CAM-0025 | 109 | 391.6000000000001 | 231.69999999999985 | 0.0 | 0.5 | 163.5 |
| CAM-0026 | 92 | 313.99999999999994 | 180.29999999999995 | 0.0 | 0.0 | 138.0 |
| CAM-0027 | 93 | 319.19999999999993 | 184.1 | 0.0 | 0.0 | 139.5 |
| CAM-0028 | 85 | 290.70000000000005 | 167.39999999999992 | 0.0 | 0.0 | 127.5 |
| CAM-0029 | 84 | 282.7 | 160.49999999999991 | 0.0 | 0.0 | 126.0 |
| CAM-0030 | 74 | 251.5 | 143.89999999999995 | 0.0 | 0.0 | 111.0 |
| CAM-0031 | 137 | 474.0000000000002 | 272.7999999999998 | 0.0 | 0.0 | 205.5 |
| CAM-0032 | 30 | 102.4 | 58.7 | 0.0 | 0.0 | 45.0 |
| CAM-0033 | 331 | 1123.8000000000006 | 640.6000000000007 | 0.0 | 0.0 | 496.5 |
| CAM-0034 | 24 | 81.8 | 46.8 | 0.0 | 0.0 | 36.0 |
| CAM-0035 | 215 | 742.9000000000002 | 429.7000000000001 | 0.0 | 0.2 | 322.5 |
| CAM-0036 | 126 | 436.0999999999999 | 253.09999999999985 | 0.0 | 0.1 | 189.0 |
| CAM-0037 | 350 | 1210.9999999999998 | 701.7 | 0.0 | 0.1 | 525.0 |
| CAM-0038 | 115 | 397.3999999999999 | 227.19999999999987 | 0.0 | 0.0 | 172.5 |
| CAM-0039 | 15 | 50.8 | 28.5 | 0.0 | 0.0 | 22.5 |
| CAM-0040 | 280 | 965.0000000000016 | 550.2000000000007 | 0.0 | 0.3 | 420.0 |
| CAM-0041 | 32 | 110.60000000000002 | 63.10000000000002 | 0.0 | 0.0 | 48.0 |
| CAM-0042 | 24 | 83.6 | 47.9 | 0.0 | 0.0 | 36.0 |
| CAM-0043 | 52 | 176.99999999999997 | 100.2 | 0.0 | 0.0 | 78.0 |
| CAM-0044 | 127 | 423.19999999999993 | 237.30000000000007 | 0.0 | 0.1 | 190.5 |
| CAM-0045 | 89 | 292.4000000000001 | 163.29999999999995 | 0.0 | 0.0 | 133.5 |
| CAM-0046 | 117 | 379.6999999999999 | 209.39999999999995 | 0.0 | 0.0 | 175.5 |
| CAM-0047 | 22 | 72.7 | 40.7 | 0.0 | 0.0 | 33.0 |
| CAM-0048 | 137 | 447.5999999999999 | 248.00000000000009 | 0.0 | 0.0 | 205.5 |
| CAM-0049 | 273 | 893.1999999999986 | 495.7 | 0.0 | 0.0 | 409.5 |
| CAM-0050 | 40 | 130.30000000000004 | 71.99999999999999 | 0.0 | 0.0 | 60.0 |
| CAM-0051 | 74 | 244.6 | 137.59999999999997 | 0.0 | 0.0 | 111.0 |
| CAM-0052 | 5 | 16.1 | 9.0 | 0.0 | 0.0 | 7.5 |
| CAM-0053 | 38 | 123.60000000000004 | 68.2 | 0.0 | 0.0 | 57.0 |
| CAM-0054 | 71 | 231.00000000000009 | 127.20000000000007 | 0.0 | 0.0 | 106.5 |
| CAM-0055 | 93 | 308.5 | 173.50000000000006 | 0.0 | 0.0 | 139.5 |
| CAM-0056 | 75 | 243.50000000000009 | 134.39999999999998 | 0.0 | 0.0 | 112.5 |
| CAM-0057 | 85 | 277.4000000000001 | 153.4 | 0.0 | 0.0 | 127.5 |
| CAM-0058 | 38 | 123.40000000000002 | 67.8 | 0.0 | 0.0 | 57.0 |
| CAM-0059 | 57 | 198.10000000000008 | 115.40000000000003 | 0.0 | 0.1 | 85.5 |
| CAM-0060 | 53 | 183.1 | 105.69999999999996 | 0.0 | 0.0 | 79.5 |
| CAM-0061 | 23 | 76.79999999999998 | 42.9 | 0.0 | 0.0 | 34.5 |
| CAM-0062 | 20 | 65.6 | 36.3 | 0.0 | 0.0 | 30.0 |
| CAM-0063 | 66 | 217.8 | 121.39999999999998 | 0.0 | 0.0 | 99.0 |
| CAM-0064 | 83 | 271.6000000000001 | 150.79999999999995 | 0.0 | 0.0 | 124.5 |
| CAM-0065 | 130 | 426.5 | 237.8 | 0.0 | 0.0 | 195.0 |
| CAM-0066 | 34 | 112.60000000000002 | 63.19999999999999 | 0.0 | 0.0 | 51.0 |
| CAM-0067 | 15 | 48.6 | 26.599999999999994 | 0.0 | 0.0 | 22.5 |
| CAM-0068 | 193 | 656.5000000000005 | 374.6000000000002 | 0.0 | 0.0 | 289.5 |
| CAM-0069 | 83 | 283.49999999999994 | 160.59999999999994 | 0.0 | 0.0 | 124.5 |
| CAM-0070 | 85 | 294.79999999999995 | 168.49999999999997 | 0.0 | 0.0 | 127.5 |
| CAM-0071 | 186 | 640.2000000000005 | 365.1999999999999 | 0.0 | 0.0 | 279.0 |
| CAM-0072 | 89 | 305.59999999999985 | 174.49999999999997 | 0.0 | 0.0 | 133.5 |
| CAM-0073 | 82 | 281.69999999999993 | 160.7999999999999 | 0.0 | 0.0 | 123.0 |
| CAM-0074 | 127 | 417.6999999999997 | 233.0999999999999 | 0.0 | 0.0 | 190.5 |
| CAM-0075 | 76 | 250.10000000000016 | 139.10000000000005 | 0.0 | 0.0 | 114.0 |
| CAM-0076 | 106 | 348.70000000000016 | 194.19999999999996 | 0.0 | 0.0 | 159.0 |
| CAM-0077 | 51 | 167.3 | 93.1 | 0.0 | 0.0 | 76.5 |
| CAM-0078 | 86 | 283.70000000000005 | 159.29999999999998 | 0.0 | 0.0 | 129.0 |
| CAM-0079 | 3 | 8.9 | 4.5 | 0.0 | 0.0 | 4.5 |
| CAM-0080 | 236 | 777.7999999999996 | 434.1999999999998 | 0.0 | 0.0 | 354.0 |
| CAM-0081 | 175 | 571.4999999999999 | 316.5 | 0.0 | 0.0 | 262.5 |
| CAM-0082 | 150 | 495.2999999999996 | 275.7000000000001 | 0.0 | 0.0 | 225.0 |
| CAM-0083 | 52 | 169.90000000000006 | 94.9 | 0.0 | 0.0 | 78.0 |
| CAM-0084 | 46 | 151.3 | 84.7 | 0.0 | 0.0 | 69.0 |
| CAM-0085 | 220 | 727.3999999999994 | 408.7999999999999 | 0.0 | 0.2 | 330.0 |
| CAM-0086 | 93 | 303.4 | 168.10000000000005 | 0.0 | 0.0 | 139.5 |
| CAM-0087 | 60 | 197.2 | 109.2 | 0.0 | 0.0 | 90.0 |
| CAM-0088 | 290 | 951.299999999999 | 529.7000000000002 | 0.0 | 0.0 | 435.0 |
| CAM-0089 | 89 | 293.6 | 163.60000000000002 | 0.0 | 0.0 | 133.5 |
| CAM-0090 | 89 | 292.80000000000007 | 163.4 | 0.0 | 0.0 | 133.5 |
| CAM-0091 | 34 | 111.10000000000002 | 61.9 | 0.0 | 0.0 | 51.0 |
| CAM-0092 | 76 | 250.1 | 139.6 | 0.0 | 0.0 | 114.0 |
| CAM-0093 | 109 | 355.6 | 196.8 | 0.0 | 0.0 | 163.5 |
| CAM-0094 | 151 | 495.6999999999997 | 276.4 | 0.0 | 0.0 | 226.5 |
| CAM-0095 | 186 | 627.7999999999996 | 356.9999999999999 | 0.0 | 0.2 | 279.0 |
| CAM-0096 | 2 | 7.300000000000001 | 4.300000000000001 | 0.0 | 0.0 | 3.0 |
| CAM-0097 | 86 | 283.90000000000003 | 159.1 | 0.0 | 0.0 | 129.0 |
| CAM-0098 | 11 | 36.1 | 20.3 | 0.0 | 0.0 | 16.5 |
| CAM-0099 | 23 | 73.3 | 39.6 | 0.0 | 0.0 | 34.5 |

**T#2.3 Camel Algorithm Energy Distribution**

**Fig#2 Camel Algorithm Iterations**

**Cuckoo Search**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Accuracy** | **Time Taken (s)** | **Energy Used (J)** | **Equivalent CO2 Emission (mg)** |
| CUC-0000 | 89.7 | 25 | 95.4 | 22.525 |
| CUC-0001 | 89.45 | 180 | 630.1 | 148.7736111111111 |
| CUC-0002 | 89.4 | 15 | 54.6 | 12.891666666666666 |
| CUC-0003 | 89.64999999999999 | 106 | 478.4999999999997 | 112.9791666666666 |
| CUC-0004 | 89.85 | 104 | 375.6 | 88.68333333333334 |
| CUC-0005 | 89.60000000000001 | 40 | 147.29999999999998 | 34.77916666666666 |
| CUC-0006 | 89.7 | 96 | 341.9999999999999 | 80.74999999999997 |
| CUC-0007 | 89.5 | 220 | 786.3999999999995 | 185.6777777777777 |
| CUC-0008 | 89.8 | 95 | 339.39999999999986 | 80.13611111111108 |
| CUC-0009 | 89.9 | 13 | 47.2 | 11.144444444444444 |
| CUC-0010 | 89.60000000000001 | 35 | 128.09999999999997 | 30.245833333333323 |
| CUC-0011 | 89.7 | 28 | 92.50000000000004 | 21.840277777777786 |
| CUC-0012 | 89.75 | 92 | 309.3 | 73.02916666666667 |
| CUC-0013 | 89.64999999999999 | 83 | 304.90000000000003 | 71.99027777777778 |
| CUC-0014 | 89.60000000000001 | 62 | 205.79999999999995 | 48.591666666666654 |
| CUC-0015 | 89.7 | 261 | 866.3000000000003 | 204.5430555555556 |
| CUC-0016 | 89.60000000000001 | 76 | 253.2 | 59.78333333333333 |
| CUC-0017 | 89.64999999999999 | 147 | 486.50000000000006 | 114.86805555555556 |
| CUC-0018 | 89.55 | 168 | 561.7000000000003 | 132.62361111111116 |
| CUC-0019 | 89.55 | 175 | 583.1000000000004 | 137.67638888888897 |
| CUC-0020 | 89.60000000000001 | 169 | 563.3000000000001 | 133.0013888888889 |
| CUC-0021 | 89.75 | 32 | 108.10000000000002 | 25.52361111111112 |
| CUC-0022 | 89.85 | 265 | 882.0000000000009 | 208.2500000000002 |
| CUC-0023 | 89.9 | 135 | 451.1000000000002 | 106.50972222222228 |
| CUC-0024 | 89.9 | 53 | 177.10000000000002 | 41.81527777777778 |
| CUC-0025 | 89.64999999999999 | 9 | 30.800000000000004 | 7.272222222222223 |
| CUC-0026 | 89.8 | 60 | 200.2 | 47.26944444444443 |
| CUC-0027 | 89.85 | 92 | 309.39999999999986 | 73.05277777777775 |
| CUC-0028 | 89.75 | 123 | 414.8000000000001 | 97.93888888888893 |
| CUC-0029 | 89.8 | 130 | 435.1 | 102.73194444444444 |
| CUC-0030 | 89.7 | 97 | 323.6 | 76.40555555555555 |
| CUC-0031 | 89.75 | 93 | 307.79999999999984 | 72.67499999999995 |
| CUC-0032 | 89.7 | 68 | 223.00000000000003 | 52.652777777777786 |
| CUC-0033 | 89.75 | 29 | 96.3 | 22.7375 |
| CUC-0034 | 89.85 | 127 | 419.8999999999999 | 99.14305555555552 |
| CUC-0035 | 89.60000000000001 | 186 | 618.6000000000004 | 146.05833333333342 |
| CUC-0036 | 89.64999999999999 | 43 | 142.7 | 33.69305555555555 |
| CUC-0037 | 89.64999999999999 | 80 | 265.69999999999993 | 62.7347222222222 |
| CUC-0038 | 89.95 | 130 | 432.7000000000001 | 102.1652777777778 |
| CUC-0039 | 89.60000000000001 | 55 | 182.2 | 43.01944444444443 |
| CUC-0040 | 89.75 | 221 | 730.0000000000005 | 172.36111111111123 |
| CUC-0041 | 89.8 | 51 | 170.5 | 40.25694444444444 |
| CUC-0042 | 89.85 | 247 | 820.1000000000012 | 193.63472222222248 |
| CUC-0043 | 89.64999999999999 | 74 | 245.3 | 57.91805555555555 |
| CUC-0044 | 89.8 | 137 | 485.00000000000006 | 114.5138888888889 |
| CUC-0045 | 89.60000000000001 | 126 | 419.20000000000016 | 98.97777777777782 |
| CUC-0046 | 89.7 | 76 | 255.6 | 60.34999999999999 |
| CUC-0047 | 89.9 | 132 | 443.8 | 104.7861111111111 |
| CUC-0048 | 89.8 | 114 | 382.00000000000006 | 90.19444444444446 |
| CUC-0049 | 89.8 | 132 | 438.3 | 103.48749999999998 |
| CUC-0050 | 89.7 | 87 | 290.69999999999993 | 68.63749999999999 |
| CUC-0051 | 89.60000000000001 | 34 | 114.2 | 26.963888888888885 |
| CUC-0052 | 89.5 | 21 | 71.1 | 16.787499999999998 |
| CUC-0053 | 89.7 | 61 | 204.6 | 48.30833333333334 |
| CUC-0054 | 89.60000000000001 | 163 | 546.5000000000001 | 129.03472222222226 |
| CUC-0055 | 89.64999999999999 | 112 | 376.2 | 88.82499999999999 |
| CUC-0056 | 89.9 | 109 | 363.6 | 85.85000000000001 |
| CUC-0057 | 89.55 | 145 | 483.29999999999984 | 114.11249999999995 |
| CUC-0058 | 89.75 | 307 | 1022.900000000002 | 241.51805555555603 |
| CUC-0059 | 89.64999999999999 | 79 | 267.6999999999998 | 63.2069444444444 |
| CUC-0060 | 89.5 | 10 | 33.7 | 7.956944444444445 |
| CUC-0061 | 89.64999999999999 | 308 | 1025.700000000001 | 242.17916666666687 |
| CUC-0062 | 89.45 | 168 | 559.8000000000004 | 132.1750000000001 |
| CUC-0063 | 89.8 | 96 | 324.50000000000017 | 76.6180555555556 |
| CUC-0064 | 89.64999999999999 | 86 | 286.90000000000003 | 67.74027777777778 |
| CUC-0065 | 89.60000000000001 | 61 | 204.6 | 48.30833333333332 |
| CUC-0066 | 89.64999999999999 | 53 | 177.39999999999998 | 41.88611111111111 |
| CUC-0067 | 89.60000000000001 | 87 | 290.50000000000006 | 68.59027777777779 |
| CUC-0068 | 89.75 | 203 | 682.2000000000005 | 161.0750000000001 |
| CUC-0069 | 89.7 | 312 | 1046.5000000000014 | 247.09027777777808 |
| CUC-0070 | 89.8 | 95 | 320.99999999999994 | 75.79166666666666 |
| CUC-0071 | 89.60000000000001 | 136 | 456.0 | 107.66666666666666 |
| CUC-0072 | 89.64999999999999 | 36 | 119.0 | 28.09722222222222 |
| CUC-0073 | 89.64999999999999 | 179 | 638.1000000000006 | 150.66250000000014 |
| CUC-0074 | 89.9 | 97 | 324.99999999999994 | 76.7361111111111 |
| CUC-0075 | 89.95 | 10 | 34.5 | 8.145833333333334 |
| CUC-0076 | 89.85 | 52 | 176.79999999999987 | 41.74444444444441 |
| CUC-0077 | 89.75 | 102 | 340.9 | 80.49027777777778 |
| CUC-0078 | 89.5 | 191 | 633.7000000000007 | 149.62361111111127 |
| CUC-0079 | 89.60000000000001 | 71 | 231.1000000000001 | 54.5652777777778 |
| CUC-0080 | 89.8 | 301 | 955.7999999999984 | 225.6749999999996 |
| CUC-0081 | 89.8 | 191 | 608.3999999999993 | 143.64999999999984 |
| CUC-0082 | 89.8 | 11 | 35.50000000000001 | 8.381944444444446 |
| CUC-0083 | 89.75 | 13 | 41.49999999999999 | 9.798611111111107 |
| CUC-0084 | 89.64999999999999 | 23 | 75.19999999999999 | 17.755555555555553 |
| CUC-0085 | 89.7 | 253 | 802.0999999999989 | 189.384722222222 |
| CUC-0086 | 89.8 | 193 | 613.7999999999992 | 144.92499999999978 |
| CUC-0087 | 89.60000000000001 | 137 | 435.9000000000001 | 102.92083333333336 |
| CUC-0088 | 89.7 | 33 | 106.20000000000002 | 25.075000000000003 |
| CUC-0089 | 89.60000000000001 | 67 | 213.60000000000008 | 50.43333333333335 |
| CUC-0090 | 89.75 | 138 | 442.3999999999999 | 104.45555555555552 |
| CUC-0091 | 89.8 | 134 | 428.29999999999984 | 101.12638888888884 |
| CUC-0092 | 89.85 | 52 | 165.9 | 39.17083333333333 |
| CUC-0093 | 89.45 | 33 | 107.20000000000002 | 25.31111111111112 |
| CUC-0094 | 90.0 | 135 | 452.8000000000002 | 106.91111111111115 |
| CUC-0095 | 89.75 | 33 | 110.4 | 26.066666666666663 |
| CUC-0096 | 89.8 | 296 | 989.1000000000012 | 233.53750000000028 |
| CUC-0097 | 89.7 | 9 | 29.9 | 7.059722222222222 |
| CUC-0098 | 89.7 | 89 | 297.69999999999993 | 70.29027777777776 |
| CUC-0099 | 89.85 | 92 | 300.5 | 70.95138888888889 |

**T#3.1 Cuckoo Search Main Result**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ID** | **population\_size** | **pa** | **n\_estimator** | **criterion** | **max\_feature** |
| CUC-0000 | 38 | 0.4953294691693303 | 73 | entropy | nan |
| CUC-0001 | 45 | 0.2596529552928612 | 871 | gini | nan |
| CUC-0002 | 39 | 0.3536874177475291 | 72 | gini | nan |
| CUC-0003 | 67 | 0.313573313447042 | 286 | entropy | nan |
| CUC-0004 | 78 | 0.126941576510788 | 668 | entropy | sqrt |
| CUC-0005 | 59 | 0.4053100917601321 | 183 | gini | nan |
| CUC-0006 | 32 | 0.7689723972750362 | 631 | entropy | sqrt |
| CUC-0007 | 52 | 0.7041344569313142 | 976 | gini | nan |
| CUC-0008 | 74 | 0.2322107640359458 | 600 | entropy | sqrt |
| CUC-0009 | 13 | 0.5922550040297156 | 93 | entropy | log2 |
| CUC-0010 | 20 | 0.1602724480551574 | 323 | gini | log2 |
| CUC-0011 | 51 | 0.2441710105444943 | 196 | entropy | log2 |
| CUC-0012 | 98 | 0.3908517219941403 | 610 | entropy | log2 |
| CUC-0013 | 31 | 0.7033589993373778 | 834 | gini | log2 |
| CUC-0014 | 63 | 0.8083691807251765 | 628 | gini | sqrt |
| CUC-0015 | 61 | 0.9157731409121947 | 761 | entropy | nan |
| CUC-0016 | 57 | 0.1665939695561264 | 768 | gini | log2 |
| CUC-0017 | 94 | 0.2642561544111848 | 688 | gini | nan |
| CUC-0018 | 85 | 0.389992546650089 | 774 | gini | nan |
| CUC-0019 | 61 | 0.2583728260993092 | 808 | gini | nan |
| CUC-0020 | 37 | 0.5951622777011842 | 773 | gini | nan |
| CUC-0021 | 73 | 0.4860867279883155 | 193 | entropy | log2 |
| CUC-0022 | 62 | 0.7617310527772861 | 761 | entropy | nan |
| CUC-0023 | 86 | 0.4923946012519314 | 885 | entropy | log2 |
| CUC-0024 | 87 | 0.2538920283948578 | 344 | entropy | sqrt |
| CUC-0025 | 13 | 0.6237772014168295 | 92 | gini | sqrt |
| CUC-0026 | 64 | 0.2208800880773575 | 394 | entropy | sqrt |
| CUC-0027 | 86 | 0.8225129316496436 | 885 | gini | sqrt |
| CUC-0028 | 98 | 0.6753288521333073 | 795 | entropy | sqrt |
| CUC-0029 | 86 | 0.5331116556528197 | 885 | entropy | log2 |
| CUC-0030 | 77 | 0.1796288305381427 | 668 | entropy | log2 |
| CUC-0031 | 47 | 0.7922334344546738 | 277 | entropy | nan |
| CUC-0032 | 18 | 0.2301616994295371 | 335 | gini | nan |
| CUC-0033 | 73 | 0.1758182450197856 | 193 | entropy | log2 |
| CUC-0034 | 86 | 0.7055199716507887 | 885 | entropy | sqrt |
| CUC-0035 | 86 | 0.3321115259023713 | 884 | gini | nan |
| CUC-0036 | 82 | 0.7532204675936485 | 459 | gini | log2 |
| CUC-0037 | 16 | 0.279827570694344 | 377 | gini | nan |
| CUC-0038 | 87 | 0.9628696395861592 | 885 | entropy | sqrt |
| CUC-0039 | 24 | 0.9163187143901852 | 577 | gini | sqrt |
| CUC-0040 | 55 | 0.5576437198830669 | 652 | entropy | nan |
| CUC-0041 | 87 | 0.4382957479236753 | 344 | entropy | sqrt |
| CUC-0042 | 77 | 0.5135023731377653 | 724 | entropy | nan |
| CUC-0043 | 51 | 0.2734633096253558 | 778 | gini | sqrt |
| CUC-0044 | 86 | 0.3653419891392205 | 885 | entropy | log2 |
| CUC-0045 | 74 | 0.1208542684504107 | 601 | gini | nan |
| CUC-0046 | 76 | 0.4704737233375671 | 768 | gini | sqrt |
| CUC-0047 | 86 | 0.5574309396650206 | 886 | entropy | log2 |
| CUC-0048 | 61 | 0.4141614450067828 | 761 | entropy | sqrt |
| CUC-0049 | 86 | 0.95495072645604 | 885 | entropy | sqrt |
| CUC-0050 | 87 | 0.8119089244296613 | 885 | gini | log2 |
| CUC-0051 | 87 | 0.2601937903688708 | 345 | gini | sqrt |
| CUC-0052 | 13 | 0.2438659608927528 | 94 | gini | nan |
| CUC-0053 | 99 | 0.9492450378241022 | 610 | gini | log2 |
| CUC-0054 | 62 | 0.1223361488149147 | 761 | gini | nan |
| CUC-0055 | 30 | 0.8266680382667214 | 516 | gini | nan |
| CUC-0056 | 77 | 0.4000254618945017 | 724 | entropy | log2 |
| CUC-0057 | 49 | 0.7470490074877814 | 673 | gini | nan |
| CUC-0058 | 86 | 0.2808735174813965 | 886 | entropy | nan |
| CUC-0059 | 49 | 0.4737898274773177 | 795 | gini | sqrt |
| CUC-0060 | 14 | 0.4620846400689405 | 92 | gini | log2 |
| CUC-0061 | 86 | 0.7693472168413331 | 886 | entropy | nan |
| CUC-0062 | 89 | 0.6340634303925566 | 778 | gini | nan |
| CUC-0063 | 18 | 0.9102323867447084 | 615 | entropy | log2 |
| CUC-0064 | 34 | 0.9755381996730144 | 881 | gini | log2 |
| CUC-0065 | 18 | 0.6756915073976263 | 615 | gini | sqrt |
| CUC-0066 | 48 | 0.1473849493265804 | 525 | gini | log2 |
| CUC-0067 | 87 | 0.9052092154851824 | 885 | gini | log2 |
| CUC-0068 | 24 | 0.3621695809594409 | 572 | entropy | nan |
| CUC-0069 | 86 | 0.9041003070681856 | 885 | entropy | nan |
| CUC-0070 | 51 | 0.6163577052494227 | 951 | gini | log2 |
| CUC-0071 | 27 | 0.6342721988202626 | 616 | gini | nan |
| CUC-0072 | 85 | 0.107242940654764 | 365 | gini | sqrt |
| CUC-0073 | 63 | 0.4815310535390863 | 495 | entropy | nan |
| CUC-0074 | 42 | 0.8654279975916322 | 638 | entropy | sqrt |
| CUC-0075 | 18 | 0.5215917045138609 | 58 | entropy | sqrt |
| CUC-0076 | 86 | 0.4868933671401025 | 343 | entropy | log2 |
| CUC-0077 | 78 | 0.7324262196186554 | 668 | entropy | log2 |
| CUC-0078 | 86 | 0.6767020871665154 | 885 | gini | nan |
| CUC-0079 | 77 | 0.8169298060779229 | 724 | gini | sqrt |
| CUC-0080 | 46 | 0.9471347460560092 | 867 | entropy | nan |
| CUC-0081 | 63 | 0.220259215488935 | 554 | entropy | nan |
| CUC-0082 | 12 | 0.3437500638392901 | 96 | gini | sqrt |
| CUC-0083 | 14 | 0.5601065183357506 | 93 | entropy | log2 |
| CUC-0084 | 55 | 0.5971925233577772 | 144 | entropy | log2 |
| CUC-0085 | 78 | 0.4646871121023959 | 728 | entropy | nan |
| CUC-0086 | 62 | 0.1998095769393889 | 554 | entropy | nan |
| CUC-0087 | 42 | 0.5751661744749565 | 638 | gini | nan |
| CUC-0088 | 87 | 0.9311195509644764 | 343 | gini | sqrt |
| CUC-0089 | 73 | 0.3278795312971138 | 193 | entropy | nan |
| CUC-0090 | 88 | 0.4028250992443721 | 921 | entropy | sqrt |
| CUC-0091 | 86 | 0.3563295739805073 | 886 | entropy | sqrt |
| CUC-0092 | 87 | 0.7776642083069168 | 343 | entropy | log2 |
| CUC-0093 | 86 | 0.1723179436825225 | 344 | gini | sqrt |
| CUC-0094 | 87 | 0.3788606452060339 | 885 | entropy | sqrt |
| CUC-0095 | 87 | 0.2409747271579165 | 343 | gini | log2 |
| CUC-0096 | 82 | 0.3861049386786845 | 846 | entropy | nan |
| CUC-0097 | 12 | 0.2659727669396358 | 96 | gini | log2 |
| CUC-0098 | 85 | 0.1806913514166758 | 885 | gini | sqrt |
| CUC-0099 | 91 | 0.5684700689543954 | 618 | entropy | sqrt |

**T#3.2 Cuckoo Search Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Time Taken(s)** | **Total Power(J)** | **CPU(J)** | **Monitor(J)** | **Disk(J)** | **Base(J)** |
| CUC-0000 | 25 | 95.4 | 58.600000000000016 | 0.0 | 0.0 | 37.5 |
| CUC-0001 | 180 | 630.1 | 363.9000000000005 | 0.0 | 0.0 | 270.0 |
| CUC-0002 | 15 | 54.6 | 32.599999999999994 | 0.0 | 0.0 | 22.5 |
| CUC-0003 | 106 | 478.4999999999997 | 295.30000000000007 | 0.0 | 26.70000000000001 | 159.0 |
| CUC-0004 | 104 | 375.6 | 221.3000000000001 | 0.0 | 0.0 | 156.0 |
| CUC-0005 | 40 | 147.29999999999998 | 88.59999999999998 | 0.0 | 0.0 | 60.0 |
| CUC-0006 | 96 | 341.9999999999999 | 199.70000000000005 | 0.0 | 0.0 | 144.0 |
| CUC-0007 | 220 | 786.3999999999995 | 460.9999999999997 | 0.0 | 0.1 | 330.0 |
| CUC-0008 | 95 | 339.39999999999986 | 198.60000000000005 | 0.0 | 0.1 | 142.5 |
| CUC-0009 | 13 | 47.2 | 28.0 | 0.0 | 0.0 | 19.5 |
| CUC-0010 | 35 | 128.09999999999997 | 76.69999999999999 | 0.0 | 0.0 | 52.5 |
| CUC-0011 | 28 | 92.50000000000004 | 51.5 | 0.0 | 0.0 | 42.0 |
| CUC-0012 | 92 | 309.3 | 174.69999999999996 | 0.0 | 0.0 | 138.0 |
| CUC-0013 | 83 | 304.90000000000003 | 177.99999999999997 | 0.0 | 6.299999999999999 | 124.5 |
| CUC-0014 | 62 | 205.79999999999995 | 115.5 | 0.0 | 0.0 | 93.0 |
| CUC-0015 | 261 | 866.3000000000003 | 486.90000000000026 | 0.0 | 0.0 | 391.5 |
| CUC-0016 | 76 | 253.2 | 142.60000000000005 | 0.0 | 0.0 | 114.0 |
| CUC-0017 | 147 | 486.50000000000006 | 272.3999999999999 | 0.0 | 0.0 | 220.5 |
| CUC-0018 | 168 | 561.7000000000003 | 317.2 | 0.0 | 0.0 | 252.0 |
| CUC-0019 | 175 | 583.1000000000004 | 326.7999999999999 | 0.0 | 0.7000000000000001 | 262.5 |
| CUC-0020 | 169 | 563.3000000000001 | 316.59999999999974 | 0.0 | 0.0 | 253.5 |
| CUC-0021 | 32 | 108.10000000000002 | 61.49999999999999 | 0.0 | 0.0 | 48.0 |
| CUC-0022 | 265 | 882.0000000000009 | 495.70000000000033 | 0.0 | 0.0 | 397.5 |
| CUC-0023 | 135 | 451.1000000000002 | 253.89999999999984 | 0.0 | 0.0 | 202.5 |
| CUC-0024 | 53 | 177.10000000000002 | 99.39999999999998 | 0.0 | 0.0 | 79.5 |
| CUC-0025 | 9 | 30.800000000000004 | 17.8 | 0.0 | 0.0 | 13.5 |
| CUC-0026 | 60 | 200.2 | 112.60000000000008 | 0.0 | 0.0 | 90.0 |
| CUC-0027 | 92 | 309.39999999999986 | 174.9 | 0.0 | 0.0 | 138.0 |
| CUC-0028 | 123 | 414.8000000000001 | 235.1 | 0.0 | 0.4 | 184.5 |
| CUC-0029 | 130 | 435.1 | 245.89999999999984 | 0.0 | 0.0 | 195.0 |
| CUC-0030 | 97 | 323.6 | 182.7999999999999 | 0.0 | 0.0 | 145.5 |
| CUC-0031 | 93 | 307.79999999999984 | 172.20000000000005 | 0.0 | 0.0 | 139.5 |
| CUC-0032 | 68 | 223.00000000000003 | 124.4 | 0.0 | 0.0 | 102.0 |
| CUC-0033 | 29 | 96.3 | 54.100000000000016 | 0.0 | 0.0 | 43.5 |
| CUC-0034 | 127 | 419.8999999999999 | 235.19999999999985 | 0.0 | 0.0 | 190.5 |
| CUC-0035 | 186 | 618.6000000000004 | 346.09999999999985 | 0.0 | 2.5 | 279.0 |
| CUC-0036 | 43 | 142.7 | 80.1 | 0.0 | 0.0 | 64.5 |
| CUC-0037 | 80 | 265.69999999999993 | 149.69999999999993 | 0.0 | 0.2 | 120.0 |
| CUC-0038 | 130 | 432.7000000000001 | 244.09999999999985 | 0.0 | 0.0 | 195.0 |
| CUC-0039 | 55 | 182.2 | 102.50000000000004 | 0.0 | 0.0 | 82.5 |
| CUC-0040 | 221 | 730.0000000000005 | 407.5000000000001 | 0.0 | 0.0 | 331.5 |
| CUC-0041 | 51 | 170.5 | 95.79999999999995 | 0.0 | 0.0 | 76.5 |
| CUC-0042 | 247 | 820.1000000000012 | 460.4000000000003 | 0.0 | 0.0 | 370.5 |
| CUC-0043 | 74 | 245.3 | 137.59999999999997 | 0.0 | 0.0 | 111.0 |
| CUC-0044 | 137 | 485.00000000000006 | 284.49999999999983 | 0.0 | 0.1 | 205.5 |
| CUC-0045 | 126 | 419.20000000000016 | 235.8999999999999 | 0.0 | 0.0 | 189.0 |
| CUC-0046 | 76 | 255.59999999999997 | 145.2 | 0.0 | 0.0 | 114.0 |
| CUC-0047 | 132 | 443.8 | 251.79999999999976 | 0.0 | 0.0 | 198.0 |
| CUC-0048 | 114 | 382.00000000000006 | 216.7 | 0.0 | 0.0 | 171.0 |
| CUC-0049 | 132 | 438.3 | 244.89999999999984 | 0.0 | 0.0 | 198.0 |
| CUC-0050 | 87 | 290.69999999999993 | 163.80000000000004 | 0.0 | 0.0 | 130.5 |
| CUC-0051 | 34 | 114.2 | 65.1 | 0.0 | 0.0 | 51.0 |
| CUC-0052 | 21 | 71.1 | 40.39999999999999 | 0.0 | 0.0 | 31.5 |
| CUC-0053 | 61 | 204.6 | 116.19999999999996 | 0.0 | 0.0 | 91.5 |
| CUC-0054 | 163 | 546.5000000000001 | 308.4999999999999 | 0.0 | 0.1 | 244.5 |
| CUC-0055 | 112 | 376.2 | 212.7999999999999 | 0.0 | 0.0 | 168.0 |
| CUC-0056 | 109 | 363.6 | 204.9999999999998 | 0.0 | 0.0 | 163.5 |
| CUC-0057 | 145 | 483.29999999999984 | 272.49999999999983 | 0.0 | 0.0 | 217.5 |
| CUC-0058 | 307 | 1022.900000000002 | 576.1000000000008 | 0.0 | 0.0 | 460.5 |
| CUC-0059 | 79 | 267.6999999999998 | 152.69999999999996 | 0.0 | 0.0 | 118.5 |
| CUC-0060 | 10 | 33.7 | 19.1 | 0.0 | 0.0 | 15.0 |
| CUC-0061 | 308 | 1025.700000000001 | 578.2000000000005 | 0.0 | 0.0 | 462.0 |
| CUC-0062 | 168 | 559.8000000000004 | 315.00000000000006 | 0.0 | 0.0 | 252.0 |
| CUC-0063 | 96 | 324.50000000000017 | 184.09999999999997 | 0.0 | 0.0 | 144.0 |
| CUC-0064 | 86 | 286.90000000000003 | 162.29999999999993 | 0.0 | 0.0 | 129.0 |
| CUC-0065 | 61 | 204.59999999999997 | 115.6 | 0.0 | 0.0 | 91.5 |
| CUC-0066 | 53 | 177.39999999999998 | 100.29999999999995 | 0.0 | 0.0 | 79.5 |
| CUC-0067 | 87 | 290.50000000000006 | 163.19999999999993 | 0.0 | 0.0 | 130.5 |
| CUC-0068 | 203 | 682.2000000000005 | 387.2000000000001 | 0.0 | 0.0 | 304.5 |
| CUC-0069 | 312 | 1046.5000000000014 | 592.1000000000008 | 0.0 | 0.0 | 468.0 |
| CUC-0070 | 95 | 320.99999999999994 | 182.30000000000004 | 0.0 | 0.0 | 142.5 |
| CUC-0071 | 136 | 456.0 | 257.1999999999998 | 0.0 | 0.0 | 204.0 |
| CUC-0072 | 36 | 119.0 | 67.10000000000002 | 0.0 | 0.0 | 54.0 |
| CUC-0073 | 179 | 638.1000000000006 | 374.5000000000001 | 0.0 | 0.2 | 268.5 |
| CUC-0074 | 97 | 324.99999999999994 | 181.39999999999984 | 0.0 | 0.3 | 145.5 |
| CUC-0075 | 10 | 34.5 | 19.500000000000004 | 0.0 | 0.0 | 15.0 |
| CUC-0076 | 52 | 176.79999999999987 | 99.90000000000002 | 0.0 | 0.0 | 78.0 |
| CUC-0077 | 102 | 340.9 | 189.89999999999992 | 0.0 | 0.0 | 153.0 |
| CUC-0078 | 191 | 633.7000000000007 | 350.9000000000003 | 0.0 | 0.0 | 286.5 |
| CUC-0079 | 71 | 231.1000000000001 | 127.8 | 0.0 | 0.0 | 106.5 |
| CUC-0080 | 301 | 955.7999999999984 | 518.0999999999998 | 0.0 | 0.0 | 451.5 |
| CUC-0081 | 191 | 608.3999999999993 | 330.40000000000003 | 0.0 | 0.1 | 286.5 |
| CUC-0082 | 11 | 35.50000000000001 | 19.4 | 0.0 | 0.0 | 16.5 |
| CUC-0083 | 13 | 41.49999999999999 | 22.4 | 0.0 | 0.0 | 19.5 |
| CUC-0084 | 23 | 75.19999999999999 | 41.8 | 0.0 | 0.0 | 34.5 |
| CUC-0085 | 253 | 802.0999999999989 | 435.79999999999984 | 0.0 | 0.0 | 379.5 |
| CUC-0086 | 193 | 613.7999999999992 | 333.0999999999998 | 0.0 | 0.0 | 289.5 |
| CUC-0087 | 137 | 435.9000000000001 | 237.2 | 0.0 | 0.0 | 205.5 |
| CUC-0088 | 33 | 106.20000000000002 | 58.4 | 0.0 | 0.0 | 49.5 |
| CUC-0089 | 67 | 213.60000000000008 | 115.00000000000004 | 0.0 | 0.0 | 100.5 |
| CUC-0090 | 138 | 442.3999999999999 | 241.6 | 0.0 | 0.1 | 207.0 |
| CUC-0091 | 134 | 428.29999999999984 | 233.9000000000001 | 0.0 | 0.0 | 201.0 |
| CUC-0092 | 52 | 165.9 | 90.09999999999997 | 0.0 | 0.0 | 78.0 |
| CUC-0093 | 33 | 107.20000000000002 | 59.2 | 0.0 | 0.0 | 49.5 |
| CUC-0094 | 135 | 452.8000000000002 | 253.19999999999985 | 0.0 | 0.0 | 202.5 |
| CUC-0095 | 33 | 110.4 | 62.10000000000001 | 0.0 | 0.0 | 49.5 |
| CUC-0096 | 296 | 989.1000000000012 | 551.6000000000007 | 0.0 | 0.0 | 444.0 |
| CUC-0097 | 9 | 29.9 | 16.6 | 0.0 | 0.0 | 13.5 |
| CUC-0098 | 89 | 297.69999999999993 | 166.29999999999993 | 0.0 | 0.1 | 133.5 |
| CUC-0099 | 92 | 300.5 | 165.70000000000002 | 0.0 | 0.0 | 138.0 |

**T#3.3 Cuckoo Search Energy Distribution**

**Fig#3 Cuckoo Search Iterations**

**Fire Fly**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Accuracy** | **Time Taken (s)** | **Energy Used (J)** | **Equivalent CO2 Emission (mg)** |
| FIR-0000 | 89.64999999999999 | 83 | 262.4000000000001 | 61.95555555555558 |
| FIR-0001 | 89.85 | 57 | 180.00000000000006 | 42.500000000000014 |
| FIR-0002 | 89.55 | 84 | 270.4000000000001 | 63.84444444444446 |
| FIR-0003 | 89.7 | 52 | 163.20000000000007 | 38.53333333333335 |
| FIR-0004 | 89.75 | 19 | 61.49999999999999 | 14.520833333333332 |
| FIR-0005 | 89.5 | 66 | 208.80000000000007 | 49.30000000000001 |
| FIR-0006 | 89.9 | 143 | 451.3999999999999 | 106.58055555555552 |
| FIR-0007 | 89.7 | 311 | 1001.2999999999988 | 236.41805555555524 |
| FIR-0008 | 89.75 | 215 | 683.099999999999 | 161.28749999999977 |
| FIR-0009 | 89.75 | 97 | 305.1000000000001 | 72.03750000000002 |
| FIR-0010 | 89.60000000000001 | 117 | 368.9999999999999 | 87.12499999999997 |
| FIR-0011 | 89.9 | 28 | 89.99999999999999 | 21.25 |
| FIR-0012 | 89.45 | 151 | 477.6 | 112.76666666666668 |
| FIR-0013 | 89.55 | 163 | 515.7999999999997 | 121.78611111111104 |
| FIR-0014 | 89.8 | 351 | 1109.5999999999988 | 261.9888888888886 |
| FIR-0015 | 89.55 | 37 | 118.00000000000004 | 27.86111111111112 |
| FIR-0016 | 89.64999999999999 | 92 | 290.5000000000001 | 68.5902777777778 |
| FIR-0017 | 89.8 | 110 | 347.60000000000014 | 82.07222222222225 |
| FIR-0018 | 89.64999999999999 | 56 | 175.30000000000007 | 41.39027777777779 |
| FIR-0019 | 89.55 | 93 | 297.8000000000001 | 70.31388888888891 |
| FIR-0020 | 89.85 | 137 | 433.1999999999998 | 102.28333333333327 |
| FIR-0021 | 89.75 | 43 | 135.40000000000006 | 31.96944444444446 |
| FIR-0022 | 89.60000000000001 | 92 | 294.1999999999999 | 69.46388888888886 |
| FIR-0023 | 89.64999999999999 | 64 | 204.10000000000005 | 48.19027777777779 |
| FIR-0024 | 89.85 | 132 | 419.5999999999999 | 99.0722222222222 |
| FIR-0025 | 89.60000000000001 | 12 | 37.5 | 8.854166666666666 |
| FIR-0026 | 89.55 | 59 | 189.4000000000001 | 44.71944444444447 |
| FIR-0027 | 89.55 | 82 | 259.60000000000014 | 61.29444444444447 |
| FIR-0028 | 89.8 | 74 | 232.70000000000013 | 54.94305555555559 |
| FIR-0029 | 89.60000000000001 | 35 | 109.8 | 25.925 |
| FIR-0030 | 89.75 | 46 | 148.00000000000003 | 34.94444444444445 |
| FIR-0031 | 89.5 | 84 | 273.70000000000005 | 64.62361111111112 |
| FIR-0032 | 89.25 | 7 | 21.2 | 5.005555555555556 |
| FIR-0033 | 89.60000000000001 | 65 | 207.00000000000003 | 48.87500000000001 |
| FIR-0034 | 89.60000000000001 | 19 | 62.0 | 14.63888888888889 |
| FIR-0035 | 89.45 | 11 | 34.2 | 8.075 |
| FIR-0036 | 89.9 | 74 | 233.70000000000005 | 55.179166666666674 |
| FIR-0037 | 89.75 | 81 | 256.2000000000002 | 60.49166666666672 |
| FIR-0038 | 89.64999999999999 | 131 | 413.7999999999997 | 97.70277777777773 |
| FIR-0039 | 89.5 | 138 | 437.8999999999999 | 103.39305555555552 |
| FIR-0040 | 89.55 | 73 | 231.80000000000013 | 54.73055555555558 |
| FIR-0041 | 89.85 | 128 | 407.0999999999999 | 96.12083333333332 |
| FIR-0042 | 89.7 | 131 | 416.5999999999998 | 98.36388888888884 |
| FIR-0043 | 89.60000000000001 | 197 | 623.2999999999993 | 147.16805555555538 |
| FIR-0044 | 89.85 | 123 | 394.3 | 93.0986111111111 |
| FIR-0045 | 89.8 | 105 | 348.1 | 82.19027777777777 |
| FIR-0046 | 89.5 | 149 | 473.9999999999999 | 111.91666666666664 |
| FIR-0047 | 89.5 | 28 | 89.00000000000001 | 21.013888888888893 |
| FIR-0048 | 89.95 | 12 | 39.7 | 9.37361111111111 |
| FIR-0049 | 89.55 | 86 | 272.6 | 64.3638888888889 |
| FIR-0050 | 89.55 | 162 | 514.0999999999996 | 121.38472222222212 |
| FIR-0051 | 89.7 | 71 | 224.8000000000001 | 53.0777777777778 |
| FIR-0052 | 89.60000000000001 | 62 | 198.1 | 46.77361111111111 |
| FIR-0053 | 89.60000000000001 | 322 | 1022.999999999998 | 241.54166666666617 |
| FIR-0054 | 89.7 | 60 | 188.70000000000007 | 44.55416666666668 |
| FIR-0055 | 89.7 | 33 | 104.20000000000005 | 24.602777777777785 |
| FIR-0056 | 89.8 | 80 | 259.30000000000007 | 61.223611111111126 |
| FIR-0057 | 89.64999999999999 | 83 | 264.0 | 62.33333333333333 |
| FIR-0058 | 89.64999999999999 | 14 | 44.7 | 10.554166666666667 |
| FIR-0059 | 89.55 | 43 | 136.5 | 32.229166666666664 |
| FIR-0060 | 89.55 | 173 | 548.3999999999996 | 129.48333333333323 |
| FIR-0061 | 89.75 | 33 | 104.3 | 24.626388888888886 |
| FIR-0062 | 89.8 | 131 | 414.5999999999997 | 97.8916666666666 |
| FIR-0063 | 89.7 | 63 | 201.9000000000001 | 47.67083333333336 |
| FIR-0064 | 89.85 | 156 | 499.4999999999995 | 117.93749999999989 |
| FIR-0065 | 89.60000000000001 | 68 | 217.80000000000007 | 51.42500000000001 |
| FIR-0066 | 89.75 | 58 | 185.10000000000005 | 43.70416666666668 |
| FIR-0067 | 89.75 | 118 | 375.8 | 88.73055555555554 |
| FIR-0068 | 89.85 | 43 | 137.60000000000002 | 32.488888888888894 |
| FIR-0069 | 89.75 | 77 | 246.60000000000005 | 58.22500000000001 |
| FIR-0070 | 89.60000000000001 | 104 | 332.29999999999995 | 78.45972222222221 |
| FIR-0071 | 89.8 | 157 | 500.09999999999945 | 118.07916666666654 |
| FIR-0072 | 89.64999999999999 | 81 | 257.5000000000001 | 60.798611111111136 |
| FIR-0073 | 89.8 | 78 | 249.4000000000001 | 58.886111111111134 |
| FIR-0074 | 89.7 | 27 | 85.99999999999999 | 20.30555555555555 |
| FIR-0075 | 89.75 | 128 | 407.3 | 96.16805555555555 |
| FIR-0076 | 89.75 | 165 | 526.0999999999999 | 124.21805555555554 |
| FIR-0077 | 89.9 | 72 | 230.00000000000009 | 54.30555555555557 |
| FIR-0078 | 89.60000000000001 | 47 | 151.20000000000002 | 35.7 |
| FIR-0079 | 89.75 | 62 | 202.1000000000001 | 47.71805555555559 |
| FIR-0080 | 89.85 | 47 | 149.7 | 35.34583333333333 |
| FIR-0081 | 89.45 | 203 | 644.4999999999992 | 152.17361111111092 |
| FIR-0082 | 89.8 | 64 | 231.8 | 54.73055555555555 |
| FIR-0083 | 89.55 | 38 | 128.1 | 30.24583333333333 |
| FIR-0084 | 89.75 | 63 | 212.0 | 50.05555555555554 |
| FIR-0085 | 89.64999999999999 | 22 | 101.5 | 23.965277777777786 |
| FIR-0086 | 89.8 | 129 | 436.4000000000001 | 103.0388888888889 |
| FIR-0087 | 89.64999999999999 | 46 | 155.69999999999993 | 36.76249999999998 |
| FIR-0088 | 89.64999999999999 | 44 | 149.39999999999995 | 35.274999999999984 |
| FIR-0089 | 89.8 | 47 | 157.29999999999995 | 37.14027777777777 |
| FIR-0090 | 89.45 | 87 | 289.9 | 68.4486111111111 |
| FIR-0091 | 89.7 | 60 | 200.2 | 47.26944444444442 |
| FIR-0092 | 89.8 | 90 | 292.3999999999999 | 69.03888888888886 |
| FIR-0093 | 89.8 | 26 | 83.1 | 19.62083333333333 |
| FIR-0094 | 89.60000000000001 | 10 | 33.0 | 7.791666666666666 |
| FIR-0095 | 89.75 | 57 | 182.50000000000009 | 43.09027777777779 |
| FIR-0096 | 89.95 | 351 | 1116.4999999999989 | 263.61805555555526 |
| FIR-0097 | 89.75 | 43 | 138.09999999999997 | 32.60694444444444 |
| FIR-0098 | 89.64999999999999 | 7 | 21.7 | 5.123611111111111 |
| FIR-0099 | 89.64999999999999 | 102 | 327.2 | 77.25555555555555 |

**T#4.1 Fire Fly Main Result**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **population\_size** | **alpha** | **beta0** | **gamma** | **theta** | **n\_estimator** | **criterion** | **max\_feature** |
| FIR-0000 | 92 | 0.8917689509621813 | 75.21115868102953 | 0.4953294691693303 | 0.8911943611104965 | 763 | gini | sqrt |
| FIR-0001 | 51 | 0.8958647271396394 | 57.02195515335964 | 0.2881207427211892 | 0.7857829646462213 | 367 | entropy | log2 |
| FIR-0002 | 49 | 0.6743720387932108 | 59.659582603676455 | 0.1527689264129116 | 0.9472975613691637 | 364 | gini | nan |
| FIR-0003 | 25 | 0.7079606885587295 | 66.2232349243786 | 0.8511194495803833 | 0.6781951413251673 | 541 | gini | log2 |
| FIR-0004 | 60 | 0.7032384660382611 | 34.0229730511158 | 0.9939138618829768 | 0.5096846933125873 | 105 | entropy | log2 |
| FIR-0005 | 49 | 0.2764916347833864 | 30.766072372408647 | 0.9954420359212452 | 0.1533522838780728 | 643 | gini | sqrt |
| FIR-0006 | 67 | 0.7880805871279015 | 0.4582046500543382 | 0.2022247876898606 | 0.9204870884761768 | 928 | entropy | sqrt |
| FIR-0007 | 33 | 0.8971734750877367 | 26.280834213459613 | 0.6095957764799698 | 0.609257099615243 | 889 | entropy | nan |
| FIR-0008 | 85 | 0.32636958088351 | 12.591622095467027 | 0.2258573718603753 | 0.2361641842950451 | 600 | entropy | nan |
| FIR-0009 | 37 | 0.8430472627708364 | 1.0626449926549664 | 0.5183879681366368 | 0.1109013075228436 | 624 | entropy | sqrt |
| FIR-0010 | 23 | 0.1951154870165916 | 75.89235016720642 | 0.3587537373755508 | 0.8364705535352945 | 551 | gini | nan |
| FIR-0011 | 17 | 0.9192855546404184 | 85.20335927671381 | 0.7071313442386068 | 0.533356985415274 | 178 | entropy | sqrt |
| FIR-0012 | 16 | 0.3786077500231735 | 31.942335907680704 | 0.8770111662004206 | 0.2348027896917932 | 705 | gini | nan |
| FIR-0013 | 55 | 0.6744327921899946 | 10.319399685547683 | 0.2437496158461494 | 0.8831937320040149 | 742 | gini | nan |
| FIR-0014 | 87 | 0.7061067782614784 | 79.42472427636146 | 0.6501073506643659 | 0.4260908157769552 | 991 | entropy | nan |
| FIR-0015 | 35 | 0.8881273477529262 | 51.37226941636303 | 0.912052771800528 | 0.9014779989414404 | 352 | gini | sqrt |
| FIR-0016 | 55 | 0.117403934067493 | 29.158293135569902 | 0.6585790162079385 | 0.8207518668312528 | 921 | gini | sqrt |
| FIR-0017 | 88 | 0.4671228117816313 | 10.041879692625136 | 0.607685593127528 | 0.9044096558369308 | 676 | entropy | log2 |
| FIR-0018 | 44 | 0.548090700287987 | 66.58459839200712 | 0.4850103113208442 | 0.9010812452488418 | 158 | entropy | nan |
| FIR-0019 | 93 | 0.7742142803251916 | 40.34860313126156 | 0.237614197984048 | 0.1358522857762634 | 838 | gini | log2 |
| FIR-0020 | 27 | 0.9502770758176444 | 99.38286524713672 | 0.343644711852245 | 0.8088343473436839 | 902 | entropy | sqrt |
| FIR-0021 | 97 | 0.933247444470928 | 65.64822381978098 | 0.7517750467373789 | 0.1119815965791204 | 227 | entropy | sqrt |
| FIR-0022 | 98 | 0.6051848540356742 | 75.76683909627849 | 0.5553865186709723 | 0.1535813877213907 | 815 | gini | sqrt |
| FIR-0023 | 54 | 0.2123447743857329 | 84.36629942966935 | 0.4551822312561766 | 0.3469266488422984 | 279 | gini | nan |
| FIR-0024 | 28 | 0.4598700702385256 | 15.97859637473896 | 0.1315851272194979 | 0.9076965297348036 | 378 | entropy | nan |
| FIR-0025 | 17 | 0.1415742264186381 | 21.476670357515168 | 0.8748236378612769 | 0.9679671951373828 | 123 | gini | sqrt |
| FIR-0026 | 43 | 0.27789823332266 | 1.5463062937833016 | 0.5259866762835905 | 0.6618840066261485 | 269 | gini | nan |
| FIR-0027 | 72 | 0.96623915000366 | 51.18200042195537 | 0.875844160650862 | 0.5400403864507931 | 353 | gini | nan |
| FIR-0028 | 13 | 0.2025828952643224 | 73.53995810516889 | 0.9527360937058914 | 0.9615773496536146 | 485 | entropy | log2 |
| FIR-0029 | 29 | 0.4205662759633127 | 23.483760240569065 | 0.6887833979847012 | 0.8325590476680745 | 165 | gini | nan |
| FIR-0030 | 49 | 0.2218330114533548 | 8.592493680815718 | 0.5191861318692734 | 0.4350763935141402 | 290 | entropy | sqrt |
| FIR-0031 | 14 | 0.9792323049123052 | 67.75171294835995 | 0.166177079888397 | 0.6426816011811248 | 382 | gini | nan |
| FIR-0032 | 76 | 0.7240198871085062 | 86.93689988914234 | 0.1058626534024828 | 0.5274824713848081 | 14 | gini | log2 |
| FIR-0033 | 19 | 0.7063699828773052 | 65.93764584444818 | 0.82983947242195 | 0.7243529184010246 | 302 | gini | nan |
| FIR-0034 | 24 | 0.4974246567610503 | 8.207688729404648 | 0.1662460826030311 | 0.4397614686013957 | 175 | gini | sqrt |
| FIR-0035 | 18 | 0.1151005791783722 | 4.396715464806173 | 0.8924985230409058 | 0.462908837306812 | 31 | entropy | nan |
| FIR-0036 | 23 | 0.4973512432978328 | 6.026751550291324 | 0.6870452700206068 | 0.7870830880367512 | 480 | entropy | sqrt |
| FIR-0037 | 63 | 0.5727765001909958 | 69.05665202085524 | 0.3976752479360185 | 0.5298348527059816 | 224 | entropy | nan |
| FIR-0038 | 24 | 0.8243308753943239 | 60.65317591842814 | 0.5053009222338155 | 0.2745070714564406 | 605 | gini | nan |
| FIR-0039 | 92 | 0.6888614162029947 | 52.18801682220773 | 0.3188231352805478 | 0.9250069727230008 | 603 | gini | nan |
| FIR-0040 | 55 | 0.1606627337729007 | 0.6469258792573198 | 0.2806062545346521 | 0.7822116288237752 | 709 | gini | log2 |
| FIR-0041 | 40 | 0.6121495647691023 | 87.30565687503099 | 0.3608122647114476 | 0.4582542699971555 | 833 | entropy | log2 |
| FIR-0042 | 65 | 0.3914980994222482 | 89.57259985699528 | 0.7218275244887356 | 0.650181569750993 | 362 | entropy | nan |
| FIR-0043 | 56 | 0.3328306685833605 | 22.899077676448663 | 0.8620015808522545 | 0.7278263809733048 | 569 | entropy | nan |
| FIR-0044 | 59 | 0.4439572176635709 | 48.25901825048486 | 0.8775222975073923 | 0.3671095378197826 | 783 | entropy | log2 |
| FIR-0045 | 53 | 0.6253701253943761 | 24.603379639126803 | 0.8748386088495188 | 0.9492025535101696 | 288 | entropy | nan |
| FIR-0046 | 53 | 0.5478858869077894 | 96.84788123912465 | 0.3434916587926501 | 0.999034806069366 | 682 | gini | nan |
| FIR-0047 | 50 | 0.827508448797785 | 79.71210135548466 | 0.8229969676686423 | 0.1355609221298807 | 72 | entropy | nan |
| FIR-0048 | 41 | 0.7860477323777897 | 32.765462396721055 | 0.3533740256318564 | 0.1296967008576448 | 59 | entropy | sqrt |
| FIR-0049 | 96 | 0.2516367853464829 | 70.13790805268793 | 0.1978297661607377 | 0.244846408795388 | 784 | gini | sqrt |
| FIR-0050 | 38 | 0.9486552455292268 | 24.733056659032084 | 0.5159994979288719 | 0.3994107171720781 | 742 | gini | nan |
| FIR-0051 | 91 | 0.5317772479716161 | 45.08431284035274 | 0.3033223184849709 | 0.7410861142560695 | 295 | gini | nan |
| FIR-0052 | 20 | 0.4966799603100469 | 93.73048317751882 | 0.1087261673944408 | 0.5507040091549822 | 639 | gini | sqrt |
| FIR-0053 | 97 | 0.6093638083744835 | 77.14335365372531 | 0.1566317327912343 | 0.4866691431631054 | 890 | entropy | nan |
| FIR-0054 | 52 | 0.571386218855114 | 62.66248631722249 | 0.1163911167038476 | 0.2930563325384094 | 169 | entropy | nan |
| FIR-0055 | 84 | 0.2716591735213886 | 54.1783023089301 | 0.6393669250069173 | 0.4208026810709472 | 271 | gini | sqrt |
| FIR-0056 | 98 | 0.3114656858907307 | 26.25556107302972 | 0.4996892052076986 | 0.4939151255805005 | 441 | entropy | log2 |
| FIR-0057 | 59 | 0.1203759483076752 | 77.54911966704611 | 0.738752426867948 | 0.4178191542202681 | 809 | gini | log2 |
| FIR-0058 | 78 | 0.852120800297745 | 60.97646909060216 | 0.4980463659401704 | 0.2597312690716683 | 61 | entropy | sqrt |
| FIR-0059 | 89 | 0.6617617144691563 | 53.44130905609619 | 0.993521356969146 | 0.2092677220607053 | 343 | gini | sqrt |
| FIR-0060 | 58 | 0.32766353606044 | 74.44505412588532 | 0.2087326984285058 | 0.978763789495454 | 784 | gini | nan |
| FIR-0061 | 97 | 0.7479764968153081 | 88.0352266753072 | 0.9650044847454018 | 0.9967386416740248 | 155 | entropy | log2 |
| FIR-0062 | 77 | 0.5389300509364588 | 13.41239980928838 | 0.2876304994944028 | 0.9924507827700206 | 363 | entropy | nan |
| FIR-0063 | 61 | 0.9130167297112852 | 10.514799617323112 | 0.4473159835795737 | 0.6079129123262101 | 387 | entropy | log2 |
| FIR-0064 | 64 | 0.3184454997817684 | 12.185707441724556 | 0.7686223028561233 | 0.3879864615015398 | 999 | entropy | log2 |
| FIR-0065 | 89 | 0.8114924403651455 | 69.75039911047875 | 0.4382559017211017 | 0.6187588961583177 | 275 | gini | nan |
| FIR-0066 | 71 | 0.7652939700289513 | 6.967649026739551 | 0.93085413692461 | 0.1162078690473221 | 520 | gini | log2 |
| FIR-0067 | 91 | 0.674567818201328 | 45.95753059795468 | 0.2179870459654743 | 0.3475069493709131 | 719 | entropy | sqrt |
| FIR-0068 | 86 | 0.8802531051727511 | 67.62460492037361 | 0.1473219806383034 | 0.2264656106886158 | 240 | entropy | log2 |
| FIR-0069 | 18 | 0.8653467605419707 | 73.9778142942364 | 0.7330997440222953 | 0.3931481960155598 | 803 | gini | log2 |
| FIR-0070 | 41 | 0.9535284388745952 | 60.6599068913105 | 0.7647823955968603 | 0.1485274172940527 | 475 | gini | nan |
| FIR-0071 | 49 | 0.5817069824502592 | 3.846020093808552 | 0.2622302648500785 | 0.4681974217074032 | 444 | entropy | nan |
| FIR-0072 | 59 | 0.3075814037199155 | 47.98212046455088 | 0.3703524270283787 | 0.4335384426034585 | 784 | gini | sqrt |
| FIR-0073 | 98 | 0.1932903474581147 | 27.18373292498957 | 0.2380452601822193 | 0.4970729075306286 | 442 | entropy | log2 |
| FIR-0074 | 18 | 0.7736969523560351 | 87.69505400573024 | 0.4398575215257846 | 0.5753590857228313 | 178 | entropy | log2 |
| FIR-0075 | 39 | 0.9867109910948414 | 85.80339696549474 | 0.323392994182211 | 0.5045322666663574 | 833 | entropy | log2 |
| FIR-0076 | 23 | 0.1103102950865092 | 6.704660264928454 | 0.5157649673323592 | 0.2320604815172486 | 477 | entropy | nan |
| FIR-0077 | 22 | 0.2236445293522698 | 8.007747533140796 | 0.9779840459497816 | 0.821310911461414 | 479 | entropy | log2 |
| FIR-0078 | 21 | 0.9880100854521638 | 9.86281260194339 | 0.8250766035485614 | 0.7594175681610849 | 476 | gini | sqrt |
| FIR-0079 | 76 | 0.3856429617511959 | 12.196335992556444 | 0.702596053343664 | 0.1803314420679045 | 361 | entropy | sqrt |
| FIR-0080 | 54 | 0.7927113033101146 | 24.75947270855649 | 0.1390420627729773 | 0.7523345568633767 | 290 | entropy | log2 |
| FIR-0081 | 69 | 0.1240062580204171 | 0.78856771025717 | 0.2485119253662278 | 0.2014189105170729 | 929 | gini | nan |
| FIR-0082 | 79 | 0.7231924947336742 | 14.15105810871449 | 0.861135224842443 | 0.187636190184537 | 365 | entropy | sqrt |
| FIR-0083 | 52 | 0.5287248900755923 | 55.47335407899352 | 0.8983443307862026 | 0.1589360967725689 | 366 | gini | sqrt |
| FIR-0084 | 18 | 0.994235095023534 | 83.72143553808088 | 0.3958377818808102 | 0.7281209342551297 | 176 | entropy | nan |
| FIR-0085 | 15 | 0.3189186161421193 | 86.67526046181146 | 0.2714454822730368 | 0.5675609263311504 | 178 | gini | log2 |
| FIR-0086 | 38 | 0.4565519366962065 | 89.00344501862479 | 0.9610410928079351 | 0.1055348792940875 | 835 | entropy | log2 |
| FIR-0087 | 54 | 0.7975299654312061 | 23.23103774592657 | 0.3678958683345598 | 0.4666965045182024 | 289 | entropy | log2 |
| FIR-0088 | 78 | 0.567079677057412 | 11.70994935553009 | 0.5801497972676449 | 0.1211441841824638 | 362 | gini | log2 |
| FIR-0089 | 53 | 0.9058624581418452 | 23.3420232752238 | 0.4512899583233997 | 0.863219813931285 | 292 | entropy | log2 |
| FIR-0090 | 80 | 0.9623814184813132 | 15.106197719880369 | 0.3014773938566688 | 0.1831968787499316 | 364 | gini | nan |
| FIR-0091 | 78 | 0.9518176960037728 | 12.911295490430334 | 0.4707884486040272 | 0.1882527170725081 | 365 | entropy | sqrt |
| FIR-0092 | 27 | 0.9404120547195364 | 99.3594069777664 | 0.1443787556930029 | 0.9815715281338092 | 903 | gini | log2 |
| FIR-0093 | 16 | 0.8389980037917545 | 83.54586320728087 | 0.6767216883619561 | 0.3383169740331055 | 177 | entropy | log2 |
| FIR-0094 | 43 | 0.1856457360150705 | 31.80608092879617 | 0.5989803411438316 | 0.8512978359682007 | 59 | gini | log2 |
| FIR-0095 | 50 | 0.9219148924378978 | 56.86521226642516 | 0.5944587177053096 | 0.6019537299715079 | 366 | entropy | sqrt |
| FIR-0096 | 65 | 0.4262319384482497 | 12.336264070514472 | 0.5081459109301875 | 0.5640290502399367 | 996 | entropy | nan |
| FIR-0097 | 84 | 0.4245775101093071 | 69.05293413132034 | 0.2392637882257479 | 0.4542803814052316 | 239 | entropy | sqrt |
| FIR-0098 | 40 | 0.7827049585286239 | 31.865604357461763 | 0.6125547649224866 | 0.4739722350032692 | 61 | gini | log2 |
| FIR-0099 | 63 | 0.9992116759545138 | 11.590991472970709 | 0.2598612617704122 | 0.5208526626384111 | 994 | gini | log2 |

**T#4.2 Fire Fly Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Time Taken(s)** | **Total Power(J)** | **CPU(J)** | **Monitor(J)** | **Disk(J)** | **Base(J)** |
| FIR-0000 | 83 | 262.4000000000001 | 141.40000000000003 | 0.0 | 0.0 | 124.5 |
| FIR-0001 | 57 | 180.00000000000006 | 96.6 | 0.0 | 0.0 | 85.5 |
| FIR-0002 | 84 | 270.4000000000001 | 147.80000000000004 | 0.0 | 0.1 | 126.0 |
| FIR-0003 | 52 | 163.20000000000007 | 87.70000000000005 | 0.0 | 0.0 | 78.0 |
| FIR-0004 | 19 | 61.49999999999999 | 34.2 | 0.0 | 0.0 | 28.5 |
| FIR-0005 | 66 | 208.80000000000007 | 112.69999999999996 | 0.0 | 0.0 | 99.0 |
| FIR-0006 | 143 | 451.3999999999999 | 243.30000000000013 | 0.0 | 0.1 | 214.5 |
| FIR-0007 | 311 | 1001.2999999999988 | 548.2999999999998 | 0.0 | 0.1 | 466.5 |
| FIR-0008 | 215 | 683.099999999999 | 370.1000000000001 | 0.0 | 0.0 | 322.5 |
| FIR-0009 | 97 | 305.1000000000001 | 163.60000000000005 | 0.0 | 0.0 | 145.5 |
| FIR-0010 | 117 | 368.9999999999999 | 198.70000000000005 | 0.0 | 0.0 | 175.5 |
| FIR-0011 | 28 | 89.99999999999999 | 49.00000000000001 | 0.0 | 0.0 | 42.0 |
| FIR-0012 | 151 | 477.6 | 257.20000000000005 | 0.0 | 0.0 | 226.5 |
| FIR-0013 | 163 | 515.7999999999997 | 278.90000000000003 | 0.0 | 0.0 | 244.5 |
| FIR-0014 | 351 | 1109.5999999999988 | 597.8999999999995 | 0.0 | 0.0 | 526.5 |
| FIR-0015 | 37 | 118.00000000000004 | 63.9 | 0.0 | 0.0 | 55.5 |
| FIR-0016 | 92 | 290.5000000000001 | 156.90000000000006 | 0.0 | 0.0 | 138.0 |
| FIR-0017 | 110 | 347.60000000000014 | 187.6 | 0.0 | 0.0 | 165.0 |
| FIR-0018 | 56 | 175.30000000000007 | 94.3 | 0.0 | 0.0 | 84.0 |
| FIR-0019 | 93 | 297.8000000000001 | 162.20000000000005 | 0.0 | 0.0 | 139.5 |
| FIR-0020 | 137 | 433.1999999999998 | 232.80000000000007 | 0.0 | 0.0 | 205.5 |
| FIR-0021 | 43 | 135.40000000000006 | 72.89999999999999 | 0.0 | 0.0 | 64.5 |
| FIR-0022 | 92 | 294.1999999999999 | 160.20000000000005 | 0.0 | 0.1 | 138.0 |
| FIR-0023 | 64 | 204.10000000000005 | 111.4 | 0.0 | 0.1 | 96.0 |
| FIR-0024 | 132 | 419.5999999999999 | 227.10000000000005 | 0.0 | 0.0 | 198.0 |
| FIR-0025 | 12 | 37.5 | 20.1 | 0.0 | 0.0 | 18.0 |
| FIR-0026 | 59 | 189.4000000000001 | 103.50000000000004 | 0.0 | 0.0 | 88.5 |
| FIR-0027 | 82 | 259.60000000000014 | 140.50000000000003 | 0.0 | 0.0 | 123.0 |
| FIR-0028 | 74 | 232.70000000000013 | 125.6 | 0.0 | 0.0 | 111.0 |
| FIR-0029 | 35 | 109.8 | 58.69999999999999 | 0.0 | 0.0 | 52.5 |
| FIR-0030 | 46 | 148.00000000000003 | 80.8 | 0.0 | 0.0 | 69.0 |
| FIR-0031 | 84 | 273.70000000000005 | 151.19999999999996 | 0.0 | 0.0 | 126.0 |
| FIR-0032 | 7 | 21.2 | 11.3 | 0.0 | 0.0 | 10.5 |
| FIR-0033 | 65 | 207.00000000000003 | 112.5 | 0.0 | 0.0 | 97.5 |
| FIR-0034 | 19 | 62.0 | 34.5 | 0.0 | 0.0 | 28.5 |
| FIR-0035 | 11 | 34.2 | 18.0 | 0.0 | 0.0 | 16.5 |
| FIR-0036 | 74 | 233.70000000000005 | 126.29999999999998 | 0.0 | 0.0 | 111.0 |
| FIR-0037 | 81 | 256.2000000000002 | 138.5 | 0.0 | 0.0 | 121.5 |
| FIR-0038 | 131 | 413.7999999999997 | 224.00000000000009 | 0.0 | 0.0 | 196.5 |
| FIR-0039 | 138 | 437.8999999999999 | 237.7000000000001 | 0.0 | 0.0 | 207.0 |
| FIR-0040 | 73 | 231.80000000000013 | 125.4 | 0.0 | 0.0 | 109.5 |
| FIR-0041 | 128 | 407.0999999999999 | 220.4000000000001 | 0.0 | 0.0 | 192.0 |
| FIR-0042 | 131 | 416.5999999999998 | 226.20000000000005 | 0.0 | 0.0 | 196.5 |
| FIR-0043 | 197 | 623.2999999999993 | 337.6 | 0.0 | 0.0 | 295.5 |
| FIR-0044 | 123 | 394.3 | 215.10000000000005 | 0.0 | 0.2 | 184.5 |
| FIR-0045 | 105 | 348.1 | 195.4000000000001 | 0.0 | 0.0 | 157.5 |
| FIR-0046 | 149 | 473.9999999999999 | 257.20000000000005 | 0.0 | 0.0 | 223.5 |
| FIR-0047 | 28 | 89.00000000000001 | 48.1 | 0.0 | 0.0 | 42.0 |
| FIR-0048 | 12 | 39.7 | 22.2 | 0.0 | 0.0 | 18.0 |
| FIR-0049 | 86 | 272.6 | 147.20000000000005 | 0.0 | 0.0 | 129.0 |
| FIR-0050 | 162 | 514.0999999999996 | 278.6 | 0.0 | 0.0 | 243.0 |
| FIR-0051 | 71 | 224.8000000000001 | 121.2 | 0.0 | 0.0 | 106.5 |
| FIR-0052 | 62 | 198.1 | 108.3 | 0.0 | 0.0 | 93.0 |
| FIR-0053 | 322 | 1022.999999999998 | 555.6999999999996 | 0.0 | 0.0 | 483.0 |
| FIR-0054 | 60 | 188.70000000000007 | 101.20000000000005 | 0.0 | 0.1 | 90.0 |
| FIR-0055 | 33 | 104.20000000000005 | 55.8 | 0.0 | 0.0 | 49.5 |
| FIR-0056 | 80 | 259.30000000000007 | 142.50000000000003 | 0.0 | 0.0 | 120.0 |
| FIR-0057 | 83 | 264.0 | 143.2 | 0.0 | 0.0 | 124.5 |
| FIR-0058 | 14 | 44.7 | 24.5 | 0.0 | 0.0 | 21.0 |
| FIR-0059 | 43 | 136.5 | 73.80000000000001 | 0.0 | 0.0 | 64.5 |
| FIR-0060 | 173 | 548.3999999999996 | 296.19999999999993 | 0.0 | 0.0 | 259.5 |
| FIR-0061 | 33 | 104.3 | 56.399999999999984 | 0.0 | 0.0 | 49.5 |
| FIR-0062 | 131 | 414.5999999999997 | 223.10000000000008 | 0.0 | 0.0 | 196.5 |
| FIR-0063 | 63 | 201.9000000000001 | 110.50000000000004 | 0.0 | 0.0 | 94.5 |
| FIR-0064 | 156 | 499.4999999999995 | 272.90000000000015 | 0.0 | 0.0 | 234.0 |
| FIR-0065 | 68 | 217.80000000000007 | 118.5 | 0.0 | 0.0 | 102.0 |
| FIR-0066 | 58 | 185.10000000000005 | 100.3 | 0.0 | 0.0 | 87.0 |
| FIR-0067 | 118 | 375.8 | 203.70000000000005 | 0.0 | 0.0 | 177.0 |
| FIR-0068 | 43 | 137.60000000000002 | 75.10000000000001 | 0.0 | 0.0 | 64.5 |
| FIR-0069 | 77 | 246.60000000000005 | 134.4 | 0.0 | 0.0 | 115.5 |
| FIR-0070 | 104 | 332.29999999999995 | 180.70000000000007 | 0.0 | 0.0 | 156.0 |
| FIR-0071 | 157 | 500.09999999999945 | 270.80000000000007 | 0.0 | 0.0 | 235.5 |
| FIR-0072 | 81 | 257.5000000000001 | 139.1 | 0.0 | 0.0 | 121.5 |
| FIR-0073 | 78 | 249.4000000000001 | 136.3 | 0.0 | 0.0 | 117.0 |
| FIR-0074 | 27 | 85.99999999999999 | 47.1 | 0.0 | 0.0 | 40.5 |
| FIR-0075 | 128 | 407.3 | 220.4 | 0.0 | 0.0 | 192.0 |
| FIR-0076 | 165 | 526.0999999999999 | 286.1 | 0.0 | 0.1 | 247.5 |
| FIR-0077 | 72 | 230.00000000000009 | 126.6 | 0.0 | 0.0 | 108.0 |
| FIR-0078 | 47 | 151.20000000000002 | 82.9 | 0.0 | 0.0 | 70.5 |
| FIR-0079 | 62 | 202.1000000000001 | 111.1 | 0.0 | 0.1 | 93.0 |
| FIR-0080 | 47 | 149.7 | 81.69999999999999 | 0.0 | 0.0 | 70.5 |
| FIR-0081 | 203 | 644.4999999999992 | 349.1999999999999 | 0.0 | 0.0 | 304.5 |
| FIR-0082 | 64 | 231.8 | 137.99999999999997 | 0.0 | 0.0 | 96.0 |
| FIR-0083 | 38 | 128.1 | 71.8 | 0.0 | 0.0 | 57.0 |
| FIR-0084 | 63 | 211.99999999999997 | 118.29999999999995 | 0.0 | 0.0 | 94.5 |
| FIR-0085 | 22 | 101.5 | 68.80000000000001 | 0.0 | 0.1 | 33.0 |
| FIR-0086 | 129 | 436.4000000000001 | 244.49999999999983 | 0.0 | 0.1 | 193.5 |
| FIR-0087 | 46 | 155.69999999999993 | 87.5 | 0.0 | 0.0 | 69.0 |
| FIR-0088 | 44 | 149.39999999999995 | 84.39999999999999 | 0.0 | 0.0 | 66.0 |
| FIR-0089 | 47 | 157.29999999999995 | 87.89999999999999 | 0.0 | 0.0 | 70.5 |
| FIR-0090 | 87 | 289.9 | 161.59999999999994 | 0.0 | 0.0 | 130.5 |
| FIR-0091 | 60 | 200.19999999999996 | 110.89999999999998 | 0.0 | 0.0 | 90.0 |
| FIR-0092 | 90 | 292.3999999999999 | 160.80000000000004 | 0.0 | 0.0 | 135.0 |
| FIR-0093 | 26 | 83.1 | 45.2 | 0.0 | 0.0 | 39.0 |
| FIR-0094 | 10 | 33.0 | 18.5 | 0.0 | 0.0 | 15.0 |
| FIR-0095 | 57 | 182.50000000000009 | 99.40000000000002 | 0.0 | 0.4 | 85.5 |
| FIR-0096 | 351 | 1116.4999999999989 | 606.9999999999998 | 0.0 | 0.0 | 526.5 |
| FIR-0097 | 43 | 138.09999999999997 | 75.6 | 0.0 | 0.0 | 64.5 |
| FIR-0098 | 7 | 21.7 | 11.5 | 0.0 | 0.0 | 10.5 |
| FIR-0099 | 102 | 327.2 | 179.5 | 0.0 | 0.0 | 153.0 |

**T#4.3 Fire Fly Energy Distribution**

**Fig#4 Fire Fly Iterations**

**Particle Swarm**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Accuracy** | **Time Taken (s)** | **Energy Used (J)** | **Equivalent CO2 Emission (mg)** |
| PAR-0000 | 89.64999999999999 | 95 | 319.3999999999998 | 75.41388888888883 |
| PAR-0001 | 89.5 | 143 | 491.19999999999993 | 115.97777777777776 |
| PAR-0002 | 89.85 | 145 | 493.1000000000001 | 116.42638888888892 |
| PAR-0003 | 89.8 | 137 | 467.8000000000004 | 110.45277777777788 |
| PAR-0004 | 89.9 | 68 | 231.2 | 54.58888888888888 |
| PAR-0005 | 89.85 | 16 | 57.2 | 13.505555555555556 |
| PAR-0006 | 89.5 | 67 | 228.5999999999999 | 53.97499999999998 |
| PAR-0007 | 89.64999999999999 | 35 | 120.0 | 28.33333333333333 |
| PAR-0008 | 89.60000000000001 | 67 | 230.39999999999992 | 54.39999999999998 |
| PAR-0009 | 89.55 | 173 | 581.8000000000004 | 137.36944444444453 |
| PAR-0010 | 89.60000000000001 | 149 | 502.3000000000004 | 118.5986111111112 |
| PAR-0011 | 89.75 | 342 | 1185.7000000000016 | 279.95694444444484 |
| PAR-0012 | 89.4 | 47 | 158.9 | 37.51805555555556 |
| PAR-0013 | 89.85 | 119 | 401.2 | 94.72777777777776 |
| PAR-0014 | 89.64999999999999 | 266 | 904.0000000000016 | 213.44444444444483 |
| PAR-0015 | 89.64999999999999 | 35 | 119.7 | 28.2625 |
| PAR-0016 | 89.85 | 151 | 512.1000000000003 | 120.91250000000004 |
| PAR-0017 | 89.75 | 49 | 164.89999999999998 | 38.93472222222221 |
| PAR-0018 | 89.75 | 56 | 192.1 | 45.35694444444445 |
| PAR-0019 | 89.7 | 29 | 98.20000000000002 | 23.18611111111112 |
| PAR-0020 | 89.60000000000001 | 101 | 342.40000000000003 | 80.84444444444445 |
| PAR-0021 | 89.75 | 112 | 384.1000000000001 | 90.6902777777778 |
| PAR-0022 | 89.85 | 115 | 393.1 | 92.81527777777778 |
| PAR-0023 | 89.55 | 64 | 218.79999999999995 | 51.6611111111111 |
| PAR-0024 | 89.55 | 158 | 536.2000000000003 | 126.60277777777785 |
| PAR-0025 | 89.64999999999999 | 33 | 115.6 | 27.29444444444444 |
| PAR-0026 | 89.60000000000001 | 21 | 71.69999999999997 | 16.92916666666666 |
| PAR-0027 | 89.7 | 79 | 269.49999999999994 | 63.63194444444443 |
| PAR-0028 | 89.75 | 128 | 434.1 | 102.49583333333334 |
| PAR-0029 | 89.7 | 86 | 323.5999999999999 | 76.40555555555554 |
| PAR-0030 | 89.85 | 55 | 188.89999999999992 | 44.60138888888887 |
| PAR-0031 | 89.75 | 305 | 1047.5000000000014 | 247.3263888888892 |
| PAR-0032 | 89.85 | 125 | 426.3999999999999 | 100.67777777777776 |
| PAR-0033 | 89.75 | 71 | 242.89999999999992 | 57.35138888888887 |
| PAR-0034 | 89.64999999999999 | 75 | 241.9000000000001 | 57.115277777777806 |
| PAR-0035 | 89.8 | 91 | 301.3 | 71.14027777777778 |
| PAR-0036 | 89.9 | 26 | 84.0 | 19.83333333333333 |
| PAR-0037 | 89.64999999999999 | 184 | 593.0999999999995 | 140.03749999999988 |
| PAR-0038 | 89.9 | 54 | 177.20000000000005 | 41.838888888888896 |
| PAR-0039 | 89.64999999999999 | 107 | 346.2999999999999 | 81.76527777777775 |
| PAR-0040 | 89.60000000000001 | 118 | 383.3000000000001 | 90.50138888888893 |
| PAR-0041 | 89.60000000000001 | 81 | 263.0000000000001 | 62.09722222222225 |
| PAR-0042 | 89.64999999999999 | 60 | 194.20000000000005 | 45.85277777777779 |
| PAR-0043 | 89.7 | 20 | 65.2 | 15.394444444444444 |
| PAR-0044 | 89.64999999999999 | 58 | 190.4 | 44.95555555555556 |
| PAR-0045 | 89.75 | 60 | 194.30000000000004 | 45.8763888888889 |
| PAR-0046 | 89.75 | 64 | 209.20000000000005 | 49.39444444444445 |
| PAR-0047 | 89.8 | 245 | 792.7999999999994 | 187.18888888888875 |
| PAR-0048 | 89.64999999999999 | 87 | 286.20000000000005 | 67.575 |
| PAR-0049 | 89.64999999999999 | 94 | 325.30000000000007 | 76.80694444444445 |
| PAR-0050 | 89.75 | 125 | 407.2999999999999 | 96.16805555555553 |
| PAR-0051 | 89.64999999999999 | 113 | 370.8000000000002 | 87.55000000000004 |
| PAR-0052 | 89.5 | 8 | 26.3 | 6.209722222222222 |
| PAR-0053 | 89.9 | 3 | 10.5 | 2.4791666666666665 |
| PAR-0054 | 89.5 | 24 | 78.9 | 18.629166666666663 |
| PAR-0055 | 89.8 | 98 | 316.50000000000006 | 74.72916666666667 |
| PAR-0056 | 89.64999999999999 | 115 | 371.9 | 87.80972222222222 |
| PAR-0057 | 89.64999999999999 | 17 | 57.3 | 13.529166666666663 |
| PAR-0058 | 89.3 | 4 | 13.3 | 3.140277777777778 |
| PAR-0059 | 89.60000000000001 | 169 | 548.4999999999997 | 129.50694444444437 |
| PAR-0060 | 89.64999999999999 | 98 | 319.70000000000016 | 75.48472222222226 |
| PAR-0061 | 89.55 | 90 | 292.9000000000001 | 69.15694444444446 |
| PAR-0062 | 89.55 | 10 | 32.3 | 7.626388888888888 |
| PAR-0063 | 89.85 | 36 | 118.30000000000004 | 27.93194444444445 |
| PAR-0064 | 89.64999999999999 | 26 | 85.10000000000001 | 20.09305555555556 |
| PAR-0065 | 89.75 | 41 | 131.80000000000004 | 31.11944444444445 |
| PAR-0066 | 89.60000000000001 | 18 | 60.3 | 14.2375 |
| PAR-0067 | 89.60000000000001 | 9 | 29.3 | 6.918055555555554 |
| PAR-0068 | 89.55 | 127 | 418.3999999999998 | 98.78888888888883 |
| PAR-0069 | 89.64999999999999 | 75 | 244.90000000000003 | 57.82361111111112 |
| PAR-0070 | 89.85 | 4 | 12.7 | 2.998611111111111 |
| PAR-0071 | 90.0 | 9 | 30.0 | 7.083333333333333 |
| PAR-0072 | 89.7 | 289 | 938.299999999999 | 221.54305555555533 |
| PAR-0073 | 89.4 | 4 | 12.1 | 2.8569444444444443 |
| PAR-0074 | 89.64999999999999 | 50 | 162.4000000000001 | 38.34444444444446 |
| PAR-0075 | 89.60000000000001 | 176 | 579.9999999999995 | 136.94444444444434 |
| PAR-0076 | 89.85 | 136 | 446.1 | 105.32916666666668 |
| PAR-0077 | 89.60000000000001 | 76 | 250.1 | 59.051388888888894 |
| PAR-0078 | 89.64999999999999 | 22 | 72.40000000000002 | 17.09444444444445 |
| PAR-0079 | 89.60000000000001 | 213 | 690.3999999999996 | 163.01111111111103 |
| PAR-0080 | 89.4 | 201 | 659.3999999999995 | 155.69166666666655 |
| PAR-0081 | 89.75 | 45 | 146.89999999999998 | 34.68472222222221 |
| PAR-0082 | 89.85 | 142 | 463.2999999999999 | 109.39027777777775 |
| PAR-0083 | 89.7 | 233 | 761.5999999999996 | 179.8222222222221 |
| PAR-0084 | 89.85 | 142 | 468.0999999999999 | 110.52361111111108 |
| PAR-0085 | 89.85 | 130 | 423.29999999999984 | 99.9458333333333 |
| PAR-0086 | 89.85 | 125 | 407.8999999999997 | 96.30972222222216 |
| PAR-0087 | 89.4 | 4 | 13.5 | 3.1875 |
| PAR-0088 | 89.8 | 89 | 291.6 | 68.85000000000001 |
| PAR-0089 | 89.60000000000001 | 151 | 493.8999999999999 | 116.61527777777776 |
| PAR-0090 | 89.75 | 342 | 1151.999999999999 | 271.99999999999983 |
| PAR-0091 | 89.85 | 145 | 471.4 | 111.30277777777776 |
| PAR-0092 | 89.85 | 36 | 119.99999999999996 | 28.333333333333325 |
| PAR-0093 | 89.3 | 3 | 9.6 | 2.2666666666666666 |
| PAR-0094 | 89.75 | 57 | 186.50000000000003 | 44.03472222222223 |
| PAR-0095 | 89.7 | 90 | 297.4 | 70.21944444444443 |
| PAR-0096 | 89.75 | 76 | 248.80000000000007 | 58.74444444444446 |
| PAR-0097 | 89.5 | 188 | 642.4000000000003 | 151.67777777777786 |
| PAR-0098 | 89.75 | 144 | 494.3000000000003 | 116.70972222222228 |
| PAR-0099 | 89.75 | 87 | 297.6 | 70.26666666666665 |

**T#5.1 Particle Swarm Main Result**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **population\_size** | **c1** | **c2** | **w** | **min\_velocity** | **max\_velocity** | **repair** | **n\_estimator** | **criterion** | **max\_feature** |
| PAR-0000 | 89 | 3.518973115387473 | 3.008347181959377 | 0.5558800007836792 | -2.390802902062923 | 3.199892658814274 | limit\_inverse | 922 | gini | log2 |
| PAR-0001 | 44 | 0.1240354906685619 | 3.5165894110128817 | 0.7738633495492911 | -3.3758170337110838 | 0.8663142063114215 | reflect | 634 | gini | nan |
| PAR-0002 | 89 | 0.5502908206217634 | 1.8156910493326364 | 0.6489923514070706 | -3.149275600858573 | 2.679379060695506 | rand | 921 | entropy | sqrt |
| PAR-0003 | 38 | 1.1080381527622367 | 2.698011401728184 | 0.1830043487302162 | -1.2574781610061674 | 8.006845924453234 | limit\_inverse | 862 | entropy | sqrt |
| PAR-0004 | 27 | 2.8868978523858204 | 0.0574393458799149 | 0.4828291131527956 | -6.465164039480151 | 4.91815682621942 | limit\_inverse | 435 | entropy | sqrt |
| PAR-0005 | 68 | 0.1453623961295349 | 2.6396419702483715 | 0.2328851509677504 | -1.893134202119196 | 5.0190155679524215 | limit\_inverse | 95 | entropy | sqrt |
| PAR-0006 | 43 | 3.805783973742792 | 1.8966188632795284 | 0.3025073413532441 | -4.055351672249205 | 3.653406243641263 | reflect | 302 | gini | nan |
| PAR-0007 | 71 | 3.3216725899860933 | 0.0995280121395478 | 0.6941618447805683 | -4.639031613734888 | 9.886629424982164 | reflect | 333 | gini | sqrt |
| PAR-0008 | 45 | 2.8020056970385867 | 3.965759242742152 | 0.3945547712368543 | -9.968937859741656 | 2.324951678665388 | limit | 296 | gini | nan |
| PAR-0009 | 35 | 1.8775571854011923 | 2.4318449669655022 | 0.9509187323849438 | -4.123550040001921 | 3.2842933327728185 | reflect | 765 | gini | nan |
| PAR-0010 | 82 | 2.248812581242101 | 0.941741894862433 | 0.6407532820759305 | -0.6552118797735105 | 1.181506280323403 | limit\_inverse | 649 | gini | nan |
| PAR-0011 | 46 | 3.9254625116050152 | 3.489022595447349 | 0.95022644287311 | -5.625444997810836 | 3.1614498166926253 | limit | 927 | entropy | nan |
| PAR-0012 | 53 | 0.8744299743617647 | 2.270847082589731 | 0.7120636819341785 | -2.9710843617821734 | 1.9458981337470471 | wang | 207 | gini | nan |
| PAR-0013 | 22 | 0.8382513594996297 | 1.894513557598986 | 0.9191655231706238 | -6.383270117755277 | 6.3387797564173285 | limit\_inverse | 752 | entropy | sqrt |
| PAR-0014 | 33 | 3.55001484302982 | 1.7730892425144682 | 0.3276082080961623 | -8.602584609909016 | 1.237928888070351 | wang | 728 | entropy | nan |
| PAR-0015 | 41 | 0.9976220255316496 | 2.858010039522185 | 0.2957705034488579 | -0.1149559840237746 | 2.4112702238712167 | wang | 206 | entropy | log2 |
| PAR-0016 | 76 | 3.118596083721385 | 3.3021110543244547 | 0.6234529014586783 | -1.6954642986655717 | 3.4284811865354614 | rand | 949 | entropy | sqrt |
| PAR-0017 | 60 | 2.5182401703437893 | 3.0887270583901905 | 0.183268736983684 | -4.922673157766141 | 8.28879775346249 | limit\_inverse | 317 | entropy | log2 |
| PAR-0018 | 31 | 0.3481735788957047 | 1.6902330561627532 | 0.1262240550228265 | -2.202076745677905 | 5.96617047993395 | rand | 520 | gini | log2 |
| PAR-0019 | 65 | 3.28472530524626 | 3.354364847195117 | 0.6271643179645877 | -0.3894799436487819 | 6.094034762974259 | limit | 192 | entropy | log2 |
| PAR-0020 | 18 | 2.262423473293144 | 1.4283325603689074 | 0.1331489086950966 | -9.444589400688503 | 4.244857641571407 | rand | 441 | gini | nan |
| PAR-0021 | 92 | 0.9981423577590038 | 0.5113021438538676 | 0.6445110102534299 | -4.278186575158704 | 5.344901667618234 | limit\_inverse | 688 | entropy | sqrt |
| PAR-0022 | 56 | 1.383262722119777 | 1.6038613695715354 | 0.4607794259610277 | -1.6701504920064618 | 8.425347625463274 | rand | 717 | entropy | log2 |
| PAR-0023 | 88 | 2.0100168028851897 | 0.5534251213489001 | 0.3294699147164133 | -7.936531709151247 | 9.935628445657454 | reflect | 280 | gini | nan |
| PAR-0024 | 23 | 1.2850547272464845 | 2.7212482405899148 | 0.6178421724778226 | -6.583825456767154 | 8.101963848444631 | limit\_inverse | 701 | gini | nan |
| PAR-0025 | 88 | 1.4600458770119946 | 1.512761174421326 | 0.8582747510845202 | -2.6660182712500973 | 9.953542111583936 | wang | 300 | gini | log2 |
| PAR-0026 | 85 | 1.7505705515541914 | 0.6607261493183536 | 0.9907139510014524 | -1.4115929254853476 | 9.531452676165337 | wang | 202 | gini | log2 |
| PAR-0027 | 90 | 0.4095741902046184 | 1.9184208379475352 | 0.3668928504470998 | -0.6831036641805728 | 8.853430867764533 | reflect | 490 | entropy | log2 |
| PAR-0028 | 31 | 3.906548143888592 | 0.0738327135799608 | 0.9881518783518752 | -0.4962331954364209 | 8.631427603337995 | limit | 800 | entropy | log2 |
| PAR-0029 | 30 | 3.6965181605527673 | 3.335582894380441 | 0.1397311318997899 | -1.458633283150471 | 6.988818915992226 | limit\_inverse | 781 | gini | log2 |
| PAR-0030 | 28 | 2.738183776860986 | 3.750088392201436 | 0.8672969001143065 | -9.4581992856201 | 3.0710823062613346 | rand | 361 | entropy | sqrt |
| PAR-0031 | 29 | 1.034134615404322 | 2.5897559159463355 | 0.5296588411561688 | -9.100438685338045 | 1.8956172089582968 | wang | 834 | entropy | nan |
| PAR-0032 | 26 | 0.1356190090057705 | 2.57773107904454 | 0.57566095852194 | -4.774467641998265 | 2.011903067065947 | reflect | 805 | entropy | sqrt |
| PAR-0033 | 55 | 3.835539130876525 | 3.381573234572304 | 0.5479317223677445 | -9.035261522283204 | 8.436365770721665 | limit\_inverse | 192 | entropy | nan |
| PAR-0034 | 83 | 1.0860543277333905 | 2.9400242215975974 | 0.9495227132824736 | -5.24885121989956 | 8.463393099976614 | wang | 742 | gini | sqrt |
| PAR-0035 | 54 | 2.574832782940028 | 0.4720528408890914 | 0.7372082142537014 | -4.526300243537803 | 2.733726407532786 | limit\_inverse | 577 | entropy | sqrt |
| PAR-0036 | 79 | 2.9419556489287197 | 2.3875906719417754 | 0.5356977779862641 | -3.9326613899168734 | 3.347561280033524 | rand | 170 | entropy | log2 |
| PAR-0037 | 52 | 3.103894582966148 | 3.2693096293981423 | 0.3062618711780417 | -3.96075250296846 | 3.360117023825389 | reflect | 509 | entropy | nan |
| PAR-0038 | 82 | 1.1798168945644636 | 3.218394712065094 | 0.6170902642276427 | -2.368126544628982 | 6.246598090767039 | rand | 338 | entropy | sqrt |
| PAR-0039 | 32 | 1.145337995815717 | 0.5314874609450224 | 0.4921666478422632 | -1.2287083091722977 | 1.77079256180527 | rand | 481 | gini | nan |
| PAR-0040 | 97 | 3.48637736076165 | 3.190731641721087 | 0.8931415381840049 | -9.592953257530382 | 3.972747300118869 | limit | 531 | gini | nan |
| PAR-0041 | 95 | 3.308712754318638 | 1.77731899126595 | 0.5451183359850342 | -7.521277526432513 | 2.489155922482029 | wang | 364 | gini | nan |
| PAR-0042 | 57 | 1.5047868437812617 | 2.441022044360515 | 0.0375574638832458 | -8.11857890439778 | 2.3627872015113827 | limit | 594 | gini | sqrt |
| PAR-0043 | 50 | 0.7851518564060482 | 3.0409968429542524 | 0.6831846755205776 | -4.821562040254761 | 4.357392178442902 | reflect | 191 | gini | sqrt |
| PAR-0044 | 48 | 0.0775854448806425 | 1.968582201396471 | 0.2792690270110005 | -1.905258008667124 | 5.646849719632088 | rand | 560 | gini | sqrt |
| PAR-0045 | 17 | 3.94451426284564 | 1.228681975422277 | 0.6451811843723128 | -6.957763460576539 | 3.73016256170886 | limit | 398 | entropy | log2 |
| PAR-0046 | 64 | 1.6156496627320869 | 1.2533626152844135 | 0.1149455767415975 | -6.304244524233869 | 1.8398096416429175 | wang | 402 | entropy | log2 |
| PAR-0047 | 69 | 3.166234811510315 | 2.499001452481806 | 0.4441801458677716 | -3.8001503100663134 | 7.782927998488518 | limit\_inverse | 692 | entropy | nan |
| PAR-0048 | 85 | 1.3621676894814247 | 2.407680792053856 | 0.7167606670378115 | -9.680462408101418 | 5.344605172896433 | limit\_inverse | 384 | gini | nan |
| PAR-0049 | 15 | 2.070492906705724 | 3.2177609157003206 | 0.8216420582955141 | -1.5363309639553222 | 4.091693185808821 | limit\_inverse | 413 | gini | nan |
| PAR-0050 | 85 | 0.8451949997481485 | 0.896925637522525 | 0.7136869769438642 | -1.44928980479526 | 6.424041683825993 | wang | 349 | entropy | nan |
| PAR-0051 | 77 | 3.639350892871061 | 0.8189780319234092 | 0.2377166983607544 | -6.782976206988996 | 1.145265125619871 | limit\_inverse | 515 | gini | nan |
| PAR-0052 | 69 | 0.7808635985729366 | 2.992710612279887 | 0.8986340033094241 | -3.2859032898643203 | 2.7953422178699547 | limit | 58 | gini | sqrt |
| PAR-0053 | 67 | 3.2855599938752054 | 0.8180591047008061 | 0.4391055340819607 | -4.1907715299804496 | 1.660775569934524 | rand | 22 | entropy | log2 |
| PAR-0054 | 56 | 1.6382275470806222 | 3.198044208947811 | 0.469085264240589 | -8.55956003491483 | 5.461558515661268 | wang | 105 | gini | nan |
| PAR-0055 | 16 | 0.5225739145168733 | 0.0941307141447058 | 0.5050483855923501 | -4.485198539498203 | 1.469180634362386 | limit | 626 | entropy | sqrt |
| PAR-0056 | 14 | 3.5441570839168053 | 2.5082655619163368 | 0.2895383157685631 | -8.123495534814229 | 8.218041743579175 | reflect | 515 | gini | nan |
| PAR-0057 | 80 | 0.7951913575584175 | 2.101059219432901 | 0.9287770380675116 | -4.635618734291773 | 4.880177345507764 | limit | 109 | entropy | sqrt |
| PAR-0058 | 29 | 1.3943295709471704 | 3.2886335654706933 | 0.232400061403058 | -1.6209734354932674 | 6.479008029900887 | reflect | 44 | gini | log2 |
| PAR-0059 | 39 | 2.8702710908506046 | 1.541495512453992 | 0.6682402359692624 | -4.859170814417569 | 4.7573170775384455 | reflect | 755 | gini | nan |
| PAR-0060 | 11 | 3.219934657305402 | 0.5929512242945503 | 0.6370669095960508 | -4.142467319112581 | 7.589298061891647 | limit | 972 | gini | log2 |
| PAR-0061 | 75 | 2.566861476330182 | 2.8570551173084917 | 0.737656720383556 | -1.0371855133122825 | 4.96259660568298 | reflect | 875 | gini | sqrt |
| PAR-0062 | 26 | 1.68246107844032 | 1.1910474734557082 | 0.6674733665744893 | -5.587574518270869 | 5.8578132661170965 | limit | 113 | gini | sqrt |
| PAR-0063 | 50 | 3.2562886074614763 | 3.2224179795305097 | 0.838749801495771 | -0.0202802565997721 | 2.305828514117011 | wang | 102 | entropy | nan |
| PAR-0064 | 23 | 0.0775436731083552 | 1.452413348307907 | 0.3821703244310774 | -1.6713708079959737 | 2.1731108768718546 | reflect | 253 | gini | sqrt |
| PAR-0065 | 64 | 1.120438441222133 | 3.063024040845808 | 0.1930596880982709 | -0.9237273823651364 | 1.0437090838358676 | wang | 182 | gini | nan |
| PAR-0066 | 94 | 0.0698853001170083 | 0.0905435071728333 | 0.4609557091472906 | -1.5175423269342403 | 8.19765113499068 | wang | 78 | gini | nan |
| PAR-0067 | 55 | 1.4332934218653397 | 3.2563709652270068 | 0.400679553908147 | -9.56943480225647 | 9.613401526671485 | rand | 92 | gini | log2 |
| PAR-0068 | 71 | 1.9783613644188776 | 2.007629950779256 | 0.8477438353176265 | -3.013356128300697 | 8.32982624404758 | wang | 557 | gini | nan |
| PAR-0069 | 22 | 1.3105767603034408 | 3.558402691672255 | 0.674799277164151 | -4.739728433725468 | 7.284214888823334 | wang | 759 | gini | sqrt |
| PAR-0070 | 16 | 0.2833852116093154 | 3.277197623887441 | 0.7000833588123283 | -0.2647079206969636 | 0.1236564844461463 | reflect | 32 | entropy | log2 |
| PAR-0071 | 54 | 2.762357104234141 | 1.5318478997981249 | 0.3481347126863863 | -5.834683512724252 | 5.597778345735328 | limit | 29 | gini | nan |
| PAR-0072 | 22 | 0.8461971282130589 | 3.1643572829741275 | 0.10415946840813 | -1.7168441086834676 | 3.008149662477524 | reflect | 809 | entropy | nan |
| PAR-0073 | 51 | 2.493485028170955 | 0.8459743405872069 | 0.3341680877955129 | -3.067133155677527 | 4.645140536580934 | limit | 20 | gini | nan |
| PAR-0074 | 56 | 1.797430411409909 | 2.745308972990006 | 0.7293325941716189 | -2.5425564768074835 | 3.6828429340980895 | limit\_inverse | 508 | gini | log2 |
| PAR-0075 | 83 | 3.78769835371341 | 3.439504511460902 | 0.3295850808961656 | -8.346840925868806 | 2.37718824055276 | limit\_inverse | 781 | gini | nan |
| PAR-0076 | 23 | 2.4891508420659467 | 2.267691063633622 | 0.5220792670487621 | -4.356460755379207 | 5.439674597673515 | limit | 871 | entropy | sqrt |
| PAR-0077 | 30 | 1.9590394341358768 | 2.2201169659217994 | 0.3843273071585903 | -7.305450045559196 | 2.2324348354214054 | limit\_inverse | 754 | gini | log2 |
| PAR-0078 | 92 | 0.0276483759648602 | 1.9731085634820027 | 0.95052768147119 | -1.6340290197456913 | 6.077785843141161 | limit | 211 | gini | log2 |
| PAR-0079 | 95 | 0.1082066464941711 | 2.163322849005052 | 0.4926960805605297 | -3.889353913549997 | 4.662421452411892 | limit | 955 | gini | nan |
| PAR-0080 | 37 | 0.3101289631806474 | 2.4383584974438244 | 0.8626100335938207 | -6.929073834837965 | 0.0388468948073161 | rand | 899 | gini | nan |
| PAR-0081 | 45 | 1.6702149199926437 | 1.6051337373809695 | 0.7231110550492268 | -6.937564181214507 | 8.427193997343792 | rand | 295 | entropy | sqrt |
| PAR-0082 | 60 | 2.71288948756479 | 1.527821213821428 | 0.3114410365907115 | -9.649302695003293 | 8.800066576418411 | limit\_inverse | 915 | entropy | sqrt |
| PAR-0083 | 75 | 2.971794037699663 | 3.5606873082649844 | 0.5039880330857762 | -0.6875835231693035 | 7.90121114937163 | rand | 652 | entropy | nan |
| PAR-0084 | 31 | 3.433849975084404 | 2.577141531083428 | 0.5818311544925977 | -8.134428593673643 | 0.0477014900979955 | rand | 900 | entropy | log2 |
| PAR-0085 | 26 | 1.6872408502563134 | 1.2813015140901105 | 0.668445830406296 | -0.7325922014364288 | 5.285516246891751 | rand | 840 | entropy | log2 |
| PAR-0086 | 29 | 2.668028819454717 | 3.801606903791567 | 0.5365004193866147 | -5.205658587015108 | 5.610840894248899 | rand | 806 | entropy | sqrt |
| PAR-0087 | 79 | 0.3364481650677446 | 0.0557402157375004 | 0.6016828505606596 | -7.913585768789911 | 7.7555850733627185 | wang | 18 | gini | nan |
| PAR-0088 | 74 | 0.5305275150158852 | 3.520342252175124 | 0.5363866696595412 | -6.835647108723448 | 5.864795359179328 | rand | 571 | entropy | sqrt |
| PAR-0089 | 87 | 1.3321647323102628 | 2.679433045506567 | 0.6652023190099832 | -0.2606302883080076 | 2.431371169330254 | limit | 672 | gini | nan |
| PAR-0090 | 75 | 3.248524177075244 | 2.732674791329713 | 0.8860242682049334 | -9.195146491447554 | 9.071575729696969 | limit\_inverse | 941 | entropy | nan |
| PAR-0091 | 71 | 1.2263811535137277 | 0.4233583264493856 | 0.7036673577454556 | -1.870595983070192 | 4.557464798220571 | reflect | 930 | entropy | sqrt |
| PAR-0092 | 23 | 1.2892315397574814 | 3.593554492504829 | 0.5913473971990136 | -7.9509293262871905 | 5.603650357041195 | rand | 226 | entropy | log2 |
| PAR-0093 | 51 | 1.6998674981789708 | 3.7128796489408993 | 0.1012825125942907 | -0.3542061638909484 | 8.359630255830613 | wang | 33 | gini | sqrt |
| PAR-0094 | 59 | 2.7998702777154123 | 3.491675470555685 | 0.767588425292167 | -0.4583318318707299 | 7.592751199268629 | reflect | 369 | entropy | log2 |
| PAR-0095 | 96 | 2.0080278600549915 | 2.953493900549278 | 0.458282794221349 | -5.240878847482088 | 8.26051209557114 | wang | 886 | gini | sqrt |
| PAR-0096 | 91 | 2.436325071261431 | 2.5702919370549364 | 0.2816010278965946 | -0.1192894109190731 | 2.564741793432569 | wang | 481 | entropy | sqrt |
| PAR-0097 | 50 | 1.0628693171043229 | 3.3690469870050554 | 0.0288743942773421 | -3.000802098895168 | 3.9218604178573537 | rand | 833 | gini | nan |
| PAR-0098 | 47 | 1.345828585775844 | 2.1797021789407363 | 0.2617410417404838 | -5.635361267896776 | 2.4709837958784284 | limit\_inverse | 400 | entropy | nan |
| PAR-0099 | 60 | 3.153803424826598 | 3.096472671637951 | 0.9637338687321164 | -3.2420141915456924 | 1.8135259906785417 | wang | 549 | entropy | log2 |

**T#5.2 Particle Swarm Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Time Taken(s)** | **Total Power(J)** | **CPU(J)** | **Monitor(J)** | **Disk(J)** | **Base(J)** |
| PAR-0000 | 95 | 319.3999999999998 | 180.8999999999999 | 0.0 | 0.1 | 142.5 |
| PAR-0001 | 143 | 491.19999999999993 | 282.59999999999985 | 0.0 | 0.0 | 214.5 |
| PAR-0002 | 145 | 493.1000000000001 | 281.70000000000005 | 0.0 | 0.0 | 217.5 |
| PAR-0003 | 137 | 467.8000000000004 | 268.4999999999998 | 0.0 | 0.0 | 205.5 |
| PAR-0004 | 68 | 231.2 | 132.09999999999997 | 0.0 | 0.3 | 102.0 |
| PAR-0005 | 16 | 57.2 | 33.9 | 0.0 | 0.0 | 24.0 |
| PAR-0006 | 67 | 228.5999999999999 | 130.70000000000007 | 0.0 | 0.0 | 100.5 |
| PAR-0007 | 35 | 120.0 | 69.4 | 0.0 | 0.0 | 52.5 |
| PAR-0008 | 67 | 230.39999999999992 | 132.39999999999998 | 0.0 | 0.0 | 100.5 |
| PAR-0009 | 173 | 581.8000000000004 | 331.20000000000005 | 0.0 | 0.0 | 259.5 |
| PAR-0010 | 149 | 502.3000000000004 | 284.1999999999998 | 0.0 | 0.0 | 223.5 |
| PAR-0011 | 342 | 1185.7000000000016 | 687.6000000000005 | 0.0 | 0.6 | 513.0 |
| PAR-0012 | 47 | 158.9 | 90.70000000000002 | 0.0 | 0.0 | 70.5 |
| PAR-0013 | 119 | 401.2 | 227.99999999999997 | 0.0 | 0.0 | 178.5 |
| PAR-0014 | 266 | 904.0000000000016 | 516.3999999999999 | 0.0 | 0.0 | 399.0 |
| PAR-0015 | 35 | 119.7 | 68.60000000000001 | 0.0 | 0.0 | 52.5 |
| PAR-0016 | 151 | 512.1000000000003 | 291.8999999999999 | 0.0 | 0.0 | 226.5 |
| PAR-0017 | 49 | 164.89999999999998 | 92.99999999999996 | 0.0 | 0.0 | 73.5 |
| PAR-0018 | 56 | 192.1 | 110.7 | 0.0 | 0.0 | 84.0 |
| PAR-0019 | 29 | 98.20000000000002 | 55.900000000000006 | 0.0 | 0.0 | 43.5 |
| PAR-0020 | 101 | 342.40000000000003 | 195.89999999999995 | 0.0 | 0.0 | 151.5 |
| PAR-0021 | 112 | 384.1000000000001 | 221.6999999999998 | 0.0 | 0.0 | 168.0 |
| PAR-0022 | 115 | 393.1 | 225.3999999999999 | 0.0 | 0.0 | 172.5 |
| PAR-0023 | 64 | 218.79999999999995 | 125.69999999999996 | 0.0 | 0.0 | 96.0 |
| PAR-0024 | 158 | 536.2000000000003 | 306.70000000000005 | 0.0 | 0.0 | 237.0 |
| PAR-0025 | 33 | 115.6 | 67.4 | 0.0 | 0.0 | 49.5 |
| PAR-0026 | 21 | 71.69999999999997 | 41.49999999999999 | 0.0 | 0.0 | 31.5 |
| PAR-0027 | 79 | 269.49999999999994 | 155.29999999999995 | 0.0 | 0.0 | 118.5 |
| PAR-0028 | 128 | 434.1 | 248.09999999999988 | 0.0 | 0.0 | 192.0 |
| PAR-0029 | 86 | 323.5999999999999 | 196.29999999999995 | 0.0 | 0.1 | 129.0 |
| PAR-0030 | 55 | 188.89999999999992 | 107.59999999999997 | 0.0 | 0.0 | 82.5 |
| PAR-0031 | 305 | 1047.5000000000014 | 595.6000000000008 | 0.0 | 0.1 | 457.5 |
| PAR-0032 | 125 | 426.3999999999999 | 241.19999999999985 | 0.0 | 0.0 | 187.5 |
| PAR-0033 | 71 | 242.89999999999992 | 138.1 | 0.0 | 0.1 | 106.5 |
| PAR-0034 | 75 | 241.9000000000001 | 132.99999999999997 | 0.0 | 0.0 | 112.5 |
| PAR-0035 | 91 | 301.3 | 169.20000000000002 | 0.0 | 0.0 | 136.5 |
| PAR-0036 | 26 | 84.0 | 45.8 | 0.0 | 0.0 | 39.0 |
| PAR-0037 | 184 | 593.0999999999995 | 327.5 | 0.0 | 0.0 | 276.0 |
| PAR-0038 | 54 | 177.20000000000005 | 99.10000000000002 | 0.0 | 0.0 | 81.0 |
| PAR-0039 | 107 | 346.2999999999999 | 190.50000000000009 | 0.0 | 0.0 | 160.5 |
| PAR-0040 | 118 | 383.3000000000001 | 211.00000000000009 | 0.0 | 0.0 | 177.0 |
| PAR-0041 | 81 | 263.0000000000001 | 145.90000000000006 | 0.0 | 0.0 | 121.5 |
| PAR-0042 | 60 | 194.20000000000005 | 106.6 | 0.0 | 0.0 | 90.0 |
| PAR-0043 | 20 | 65.2 | 36.0 | 0.0 | 0.0 | 30.0 |
| PAR-0044 | 58 | 190.4 | 105.9 | 0.0 | 0.0 | 87.0 |
| PAR-0045 | 60 | 194.30000000000004 | 107.0 | 0.0 | 0.0 | 90.0 |
| PAR-0046 | 64 | 209.20000000000005 | 116.0 | 0.0 | 0.0 | 96.0 |
| PAR-0047 | 245 | 792.7999999999994 | 437.1 | 0.0 | 0.0 | 367.5 |
| PAR-0048 | 87 | 286.20000000000005 | 159.39999999999998 | 0.0 | 0.0 | 130.5 |
| PAR-0049 | 94 | 325.30000000000007 | 187.7 | 0.0 | 0.1 | 141.0 |
| PAR-0050 | 125 | 407.2999999999999 | 225.7 | 0.0 | 0.0 | 187.5 |
| PAR-0051 | 113 | 370.8000000000002 | 206.6 | 0.0 | 0.0 | 169.5 |
| PAR-0052 | 8 | 26.3 | 14.5 | 0.0 | 0.0 | 12.0 |
| PAR-0053 | 3 | 10.5 | 6.1 | 0.0 | 0.0 | 4.5 |
| PAR-0054 | 24 | 78.9 | 44.20000000000001 | 0.0 | 0.0 | 36.0 |
| PAR-0055 | 98 | 316.50000000000006 | 173.99999999999997 | 0.0 | 0.0 | 147.0 |
| PAR-0056 | 115 | 371.9 | 205.1 | 0.0 | 0.0 | 172.5 |
| PAR-0057 | 17 | 57.3 | 32.6 | 0.0 | 0.0 | 25.5 |
| PAR-0058 | 4 | 13.3 | 7.4 | 0.0 | 0.0 | 6.0 |
| PAR-0059 | 169 | 548.4999999999997 | 302.99999999999994 | 0.0 | 0.0 | 253.5 |
| PAR-0060 | 98 | 319.70000000000016 | 177.10000000000002 | 0.0 | 0.0 | 147.0 |
| PAR-0061 | 90 | 292.9000000000001 | 162.29999999999998 | 0.0 | 0.3 | 135.0 |
| PAR-0062 | 10 | 32.3 | 17.8 | 0.0 | 0.0 | 15.0 |
| PAR-0063 | 36 | 118.30000000000004 | 66.39999999999999 | 0.0 | 0.0 | 54.0 |
| PAR-0064 | 26 | 85.10000000000001 | 47.4 | 0.0 | 0.0 | 39.0 |
| PAR-0065 | 41 | 131.80000000000004 | 72.5 | 0.0 | 0.0 | 61.5 |
| PAR-0066 | 18 | 60.3 | 33.8 | 0.0 | 0.0 | 27.0 |
| PAR-0067 | 9 | 29.3 | 15.999999999999998 | 0.0 | 0.0 | 13.5 |
| PAR-0068 | 127 | 418.3999999999998 | 234.5 | 0.0 | 0.0 | 190.5 |
| PAR-0069 | 75 | 244.90000000000003 | 135.6 | 0.0 | 0.0 | 112.5 |
| PAR-0070 | 4 | 12.7 | 6.9 | 0.0 | 0.0 | 6.0 |
| PAR-0071 | 9 | 30.0 | 16.9 | 0.0 | 0.0 | 13.5 |
| PAR-0072 | 289 | 938.299999999999 | 517.8 | 0.0 | 0.0 | 433.5 |
| PAR-0073 | 4 | 12.1 | 6.200000000000001 | 0.0 | 0.0 | 6.0 |
| PAR-0074 | 50 | 162.4000000000001 | 89.89999999999998 | 0.0 | 0.0 | 75.0 |
| PAR-0075 | 176 | 579.9999999999995 | 322.70000000000005 | 0.0 | 0.3 | 264.0 |
| PAR-0076 | 136 | 446.1 | 247.99999999999983 | 0.0 | 0.0 | 204.0 |
| PAR-0077 | 76 | 250.1 | 139.09999999999997 | 0.0 | 0.0 | 114.0 |
| PAR-0078 | 22 | 72.40000000000002 | 40.2 | 0.0 | 0.0 | 33.0 |
| PAR-0079 | 213 | 690.3999999999996 | 380.3999999999996 | 0.0 | 0.0 | 319.5 |
| PAR-0080 | 201 | 659.3999999999995 | 366.9 | 0.0 | 0.1 | 301.5 |
| PAR-0081 | 45 | 146.89999999999998 | 81.80000000000001 | 0.0 | 0.0 | 67.5 |
| PAR-0082 | 142 | 463.2999999999999 | 255.9 | 0.0 | 0.0 | 213.0 |
| PAR-0083 | 233 | 761.5999999999996 | 423.1 | 0.0 | 0.0 | 349.5 |
| PAR-0084 | 142 | 468.0999999999999 | 261.0999999999999 | 0.0 | 0.0 | 213.0 |
| PAR-0085 | 130 | 423.29999999999984 | 233.30000000000004 | 0.0 | 0.1 | 195.0 |
| PAR-0086 | 125 | 407.8999999999997 | 225.89999999999995 | 0.0 | 0.0 | 187.5 |
| PAR-0087 | 4 | 13.5 | 7.5 | 0.0 | 0.0 | 6.0 |
| PAR-0088 | 89 | 291.6 | 162.10000000000002 | 0.0 | 0.0 | 133.5 |
| PAR-0089 | 151 | 493.8999999999999 | 273.19999999999993 | 0.0 | 0.0 | 226.5 |
| PAR-0090 | 342 | 1151.999999999999 | 655.2000000000006 | 0.0 | 0.1 | 513.0 |
| PAR-0091 | 145 | 471.4 | 261.0999999999999 | 0.0 | 0.0 | 217.5 |
| PAR-0092 | 36 | 119.99999999999996 | 67.80000000000001 | 0.0 | 0.0 | 54.0 |
| PAR-0093 | 3 | 9.6 | 5.2 | 0.0 | 0.0 | 4.5 |
| PAR-0094 | 57 | 186.50000000000003 | 103.3 | 0.0 | 0.0 | 85.5 |
| PAR-0095 | 90 | 297.4 | 166.29999999999998 | 0.0 | 0.0 | 135.0 |
| PAR-0096 | 76 | 248.80000000000007 | 138.20000000000002 | 0.0 | 0.0 | 114.0 |
| PAR-0097 | 188 | 642.4000000000003 | 367.5000000000003 | 0.0 | 0.0 | 282.0 |
| PAR-0098 | 144 | 494.3000000000003 | 281.1 | 0.0 | 0.1 | 216.0 |
| PAR-0099 | 87 | 297.6 | 168.99999999999986 | 0.0 | 0.0 | 130.5 |

**T#5.3 Particle Swarm Energy Distribution**

**Fig#5 Particle Swarm Iterations**

**Self Adaptive Bat**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Accuracy** | **Time Taken (s)** | **Energy Used (J)** | **Equivalent CO2 Emission (mg)** |
| SEL-0000 | 89.75 | 138 | 465.7000000000001 | 109.95694444444446 |
| SEL-0001 | 89.8 | 61 | 203.7 | 48.09583333333333 |
| SEL-0002 | 89.60000000000001 | 89 | 321.5 | 75.90972222222221 |
| SEL-0003 | 89.85 | 118 | 396.2000000000001 | 93.54722222222225 |
| SEL-0004 | 89.45 | 21 | 71.8 | 16.952777777777776 |
| SEL-0005 | 89.9 | 101 | 345.70000000000005 | 81.62361111111112 |
| SEL-0006 | 89.64999999999999 | 40 | 134.8 | 31.82777777777778 |
| SEL-0007 | 89.60000000000001 | 154 | 515.9000000000001 | 121.80972222222223 |
| SEL-0008 | 89.7 | 65 | 221.7 | 52.34583333333332 |
| SEL-0009 | 89.75 | 46 | 157.29999999999993 | 37.14027777777776 |
| SEL-0010 | 89.75 | 84 | 280.5999999999999 | 66.25277777777775 |
| SEL-0011 | 89.7 | 66 | 224.1 | 52.91249999999999 |
| SEL-0012 | 89.75 | 76 | 256.9999999999999 | 60.68055555555553 |
| SEL-0013 | 89.64999999999999 | 15 | 52.8 | 12.466666666666669 |
| SEL-0014 | 89.8 | 29 | 98.7 | 23.304166666666667 |
| SEL-0015 | 89.8 | 57 | 196.2 | 46.32499999999999 |
| SEL-0016 | 89.85 | 116 | 391.5999999999999 | 92.46111111111108 |
| SEL-0017 | 89.85 | 208 | 703.9000000000003 | 166.19861111111118 |
| SEL-0018 | 89.75 | 26 | 91.2 | 21.53333333333333 |
| SEL-0019 | 89.85 | 98 | 328.8 | 77.63333333333334 |
| SEL-0020 | 89.75 | 12 | 41.2 | 9.727777777777776 |
| SEL-0021 | 89.64999999999999 | 94 | 320.29999999999984 | 75.62638888888885 |
| SEL-0022 | 89.5 | 117 | 398.50000000000017 | 94.0902777777778 |
| SEL-0023 | 89.45 | 201 | 684.6000000000001 | 161.6416666666667 |
| SEL-0024 | 89.8 | 59 | 199.3999999999999 | 47.08055555555553 |
| SEL-0025 | 89.55 | 196 | 660.3000000000006 | 155.9041666666668 |
| SEL-0026 | 89.7 | 189 | 639.0000000000005 | 150.8750000000001 |
| SEL-0027 | 89.60000000000001 | 204 | 689.5000000000009 | 162.7986111111113 |
| SEL-0028 | 89.75 | 55 | 184.29999999999995 | 43.51527777777776 |
| SEL-0029 | 89.8 | 89 | 300.79999999999984 | 71.02222222222218 |
| SEL-0030 | 89.9 | 33 | 114.1 | 26.940277777777776 |
| SEL-0031 | 89.75 | 34 | 112.79999999999998 | 26.63333333333333 |
| SEL-0032 | 89.7 | 32 | 109.1 | 25.759722222222223 |
| SEL-0033 | 89.85 | 187 | 633.7000000000002 | 149.62361111111113 |
| SEL-0034 | 89.75 | 299 | 1008.7000000000014 | 238.1652777777781 |
| SEL-0035 | 89.60000000000001 | 53 | 179.99999999999994 | 42.49999999999999 |
| SEL-0036 | 89.9 | 122 | 413.40000000000026 | 97.6083333333334 |
| SEL-0037 | 89.64999999999999 | 77 | 259.99999999999983 | 61.38888888888885 |
| SEL-0038 | 89.85 | 127 | 430.70000000000016 | 101.6930555555556 |
| SEL-0039 | 89.64999999999999 | 25 | 83.2 | 19.64444444444445 |
| SEL-0040 | 89.8 | 161 | 578.4000000000004 | 136.56666666666678 |
| SEL-0041 | 89.75 | 99 | 338.1 | 79.82916666666667 |
| SEL-0042 | 89.9 | 85 | 286.69999999999993 | 67.69305555555553 |
| SEL-0043 | 89.85 | 72 | 240.39999999999995 | 56.7611111111111 |
| SEL-0044 | 89.7 | 44 | 149.99999999999997 | 35.41666666666666 |
| SEL-0045 | 89.60000000000001 | 8 | 26.100000000000005 | 6.162500000000001 |
| SEL-0046 | 89.64999999999999 | 63 | 215.4 | 50.85833333333333 |
| SEL-0047 | 89.75 | 241 | 813.3000000000006 | 192.0291666666668 |
| SEL-0048 | 89.85 | 134 | 451.2000000000001 | 106.53333333333336 |
| SEL-0049 | 89.85 | 10 | 36.50000000000001 | 8.618055555555557 |
| SEL-0050 | 89.60000000000001 | 87 | 294.29999999999995 | 69.48749999999998 |
| SEL-0051 | 89.7 | 76 | 256.29999999999995 | 60.51527777777777 |
| SEL-0052 | 89.8 | 106 | 362.0 | 85.47222222222221 |
| SEL-0053 | 89.7 | 65 | 219.6 | 51.84999999999999 |
| SEL-0054 | 89.7 | 55 | 186.9 | 44.12916666666667 |
| SEL-0055 | 89.8 | 8 | 26.700000000000003 | 6.304166666666667 |
| SEL-0056 | 89.85 | 23 | 80.6 | 19.030555555555555 |
| SEL-0057 | 89.75 | 123 | 417.60000000000014 | 98.60000000000002 |
| SEL-0058 | 89.75 | 35 | 119.1 | 28.12083333333333 |
| SEL-0059 | 89.60000000000001 | 34 | 114.90000000000003 | 27.12916666666668 |
| SEL-0060 | 89.7 | 7 | 24.500000000000004 | 5.784722222222223 |
| SEL-0061 | 89.75 | 116 | 394.1 | 93.0513888888889 |
| SEL-0062 | 89.5 | 20 | 68.80000000000001 | 16.244444444444447 |
| SEL-0063 | 89.7 | 71 | 240.89999999999995 | 56.879166666666656 |
| SEL-0064 | 89.60000000000001 | 17 | 59.89999999999999 | 14.143055555555554 |
| SEL-0065 | 89.85 | 97 | 330.8000000000001 | 78.10555555555558 |
| SEL-0066 | 89.60000000000001 | 211 | 716.6000000000008 | 169.19722222222242 |
| SEL-0067 | 89.7 | 189 | 639.4000000000003 | 150.96944444444452 |
| SEL-0068 | 89.85 | 251 | 849.4000000000009 | 200.552777777778 |
| SEL-0069 | 89.55 | 53 | 178.09999999999994 | 42.05138888888887 |
| SEL-0070 | 89.60000000000001 | 14 | 47.50000000000001 | 11.21527777777778 |
| SEL-0071 | 89.75 | 53 | 179.39999999999992 | 42.35833333333331 |
| SEL-0072 | 89.75 | 24 | 80.30000000000003 | 18.95972222222223 |
| SEL-0073 | 89.75 | 47 | 160.49999999999994 | 37.89583333333332 |
| SEL-0074 | 89.75 | 83 | 280.99999999999994 | 66.3472222222222 |
| SEL-0075 | 89.8 | 131 | 446.0000000000003 | 105.3055555555556 |
| SEL-0076 | 89.8 | 25 | 86.2 | 20.35277777777777 |
| SEL-0077 | 89.64999999999999 | 38 | 132.9 | 31.379166666666663 |
| SEL-0078 | 89.85 | 95 | 322.4 | 76.12222222222222 |
| SEL-0079 | 89.75 | 149 | 501.7000000000002 | 118.45694444444447 |
| SEL-0080 | 89.64999999999999 | 51 | 171.3 | 40.44583333333333 |
| SEL-0081 | 89.55 | 91 | 308.1 | 72.74583333333334 |
| SEL-0082 | 89.64999999999999 | 127 | 430.1 | 101.5513888888889 |
| SEL-0083 | 89.64999999999999 | 269 | 934.900000000001 | 220.740277777778 |
| SEL-0084 | 89.85 | 39 | 134.0 | 31.63888888888889 |
| SEL-0085 | 89.8 | 20 | 68.10000000000001 | 16.07916666666667 |
| SEL-0086 | 89.64999999999999 | 36 | 124.0 | 29.27777777777778 |
| SEL-0087 | 89.64999999999999 | 174 | 586.4000000000005 | 138.4555555555557 |
| SEL-0088 | 89.85 | 114 | 389.7999999999998 | 92.03611111111104 |
| SEL-0089 | 89.8 | 136 | 460.90000000000015 | 108.82361111111116 |
| SEL-0090 | 89.7 | 265 | 894.1000000000013 | 211.1069444444448 |
| SEL-0091 | 89.75 | 71 | 240.89999999999992 | 56.87916666666665 |
| SEL-0092 | 89.75 | 25 | 85.00000000000001 | 20.069444444444446 |
| SEL-0093 | 89.55 | 171 | 577.6000000000003 | 136.37777777777782 |
| SEL-0094 | 89.85 | 203 | 686.8000000000002 | 162.16111111111115 |
| SEL-0095 | 89.8 | 351 | 1187.7000000000014 | 280.429166666667 |
| SEL-0096 | 89.75 | 145 | 493.30000000000007 | 116.47361111111113 |
| SEL-0097 | 89.75 | 73 | 248.4999999999999 | 58.673611111111086 |
| SEL-0098 | 89.75 | 67 | 231.0 | 54.54166666666665 |
| SEL-0099 | 89.8 | 90 | 301.9999999999999 | 71.30555555555553 |

**T#6.1 Self Adaptive Bat Main Result**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **population\_size** | **loudness** | **pulse\_rate** | **epsilon** | **alpha** | **min\_frequency** | **max\_frequency** | **n\_estimator** | **criterion** | **max\_feature** |
| SEL-0000 | 45 | 0.4953294691693303 | 0.6002920007053112 | 0.0063789453395607 | 0.8917689509621813 | 9.21422629852615 | 78.4827738814337 | 880 | entropy | sqrt |
| SEL-0001 | 95 | 0.8614281821799779 | 0.796477014594362 | 0.0069144348303861 | 0.1279079854004264 | 6.31227604521258 | 69.61764669660025 | 385 | entropy | sqrt |
| SEL-0002 | 93 | 0.4978640123835224 | 0.5090871677180451 | 0.0600596490151842 | 0.9978071365524832 | 2.7311981207266167 | 72.36074137762624 | 382 | gini | nan |
| SEL-0003 | 28 | 0.191723735630543 | 0.2647039138571946 | 0.0628077080847378 | 0.3493085843715032 | 8.610417751508262 | 88.6826965509445 | 325 | entropy | nan |
| SEL-0004 | 37 | 0.3743900780349997 | 0.5345462018375161 | 0.0659003174599662 | 0.7495520167868096 | 4.301354431109951 | 41.81352364467864 | 204 | gini | log2 |
| SEL-0005 | 42 | 0.2644644623596952 | 0.3095966358709754 | 0.0985805517970601 | 0.1327065391291453 | 0.8656813233197913 | 82.96179218092723 | 649 | entropy | log2 |
| SEL-0006 | 84 | 0.9075516816611184 | 0.3722566072179196 | 0.0137868718252162 | 0.956301394092128 | 2.953998425463765 | 63.50183494975716 | 379 | gini | log2 |
| SEL-0007 | 86 | 0.2745576897508995 | 0.7247456603025114 | 0.0148329389992097 | 0.847376332746871 | 3.2690122425907098 | 58.24871547638601 | 687 | gini | nan |
| SEL-0008 | 18 | 0.943559675266398 | 0.4550992941131689 | 0.0391888734513831 | 0.730451281833682 | 2.8940862906654496 | 10.2795592623251 | 402 | entropy | sqrt |
| SEL-0009 | 86 | 0.9313760525356022 | 0.9558268591464496 | 0.0484008441902505 | 0.5224503667152683 | 7.632338519020548 | 62.88804963998271 | 294 | entropy | sqrt |
| SEL-0010 | 30 | 0.8217451290912786 | 0.6766779538683375 | 0.0211320772362361 | 0.6059828307794728 | 6.46126341665839 | 94.1030930820384 | 810 | gini | sqrt |
| SEL-0011 | 24 | 0.9514379964172044 | 0.9552037985857992 | 0.0949977201201235 | 0.9832290651111284 | 9.267307256274538 | 49.37099501970248 | 416 | entropy | sqrt |
| SEL-0012 | 58 | 0.9591395464133698 | 0.7408573137407606 | 0.0293817428018669 | 0.2967467442313971 | 1.998412489993605 | 73.26024074396044 | 484 | entropy | sqrt |
| SEL-0013 | 28 | 0.2133188744693481 | 0.9272489708535614 | 0.0996131660477701 | 0.2886065558874167 | 7.501941247213017 | 42.5505689402025 | 145 | gini | log2 |
| SEL-0014 | 62 | 0.7278026364168874 | 0.3948473872865461 | 0.0923266700864774 | 0.8987533396817095 | 7.254370861165908 | 22.576738510818863 | 265 | gini | sqrt |
| SEL-0015 | 57 | 0.4279958124362516 | 0.3661934531039721 | 0.0982698064287108 | 0.3244649557446211 | 1.9856261652856844 | 98.96539614378602 | 358 | entropy | sqrt |
| SEL-0016 | 66 | 0.1687960748614853 | 0.6611076113128105 | 0.0698179220029914 | 0.8016841188373117 | 9.490899170058189 | 84.74082131200986 | 741 | entropy | log2 |
| SEL-0017 | 42 | 0.6208195110875413 | 0.2649418632853156 | 0.0511955927665211 | 0.6666040383273526 | 3.109389058576816 | 55.69594158010473 | 567 | entropy | nan |
| SEL-0018 | 77 | 0.4434027834873446 | 0.2136016495205439 | 0.0319134176588724 | 0.1783390552515336 | 5.153788730438005 | 80.18130928889885 | 251 | gini | log2 |
| SEL-0019 | 18 | 0.5162230059330248 | 0.6644478861681289 | 0.0627448203463887 | 0.8390631936804084 | 1.8408124595895317 | 96.49468050716096 | 616 | entropy | log2 |
| SEL-0020 | 79 | 0.8295089967508756 | 0.2198340178255869 | 0.0329186569899131 | 0.6090452814909574 | 4.361669193659439 | 14.99869539380345 | 98 | gini | log2 |
| SEL-0021 | 38 | 0.1866942147781303 | 0.6800599092280869 | 0.056288846274315 | 0.3245820304957759 | 6.853741091069763 | 61.49632082357167 | 913 | gini | log2 |
| SEL-0022 | 70 | 0.4261897009635769 | 0.5147014833649249 | 0.086603367707605 | 0.4112341124769498 | 7.149174732910839 | 84.96864557194183 | 517 | gini | nan |
| SEL-0023 | 97 | 0.9438204041366876 | 0.396522923244772 | 0.0349656158750807 | 0.5522537806491677 | 2.7311627730694776 | 28.57121461763877 | 877 | gini | nan |
| SEL-0024 | 31 | 0.7834359412097152 | 0.6560579552300403 | 0.0279262880318078 | 0.389137313630459 | 6.986187724201986 | 40.74557088909562 | 161 | entropy | nan |
| SEL-0025 | 59 | 0.5113189889790577 | 0.8724472759760682 | 0.0271395099667842 | 0.4285103223276988 | 2.935810101656824 | 76.00583555874913 | 874 | gini | nan |
| SEL-0026 | 48 | 0.5510684224375982 | 0.9916425559013072 | 0.0205589697588409 | 0.493878374099693 | 1.9421330802475167 | 87.29566367063187 | 836 | gini | nan |
| SEL-0027 | 87 | 0.5514650862130996 | 0.4302035654023899 | 0.0724434402454527 | 0.1921541927960391 | 4.849942382453071 | 93.85206702237484 | 894 | gini | nan |
| SEL-0028 | 22 | 0.4471843203722451 | 0.9893366905166878 | 0.050888289829282 | 0.9789733323749332 | 7.985802467045852 | 95.5339012410722 | 247 | gini | nan |
| SEL-0029 | 34 | 0.5402185450894988 | 0.2257580187098109 | 0.0499106045162711 | 0.9317165861243726 | 7.794124570577695 | 86.87230045164576 | 240 | entropy | nan |
| SEL-0030 | 77 | 0.4050042914285511 | 0.8805672101028759 | 0.051979768855272 | 0.7160913497937218 | 3.545830887564101 | 14.876206429419115 | 208 | entropy | sqrt |
| SEL-0031 | 51 | 0.8594035075272777 | 0.5766929570405519 | 0.0633192243577571 | 0.3326802884659725 | 8.333117161938947 | 18.096051831957595 | 226 | entropy | sqrt |
| SEL-0032 | 83 | 0.3263882179735297 | 0.618094862669746 | 0.0998755287072214 | 0.1305142770262983 | 8.035092387918034 | 57.02979122201562 | 194 | entropy | sqrt |
| SEL-0033 | 39 | 0.7154766811386368 | 0.59313855013097 | 0.0854432716349291 | 0.962996304447218 | 1.8461442142447737 | 18.68264629945117 | 512 | entropy | nan |
| SEL-0034 | 59 | 0.1045009312555751 | 0.954570441954226 | 0.0243066201146827 | 0.3443622237400129 | 7.394612003804263 | 52.76033902090396 | 816 | entropy | nan |
| SEL-0035 | 43 | 0.4008086187454959 | 0.7634873928283312 | 0.0608772800945947 | 0.6793373761615064 | 5.727610090599553 | 59.26329780815977 | 497 | gini | sqrt |
| SEL-0036 | 65 | 0.5152574067731476 | 0.5821280001876377 | 0.0541772298041998 | 0.7619400210089619 | 1.6199968179224755 | 64.60604749074813 | 769 | entropy | sqrt |
| SEL-0037 | 91 | 0.8913680549015369 | 0.3756356840602375 | 0.0505887655235369 | 0.7983762811673834 | 5.041635035198087 | 64.35322747328385 | 474 | entropy | sqrt |
| SEL-0038 | 74 | 0.1543318041920763 | 0.6553812378048784 | 0.0854362881949925 | 0.3654588012770043 | 3.318600090692476 | 78.68686109833916 | 806 | entropy | log2 |
| SEL-0039 | 71 | 0.9026144847091192 | 0.542949983058037 | 0.0073668064865333 | 0.3577010490585364 | 4.764237138888693 | 88.94162521744933 | 253 | gini | sqrt |
| SEL-0040 | 18 | 0.8089776908366232 | 0.9038273843656044 | 0.0338733568274624 | 0.8844349061713712 | 5.266911965588118 | 13.66342068222656 | 976 | entropy | log2 |
| SEL-0041 | 58 | 0.7453414454309494 | 0.5906065023865308 | 0.0141871255379719 | 0.8444603697216936 | 3.579237298356669 | 32.30850226210738 | 955 | gini | sqrt |
| SEL-0042 | 26 | 0.2116577168633995 | 0.1338017174949213 | 0.045921729452414 | 0.4385770398507839 | 5.906439656740357 | 26.932789860419994 | 532 | entropy | sqrt |
| SEL-0043 | 98 | 0.1620250793876899 | 0.7148662079685199 | 0.0455355841304439 | 0.2766591676913609 | 1.833454870483072 | 56.605941637707154 | 453 | entropy | log2 |
| SEL-0044 | 65 | 0.2600000929071908 | 0.3513421243099005 | 0.0241085849706743 | 0.1174567250981445 | 5.561795853990093 | 82.85267792199589 | 429 | gini | log2 |
| SEL-0045 | 24 | 0.4496242594869295 | 0.6806630659350815 | 0.0783642531133918 | 0.9875157091402692 | 3.926773395485732 | 37.38012885481116 | 89 | gini | log2 |
| SEL-0046 | 53 | 0.4774751649615241 | 0.2034510190674378 | 0.0793040747795078 | 0.4635211741147196 | 3.969038743300066 | 43.26179928189517 | 610 | gini | sqrt |
| SEL-0047 | 39 | 0.8569248863083163 | 0.4997621312809945 | 0.0782137687434025 | 0.8124028325898209 | 6.8928096808732775 | 65.79864720940319 | 664 | entropy | nan |
| SEL-0048 | 41 | 0.9094800396763316 | 0.7450846003340303 | 0.0330448810963121 | 0.4064877301333206 | 3.779412612809452 | 12.87583832708724 | 837 | entropy | log2 |
| SEL-0049 | 35 | 0.7121235451887695 | 0.8394778524659626 | 0.044223308027684 | 0.5658609040087879 | 4.073624445651803 | 86.1730213244021 | 69 | entropy | log2 |
| SEL-0050 | 53 | 0.7060382060324653 | 0.7423182792494778 | 0.0709147920440973 | 0.2901688749433334 | 3.4288386937935265 | 86.95639175684266 | 845 | gini | log2 |
| SEL-0051 | 37 | 0.8115373042995474 | 0.313945028524679 | 0.0205774871419289 | 0.9188539508959888 | 5.106640026050231 | 38.95321413709903 | 754 | gini | sqrt |
| SEL-0052 | 15 | 0.3303882416257991 | 0.9087706029784816 | 0.0052980361175478 | 0.2756943096789107 | 0.4896923692683264 | 70.42687039122112 | 669 | entropy | sqrt |
| SEL-0053 | 76 | 0.4959719793986936 | 0.4951949806737646 | 0.0701700468135899 | 0.8392509986219212 | 0.1284127419675351 | 62.28305623017596 | 638 | gini | sqrt |
| SEL-0054 | 38 | 0.55459961813021 | 0.8429351268621071 | 0.0525041064311573 | 0.8240430813873463 | 2.44450447123164 | 21.29509986212934 | 512 | gini | log2 |
| SEL-0055 | 22 | 0.1509928595702313 | 0.5545435470331151 | 0.0632849914668451 | 0.2175791307662964 | 6.2265353127102765 | 59.633213144516176 | 86 | gini | sqrt |
| SEL-0056 | 98 | 0.8421580891314715 | 0.3605844841917068 | 0.0358877807266914 | 0.8974353438812812 | 5.104054995589838 | 26.88854018667195 | 55 | entropy | nan |
| SEL-0057 | 12 | 0.2470713896198056 | 0.9358993342607604 | 0.0582227197932795 | 0.2789180554506439 | 1.00224364845517 | 58.27943139137404 | 781 | entropy | log2 |
| SEL-0058 | 89 | 0.5255060468618019 | 0.3091600552627522 | 0.0255312726570656 | 0.4137241534631133 | 0.3493985880808548 | 85.41123908056059 | 220 | entropy | log2 |
| SEL-0059 | 92 | 0.9771686234270696 | 0.7014162123723362 | 0.0333064426860565 | 0.7458109954413861 | 7.531525971878763 | 56.26746267024188 | 331 | gini | log2 |
| SEL-0060 | 16 | 0.6468944564485855 | 0.6733602186364458 | 0.04295755663603 | 0.8244852978937154 | 9.722219733566282 | 62.71779412798678 | 25 | gini | nan |
| SEL-0061 | 91 | 0.1581551586117086 | 0.7638910483452004 | 0.036015390973722 | 0.6775438321742909 | 8.739485687806013 | 90.66533038018946 | 734 | entropy | log2 |
| SEL-0062 | 15 | 0.2602919312115853 | 0.7007260299170404 | 0.037616431099965 | 0.478553742649072 | 1.040785713805208 | 49.71182933556218 | 189 | gini | log2 |
| SEL-0063 | 53 | 0.8231400336175236 | 0.854874821346194 | 0.0822729809253302 | 0.8326649366788321 | 0.9354460083861392 | 99.81747769060205 | 450 | entropy | sqrt |
| SEL-0064 | 88 | 0.3081574373831685 | 0.4439532919879697 | 0.0415974766973475 | 0.1174473264493799 | 2.458706363894587 | 84.95766272803623 | 154 | gini | sqrt |
| SEL-0065 | 57 | 0.753219849661292 | 0.2737537192884438 | 0.0131205210030558 | 0.3520986492749799 | 1.7393554559538515 | 91.68645355871378 | 611 | entropy | sqrt |
| SEL-0066 | 59 | 0.8671196890643261 | 0.5148601382325616 | 0.0336784803353552 | 0.1157241925263268 | 0.6949256696637474 | 86.34211905759184 | 944 | gini | nan |
| SEL-0067 | 66 | 0.6245598922488039 | 0.4606115985173323 | 0.038405934252264 | 0.4224910199197014 | 0.831158625479459 | 13.87508677969176 | 515 | entropy | nan |
| SEL-0068 | 61 | 0.7377704564326715 | 0.8629694517858639 | 0.0190355442680098 | 0.5451313069942475 | 5.526001930298927 | 72.87979484529373 | 685 | entropy | nan |
| SEL-0069 | 63 | 0.2360231548124958 | 0.7073193494477359 | 0.0387395469585471 | 0.3948797710682742 | 7.572429033703203 | 57.34244409647079 | 151 | entropy | nan |
| SEL-0070 | 99 | 0.6065806115722011 | 0.7300750229310955 | 0.0519067951706357 | 0.1637616726120959 | 0.2322140423626928 | 97.61762871372734 | 82 | entropy | sqrt |
| SEL-0071 | 17 | 0.7578217286216709 | 0.4133212414177477 | 0.0218652798372733 | 0.7215303484526817 | 0.1996266421855186 | 47.48784838548174 | 495 | gini | log2 |
| SEL-0072 | 87 | 0.9248194102773204 | 0.193743521567317 | 0.0538688481516026 | 0.2903943538479382 | 8.077852073999718 | 84.54840302184878 | 150 | entropy | sqrt |
| SEL-0073 | 23 | 0.8044019206375908 | 0.4007512790159616 | 0.002126030208035 | 0.6610341313384649 | 0.1110554641991456 | 72.39580159890225 | 461 | gini | log2 |
| SEL-0074 | 36 | 0.6583538679356582 | 0.756399334754457 | 0.0419716470806407 | 0.5044218425672294 | 5.037713564357884 | 77.11699170873264 | 524 | entropy | log2 |
| SEL-0075 | 36 | 0.8811299331162006 | 0.3966265728065491 | 0.04510838344535 | 0.9522321295855172 | 7.795267582402671 | 24.87843166718075 | 818 | entropy | sqrt |
| SEL-0076 | 17 | 0.1516925887574503 | 0.5698713403438859 | 0.0508194939451263 | 0.660058939464838 | 8.70228318244724 | 60.79185320158714 | 162 | entropy | log2 |
| SEL-0077 | 29 | 0.5254625131492557 | 0.4458945764427313 | 0.0175372836240758 | 0.5407838726805724 | 7.520328641462455 | 34.250949589967234 | 234 | entropy | sqrt |
| SEL-0078 | 11 | 0.6644170976983633 | 0.9554749133240712 | 0.0083293195256697 | 0.1062208845920935 | 2.035965650997802 | 85.29373882228879 | 912 | gini | log2 |
| SEL-0079 | 14 | 0.7856008901346472 | 0.5434264725044767 | 0.0199723712005188 | 0.1243464954611885 | 9.54999508355068 | 64.99581477805003 | 950 | entropy | log2 |
| SEL-0080 | 66 | 0.7837286998470895 | 0.8763490302344387 | 0.0108319585177262 | 0.1697790167156456 | 8.986915049870438 | 37.63833548645832 | 316 | entropy | sqrt |
| SEL-0081 | 72 | 0.2507239151339275 | 0.7507999495443041 | 0.0739202915172036 | 0.4757983569983448 | 2.884480704609569 | 37.56192236906945 | 399 | gini | nan |
| SEL-0082 | 35 | 0.3740760124326168 | 0.3802969329316403 | 0.0955284226515089 | 0.7104001347020777 | 9.149879099976646 | 13.156275744970358 | 567 | gini | nan |
| SEL-0083 | 80 | 0.7304421536595435 | 0.5535892297771986 | 0.0615821634186803 | 0.7686536584824242 | 6.485529306004287 | 93.81174829147626 | 730 | entropy | nan |
| SEL-0084 | 81 | 0.4114940791389885 | 0.6236480390433379 | 0.0775559643106768 | 0.8726162443939908 | 8.992043636017561 | 26.790142656937206 | 245 | entropy | sqrt |
| SEL-0085 | 68 | 0.4415329231006244 | 0.7016012473656664 | 0.0878353444935365 | 0.4796291913076705 | 8.385826390415952 | 93.40667018707217 | 190 | gini | log2 |
| SEL-0086 | 64 | 0.3265190767459737 | 0.5828503774479533 | 0.0646172828589355 | 0.7003064843773115 | 8.04230426564428 | 53.149072716864026 | 220 | entropy | log2 |
| SEL-0087 | 63 | 0.8116684905370543 | 0.6415145655045936 | 0.0280303789878479 | 0.1757008371402425 | 0.0891071730036152 | 28.7777280808908 | 770 | gini | nan |
| SEL-0088 | 66 | 0.2182557112129233 | 0.5827480026935871 | 0.0583520873467519 | 0.2193686908785742 | 5.673761912033648 | 38.47917602148897 | 714 | entropy | log2 |
| SEL-0089 | 10 | 0.945902729538856 | 0.6986820871089848 | 0.0278446762856098 | 0.3997370647698092 | 6.690827859252169 | 97.65432740522792 | 863 | entropy | sqrt |
| SEL-0090 | 41 | 0.9336741276752591 | 0.89742184138444 | 0.0692764602882186 | 0.8309179398419299 | 9.404270713827875 | 17.24368157697202 | 733 | entropy | nan |
| SEL-0091 | 87 | 0.148182445770693 | 0.7333006219709101 | 0.0561122309172261 | 0.3759357595405886 | 9.301408175094124 | 83.16463615236827 | 684 | gini | log2 |
| SEL-0092 | 73 | 0.5316629403411873 | 0.6322126574791123 | 0.0608827063389254 | 0.3900770964454333 | 2.1840588346891066 | 28.441636063415284 | 154 | entropy | log2 |
| SEL-0093 | 56 | 0.2500893845811479 | 0.1911542613348616 | 0.0294256107471778 | 0.4824701870902684 | 0.2374239544135836 | 96.81214452498146 | 470 | entropy | nan |
| SEL-0094 | 98 | 0.5805667496027078 | 0.7908295827629502 | 0.0845065544041382 | 0.7299708124859677 | 3.6293641988156766 | 95.87501351316344 | 556 | entropy | nan |
| SEL-0095 | 55 | 0.1718958557179842 | 0.5124545147992141 | 0.0421462618118491 | 0.5518062685123731 | 8.855031577009157 | 52.8320903726612 | 965 | entropy | nan |
| SEL-0096 | 53 | 0.2743519083401146 | 0.3534409251069351 | 0.0781577844725415 | 0.648173141033822 | 4.7588801822852345 | 98.92639530172836 | 909 | entropy | sqrt |
| SEL-0097 | 70 | 0.8160307786649496 | 0.1259869548496079 | 0.0310874810367792 | 0.3391455963484726 | 8.314163423573339 | 72.9927811099435 | 452 | entropy | log2 |
| SEL-0098 | 41 | 0.9361681871218324 | 0.3355669375664354 | 0.0654687132514807 | 0.4028114317995649 | 3.941331214642881 | 49.28174858892902 | 418 | entropy | sqrt |
| SEL-0099 | 53 | 0.422282551268182 | 0.9673604818589048 | 0.0500632447576342 | 0.8096057705859845 | 5.454022036958561 | 70.82187227608877 | 569 | entropy | sqrt |

**T#6.2 Self Adaptive Bat Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Time Taken(s)** | **Total Power(J)** | **CPU(J)** | **Monitor(J)** | **Disk(J)** | **Base(J)** |
| SEL-0000 | 138 | 465.7000000000001 | 264.7999999999998 | 0.0 | 0.0 | 207.0 |
| SEL-0001 | 61 | 203.7 | 115.9 | 0.0 | 0.0 | 91.5 |
| SEL-0002 | 89 | 321.5 | 191.6999999999999 | 0.0 | 0.1 | 133.5 |
| SEL-0003 | 118 | 396.2000000000001 | 225.59999999999985 | 0.0 | 0.0 | 177.0 |
| SEL-0004 | 21 | 71.8 | 41.7 | 0.0 | 0.0 | 31.5 |
| SEL-0005 | 101 | 345.70000000000005 | 197.99999999999983 | 0.0 | 0.0 | 151.5 |
| SEL-0006 | 40 | 134.8 | 76.50000000000001 | 0.0 | 0.0 | 60.0 |
| SEL-0007 | 154 | 515.9000000000001 | 291.3 | 0.0 | 0.0 | 231.0 |
| SEL-0008 | 65 | 221.69999999999996 | 126.19999999999996 | 0.0 | 0.0 | 97.5 |
| SEL-0009 | 46 | 157.29999999999993 | 90.40000000000002 | 0.0 | 0.0 | 69.0 |
| SEL-0010 | 84 | 280.5999999999999 | 157.8 | 0.0 | 0.0 | 126.0 |
| SEL-0011 | 66 | 224.1 | 127.8 | 0.0 | 0.0 | 99.0 |
| SEL-0012 | 76 | 256.9999999999999 | 146.7 | 0.0 | 0.0 | 114.0 |
| SEL-0013 | 15 | 52.8 | 30.9 | 0.0 | 0.0 | 22.5 |
| SEL-0014 | 29 | 98.7 | 56.400000000000006 | 0.0 | 0.0 | 43.5 |
| SEL-0015 | 57 | 196.2 | 113.6 | 0.0 | 0.0 | 85.5 |
| SEL-0016 | 116 | 391.5999999999999 | 222.5999999999999 | 0.0 | 0.0 | 174.0 |
| SEL-0017 | 208 | 703.9000000000003 | 401.60000000000025 | 0.0 | 0.0 | 312.0 |
| SEL-0018 | 26 | 91.2 | 53.39999999999999 | 0.0 | 0.0 | 39.0 |
| SEL-0019 | 98 | 328.8 | 186.2 | 0.0 | 0.0 | 147.0 |
| SEL-0020 | 12 | 41.2 | 23.6 | 0.0 | 0.0 | 18.0 |
| SEL-0021 | 94 | 320.29999999999984 | 183.4 | 0.0 | 0.0 | 141.0 |
| SEL-0022 | 117 | 398.50000000000017 | 227.09999999999985 | 0.0 | 0.2 | 175.5 |
| SEL-0023 | 201 | 684.6000000000001 | 391.6000000000001 | 0.0 | 0.1 | 301.5 |
| SEL-0024 | 59 | 199.3999999999999 | 113.7 | 0.0 | 0.0 | 88.5 |
| SEL-0025 | 196 | 660.3000000000006 | 376.1 | 0.0 | 0.0 | 294.0 |
| SEL-0026 | 189 | 639.0000000000005 | 362.8999999999999 | 0.0 | 0.2 | 283.5 |
| SEL-0027 | 204 | 689.5000000000009 | 392.5000000000002 | 0.0 | 0.0 | 306.0 |
| SEL-0028 | 55 | 184.29999999999995 | 104.2 | 0.0 | 0.0 | 82.5 |
| SEL-0029 | 89 | 300.79999999999984 | 170.79999999999998 | 0.0 | 0.0 | 133.5 |
| SEL-0030 | 33 | 114.1 | 65.90000000000002 | 0.0 | 0.0 | 49.5 |
| SEL-0031 | 34 | 112.79999999999998 | 63.19999999999999 | 0.0 | 0.0 | 51.0 |
| SEL-0032 | 32 | 109.1 | 62.5 | 0.0 | 0.0 | 48.0 |
| SEL-0033 | 187 | 633.7000000000002 | 362.9999999999999 | 0.0 | 0.0 | 280.5 |
| SEL-0034 | 299 | 1008.7000000000014 | 575.0000000000013 | 0.0 | 0.1 | 448.5 |
| SEL-0035 | 53 | 179.99999999999994 | 103.4 | 0.0 | 0.0 | 79.5 |
| SEL-0036 | 122 | 413.40000000000026 | 236.89999999999975 | 0.0 | 0.0 | 183.0 |
| SEL-0037 | 77 | 259.99999999999983 | 148.0999999999999 | 0.0 | 0.0 | 115.5 |
| SEL-0038 | 127 | 430.70000000000016 | 246.09999999999985 | 0.0 | 0.0 | 190.5 |
| SEL-0039 | 25 | 83.2 | 46.8 | 0.0 | 0.0 | 37.5 |
| SEL-0040 | 161 | 578.4000000000004 | 343.4999999999998 | 0.0 | 0.1 | 241.5 |
| SEL-0041 | 99 | 338.1 | 193.79999999999995 | 0.0 | 0.0 | 148.5 |
| SEL-0042 | 85 | 286.69999999999993 | 162.59999999999997 | 0.0 | 0.0 | 127.5 |
| SEL-0043 | 72 | 240.39999999999995 | 136.10000000000005 | 0.0 | 0.0 | 108.0 |
| SEL-0044 | 44 | 149.99999999999997 | 86.10000000000001 | 0.0 | 0.0 | 66.0 |
| SEL-0045 | 8 | 26.100000000000005 | 14.199999999999998 | 0.0 | 0.0 | 12.0 |
| SEL-0046 | 63 | 215.4 | 123.69999999999996 | 0.0 | 0.0 | 94.5 |
| SEL-0047 | 241 | 813.3000000000006 | 461.70000000000033 | 0.0 | 0.0 | 361.5 |
| SEL-0048 | 134 | 451.2000000000001 | 254.59999999999968 | 0.0 | 0.0 | 201.0 |
| SEL-0049 | 10 | 36.50000000000001 | 21.9 | 0.0 | 0.0 | 15.0 |
| SEL-0050 | 87 | 294.29999999999995 | 167.59999999999988 | 0.0 | 0.0 | 130.5 |
| SEL-0051 | 76 | 256.29999999999995 | 144.99999999999997 | 0.0 | 0.0 | 114.0 |
| SEL-0052 | 106 | 362.0 | 206.6999999999999 | 0.0 | 0.0 | 159.0 |
| SEL-0053 | 65 | 219.6 | 125.29999999999995 | 0.0 | 0.0 | 97.5 |
| SEL-0054 | 55 | 186.9 | 106.70000000000005 | 0.0 | 0.0 | 82.5 |
| SEL-0055 | 8 | 26.700000000000003 | 15.0 | 0.0 | 0.0 | 12.0 |
| SEL-0056 | 23 | 80.6 | 47.1 | 0.0 | 0.0 | 34.5 |
| SEL-0057 | 123 | 417.60000000000014 | 238.9999999999999 | 0.0 | 0.0 | 184.5 |
| SEL-0058 | 35 | 119.1 | 67.9 | 0.0 | 0.0 | 52.5 |
| SEL-0059 | 34 | 114.90000000000003 | 65.70000000000002 | 0.0 | 0.0 | 51.0 |
| SEL-0060 | 7 | 24.500000000000004 | 14.499999999999998 | 0.0 | 0.0 | 10.5 |
| SEL-0061 | 116 | 394.1 | 224.79999999999984 | 0.0 | 0.0 | 174.0 |
| SEL-0062 | 20 | 68.80000000000001 | 39.9 | 0.0 | 0.0 | 30.0 |
| SEL-0063 | 71 | 240.89999999999995 | 137.69999999999996 | 0.0 | 0.0 | 106.5 |
| SEL-0064 | 17 | 59.89999999999999 | 35.2 | 0.0 | 0.0 | 25.5 |
| SEL-0065 | 97 | 330.8000000000001 | 189.59999999999997 | 0.0 | 0.0 | 145.5 |
| SEL-0066 | 211 | 716.6000000000008 | 410.4000000000002 | 0.0 | 0.3 | 316.5 |
| SEL-0067 | 189 | 639.4000000000003 | 363.1999999999998 | 0.0 | 0.1 | 283.5 |
| SEL-0068 | 251 | 849.4000000000009 | 483.8000000000007 | 0.0 | 0.0 | 376.5 |
| SEL-0069 | 53 | 178.09999999999994 | 100.69999999999996 | 0.0 | 0.0 | 79.5 |
| SEL-0070 | 14 | 47.50000000000001 | 27.0 | 0.0 | 0.0 | 21.0 |
| SEL-0071 | 53 | 179.39999999999992 | 103.10000000000002 | 0.0 | 0.0 | 79.5 |
| SEL-0072 | 24 | 80.30000000000003 | 45.4 | 0.0 | 0.0 | 36.0 |
| SEL-0073 | 47 | 160.49999999999994 | 92.19999999999996 | 0.0 | 0.0 | 70.5 |
| SEL-0074 | 83 | 280.99999999999994 | 159.9999999999999 | 0.0 | 0.0 | 124.5 |
| SEL-0075 | 131 | 446.0000000000003 | 255.0999999999998 | 0.0 | 0.4 | 196.5 |
| SEL-0076 | 25 | 86.2 | 49.9 | 0.0 | 0.0 | 37.5 |
| SEL-0077 | 38 | 132.9 | 77.7 | 0.0 | 0.0 | 57.0 |
| SEL-0078 | 95 | 322.4 | 183.89999999999984 | 0.0 | 0.0 | 142.5 |
| SEL-0079 | 149 | 501.7000000000002 | 285.39999999999986 | 0.0 | 0.0 | 223.5 |
| SEL-0080 | 51 | 171.3 | 96.7 | 0.0 | 0.0 | 76.5 |
| SEL-0081 | 91 | 308.1 | 175.89999999999998 | 0.0 | 0.0 | 136.5 |
| SEL-0082 | 127 | 430.1 | 245.9999999999999 | 0.0 | 0.0 | 190.5 |
| SEL-0083 | 269 | 934.900000000001 | 542.8000000000004 | 0.0 | 0.0 | 403.5 |
| SEL-0084 | 39 | 134.0 | 76.50000000000001 | 0.0 | 0.0 | 58.5 |
| SEL-0085 | 20 | 68.10000000000001 | 39.2 | 0.0 | 0.0 | 30.0 |
| SEL-0086 | 36 | 124.0 | 71.7 | 0.0 | 0.0 | 54.0 |
| SEL-0087 | 174 | 586.4000000000005 | 333.1999999999999 | 0.0 | 0.0 | 261.0 |
| SEL-0088 | 114 | 389.7999999999998 | 224.49999999999991 | 0.0 | 0.0 | 171.0 |
| SEL-0089 | 136 | 460.90000000000015 | 262.2999999999998 | 0.0 | 0.0 | 204.0 |
| SEL-0090 | 265 | 894.1000000000013 | 509.7000000000004 | 0.0 | 0.0 | 397.5 |
| SEL-0091 | 71 | 240.89999999999992 | 137.60000000000002 | 0.0 | 0.0 | 106.5 |
| SEL-0092 | 25 | 85.00000000000001 | 48.8 | 0.0 | 0.0 | 37.5 |
| SEL-0093 | 171 | 577.6000000000003 | 328.5 | 0.0 | 0.0 | 256.5 |
| SEL-0094 | 203 | 686.8000000000002 | 389.90000000000026 | 0.0 | 0.0 | 304.5 |
| SEL-0095 | 351 | 1187.7000000000014 | 675.5000000000013 | 0.0 | 0.0 | 526.5 |
| SEL-0096 | 145 | 493.30000000000007 | 281.29999999999995 | 0.0 | 0.0 | 217.5 |
| SEL-0097 | 73 | 248.4999999999999 | 142.19999999999993 | 0.0 | 0.0 | 109.5 |
| SEL-0098 | 67 | 230.99999999999997 | 133.39999999999998 | 0.0 | 0.0 | 100.5 |
| SEL-0099 | 90 | 301.9999999999999 | 170.89999999999992 | 0.0 | 0.0 | 135.0 |

**T#6.3 Self Adaptive Bat Energy Distribution**

**Fig#6 Self Adaptive Bat Iterations**