|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TABLE I  ARPD of five algorithms under four SDST conditions () | | | | | | | | | | | | | | | | | | | | | | |
|  |  |  | DABC | | | | NEABC | | | | MIG | | | | MCEDA | | | | CLDHH | | | |
| SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 |
| 2 | 20 | 5 | 0.193 | 0.179 | 0.199 | 0.214 | 0.134 | 0.118 | 0.135 | 0.137 | 0.092 | 0.086 | 0.103 | 0.099 | 0.089 | 0.093 | 0.099 | 0.105 | **0.018** | **0.020** | **0.024** | **0.034** |
| 10 | 0.221 | 0.175 | 0.176 | 0.172 | 0.170 | 0.120 | 0.114 | 0.111 | 0.142 | 0.103 | 0.094 | 0.091 | 0.152 | 0.105 | 0.098 | 0.092 | **0.063** | **0.024** | **0.022** | **0.028** |
| 20 | 0.181 | 0.143 | 0.161 | 0.159 | 0.138 | 0.100 | 0.117 | 0.116 | 0.111 | 0.083 | 0.099 | 0.100 | 0.123 | 0.083 | 0.098 | 0.096 | **0.041** | **0.022** | **0.027** | **0.023** |
| 50 | 5 | 0.357 | 0.340 | 0.340 | 0.322 | 0.222 | 0.206 | 0.190 | 0.181 | 0.138 | 0.154 | 0.135 | 0.132 | 0.148 | 0.155 | 0.130 | 0.127 | **0.026** | **0.034** | **0.028** | **0.017** |
| 10 | 0.380 | 0.317 | 0.326 | 0.301 | 0.236 | 0.183 | 0.186 | 0.157 | 0.158 | 0.135 | 0.141 | 0.128 | 0.170 | 0.131 | 0.150 | 0.120 | **0.029** | **0.024** | **0.026** | **0.020** |
| 20 | 0.352 | 0.325 | 0.308 | 0.307 | 0.193 | 0.170 | 0.173 | 0.156 | 0.135 | 0.134 | 0.139 | 0.125 | 0.149 | 0.139 | 0.142 | 0.127 | **0.027** | **0.021** | **0.027** | **0.024** |
| 80 | 5 | 0.398 | 0.367 | 0.377 | 0.408 | 0.217 | 0.199 | 0.197 | 0.199 | 0.128 | 0.128 | 0.102 | 0.122 | 0.133 | 0.124 | 0.112 | 0.112 | **0.030** | **0.046** | **0.026** | **0.030** |
| 10 | 0.473 | 0.360 | 0.340 | 0.332 | 0.248 | 0.158 | 0.161 | 0.152 | 0.159 | 0.110 | 0.102 | 0.111 | 0.174 | 0.108 | 0.104 | 0.111 | **0.058** | **0.032** | **0.022** | **0.017** |
| 20 | 2.297 | 0.381 | 0.386 | 0.310 | 1.141 | 0.160 | 0.191 | 0.132 | 0.656 | 0.121 | 0.137 | 0.101 | 0.715 | 0.122 | 0.145 | 0.100 | **0.228** | **0.023** | **0.032** | **0.013** |
| 100 | 5 | 0.404 | 0.346 | 0.381 | 0.389 | 0.224 | 0.174 | 0.185 | 0.163 | 0.104 | 0.078 | 0.095 | 0.070 | 0.116 | 0.087 | 0.098 | 0.070 | **0.033** | **0.034** | **0.034** | **0.028** |
| 10 | 0.456 | 0.363 | 0.361 | 0.360 | 0.213 | 0.161 | 0.174 | 0.155 | 0.116 | 0.100 | 0.114 | 0.096 | 0.126 | 0.099 | 0.114 | 0.096 | **0.027** | **0.032** | **0.018** | **0.013** |
| 20 | 0.422 | 0.398 | 0.364 | 0.352 | 0.163 | 0.164 | 0.155 | 0.160 | 0.091 | 0.109 | 0.108 | 0.113 | 0.101 | 0.112 | 0.112 | 0.116 | **0.023** | **0.017** | **0.023** | **0.021** |
| 200 | 5 | 0.345 | 0.339 | 0.385 | 0.407 | 0.155 | 0.132 | 0.147 | 0.148 | **0.014** | **0.009** | **0.022** | 0.019 | 0.022 | 0.011 | **0.022** | **0.018** | 0.034 | 0.029 | 0.033 | 0.036 |
| 10 | 0.407 | 0.346 | 0.381 | 0.334 | 0.158 | 0.120 | 0.164 | 0.116 | **0.011** | **0.007** | 0.056 | **0.017** | **0.011** | 0.008 | 0.059 | **0.017** | 0.044 | 0.033 | **0.049** | 0.019 |
| 20 | 0.462 | 0.406 | 0.346 | 0.347 | 0.154 | 0.134 | 0.104 | 0.124 | **0.028** | 0.043 | **0.023** | 0.048 | 0.029 | **0.040** | 0.024 | 0.050 | 0.043 | 0.043 | **0.023** | **0.033** |
| Mean | | | 0.490 | 0.319 | 0.322 | 0.314 | 0.251 | 0.153 | 0.160 | 0.147 | 0.139 | 0.093 | 0.098 | 0.091 | 0.151 | 0.094 | 0.100 | 0.090 | **0.048** | **0.029** | **0.028** | **0.024** |
| 3 | 20 | 5 | 0.123 | 0.089 | 0.098 | 0.119 | 0.094 | 0.062 | 0.065 | 0.079 | 0.077 | 0.054 | 0.050 | 0.053 | 0.082 | 0.055 | 0.054 | 0.063 | **0.025** | **0.015** | **0.019** | **0.024** |
| 10 | 0.085 | 0.082 | 0.100 | 0.094 | 0.065 | 0.060 | 0.073 | 0.070 | 0.050 | 0.056 | 0.067 | 0.059 | 0.057 | 0.057 | 0.069 | 0.062 | **0.013** | **0.017** | **0.025** | **0.019** |
| 20 | 0.070 | 0.073 | 0.079 | 0.092 | 0.053 | 0.053 | 0.057 | 0.059 | 0.043 | 0.049 | 0.053 | 0.049 | 0.049 | 0.054 | 0.053 | 0.056 | **0.013** | **0.015** | **0.017** | **0.021** |
| 50 | 5 | 0.235 | 0.226 | 0.252 | 0.239 | 0.185 | 0.162 | 0.169 | 0.153 | 0.113 | 0.113 | 0.111 | 0.091 | 0.123 | 0.115 | 0.116 | 0.105 | **0.020** | **0.025** | **0.021** | **0.013** |
| 10 | 0.245 | 0.217 | 0.214 | 0.212 | 0.170 | 0.148 | 0.149 | 0.137 | 0.110 | 0.109 | 0.115 | 0.096 | 0.118 | 0.109 | 0.112 | 0.101 | **0.022** | **0.018** | **0.019** | **0.019** |
| 20 | 0.223 | 0.221 | 0.208 | 0.199 | 0.152 | 0.142 | 0.138 | 0.135 | 0.106 | 0.116 | 0.110 | 0.105 | 0.117 | 0.113 | 0.108 | 0.106 | **0.025** | **0.022** | **0.017** | **0.019** |
| 80 | 5 | 0.297 | 0.298 | 0.299 | 0.306 | 0.226 | 0.199 | 0.180 | 0.168 | 0.118 | 0.117 | 0.122 | 0.093 | 0.141 | 0.118 | 0.119 | 0.109 | **0.025** | **0.024** | **0.024** | **0.019** |
| 10 | 0.323 | 0.288 | 0.305 | 0.271 | 0.192 | 0.167 | 0.180 | 0.152 | 0.122 | 0.122 | 0.145 | 0.113 | 0.132 | 0.125 | 0.146 | 0.121 | **0.019** | **0.019** | **0.021** | **0.016** |
| 20 | 0.825 | 0.284 | 0.299 | 0.270 | 0.490 | 0.162 | 0.171 | 0.156 | 0.326 | 0.118 | 0.139 | 0.123 | 0.350 | 0.125 | 0.144 | 0.129 | **0.080** | **0.016** | **0.024** | **0.023** |
| 100 | 5 | 0.351 | 0.324 | 0.355 | 0.371 | 0.246 | 0.201 | 0.204 | 0.197 | 0.140 | 0.122 | 0.125 | 0.103 | 0.148 | 0.128 | 0.129 | 0.124 | **0.027** | **0.027** | **0.036** | **0.031** |
| 10 | 0.374 | 0.329 | 0.306 | 0.313 | 0.221 | 0.184 | 0.171 | 0.164 | 0.128 | 0.134 | 0.119 | 0.111 | 0.137 | 0.127 | 0.119 | 0.119 | **0.017** | **0.025** | **0.018** | **0.021** |
| 20 | 0.350 | 0.325 | 0.299 | 0.300 | 0.180 | 0.172 | 0.162 | 0.156 | 0.112 | 0.135 | 0.124 | 0.117 | 0.117 | 0.127 | 0.122 | 0.119 | **0.023** | **0.020** | **0.012** | **0.013** |
| 200 | 5 | 0.387 | 0.332 | 0.360 | 0.352 | 0.255 | 0.182 | 0.172 | 0.158 | 0.097 | 0.066 | 0.059 | 0.038 | 0.114 | 0.065 | 0.058 | 0.042 | **0.045** | **0.028** | **0.022** | **0.023** |
| 10 | 0.396 | 0.357 | 0.347 | 0.336 | 0.191 | 0.167 | 0.159 | 0.143 | 0.082 | 0.079 | 0.083 | 0.068 | 0.081 | 0.078 | 0.087 | 0.071 | **0.024** | **0.027** | **0.019** | **0.025** |
| 20 | 0.439 | 0.372 | 0.354 | 0.348 | 0.184 | 0.155 | 0.154 | 0.153 | 0.091 | 0.076 | 0.096 | 0.093 | 0.089 | 0.076 | 0.094 | 0.094 | **0.027** | **0.024** | **0.022** | **0.021** |
| Mean | | | 0.315 | 0.254 | 0.258 | 0.255 | 0.194 | 0.148 | 0.147 | 0.139 | 0.114 | 0.098 | 0.101 | 0.087 | 0.124 | 0.098 | 0.102 | 0.095 | **0.027** | **0.021** | **0.021** | **0.020** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TABLE II  ARPD of five algorithms under four SDST conditions () | | | | | | | | | | | | | | | | | | | | | | |
|  |  |  | DABC | | | | NEABC | | | | MIG | | | | MCEDA | | | | CLDHH | | | |
| SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 |
| 4 | 20 | 5 | 0.027 | 0.068 | 0.058 | 2.076 | 0.017 | 0.049 | 0.036 | 1.213 | 0.013 | 0.044 | 0.029 | 0.759 | 0.015 | 0.046 | 0.033 | 0.821 | **0.006** | **0.017** | **0.014** | **0.163** |
| 10 | 0.037 | 0.055 | 0.060 | 0.070 | 0.025 | 0.045 | 0.041 | 0.045 | 0.023 | 0.044 | 0.038 | 0.042 | 0.024 | 0.044 | 0.037 | 0.045 | **0.005** | **0.017** | **0.015** | **0.022** |
| 20 | 0.046 | 0.052 | 0.054 | 0.045 | 0.037 | 0.038 | 0.041 | 0.031 | 0.035 | 0.039 | 0.045 | 0.028 | 0.036 | 0.041 | 0.044 | 0.030 | **0.015** | **0.013** | **0.019** | **0.010** |
| 50 | 5 | 0.159 | 0.169 | 0.179 | 0.178 | 0.123 | 0.118 | 0.122 | 0.120 | 0.088 | 0.085 | 0.087 | 0.082 | 0.092 | 0.087 | 0.090 | 0.090 | **0.016** | **0.021** | **0.019** | **0.017** |
| 10 | 0.175 | 0.155 | 0.153 | 0.163 | 0.116 | 0.105 | 0.110 | 0.104 | 0.090 | 0.088 | 0.091 | 0.081 | 0.094 | 0.089 | 0.092 | 0.087 | **0.018** | **0.020** | **0.015** | **0.016** |
| 20 | 0.156 | 0.143 | 0.135 | 0.137 | 0.112 | 0.104 | 0.089 | 0.104 | 0.093 | 0.084 | 0.080 | 0.084 | 0.096 | 0.085 | 0.078 | 0.089 | **0.024** | **0.016** | **0.009** | **0.019** |
| 80 | 5 | 0.224 | 0.216 | 0.228 | 0.241 | 0.188 | 0.174 | 0.150 | 0.153 | 0.114 | 0.109 | 0.097 | 0.092 | 0.117 | 0.104 | 0.100 | 0.097 | **0.019** | **0.022** | **0.017** | **0.019** |
| 10 | 0.227 | 0.219 | 0.223 | 0.221 | 0.157 | 0.157 | 0.156 | 0.133 | 0.100 | 0.109 | 0.115 | 0.092 | 0.102 | 0.110 | 0.114 | 0.098 | **0.013** | **0.018** | **0.013** | **0.012** |
| 20 | 0.241 | 0.236 | 0.212 | 0.219 | 0.164 | 0.151 | 0.141 | 0.142 | 0.114 | 0.113 | 0.109 | 0.110 | 0.116 | 0.114 | 0.111 | 0.110 | **0.024** | **0.023** | **0.016** | **0.023** |
| 100 | 5 | 0.272 | 0.243 | 0.277 | 0.273 | 0.217 | 0.180 | 0.179 | 0.155 | 0.135 | 0.113 | 0.119 | 0.095 | 0.137 | 0.109 | 0.121 | 0.103 | **0.023** | **0.014** | **0.025** | **0.020** |
| 10 | 0.273 | 0.251 | 0.244 | 0.258 | 0.181 | 0.153 | 0.149 | 0.161 | 0.120 | 0.103 | 0.101 | 0.111 | 0.122 | 0.106 | 0.107 | 0.119 | **0.020** | **0.009** | **0.012** | **0.017** |
| 20 | 0.952 | 0.255 | 0.238 | 0.239 | 0.602 | 0.149 | 0.148 | 0.143 | 0.416 | 0.105 | 0.112 | 0.110 | 0.425 | 0.106 | 0.111 | 0.114 | **0.095** | **0.013** | **0.013** | **0.016** |
| 200 | 5 | 0.351 | 0.296 | 0.329 | 0.330 | 0.272 | 0.201 | 0.187 | 0.166 | 0.125 | 0.087 | 0.087 | 0.056 | 0.128 | 0.079 | 0.084 | 0.063 | **0.029** | **0.014** | **0.016** | **0.016** |
| 10 | 0.373 | 0.308 | 0.324 | 0.313 | 0.207 | 0.162 | 0.167 | 0.154 | 0.117 | 0.087 | 0.104 | 0.090 | 0.119 | 0.088 | 0.107 | 0.098 | **0.024** | **0.011** | **0.015** | **0.016** |
| 20 | 0.362 | 0.357 | 0.311 | 0.304 | 0.170 | 0.169 | 0.146 | 0.145 | 0.092 | 0.108 | 0.105 | 0.099 | 0.094 | 0.107 | 0.101 | 0.102 | **0.023** | **0.021** | **0.013** | **0.014** |
| Mean | | | 0.258 | 0.202 | 0.202 | 0.338 | 0.173 | 0.130 | 0.124 | 0.198 | 0.112 | 0.088 | 0.088 | 0.129 | 0.114 | 0.088 | 0.089 | 0.138 | **0.024** | **0.017** | **0.015** | **0.027** |
| 5 | 20 | 5 | **0.000** | 0.055 | 0.035 | 0.028 | **0.000** | 0.049 | 0.028 | 0.016 | 0.001 | **0.008** | **0.018** | 0.013 | 0.001 | 0.053 | 0.028 | 0.018 | **0.000** | 0.047 | 0.020 | **0.009** |
| 10 | 0.016 | 0.024 | 0.039 | 0.034 | 0.012 | 0.012 | 0.030 | 0.024 | 0.014 | 0.015 | 0.030 | 0.024 | 0.014 | 0.017 | 0.034 | 0.025 | **0.005** | **0.004** | **0.013** | **0.011** |
| 20 | 0.042 | 0.039 | 0.032 | 0.036  0.026 | 0.031 | 0.025 | 0.019 | 0.026 | 0.033 | 0.029 | 0.023 | 0.028 | 0.034 | 0.032 | 0.024 | 0.030 | **0.015** | **0.016** | **0.014** | **0.010** |
| 50 | 5 | 0.104 | 0.110 | 0.129 | 0.126 | 0.072 | 0.068 | 0.090 | 0.079 | 0.064 | 0.061 | 0.071 | 0.062 | 0.066 | 0.061 | 0.074 | 0.064 | **0.013** | **0.009** | **0.014** | **0.011** |
| 10 | 0.109 | 0.110 | 0.125 | 0.121 | 0.072 | 0.077 | 0.087 | 0.084 | 0.063 | 0.066 | 0.076 | 0.081 | 0.066 | 0.068 | 0.081 | 0.082 | **0.013** | **0.010** | **0.015** | **0.017** |
| 20 | 0.107 | 0.102 | 0.105 | 0.107 | 0.073 | 0.069 | 0.074 | 0.071 | 0.068 | 0.061 | 0.071 | 0.069 | 0.071 | 0.063 | 0.074 | 0.070 | **0.016** | **0.012** | **0.012** | **0.009** |
| 80 | 5 | 0.173 | 0.167 | 0.190 | 0.191 | 0.144 | 0.128 | 0.138 | 0.136 | 0.097 | 0.085 | 0.086 | 0.091 | 0.098 | 0.084 | 0.089 | 0.093 | **0.018** | **0.012** | **0.016** | **0.023** |
| 10 | 0.175 | 0.170 | 0.167 | 0.168 | 0.123 | 0.127 | 0.121 | 0.117 | 0.084 | 0.088 | 0.080 | 0.092 | 0.086 | 0.090 | 0.086 | 0.093 | **0.014** | **0.016** | **0.009** | **0.013** |
| 20 | 0.163 | 0.155 | 0.160 | 0.164 | 0.113 | 0.103 | 0.112 | 0.112 | 0.080 | 0.078 | 0.083 | 0.085 | 0.081 | 0.079 | 0.087 | 0.089 | **0.011** | **0.010** | **0.012** | **0.017** |
| 100 | 5 | 0.207 | 0.184 | 0.218 | 0.214 | 0.185 | 0.149 | 0.149 | 0.140 | 0.105 | 0.088 | 0.092 | 0.086 | 0.108 | 0.087 | 0.095 | 0.089 | **0.017** | **0.010** | **0.014** | **0.014** |
| 10 | 0.219 | 0.208 | 0.205 | 0.193 | 0.169 | 0.153 | 0.138 | 0.127 | 0.108 | 0.095 | 0.097 | 0.092 | 0.110 | 0.099 | 0.102 | 0.095 | **0.023** | **0.016** | **0.015** | **0.009** |
| 20 | 0.212 | 0.209 | 0.196 | 0.181 | 0.140 | 0.148 | 0.129 | 0.120 | 0.099 | 0.109 | 0.097 | 0.087 | 0.100 | 0.113 | 0.100 | 0.093 | **0.015** | **0.020** | **0.012** | **0.013** |
| 200 | 5 | 0.302 | 0.209 | 0.296 | 0.305 | 0.244 | 0.148 | 0.182 | 0.176 | 0.114 | 0.109 | 0.088 | 0.074 | 0.116 | 0.113 | 0.090 | 0.076 | **0.016** | **0.020** | **0.014** | **0.016** |
| 10 | 0.331 | 0.286 | 0.286 | 0.286 | 0.211 | 0.175 | 0.161 | 0.156 | 0.119 | 0.107 | 0.104 | 0.102 | 0.122 | 0.109 | 0.107 | 0.106 | **0.020** | **0.015** | **0.015** | **0.014** |
| 20 | 0.346 | 0.285 | 0.285 | 0.257 | 0.192 | 0.151 | 0.153 | 0.142 | 0.116 | 0.090 | 0.102 | 0.094 | 0.118 | 0.095 | 0.107 | 0.099 | **0.024** | **0.015** | **0.014** | **0.008** |
| Mean | | | 0.167 | 0.154 | 0.165 | 0.161 | 0.119 | 0.105 | 0.107 | 0.102 | 0.078 | 0.073 | 0.075 | 0.072 | 0.079 | 0.078 | 0.079 | 0.075 | **0.015** | **0.015** | **0.014** | **0.013** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TABLE III  ARPD of five algorithms under four SDST conditions () | | | | | | | | | | | | | | | | | | | | | | | | |
|  |  |  | DABC | | | | NEABC | | | | MIG | | | | | MCEDA | | | | | CLDHH | | | |
| SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | | SSD  =50 | SSD  =100 | SSD  =125 |
| 2 | 20 | 5 | 0.140 | 0.117 | 0.099 | 0.102 | 0.148 | 0.132 | 0.107 | 0.119 | 0.125 | 0.101 | 0.084 | 0.088 | 0.133 | | 0.107 | 0.097 | 0.097 | **0.044** | | **0.040** | **0.026** | **0.027** |
| 10 | 0.135 | 0.095 | 0.097 | 0.102 | 0.151 | 0.106 | 0.102 | 0.101 | 0.123 | 0.091 | 0.090 | 0.083 | 0.125 | | 0.089 | 0.095 | 0.087 | **0.042** | | **0.023** | **0.031** | **0.023** |
| 20 | 0.105 | 0.091 | 0.102 | 0.097 | 0.116 | 0.104 | 0.108 | 0.097 | 0.097 | 0.088 | 0.092 | 0.079 | 0.100 | | 0.086 | 0.099 | 0.080 | **0.031** | | **0.026** | **0.028** | **0.016** |
| 50 | 5 | 0.211 | 0.214 | 0.206 | 0.223 | 0.217 | 0.241 | 0.175 | 0.203 | 0.159 | 0.172 | 0.129 | 0.156 | 0.166 | | 0.179 | 0.134 | 0.152 | **0.028** | | **0.028** | **0.026** | **0.036** |
| 10 | 0.244 | 0.196 | 0.200 | 0.220 | 0.264 | 0.196 | 0.172 | 0.159 | 0.182 | 0.152 | 0.136 | 0.132 | 0.189 | | 0.150 | 0.144 | 0.135 | **0.032** | | **0.026** | **0.017** | **0.022** |
| 20 | 0.200 | 0.198 | 0.189 | 0.203 | 0.189 | 0.176 | 0.149 | 0.147 | 0.139 | 0.150 | 0.127 | 0.118  0.122 | 0.144 | | 0.149 | 0.130 | 0.122 | **0.018** | | **0.026** | **0.019** | **0.018** |
| 80 | 5 | 0.251 | 0.240 | 0.239 | 0.254 | 0.237 | 0.212 | 0.185 | 0.185 | 0.172 | 0.154 | 0.109 | 0.121 | 0.177 | | 0.149 | 0.114 | 0.124 | **0.036** | | **0.019** | **0.015** | **0.029** |
| 10 | 0.285 | 0.234 | 0.235 | 0.260 | 0.259 | 0.186 | 0.157 | 0.156 | 0.172 | 0.145 | 0.122 | 0.124 | 0.181 | | 0.137 | 0.125 | 0.130 | **0.028** | | **0.020** | **0.021** | **0.022** |
| 20 | 0.260 | 0.247 | 0.260 | 0.256 | 0.189 | 0.183 | 0.170 | 0.149 | 0.140 | 0.149 | 0.136 | 0.124 | 0.145 | | 0.146 | 0.143 | 0.123 | **0.027** | | **0.017** | **0.022** | **0.023** |
| 100 | 5 | 0.272 | 0.255 | 0.243 | 0.224 | 0.240 | 0.221 | 0.161 | 0.138 | 0.163 | 0.150 | 0.090 | 0.069 | 0.168 | | 0.146 | 0.095 | 0.078 | **0.029** | | **0.023** | **0.026** | **0.014** |
| 10 | 0.288 | 0.258 | 0.236 | 0.275 | 0.240 | 0.189 | 0.140 | 0.157 | 0.155 | 0.143 | 0.101 | 0.113 | 0.151 | | 0.138 | 0.103 | 0.112 | **0.030** | | **0.024** | **0.015** | **0.024** |
| 20 | 0.314 | 0.285 | 0.257 | 0.311 | 0.218 | 0.203 | 0.147 | 0.171 | 0.159 | 0.158 | 0.119 | 0.142 | 0.159 | | 0.159 | 0.126 | 0.145 | **0.040** | | **0.027** | **0.016** | **0.028** |
| 200 | 5 | 0.322 | 0.276 | 0.255 | 0.276 | 0.245 | 0.207 | 0.134 | 0.143 | 0.134 | 0.082 | **0.017** | **0.018** | 0.139 | | 0.079 | 0.018 | 0.020 | **0.082** | | **0.048** | 0.023 | 0.019 |
| 10 | 0.290 | 0.267 | 0.259 | 0.301 | 0.173 | 0.149 | 0.124 | 0.136 | 0.057 | 0.064 | 0.042 | 0.057 | 0.059 | | 0.063 | 0.047 | 0.059 | **0.044** | | **0.047** | **0.033** | **0.037** |
| 20 | 0.345 | 0.318 | 0.288 | 0.312 | 0.179 | 0.162 | 0.117 | 0.134 | 0.081 | 0.091 | 0.056 | 0.080 | 0.082 | | 0.086  0.086 | 0.055 | 0.078 | **0.062** | | **0.057** | **0.040** | **0.050** |
| Mean | | | 0.244 | 0.219 | 0.211 | 0.228 | 0.204 | 0.178 | 0.143 | 0.146 | 0.137 | 0.126 | 0.097 | 0.100 | 0.141 | | 0.124 | 0.102 | 0.103 | **0.038** | | **0.030** | **0.024** | **0.026** |
| 3 | 20 | 5 | 0.070 | 0.040 | 0.052 | 0.055 | 0.075 | 0.049 | 0.061 | 0.058 | 0.067 | 0.041 | 0.047 | 0.048 | 0.068 | | 0.040 | 0.057 | 0.051 | **0.024** | | **0.016** | **0.016** | **0.020** |
| 10 | 0.074 | 0.062 | 0.067 | 0.070 | 0.081 | 0.066 | 0.070 | 0.068 | 0.071 | 0.060 | 0.068 | 0.066 | 0.072 | | 0.059 | 0.074 | 0.068 | **0.032** | | **0.028** | **0.026** | **0.025** |
| 20 | 0.056 | 0.048 | 0.053 | 0.056 | 0.060 | 0.053 | 0.052 | 0.056 | 0.048 | 0.042 | 0.045 | 0.053 | 0.051 | | 0.043 | 0.049 | 0.055 | **0.017** | | **0.018** | **0.015** | **0.019** |
| 50 | 5 | 0.135 | 0.123 | 0.137 | 0.134 | 0.188 | 0.152 | 0.161 | 0.125 | 0.135 | 0.125 | 0.115 | 0.090 | 0.137 | | 0.120 | 0.130 | 0.101 | **0.025** | | **0.025** | **0.029** | **0.012** |
| 10 | 0.139 | 0.108 | 0.133 | 0.152 | 0.166 | 0.130 | 0.140 | 0.142 | 0.124 | 0.102 | 0.114 | 0.115 | 0.126 | | 0.099 | 0.117 | 0.121 | **0.027** | | **0.014** | **0.027** | **0.023** |
| 20 | 0.118 | 0.119 | 0.121 | 0.141 | 0.138 | 0.129 | 0.123 | 0.124 | 0.107 | 0.105 | 0.104 | 0.103 | 0.106 | | 0.107 | 0.107 | 0.107 | **0.023** | | **0.018** | **0.013** | **0.016** |
| 80 | 5 | 0.156 | 0.179 | 0.183 | 0.193 | 0.224 | 0.226 | 0.181 | 0.156 | 0.136 | 0.155 | 0.135 | 0.100 | 0.147 | | 0.155 | 0.135 | 0.114 | **0.025** | | **0.028** | **0.026** | **0.019** |
| 10 | 0.170 | 0.168 | 0.180 | 0.201 | 0.192 | 0.175 | 0.168 | 0.160 | 0.131 | 0.135 | 0.135 | 0.126 | 0.137 | | 0.133 | 0.140 | 0.129 | **0.021** | | **0.016** | **0.017** | **0.022** |
| 20 | 0.174 | 0.178 | 0.180 | 0.178 | 0.189 | 0.174 | 0.155 | 0.134 | 0.130 | 0.133 | 0.122 | 0.106 | 0.129 | | 0.133 | 0.130 | 0.106 | **0.022** | | **0.022** | **0.017** | **0.010** |
| 100 | 5 | 0.191 | 0.170 | 0.199 | 0.218 | 0.246 | 0.198 | 0.174 | 0.168 | 0.155 | 0.123 | 0.123 | 0.097 | 0.160 | | 0.123 | 0.135 | 0.107 | **0.017** | | **0.010** | **0.015** | **0.013** |
| 10 | 0.218 | 0.195 | 0.200 | 0.223 | 0.231 | 0.192 | 0.165 | 0.156 | 0.151 | 0.138 | 0.127 | 0.125 | 0.156 | | 0.136 | 0.131 | 0.130 | **0.023** | | **0.021** | **0.016** | **0.017** |
| 20 | 0.209 | 0.191 | 0.192 | 0.220 | 0.190 | 0.174 | 0.150 | 0.149 | 0.135 | 0.127 | 0.118 | 0.125 | 0.136 | | 0.124 | 0.120 | 0.129 | **0.023** | | **0.016** | **0.009** | **0.017** |
| 200 | 5 | 0.236 | 0.228 | 0.228 | 0.257 | 0.271 | 0.214 | 0.175 | 0.159 | 0.131 | 0.117 | 0.080 | 0.061 | 0.138 | | 0.112 | 0.076 | 0.067 | **0.019** | | **0.018** | **0.029** | **0.029** |
| 10 | 0.274 | 0.280 | 0.253 | 0.267 | 0.215 | 0.219 | 0.158 | 0.145 | 0.135 | 0.138 | 0.105 | 0.090 | 0.132 | | 0.144 | 0.107 | 0.092 | **0.019** | | **0.035** | **0.020** | **0.023** |
| 20 | 0.288 | 0.276 | 0.256 | 0.271 | 0.188 | 0.191 | 0.143 | 0.139 | 0.121 | 0.129 | 0.110 | 0.098 | 0.115 | | 0.131 | 0.111 | 0.098 | **0.037** | | **0.021** | **0.028** | **0.018** |
| Mean | | | 0.167 | 0.158 | 0.162 | 0.176 | 0.177 | 0.156 | 0.138 | 0.129 | 0.118 | 0.111 | 0.103 | 0.094 | 0.121 | | 0.111 | 0.108 | 0.098 | **0.024** | | **0.020** | **0.020** | **0.019** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TABLE IV  ARPD of five algorithms under four SDST conditions () | | | | | | | | | | | | | | | | | | | | | | |
|  |  |  | DABC | | | | NEABC | | | | MIG | | | | MCEDA | | | | CLDHH | | | |
| SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 |
| 4 | 20 | 5 | 0.057 | 0.051 | 0.034 | 0.030 | 0.055 | 0.052 | 0.035 | 0.031 | **0.016** | 0.044 | 0.032 | 0.027 | 0.052 | 0.046 | 0.031 | 0.028 | 0.046 | **0.020** | **0.016** | **0.013** |
| 10 | 0.067 | 0.047 | 0.035 | 0.043 | 0.067 | 0.049 | 0.037 | 0.041 | **0.022** | 0.038 | 0.034 | 0.041 | 0.063 | 0.042 | 0.036 | 0.043 | 0.052 | **0.018** | **0.016** | **0.016** |
| 20 | 0.029 | 0.040 | 0.038 | 0.048 | 0.026 | 0.037 | 0.037 | 0.047 | 0.021 | 0.030 | 0.036 | 0.045 | 0.018 | 0.031 | 0.039 | 0.048 | **0.008** | **0.016** | **0.014** | **0.023** |
| 50 | 5 | 0.074 | 0.088 | 0.080 | 0.098 | 0.108 | 0.111 | 0.096 | 0.102 | 0.093 | 0.089 | 0.076 | 0.076 | 0.089 | 0.094 | 0.081 | 0.087 | **0.016** | **0.016** | **0.011** | **0.016** |
| 10 | 0.095 | 0.089 | 0.095 | 0.098 | 0.112 | 0.104 | 0.104 | 0.096 | 0.096 | 0.090 | 0.095 | 0.083 | 0.092 | 0.092 | 0.095 | 0.088 | **0.016** | **0.018** | **0.019** | **0.017** |
| 20 | 0.084 | 0.096 | 0.088 | 0.086 | 0.090 | 0.104 | 0.093 | 0.078 | 0.085 | 0.091 | 0.091 | 0.073 | 0.081 | 0.091 | 0.095 | 0.080 | **0.016** | **0.024** | **0.017** | **0.013** |
| 80 | 5 | 0.201 | 0.109 | 0.121 | 0.144 | 0.324 | 0.170 | 0.149 | 0.147 | 0.207 | 0.107 | 0.099 | 0.094 | 0.201 | 0.106 | 0.110 | 0.097 | **0.025** | **0.016** | **0.016** | **0.017** |
| 10 | 0.132 | 0.126 | 0.130 | 0.161 | 0.180 | 0.158 | 0.148 | 0.157 | 0.123 | 0.113 | 0.112 | 0.118 | 0.123 | 0.112 | 0.119 | 0.128 | **0.028** | **0.017** | **0.014** | **0.026** |
| 20 | 0.124 | 0.129 | 0.120 | 0.139 | 0.146 | 0.145 | 0.125 | 0.122 | 0.114 | 0.110 | 0.101 | 0.096 | 0.105 | 0.109 | 0.100 | 0.101 | **0.017** | **0.021** | **0.014** | **0.017** |
| 100 | 5 | 0.129 | 0.128 | 0.136 | 0.161 | 0.217 | 0.184 | 0.159 | 0.146 | 0.124 | 0.112 | 0.106 | 0.097 | 0.124 | 0.111 | 0.114 | 0.104 | **0.014** | **0.012** | **0.015** | **0.012** |
| 10 | 0.148 | 0.145 | 0.156 | 0.161 | 0.188 | 0.165 | 0.153 | 0.138 | 0.126 | 0.117 | 0.119 | 0.104 | 0.120 | 0.120 | 0.120 | 0.110 | **0.022** | **0.017** | **0.018** | **0.012** |
| 20 | 0.155 | 0.147 | 0.143 | 0.166 | 0.174 | 0.157 | 0.132 | 0.138 | 0.121 | 0.113 | 0.102 | 0.111 | 0.117 | 0.113 | 0.105 | 0.114 | **0.025** | **0.018** | **0.014** | **0.013** |
| 200 | 5 | 0.202 | 0.204 | 0.201 | 0.224 | 0.279 | 0.242 | 0.173 | 0.155 | 0.152 | 0.135 | 0.101 | 0.079 | 0.149 | 0.137 | 0.100 | 0.083 | **0.022** | **0.021** | **0.015** | **0.015** |
| 10 | 0.234 | 0.218 | 0.211 | 0.238 | 0.229 | 0.196 | 0.155 | 0.153 | 0.153 | 0.133 | 0.107 | 0.112 | 0.149 | 0.134 | 0.109 | 0.115 | **0.016** | **0.019** | **0.008** | **0.018** |
| 20 | 0.217 | 0.235 | 0.215 | 0.240 | 0.175 | 0.184 | 0.153 | 0.147 | 0.107 | 0.127 | 0.116 | 0.115 | 0.106 | 0.127 | 0.115 | 0.120 | **0.019** | **0.015** | **0.016** | **0.011** |
| Mean | | | 0.130 | 0.123 | 0.120 | 0.136 | 0.158 | 0.137 | 0.117 | 0.113 | 0.104 | 0.097 | 0.088 | 0.085 | 0.106 | 0.098 | 0.091 | 0.090 | **0.023** | **0.018** | **0.015** | **0.016** |
| 5 | 20 | 5 | **0.000** | 0.051 | 0.019 | 0.015 | **0.000** | 0.047 | 0.019 | 0.012 | **0.000** | 0.006 | **0.013** | 0.014 | **0.000** | **0.005** | 0.018 | 0.016 | **0.000** | 0.048 | **0.013** | **0.007** |
| 10 | 0.014 | 0.016 | 0.027 | 0.020 | 0.012 | 0.014 | 0.024 | 0.019 | 0.011 | 0.014 | 0.026 | 0.018 | 0.012 | 0.015 | 0.028 | 0.020 | **0.005** | **0.007** | **0.011** | **0.007** |
| 20 | 0.029 | 0.035 | 0.012 | 0.032 | 0.024 | 0.031 | 0.009 | 0.029 | 0.023 | 0.032 | 0.010 | 0.032 | 0.023 | 0.034 | 0.011 | 0.033 | **0.009** | **0.016** | **0.005** | **0.011** |
| 50 | 5 | 0.050 | 0.055 | 0.060 | 0.067 | 0.063 | 0.072  0.072 | 0.070 | 0.064 | 0.056 | 0.052 | 0.067 | 0.066 | 0.057 | 0.053 | 0.069 | 0.066 | **0.009** | **0.012** | **0.011** | **0.015** |
| 10 | 0.061 | 0.064 | 0.068 | 0.064 | 0.061 | 0.075 | 0.071 | 0.064 | 0.059 | 0.061 | 0.075 | 0.068 | 0.059 | 0.062 | 0.076 | 0.069 | **0.012** | **0.013** | **0.010** | **0.011** |
| 20 | 0.065 | 0.062 | 0.065 | 0.071 | 0.068 | 0.066 | 0.063 | 0.067 | 0.066 | 0.059 | 0.069 | 0.073 | 0.066 | 0.061 | 0.070 | 0.074 | **0.014** | **0.010** | **0.014** | **0.012** |
| 80 | 5 | 0.072 | 0.088 | 0.105 | 0.103 | 0.112 | 0.130 | 0.119 | 0.108 | 0.079 | 0.084 | 0.100 | 0.081 | 0.080 | 0.086 | 0.101 | 0.081 | **0.010** | **0.017** | **0.020** | **0.011** |
| 10 | 0.088 | 0.092 | 0.091 | 0.108 | 0.119 | 0.113 | 0.104 | 0.111 | 0.085 | 0.090 | 0.086 | 0.096 | 0.085 | 0.091 | 0.087 | 0.096 | **0.014** | **0.015** | **0.010** | **0.016** |
| 20 | 0.099 | 0.091 | 0.094 | 0.105 | 0.111 | 0.105 | 0.100 | 0.099 | 0.091 | 0.088 | 0.087 | 0.092 | 0.092 | 0.089 | 0.088 | 0.092 | **0.018** | **0.013** | **0.014** | **0.014** |
| 100 | 5 | 0.093 | 0.094 | 0.120 | 0.135 | 0.160 | 0.154 | 0.143 | 0.144 | 0.101 | 0.091 | 0.106 | 0.103 | 0.102 | 0.093 | 0.108 | 0.103 | **0.011** | **0.018** | **0.017** | **0.022** |
| 10 | 0.102 | 0.120 | 0.115 | 0.122 | 0.147 | 0.152 | 0.132 | 0.121 | 0.097 | 0.112 | 0.100 | 0.098 | 0.098 | 0.113 | 0.101 | 0.099 | **0.015** | **0.017** | **0.014** | **0.011** |
| 20 | 0.108 | 0.108 | 0.114 | 0.126 | 0.133 | 0.133 | 0.122 | 0.112 | 0.090 | 0.103 | 0.095 | 0.101 | 0.091 | 0.104 | 0.096 | 0.101 | **0.014** | **0.013** | **0.016** | **0.015** |
| 200 | 5 | 0.168 | 0.157 | 0.177 | 0.191 | 0.266 | 0.210 | 0.181 | 0.156 | 0.145 | 0.155 | 0.108 | 0.091 | 0.145 | 0.156 | 0.109 | 0.091 | **0.017** | **0.014** | **0.016** | **0.010** |
| 10 | 0.176 | 0.183 | 0.186 | 0.198 | 0.208 | 0.199 | 0.164 | 0.149 | 0.124 | 0.176 | 0.118 | 0.111 | 0.124 | 0.177 | 0.119 | 0.112 | **0.016** | **0.018** | **0.015** | **0.015** |
| 20 | 0.185 | 0.179 | 0.186 | 0.192 | 0.181 | 0.170 | 0.150 | 0.138 | 0.110 | 0.174 | 0.115 | 0.109 | 0.111 | 0.175 | 0.117 | 0.110 | **0.015** | **0.013** | **0.013** | **0.010** |
| Mean | | | 0.087 | 0.093 | 0.096 | 0.103 | 0.111 | 0.111 | 0.098 | 0.093 | 0.076 | 0.086 | 0.078 | 0.077 | 0.076 | 0.088 | 0.080 | 0.078 | **0.012** | **0.016** | **0.013** | **0.012** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TABLE V  ARPD of five algorithms under four SDST conditions () | | | | | | | | | | | | | | | | | | | | | | | |
|  |  |  | DABC | | | | NEABC | | | | MIG | | | | MCEDA | | | | | CLDHH | | | |
| SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | | SSD  =50 | SSD  =100 | SSD  =125 |
| 2 | 20 | 5 | 0.123 | 0.109 | 0.098 | 0.095 | 0.127 | 0.121 | 0.107 | 0.104 | 0.112 | 0.098 | 0.091 | 0.086 | 0.112 | 0.100 | 0.095 | 0.091 | **0.037** | | **0.024** | **0.034** | **0.025** |
| 10 | 0.131 | 0.090 | 0.123 | 0.095 | 0.137 | 0.100 | 0.121 | 0.093 | 0.121 | 0.082 | 0.097 | 0.082 | 0.130 | 0.084 | 0.100 | 0.080 | **0.036** | | **0.026** | **0.034** | **0.020** |
| 20 | 0.119 | 0.091 | 0.109 | 0.127 | 0.121 | 0.097 | 0.107 | 0.127 | 0.108 | 0.080 | 0.085 | 0.114 | 0.116 | 0.079 | 0.085 | 0.106 | **0.037** | | **0.020** | **0.030** | **0.039** |
| 50 | 5 | 0.174 | 0.180 | 0.202 | 0.172 | 0.164 | 0.138 | 0.156 | 0.134 | 0.144 | 0.146 | 0.151 | 0.124 | 0.154 | 0.150 | 0.151 | 0.128 | **0.040** | | **0.024** | **0.038** | **0.024** |
| 10 | 0.178 | 0.162  0.133 | 0.248 | 0.213 | 0.166 | 0.133 | 0.156 | 0.137 | 0.131 | 0.124 | 0.152 | 0.136 | 0.145 | 0.127 | 0.157 | 0.133 | **0.020** | | **0.012** | **0.037** | **0.022** |
| 20 | 0.191 | 0.185 | 0.213 | 0.202 | 0.168 | 0.150 | 0.131 | 0.135 | 0.144 | 0.140 | 0.125 | 0.123 | 0.158 | 0.141 | 0.124 | 0.125 | **0.037** | | **0.026** | **0.020** | **0.018** |
| 80 | 5 | 0.167 | 0.251 | 0.218 | 0.255 | 0.147 | 0.188 | 0.145 | 0.139 | 0.103 | 0.171 | 0.121 | 0.130 | 0.121 | 0.174 | 0.132 | 0.123 | **0.029** | | **0.030** | **0.027** | **0.026** |
| 10 | 0.210 | 0.223 | 0.282 | 0.254 | 0.158 | 0.158 | 0.149 | 0.135 | 0.127 | 0.142 | 0.132 | 0.132 | 0.140 | 0.146 | 0.140 | 0.126 | **0.033** | | **0.020** | **0.024** | **0.018** |
| 20 | 0.229 | 0.256 | 0.290 | 0.261 | 0.162 | 0.185 | 0.147 | 0.141 | 0.127 | 0.167 | 0.132 | 0.139 | 0.138 | 0.169 | 0.136 | 0.132 | **0.036** | | **0.026** | **0.021** | **0.027** |
| 100 | 5 | 0.192 | 0.245 | 0.249 | 0.283 | 0.148 | 0.168 | 0.135 | 0.120 | 0.101 | 0.151 | 0.115 | 0.117 | 0.124 | 0.149 | 0.119 | 0.109 | **0.034** | | **0.018** | **0.039** | **0.021** |
| 10 | 0.193 | 0.253 | 0.296 | 0.274 | 0.114 | 0.162 | 0.141 | 0.132 | 0.079 | 0.145 | 0.125 | 0.125 | 0.095 | 0.144 | 0.127 | 0.122 | **0.018** | | **0.023** | **0.024** | **0.015** |
| 20 | 0.226 | 0.270 | 0.305 | 0.291 | 0.131 | 0.176 | 0.147 | 0.145 | 0.099 | 0.148 | 0.132 | 0.137 | 0.112 | 0.156 | 0.134 | 0.135 | **0.029** | | **0.024** | **0.020** | **0.019** |
| 200 | 5 | 0.158 | 0.267 | 0.244 | 0.291 | 0.072 | 0.126 | 0.039 | 0.043 | **0.015** | 0.096 | 0.025 | 0.033 | 0.022 | 0.098 | 0.026 | 0.030 | 0.036 | | **0.059** | **0.018** | **0.020** |
| 10 | 0.198 | 0.297 | 0.323 | 0.268 | 0.047 | 0.122 | 0.088 | 0.054 | **0.010** | 0.105 | 0.074 | 0.043 | 0.014 | 0.105 | 0.075 | 0.045 | 0.041 | | **0.072** | **0.046** | **0.031** |
| 20 | 0.230 | 0.330 | 0.297 | 0.319 | 0.044 | 0.132 | 0.051 | 0.104 | **0.009** | 0.115 | 0.039 | 0.097 | 0.015 | 0.114 | 0.040 | 0.095 | 0.041 | | **0.070** | **0.030** | **0.061** |
| Mean | | | 0.181 | 0.214 | 0.233 | 0.227 | 0.127 | 0.144 | 0.121 | 0.116 | 0.095 | 0.127 | 0.106 | 0.108 | 0.106 | 0.129 | 0.109 | 0.105 | **0.034** | | **0.032** | **0.029** | **0.026** |
| 3 | 20 | 5 | 0.067 | 0.057 | 0.055 | 0.039 | 0.067 | 0.058 | 0.055 | 0.040 | 0.060 | 0.053 | 0.044 | 0.033 | 0.066 | 0.055 | 0.043 | 0.031 | **0.025** | | **0.023** | **0.023** | **0.017** |
| 10 | 0.069 | 0.062 | 0.052 | 0.067 | 0.073 | 0.068 | 0.055 | 0.067 | 0.061 | 0.056 | 0.044 | 0.061 | 0.066 | 0.055 | 0.042 | 0.056 | **0.030** | | **0.022** | **0.025** | **0.025** |
| 20 | 0.055 | 0.065 | 0.040 | 0.071 | 0.057 | 0.067 | 0.042 | 0.077 | 0.046 | 0.055 | 0.036 | 0.073 | 0.049 | 0.055 | 0.036 | 0.067 | **0.018** | | **0.034** | **0.015** | **0.036** |
| 50 | 5 | 0.111 | 0.105 | 0.141 | 0.133 | 0.104 | 0.094 | 0.085 | 0.085 | 0.116 | 0.107 | 0.097 | 0.103 | 0.129 | 0.108 | 0.096 | 0.099 | **0.024** | | **0.017** | **0.019** | **0.029** |
| 10 | 0.119 | 0.114 | 0.137 | 0.143 | 0.110 | 0.102 | 0.104 | 0.105 | 0.111 | 0.106 | 0.107 | 0.118 | 0.120 | 0.109 | 0.110 | 0.113 | **0.030** | | **0.017** | **0.024** | **0.020** |
| 20 | 0.119 | 0.110 | 0.122 | 0.131 | 0.110 | 0.097 | 0.102 | 0.096 | 0.110 | 0.099 | 0.108 | 0.103 | 0.116 | 0.101 | 0.110 | 0.102 | **0.029** | | **0.014** | **0.021** | **0.018** |
| 80 | 5 | 0.128 | 0.161 | 0.204 | 0.189 | 0.129 | 0.118 | 0.100 | 0.112 | 0.118 | 0.139 | 0.117 | 0.120 | 0.141 | 0.141 | 0.122 | 0.115 | **0.024** | | **0.022** | **0.020** | **0.020** |
| 10 | 0.139 | 0.158 | 0.162 | 0.184 | 0.130 | 0.129 | 0.113 | 0.111 | 0.109 | 0.128 | 0.124 | 0.122 | 0.120 | 0.132 | 0.122 | 0.120 | **0.024** | | **0.016** | **0.016** | **0.017** |
| 20 | 0.150 | 0.166 | 0.149 | 0.175 | 0.133 | 0.128 | 0.111 | 0.111 | 0.112 | 0.131 | 0.112 | 0.118 | 0.120 | 0.132 | 0.113 | 0.115 | **0.021** | | **0.018** | **0.012** | **0.017** |
| 100 | 5 | 0.136 | 0.171 | 0.220 | 0.054 | 0.144 | 0.128 | 0.113 | 0.034 | 0.116 | 0.128 | 0.112 | 0.029 | 0.131 | 0.132 | 0.116 | 0.030 | **0.018** | | **0.012** | **0.016** | **0.007** |
| 10 | 0.189 | 0.208 | 0.191 | 0.205 | 0.183 | 0.166 | 0.142 | 0.125 | 0.142 | 0.161 | 0.131 | 0.126 | 0.156 | 0.162 | 0.132 | 0.118 | **0.035** | | **0.027** | **0.024** | **0.011** |
| 20 | 0.189 | 0.188 | 0.185 | 0.219 | 0.167 | 0.141 | 0.133 | 0.134 | 0.130 | 0.133 | 0.131 | 0.135 | 0.140 | 0.132 | 0.132 | 0.130 | **0.032** | | **0.019** | **0.019** | **0.020** |
| 200 | 5 | 0.165 | 0.239 | 0.276 | 0.263 | 0.154 | 0.171 | 0.119 | 0.104 | 0.076 | 0.134 | 0.087 | 0.084 | 0.097 | 0.134 | 0.093 | 0.084 | **0.040** | | **0.016** | **0.030** | **0.033** |
| 10 | 0.227 | 0.252 | 0.235 | 0.270 | 0.155 | 0.166 | 0.131 | 0.126 | 0.112 | 0.138 | 0.114 | 0.110 | 0.118 | 0.137 | 0.115 | 0.106 | **0.036** | | **0.026** | **0.028** | **0.013** |
| 20 | 0.228 | 0.265 | 0.234 | 0.271 | 0.120 | 0.162 | 0.127 | 0.129 | 0.081 | 0.138 | 0.112 | 0.118 | 0.084 | 0.137 | 0.112 | 0.115 | **0.028** | | **0.022** | **0.019** | **0.019** |
| Mean | | | 0.139 | 0.155 | 0.160 | 0.161 | 0.122 | 0.120 | 0.102 | 0.097 | 0.100 | 0.114 | 0.098 | 0.097 | 0.110 | 0.115 | 0.100 | 0.093 | **0.028** | | **0.020** | **0.021** | **0.020** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TABLE VI  ARPD of five algorithms under four SDST conditions () | | | | | | | | | | | | | | | | | | | | | | |
|  |  |  | DABC | | | | NEABC | | | | MIG | | | | MCEDA | | | | CLDHH | | | |
| SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 | SSD  =10 | SSD  =50 | SSD  =100 | SSD  =125 |
| 4 | 20 | 5 | 0.019 | 0.043 | 0.043 | 0.028 | 0.016 | 0.043 | 0.040 | 0.027 | 0.014 | 0.034 | 0.033 | 0.024 | 0.016 | 0.038 | 0.034 | 0.022 | **0.008** | **0.017** | **0.019** | **0.011** |
| 10 | 0.024 | 0.041 | 0.043 | 0.042 | 0.022 | 0.039 | 0.043 | 0.042 | 0.019 | 0.031 | 0.031 | 0.035 | 0.019 | 0.032 | 0.030 | 0.033 | **0.007** | **0.014** | **0.019** | **0.019** |
| 20 | 0.032 | 0.040 | 0.044 | 0.036 | 0.031 | 0.036 | 0.044 | 0.036 | 0.026 | 0.029 | 0.036 | 0.031 | 0.027 | 0.030 | 0.034 | 0.027 | **0.011** | **0.016** | **0.017** | **0.016** |
| 50 | 5 | 0.065 | 0.082 | 0.076 | 0.092 | 0.054 | 0.073 | 0.059 | 0.061 | 0.075 | 0.092 | 0.074 | 0.087 | 0.079 | 0.092 | 0.075 | 0.080 | **0.014** | **0.017** | **0.013** | **0.018** |
| 10 | 0.093 | 0.075 | 0.089 | 0.090 | 0.087 | 0.069 | 0.083 | 0.067 | 0.096 | 0.079 | 0.093 | 0.087 | 0.098 | 0.078 | 0.092 | 0.081 | **0.022** | **0.014** | **0.022** | **0.013** |
| 20 | 0.077 | 0.076 | 0.080 | 0.080 | 0.067 | 0.070 | 0.075 | 0.064 | 0.074 | 0.076 | 0.082 | 0.077 | 0.075 | 0.076 | 0.084 | 0.075 | **0.016** | **0.016** | **0.019** | **0.014** |
| 80 | 5 | 0.078 | 0.106 | 0.111 | 0.122 | 0.075 | 0.079 | 0.072 | 0.062 | 0.097 | 0.106 | 0.094 | 0.096 | 0.099 | 0.110 | 0.095 | 0.090 | **0.014** | **0.012** | **0.012** | **0.012** |
| 10 | 0.113 | 0.126 | 0.136 | 0.137 | 0.108 | 0.102 | 0.096 | 0.085 | 0.110 | 0.118 | 0.113 | 0.107 | 0.111 | 0.116 | 0.114 | 0.105 | **0.018** | **0.019** | **0.024** | **0.015** |
| 20 | 0.111 | 0.115 | 0.105 | 0.128 | 0.098 | 0.092 | 0.083 | 0.086 | 0.100 | 0.101 | 0.095 | 0.102 | 0.101 | 0.104 | 0.097 | 0.097 | **0.017** | **0.014** | **0.008** | **0.015** |
| 100 | 5 | 0.110 | 0.127 | 0.127 | 0.144 | 0.110 | 0.093 | 0.078 | 0.078 | 0.123 | 0.122 | 0.097 | 0.097 | 0.125 | 0.122 | 0.102 | 0.094 | **0.029** | **0.020** | **0.020** | **0.014** |
| 10 | 0.124 | 0.134 | 0.165 | 0.147 | 0.119 | 0.099 | 0.097 | 0.089 | 0.111 | 0.113 | 0.106 | 0.105 | 0.112 | 0.113 | 0.105 | 0.100 | **0.021** | **0.016** | **0.015** | **0.009** |
| 20 | 0.140 | 0.139 | 0.124 | 0.149 | 0.122 | 0.100 | 0.090 | 0.099 | 0.112 | 0.110 | 0.101 | 0.109 | 0.114 | 0.111 | 0.102 | 0.108 | **0.022** | **0.016** | **0.011** | **0.012** |
| 200 | 5 | 0.133 | 0.206 | 0.194 | 0.211 | 0.161 | 0.185 | 0.090 | 0.122 | 0.102 | 0.147 | 0.101 | 0.093 | 0.104 | 0.147 | 0.102 | 0.087 | **0.016** | **0.021** | **0.011** | **0.015** |
| 10 | 0.168 | 0.221 | 0.226 | 0.224 | 0.144 | 0.174 | 0.132 | 0.130 | 0.107 | 0.147 | 0.114 | 0.117 | 0.108 | 0.148 | 0.115 | 0.114 | **0.010** | **0.023** | **0.011** | **0.015** |
| 20 | 0.179 | 0.218 | 0.201 | 0.219 | 0.129 | 0.152 | 0.141 | 0.124 | 0.092 | 0.123 | 0.124 | 0.115 | 0.093 | 0.125 | 0.123 | 0.111 | **0.017** | **0.015** | **0.017** | **0.010** |
| Mean | | | 0.098 | 0.117 | 0.118 | 0.123 | 0.090 | 0.094 | 0.082 | 0.078 | 0.084 | 0.095 | 0.086 | 0.085 | 0.085 | 0.096 | 0.087 | 0.082 | **0.016** | **0.017** | **0.016** | **0.014** |
| 5 | 20 | 5 | **0.000** | 0.005 | 0.013 | 0.020 | **0.000** | 0.002 | 0.011 | 0.017 | **0.000** | 0.004 | 0.008 | 0.012 | **0.000** | 0.004 | 0.008 | 0.013 | **0.000** | **0.002** | **0.005** | **0.009** |
| 10 | 0.010 | 0.014 | 0.037 | 0.024 | 0.009 | 0.013 | 0.035 | 0.021 | 0.009 | 0.010 | 0.030 | 0.016 | 0.008 | 0.011 | 0.029 | 0.015 | **0.004** | **0.004** | **0.018** | **0.010** |
| 20 | 0.027 | 0.027 | 0.022 | 0.032 | 0.022 | 0.023 | 0.017 | 0.026 | 0.021 | 0.015 | 0.017 | 0.022 | 0.023 | 0.016 | 0.018 | 0.023 | **0.009** | **0.013** | **0.011** | **0.011** |
| 50 | 5 | 0.057 | 0.059 | 0.059 | 0.062 | 0.048 | 0.046 | 0.046 | 0.037 | 0.064 | 0.064 | 0.064 | 0.054 | 0.067 | 0.067 | 0.067 | 0.056 | **0.018** | **0.013** | **0.013** | **0.014** |
| 10 | 0.074 | 0.064 | 0.069 | 0.073 | 0.064 | 0.055 | 0.061 | 0.058 | 0.073 | 0.064 | 0.070 | 0.069 | 0.075 | 0.066 | 0.072 | 0.071 | **0.023** | **0.011** | **0.017** | **0.015** |
| 20 | 0.061 | 0.073 | 0.059 | 0.073 | 0.053 | 0.066 | 0.052 | 0.066 | 0.058 | 0.071 | 0.060 | 0.073 | 0.060 | 0.073 | 0.062 | 0.074 | **0.014** | **0.015** | **0.012** | **0.019** |
| 80 | 5 | 0.060 | 0.079 | 0.079 | 0.095 | 0.050 | 0.057 | 0.060 | 0.049 | 0.072 | 0.086 | 0.080 | 0.077 | 0.076 | 0.088 | 0.083 | 0.080 | **0.015** | **0.009** | **0.011** | **0.013** |
| 10 | 0.076 | 0.081 | 0.097 | 0.099 | 0.067 | 0.066 | 0.076 | 0.067 | 0.078 | 0.080 | 0.093 | 0.088 | 0.080 | 0.082 | 0.095 | 0.089 | **0.012** | **0.011** | **0.017** | **0.013** |
| 20 | 0.088 | 0.088 | 0.118 | 0.097 | 0.076 | 0.070 | 0.060 | 0.072 | 0.081 | 0.084 | 0.072 | 0.085 | 0.082 | 0.085 | 0.074 | 0.086 | **0.018** | **0.012** | **0.007** | **0.012** |
| 100 | 5 | 0.075 | 0.089 | 0.096 | 0.115 | 0.066 | 0.067 | 0.063 | 0.058 | 0.087 | 0.097 | 0.088 | 0.082 | 0.090 | 0.099 | 0.090 | 0.084 | **0.010** | **0.013** | **0.013** | **0.013** |
| 10 | 0.103 | 0.105 | 0.110 | 0.114 | 0.096 | 0.086 | 0.079 | 0.067 | 0.101 | 0.099 | 0.094 | 0.088 | 0.103 | 0.101 | 0.096 | 0.089 | **0.017** | **0.013** | **0.010** | **0.012** |
| 20 | 0.099 | 0.097 | 0.135 | 0.118 | 0.084 | 0.075 | 0.071 | 0.079 | 0.086 | 0.087 | 0.085 | 0.097 | 0.087 | 0.088 | 0.085 | 0.098 | **0.016** | **0.008** | **0.008** | **0.015** |
| 200 | 5 | 0.117 | 0.154 | 0.171 | 0.174 | 0.155 | 0.124 | 0.133 | 0.095 | 0.105 | 0.116 | 0.113 | 0.087 | 0.108 | 0.118 | 0.114 | 0.088 | **0.014** | **0.015** | **0.017** | **0.014** |
| 10 | 0.139 | 0.174 | 0.172 | 0.184 | 0.143 | 0.152 | 0.125 | 0.116 | 0.101 | 0.135 | 0.112 | 0.103 | 0.102 | 0.136 | 0.114 | 0.104 | **0.014** | **0.019** | **0.012** | **0.011** |
| 20 | 0.152 | 0.160 | 0.159 | 0.170 | 0.121 | 0.126 | 0.130 | 0.119 | 0.092 | 0.107 | 0.117 | 0.115 | 0.093 | 0.109 | 0.118 | 0.117 | **0.016** | **0.010** | **0.015** | **0.012** |
| Mean | | | 0.076 | 0.085 | 0.093 | 0.097 | 0.070 | 0.069 | 0.068 | 0.063 | 0.069 | 0.075 | 0.074 | 0.071 | 0.070 | 0.076 | 0.075 | 0.072 | **0.013** | **0.011** | **0.012** | **0.013** |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| TABLE VII  The ARPD of the five algorithms | | | | | | | |
|  |  |  | DABC | NEABC | MIG | MCEDA | CLDHH |
| 10 |  | 2 | 0.330 | 0.162 | 0.097 | 0.099 | **0.029** |
| 3 | 0.263 | 0.152 | 0.097 | 0.101 | **0.022** |
| 4 | 0.205 | 0.130 | 0.087 | 0.089 | **0.017** |
| 5 | 0.163 | 0.109 | 0.074 | 0.077 | **0.014** |
|  | 20 | 0.089 | 0.063 | 0.052 | 0.056 | **0.019** |
| 50 | 0.207 | 0.132 | 0.100 | 0.103 | **0.019** |
| 80 | 0.268 | 0.160 | 0.109 | 0.112 | **0.021** |
| 100 | 0.295 | 0.169 | 0.108 | 0.111 | **0.020** |
| 200 | 0.341 | 0.167 | 0.075 | 0.076 | **0.023** |
|  | 5 | 0.245 | 0.150 | 0.085 | 0.089 | **0.022** |
| 10 | 0.239 | 0.137 | 0.091 | 0.093 | **0.020** |
| 20 | 0.236 | 0.127 | 0.091 | 0.093 | **0.020** |
|  | 10 | 0.257 | 0.156 | 0.094 | 0.099 | **0.023** |
| 50 | 0.233 | 0.135 | 0.088 | 0.089 | **0.020** |
| 100 | 0.237 | 0.135 | 0.090 | 0.092 | **0.019** |
| 125 | 0.233 | 0.127 | 0.083 | 0.086 | **0.018** |
| Mean |  | 0.240 | 0.138 | 0.089 | 0.092 | **0.020** |
| 20 |  | 2 | 0.226 | 0.168 | 0.115 | 0.117 | **0.029** |
| 3 | 0.166 | 0.150 | 0.107 | 0.109 | **0.021** |
| 4 | 0.126 | 0.129 | 0.092 | 0.095 | **0.018** |
| 5 | 0.095 | 0.103 | 0.079 | 0.080 | **0.013** |
|  | 20 | 0.058 | 0.060 | 0.050 | 0.054 | **0.021** |
| 50 | 0.123 | 0.125 | 0.102 | 0.105 | **0.019** |
| 80 | 0.163 | 0.157 | 0.116 | 0.118 | **0.019** |
| 100 | 0.183 | 0.167 | 0.118 | 0.120 | **0.018** |
| 200 | 0.238 | 0.178 | 0.106 | 0.106 | **0.025** |
|  | 5 | 0.147 | 0.149 | 0.096 | 0.099 | **0.021** |
| 10 | 0.156 | 0.138 | 0.101 | 0.103 | **0.021** |
| 20 | 0.156 | 0.126 | 0.098 | 0.099 | **0.020** |
|  | 10 | 0.156 | 0.160 | 0.107 | 0.110 | **0.024** |
| 50 | 0.148 | 0.146 | 0.105 | 0.105 | **0.021** |
| 100 | 0.147 | 0.124 | 0.092 | 0.095 | **0.018** |
| 125 | 0.161 | 0.120 | 0.089 | 0.092 | **0.018** |
| Mean |  | 0.153 | 0.138 | 0.098 | 0.100 | **0.020** |
| 40 |  | 2 | 0.214 | 0.127 | 0.109 | 0.113 | **0.030** |
| 3 | 0.157 | 0.112 | 0.104 | 0.106 | **0.022** |
| 4 | 0.114 | 0.087 | 0.088 | 0.088 | **0.016** |
| 5 | 0.088 | 0.068 | 0.072 | 0.074 | **0.012** |
|  | 20 | 0.056 | 0.056 | 0.048 | 0.048 | **0.019** |
| 50 | 0.116 | 0.093 | 0.098 | 0.100 | **0.020** |
| 80 | 0.152 | 0.106 | 0.110 | 0.113 | **0.018** |
| 100 | 0.173 | 0.114 | 0.113 | 0.116 | **0.019** |
| 200 | 0.218 | 0.122 | 0.097 | 0.098 | **0.025** |
|  | 5 | 0.134 | 0.093 | 0.090 | 0.092 | **0.020** |
| 10 | 0.147 | 0.102 | 0.096 | 0.098 | **0.020** |
| 20 | 0.148 | 0.100 | 0.094 | 0.095 | **0.020** |
|  | 10 | 0.124 | 0.102 | 0.087 | 0.093 | **0.023** |
| 50 | 0.142 | 0.106 | 0.103 | 0.104 | **0.020** |
| 100 | 0.151 | 0.094 | 0.091 | 0.093 | **0.020** |
| 125 | 0.155 | 0.090 | 0.092 | 0.090 | **0.018** |
| Mean |  | 0.143 | 0.098 | 0.093 | 0.095 | **0.020** |

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| TABLE VIII  The Wilcoxon test for the five algorithms () | | | | | | | |
| vs. |  |  |  |  |  |  |  |
|  | 10 | 26565 | 0 | -13.15 | 0.00E+00 |  |  |
| 50 | 28203 | 0 | -13.35 | 0.00E+00 |  |  |
| 100 | 28441 | 0 | -13.37 | 0.00E+00 |  |  |
| 125 | 28680 | 0 | -13.40 | 0.00E+00 |  |  |
|  | 10 | 26565 | 0 | -13.15 | 0.00E+00 |  |  |
| 50 | 27495 | 0 | -13.26 | 0.00E+00 |  |  |
| 100 | 28203 | 0 | -13.35 | 0.00E+00 |  |  |
| 125 | 28680 | 0 | -13.40 | 0.00E+00 |  |  |
|  | 10 | 26568 | 228 | -12.95 | 0.00E+00 |  |  |
| 50 | 28245 | 435 | -13.00 | 0.00E+00 |  |  |
| 100 | 28528 | 152 | -13.26 | 0.00E+00 |  |  |
| 125 | 28566 | 114 | -13.30 | 0.00E+00 |  |  |
|  | 10 | 26398 | 167 | -12.98 | 0.00E+00 |  |  |
| 50 | 27806 | 160 | -13.17 | 0.00E+00 |  |  |
| 100 | 28594 | 86 | -13.32 | 0.00E+00 |  |  |
| 125 | 28576 | 104 | -13.31 | 0.00E+00 |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| TABLE IX  The Wilcoxon test for the five algorithms () | | | | | | | |
| vs. |  |  |  |  |  |  |  |
|  | 10 | 26335 | 0 | -13.12 | 0.00E+00 |  |  |
| 50 | 27966 | 0 | -13.32 | 0.00E+00 |  |  |
| 100 | 28203 | 0 | -13.35 | 0.00E+00 |  |  |
| 125 | 28680 | 0 | -13.40 | 0.00E+00 |  |  |
|  | 10 | 26335 | 0 | -13.12 | 0.00E+00 |  |  |
| 50 | 27964 | 2 | -13.32 | 0.00E+00 |  |  |
| 100 | 28203 | 0 | -13.35 | 0.00E+00 |  |  |
| 125 | 28680 | 0 | -13.40 | 0.00E+00 |  |  |
|  | 10 | 26866 | 395 | -12.85 | 0.00E+00 |  |  |
| 50 | 28229 | 212 | -13.18 | 0.00E+00 |  |  |
| 100 | 28347 | 94 | -13.29 | 0.00E+00 |  |  |
| 125 | 28903 | 17 | -13.42 | 0.00E+00 |  |  |
|  | 10 | 26334 | 1 | -13.12 | 0.00E+00 |  |  |
| 50 | 28221 | 220 | -13.17 | 0.00E+00 |  |  |
| 100 | 28166 | 37 | -13.31 | 0.00E+00 |  |  |
| 125 | 28670 | 10 | -13.39 | 0.00E+00 |  |  |

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| --- | --- | --- | --- | --- | --- |
| TABLE X  Effectiveness analysis results of CLDHH and three variants for initialization | | | | | |
|  | | CLDHH\_PIM | CLDHH\_iNEH2 | CLDHH\_Random | CLDHH |
|  | 2 | 0.089 | 0.064 | 0.115 | **0.043** |
| 3 | 0.061 | 0.050 | 0.090 | **0.028** |
| 4 | 0.043 | 0.046 | 0.074 | **0.023** |
| 5 | 0.027 | 0.036 | 0.051 | **0.017** |
|  | 20 | 0.040 | 0.046 | 0.043 | **0.028** |
| 50 | 0.041 | 0.055 | 0.059 | **0.025** |
| 80 | 0.050 | 0.055 | 0.082 | **0.025** |
| 100 | 0.059 | 0.048 | 0.096 | **0.024** |
| 200 | 0.085 | 0.042 | 0.133 | **0.038** |
|  | 5 | 0.055 | 0.050 | 0.093 | **0.029** |
| 10 | 0.057 | 0.051 | 0.083 | **0.028** |
| 20 | 0.053 | 0.046 | 0.072 | **0.027** |
|  | 10 | 0.069 | 0.059 | 0.112 | **0.030** |
| 50 | 0.059 | 0.055 | 0.094 | **0.025** |
| 100 | 0.046 | 0.042 | 0.064 | **0.029** |
| 125 | 0.046 | 0.039 | 0.059 | **0.028** |
| Mean |  | 0.055 | 0.049 | 0.083 | **0.028** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TABLE XI  Effectiveness analysis results of CLDHH and six variants for initialization | | | | | | | | |
|  | | CLDHH\_  URL | CLDHH\_  EDA | CLDHH\_  DD | CLDHH\_  PR | CLDHH\_  DR | CLDHH\_  DAAE | CLDHH |
|  | 2 | 0.160 | 0.157 | 0.056 | 0.063 | 0.058 | 0.135 | **0.051** |
| 3 | 0.130 | 0.128 | 0.044 | 0.046 | 0.044 | 0.107 | **0.029** |
| 4 | 0.107 | 0.105 | 0.040 | 0.043 | 0.040 | 0.087 | **0.021** |
| 5 | 0.085 | 0.083 | 0.033 | 0.033 | 0.032 | 0.070 | **0.015** |
|  | 20 | 0.067 | 0.066 | 0.043 | 0.042 | 0.044 | 0.065 | **0.024** |
| 50 | 0.115 | 0.112 | 0.048 | 0.050 | 0.048 | 0.095 | **0.022** |
| 80 | 0.134 | 0.131 | 0.045 | 0.049 | 0.046 | 0.106 | **0.023** |
| 100 | 0.140 | 0.137 | 0.042 | 0.045 | 0.043 | 0.112 | **0.026** |
| 200 | 0.147 | 0.145 | **0.037** | 0.046 | 0.038 | 0.121 | 0.049 |
|  | 5 | 0.125 | 0.122 | 0.043 | 0.047 | 0.044 | 0.097 | **0.031** |
| 10 | 0.124 | 0.122 | 0.046 | 0.049 | 0.046 | 0.104 | **0.030** |
| 20 | 0.112 | 0.111 | 0.041 | 0.044 | 0.042 | 0.098 | **0.027** |
|  | 10 | 0.134 | 0.133 | 0.048 | 0.055 | 0.048 | 0.110 | **0.032** |
| 50 | 0.125 | 0.125 | 0.046 | 0.052 | 0.047 | 0.104 | **0.025** |
| 100 | 0.112 | 0.108 | 0.040 | 0.040 | 0.040 | 0.093 | **0.028** |
| 125 | 0.111 | 0.107 | 0.038 | 0.039 | 0.040 | 0.091 | **0.030** |
| Mean |  | 0.121 | 0.118 | 0.043 | 0.046 | 0.044 | 0.100 | **0.029** |

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| --- | --- | --- | --- | --- | --- | --- |
| TABLE XII  The Wilcoxon test results of CLDHH and six variants | | | | | | |
| vs. |  |  |  |  |  |  |
| CLDHH\_URL | 443211 | 0 | -26.57 | 0.00E+00 |  |  |
| CLDHH\_EDA | 444146 | 7 | -26.59 | 0.00E+00 |  |  |
| CLDHH\_DD | 364023 | 78247 | -17.16 | 0.00E+00 |  |  |
| CLDHH\_PR | 380592 | 62619 | -19.06 | 0.00E+00 |  |  |
| CLDHH\_DR | 370065 | 73145 | -17.80 | 0.00E+00 |  |  |
| CLDHH\_DAAE | 443951 | 202 | -26.56 | 0.00E+00 |  |  |