Supplementary Information

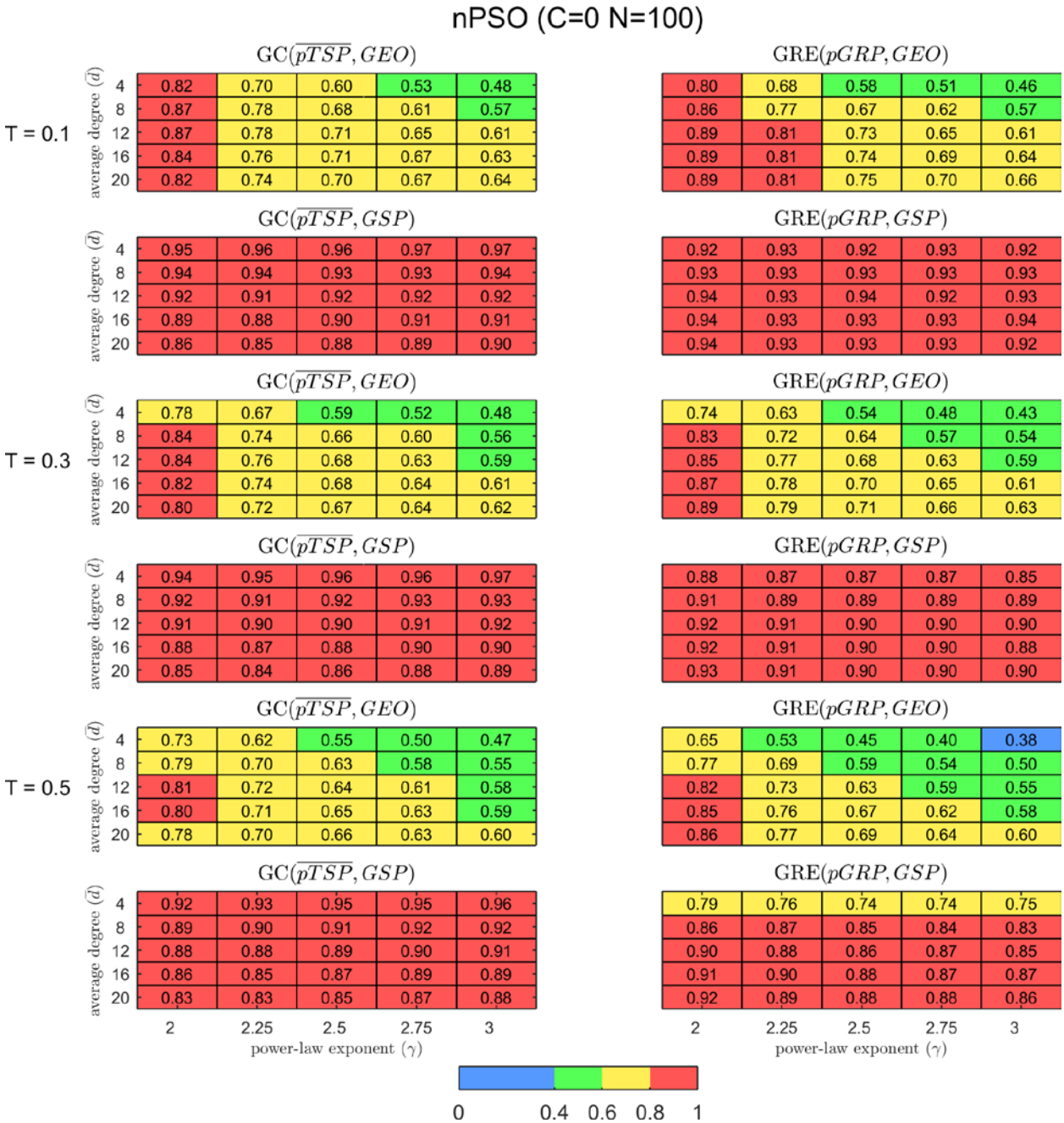
Suppl. Algorithm 1. Pseudocode to find all the paths of a given length between two nodes.

INPUT
A = adjacency list
s = source node
t = target node
L = path length

OUTPUT
paths = list of paths, where each path is a list of L+1 nodes corresponding to the sequence of nodes involved in the path from s to t

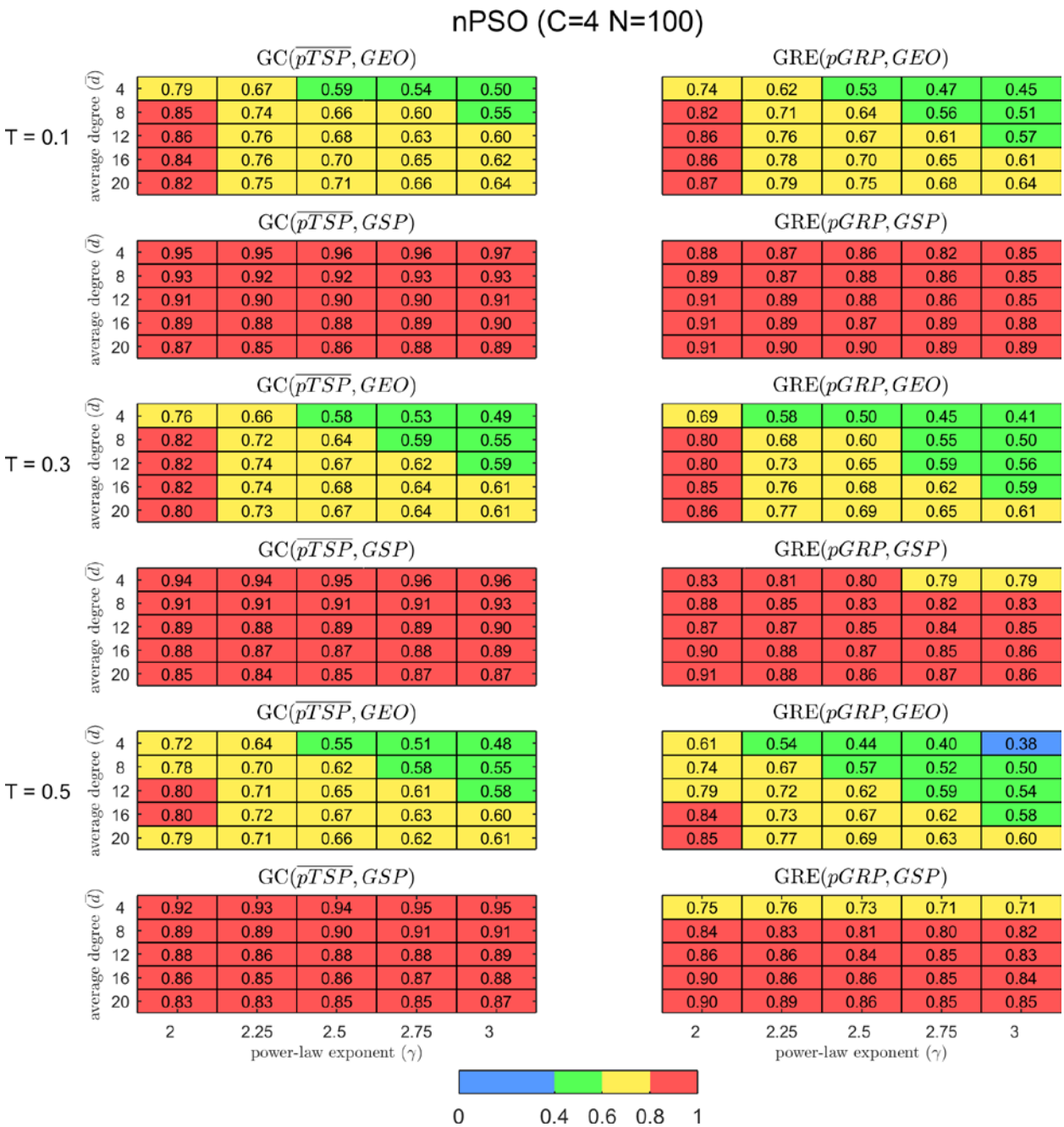
```
function paths = find_paths(A, s, t, L)

paths = list()                                  # initialize paths to empty list
path = list()                                   # initialize path to empty list

paths = find_paths_rec(A, s, t, L, paths, path)        # start recursion from the source node
```

```
function paths = find_paths_rec(A, u, t, L, paths, path)

l = length(path)-1                              # current path length

if (u!=t) & (u not in path) & (l+1<L)           # if u is not the target and not in the path, and L is not reached
        path.append(u)                          # add node u to the path
        for v in A[u]                           # for each neighbour of the node u
                paths = find_paths_rec(A, v, t, L, paths, path)        # continue recursion
        end
elseif (u==t) & (l+1==L)                        # if u is the target and L is reached
        path.append(t)                          # add target node to the path
        paths.append(path)                      # store the path
end
```

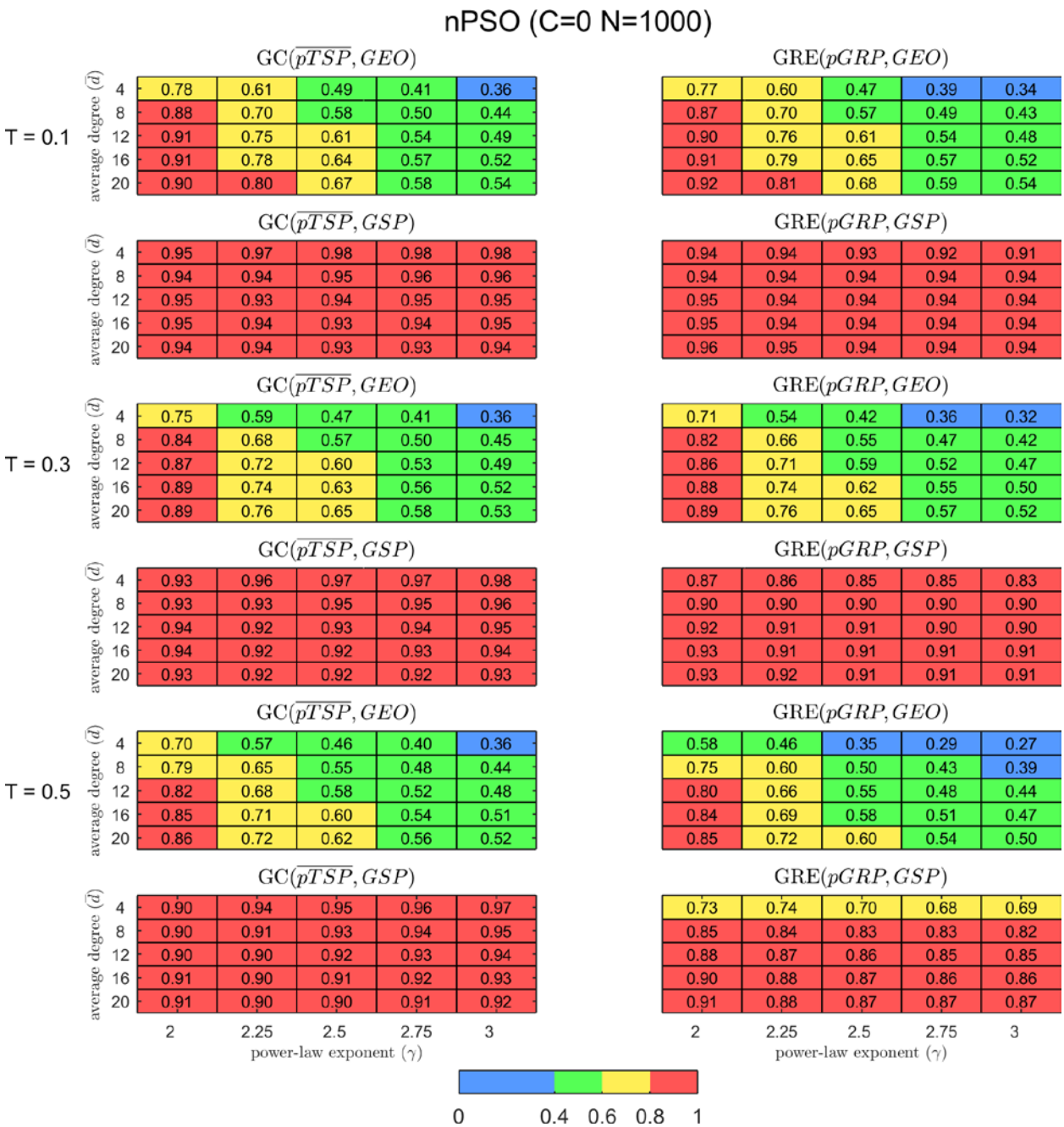


Suppl. Figure 1. GC and GRE evaluation on nPSO networks (C = 0, N = 100).

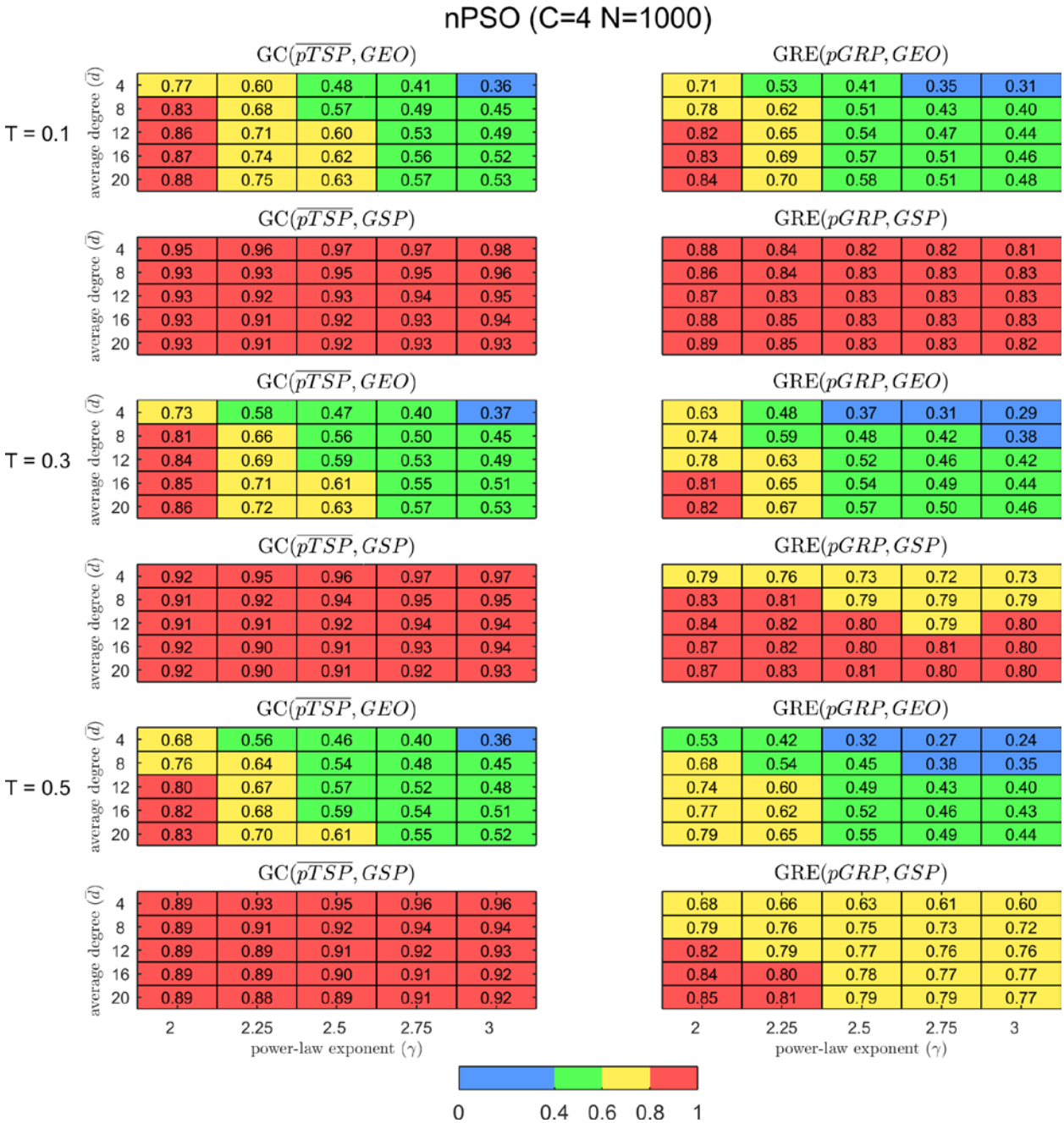
nPSO networks have been generated with parameters N = 100, $\bar{d}$ = [4, 8, 12, 16, 20], T = [0.1, 0.3, 0.5], γ = [2, 2.25, 2.5, 2.75, 3] and C = 0. For each combination of parameters, 10 networks have been generated. For each network we have computed: GC($\overline{pTSP}$, GEO), GRE(pGRP, GEO), GC($\overline{pTSP}$, GSP) and GRE(pGRP, GSP). For each value of T, indicated on the left, each heatmap reports the mean value (over 10 network realizations) of the respective network measure for each combination of $\bar{d}$ and γ in the nPSO generative model.



Suppl. Figure 2. GC and GRE evaluation on nPSO networks (C = 4, N = 100).
nPSO networks have been generated with parameters N = 100, $\bar{d}$ = [4, 8, 12, 16, 20], T = [0.1, 0.3, 0.5], γ = [2, 2.25, 2.5, 2.75, 3] and C = 4. For each combination of parameters, 10 networks have been generated. For each network we have computed: GC($\overline{pTSP}$, GEO), GRE(pGRP, GEO), GC($\overline{pTSP}$, GSP) and GRE(pGRP, GSP). For each value of T, indicated on the left, each heatmap reports the mean value (over 10 network realizations) of the respective network measure for each combination of $\bar{d}$ and γ in the nPSO generative model.



Suppl. Figure 3. GC and GRE evaluation on nPSO networks (C = 0, N = 1000).
nPSO networks have been generated with parameters N = 1000, $\bar{d}$ = [4, 8, 12, 16, 20], T = [0.1, 0.3, 0.5], γ = [2, 2.25, 2.5, 2.75, 3] and C = 0. For each combination of parameters, 10 networks have been generated. For each network we have computed: GC($\overline{pTSP}$, GEO), GRE(pGRP, GEO), GC($\overline{pTSP}$, GSP) and GRE(pGRP, GSP). For each value of T, indicated on the left, each heatmap reports the mean value (over 10 network realizations) of the respective network measure for each combination of $\bar{d}$ and γ in the nPSO generative model.



Suppl. Figure 4. GC and GRE evaluation on nPSO networks (C = 4, N = 1000).
nPSO networks have been generated with parameters N = 1000, $\bar{d}$ = [4, 8, 12, 16, 20], T = [0.1, 0.3, 0.5], γ = [2, 2.25, 2.5, 2.75, 3] and C = 4. For each combination of parameters, 10 networks have been generated. For each network we have computed: GC($\overline{pTSP}$, GEO), GRE(pGRP, GEO), GC($\overline{pTSP}$, GSP) and GRE(pGRP, GSP). For each value of T, indicated on the left, each heatmap reports the mean value (over 10 network realizations) of the respective network measure for each combination of $\bar{d}$ and γ in the nPSO generative model.