**Detailed Descriptions of the Network Datasets**

1. **Overview of Ten Real-World Datasets**
2. **Dolphins:** This dataset represents a social network of bottlenose dolphins. The network comprises 62 nodes (representing an individual dolphin) and 159 edges (denoting social relationships between pairs of dolphins).
3. **Polbooks:** A network comprising buying relationships for political books within the United States. It consists of 105 nodes (representing distinct political books) and 441 edges (signifying the similarity or relatedness between these books).
4. **Blogs:** This dataset represents a hyperlink network of blog homepages active during the 2004 US election. The network comprises 1224 nodes (representing distinct blog homepages), and 19025 edges (indicating the existence of hyperlink relationships between blogs).
5. **Euroroad:** This dataset represents the backbone road network of Europe. The network comprises 1174 nodes (representing a major city or town in Europe) and 1417 edges (denoting road connections between these urban centers).
6. **Friendships:** This dataset represents a social network constructed based on friendship relationships established on a website. The network comprises 1858 nodes (representing an individual user) and 12534 edges (denoting social connections between pairs of users).
7. **Protein:** This dataset represents a protein-protein interaction network. The network comprises 1870 nodes (representing a distinct protein) and 2277 edges (denoting interactions between pairs of proteins).
8. **Hamster:** This dataset represents a social network comprising 2426 nodes (representing an individual user) and 16630 edges (denoting friendships and family ties between pairs of users).
9. **Power:** This dataset represents a power grid network within the United States. The network comprises 4941 nodes (representing a component of the electrical system) and 6594 edges (denoting transmission lines or electrical connections between these components).
10. **As20000102:** This dataset represents an autonomous system (AS) communication network of the Internet. The network comprises 6474 nodes (representing an autonomous system) and 13895 edges (denoting communication relationships between these systems).

(10) **Ca-astroph:** This dataset represents a co-authorship network of astrophysicists. The network comprises 18871 nodes (representing an author in the astrophysics domain) and 198050 edges (denoting co-authorship relationships based on published articles).

**2. Generation and Description of Artificial Networks**

**(1) Random networks**

Random networks are characterized by the random establishment of connections between nodes. In this study, we generated four artificial random networks, designated RA-1, RA-2, RA-3, and RA-4, using the classical Erdős-Rényi (ER) random network generation model. The network generation code and datasets are publicly available at **https://github.com/zhangsmile1988/SGM** under the zipped file "**random networks**".

1. **Scale-free networks**

Scale-free networks are characterized by a node degree distribution that follows a power law, exhibiting a small number of nodes with a high degree value and a majority of nodes with a low degree value. In this study, we generated four scale-free networks, designated FR-1, FR-2, FR-3, and FR-4, using a method based on the Barabási-Albert (BA) model. The generation code and datasets of the networks are publicly available at **https://github.com/zhangsmile1988/SGM** under the zipped file "**scale-free networks**".