1：Numerous sampling strategies have been proposed to simplify large-scale networks for highly readable visualizations.

2：It is of great challenge to preserve the contextual structures in a sampled graph,

3： because they are easily overlooked during the process of sampling due to their irregular distribution and immunity to scale.

4：To address this issue, we propose a new graph sampling method oriented to the preservation of contextual structures.

5.First, contextual structures are effectively extracted and organized by graph representation learning (GRL) models.

6：Then, we propose a multi-objective blue noise sampling model to select a subset of nodes in the vectorized space,

7：Aiming to preserve not only contextual structures but those significant topology features.

8：Meanwhile, we design a visual interface enabling users to interactively conduct context-aware sampling, visually compare sampling results, and deeply explore large networks.

9：Finally, case studies and quantitative comparisons are conducted to demonstrate the effectiveness of our method in the abstraction and exploration of large networks.

10

Communities are significant contextual structures, and the changes of communities will mislead users in the exploration of networks.

11：Thus, we at first load the Bitcoin dataset into the system.

12：The network is medium in size, but complex in relation.

13：A community function is provided to display different communities with multiple colors.

14：There are obvious local communities (C1: yellow, C2: orange, C3: purple) in the bitcoin trading network.

15：Each community may represent a different trading mode respectively.

16.Then，we use a variety of sampling strategies to conduct graph simplification for comparison .of community retention.

17.The sampling rate is specified as 10\%。

18.Comparison 1：ISRW retains the community C1-C2 and loses community C3.

19.Comparison 2：Communities C1-C3 are retained in the sampling results of TIES, but their scales are obviously imbalance.

20.the scales of C1 and C2 are smaller than expected, and structures of C3 are evidently broken.

1. Comparison 3：our method does not only retains communities C1-C3, but also preserves accounts of nodes as uniform as possible.
2. We further retain their connections and original structures in a relatively balanced way.
3. The experimental results prove the effectiveness of our algorithm in maintaining contextual structures of original networks.

Significant nodes is of great importance for subsequent network analysis, graph calculation and literature data processing.

25.

Thus，we compare the preservation of important node in the ieeevis network.

26

There are five identified nodes with larger betweenness, such as A, B , C, D and E.

27.These points are not only the key nodes in the literature network, but also important figures in the specific field.

28.Fistly, the sampling rate is specified as 15\%.

29.It can be observed that all points can be retained with our method and ISRW.

30.Two nodes are retained with RNS and three nodes are retained with TIES.

31.Then, we further decrease the sampling rate as 10\%.

32.More significant nodes disappear in the sampling results, such as RNS, TIES and ISRW.

33.In contrast, our method presents well stability, also retaining almost all significant nodes.

34.Evidently, the retention of significant nodes in our sampling method performs well.