This paper focuses on the analysis of space-filling curves, which is a way of mapping the multi-dimensional space into the 1-D space. Specifically, this paper proposes a framework that can characterize the features of any kind of space-filling curves in five indices, namely J, C, R, F, and S. The proposed 5 indices are used to select the appropriate space filling curves for different applications. Moreover, the authors also propose closed formulas that can describe the 5 indices for any D-dimensional space and grid size N for different applications. The most advantage of this paper is the proposal of a generic framework for evaluating a specific space-filling curve in different aspects, which can be mounted to appropriate applications. The main advantage of this paper is that the author has applied different dataset and compared with a number of the existing methods. This paper overall is a good piece of work, though suffers from some problems.

1. Presentation.

The readability of this paper is ensured by the good presentation, especially in the technique section, the problem formulation section and experimental section. First, for the technique section, this paper provides an effective high-level illustration (i.e., Fig. 2) the author is recommended to utilize this figure to help readers figure out their several definitions, e.g., features, vertex vectors, nodes, and time intervals, etc. The concepts claimed and their relationships are stated clearly. Second, formal definitions of each type of indices are proposed and elaborated in details. This ensures the foundation of a generic framework to be general and robust in the presentation of all of jump, contiguity, reverse, forward, and still. Third, the authors provide symbol table, which is very intuitive and helpful in improving the readability.

2. The proposed method is new and it is supported by sufficient theoretical verification.

There are mainly 5 indices in the proposed framework: jump, contiguity, reverse, forward, and still. All the physical properties of the 5 indices are mathematically formulated and characterized by definitions and math proofs (also in appendix). Moreover, for emphasizing the usefulness of practical cases, multiple case studies are provided by the authors, which shows the theatrical advantage and practical effectiveness of using the proposed 5 indices in evaluating different space filling curves.

3. The experimental section validates both the effectiveness and efficiency of the proposed framework.

In the experimental section, the author first test the scalability of the proposed framework and demonstrate it is scalable in the grid size, especially by Figure 9 and Figure 10. The results also demonstrate the correctness of the proposed Lemmas 2, 4, 6, and 8. More than this, the author then evaluate the performance related to the intentional bias of SFCs, which is a specially-designed metric for this paper. The assignment of the different parameters to the space dimensions are demonstrated by the effective experiments.

Other obvious flaws are:

1) The existing work presented is insufficient.
This paper does not provide a separate section for related work. Instead, it only uses a small paragraph in introduction to review merely a few existing multitask learning papers. Other related work like MOE-based work is forgotten to be introduced.

2) Dataset used in experimental need better description.

In the experiment section, the author did not clearly state the dataset. For example, the author did not introduce clearly the dataset before describing the experiment results. Moreover, a detailed elaboration of the generation process of the experiment dataset is also needed.

3) Experiment settings need better explanation.

There are quite a few tunable parameters in this framework or the dataset, such as the grid size N and the percentage of Jumps. The settings of some of these parameters seem to be arbitrary and the authors did not introduce the selection process of the parameters.

4) Lack comparison with peer method which can also characterize the space-filling curves.

The authors provide the comparative study in terms of different space-filling curves. However, they did not provide the comparative study in terms of different frameworks for analyzing space-filling curves. It will be interesting to see such a comparison which can more comprehensively evaluate the advantage of the proposed framework over its peers.

In all, this paper proposed a method which can characterize the space-filling curves from multiple dimensions to 1-dimension, and provided closed form formulas to compute the description vector which contains 5 indices. The presentation seems to be clear in general. The proposed method is new, generic, and significant. The experiment section provides both metrics for effectiveness and efficiency. However there are also some flaws in this paper, especially in the experiment section. The authors are encouraged to improve these flaws in order to make this paper persuadable and readable enough.