Review of: "Measuring Complexity using Information"

Caglar Uyulan[1]

1 İzmir Katip celebi University

Potential competing interests: No potential competing interests to declare.

The paper effectively integrates concepts from various scientific disciplines to propose a unified framework for measuring complexity. It provides an extensive literature review, citing significant works from different fields, which establishes a solid foundation for the proposed methods. The introduction of Infodynamics and the distinction between different types of information (useful, redundant, and noisy) is an innovative approach that adds depth to the study of complexity.

Limitations and Shortcomings

1. While the paper proposes a novel framework, it lacks sufficient empirical validation. The examples provided are theoretical and do not include rigorous experimental or real-world data to support the claims. Incorporate case studies or empirical data to validate the proposed framework. For instance, applying the framework to specific complex systems like ecological networks or economic markets could provide tangible evidence of its utility.
2. The definitions of key terms such as "useful information" and "redundant information" are not sufficiently clear. This lack of clarity can lead to confusion and misinterpretation. Provide precise, operational definitions for all key terms. Include mathematical formulations where applicable to ensure that the concepts are unambiguously defined.
3. The paper frequently uses analogies between thermodynamics and information theory without thoroughly justifying the validity of these analogies. This could undermine the robustness of the proposed framework. Strengthen the theoretical basis for the analogies used. Ensure that each analogy is rigorously justified and supported by both theoretical and empirical evidence.
4. The paper primarily focuses on certain types of systems (e.g., biological, ecological, economic) and does not sufficiently address the applicability of the proposed methods to other types of complex systems. Expand the scope to include a wider variety of complex systems. Discuss the potential limitations and adaptations needed for the framework to apply to different domains such as artificial intelligence, social networks, and large-scale engineering systems.
5. The discussion on multidimensional complexity is somewhat simplistic and does not fully capture the intricacies of high-dimensional systems. Enhance the treatment of multidimensional complexity by incorporating more sophisticated mathematical tools and models. For instance, tensor-based approaches and higher-order network analysis could provide a more nuanced understanding of complex systems.
6. The paper acknowledges the computational difficulties in measuring complexity but does not provide sufficient solutions or alternatives to address these challenges. Propose and evaluate computational methods or algorithms that can feasibly handle the complexity of high-dimensional systems. Include a discussion on the trade-offs between

accuracy and computational feasibility.

Overall, the paper "Measuring Complexity using Information" by Klaus Jaffe presents a thought-provoking and innovative approach to understanding complexity. However, to enhance its impact and applicability, it requires empirical validation, clearer definitions, stronger theoretical justification, a broader scope, more sophisticated multidimensional analysis, and practical computational solutions. Addressing these limitations will significantly improve the robustness and utility of the proposed framework.