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| Journal Name: | [**Advances in Research**](https://journalair.com/index.php/AIR/index) |
| Manuscript Number: | **Ms\_AIR\_136419** |
| Title of the Manuscript: | **A Formal Framework for Molecular Interaction Hyper Networks and Molecular Interaction Super Hyper Networks** |
| Type of the Article | **Original Research Article** |

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| PART 1: Comments | | | | |
|  | | Reviewer’s comment **Artificial Intelligence (AI) generated or assisted review comments are strictly prohibited during peer review.** | | **Author’s Feedback** (It is mandatory that authors should write his/her feedback here) |
| **Please write a few sentences regarding the importance of this manuscript for the scientific community. A minimum of 3-4 sentences may be required for this part.** | | This manuscript introduces a novel formal framework for modeling complex molecular interactions using hypernetworks and superhypernetworks, which significantly extends traditional graph-based approaches. By capturing higher-order and hierarchical relationships in biochemical systems, it provides a powerful tool for researchers in bioinformatics, systems biology, and network science. The proposed models enable more accurate representations of multi-scale molecular interactions, such as protein complexes and signaling pathways, which are crucial for understanding cellular processes. This work lays the foundation for future advancements in computational biology and drug discovery by addressing the limitations of pairwise interaction models. | | Thank you for your valuable comment. |
| **Is the title of the article suitable?**  **(If not please suggest an alternative title)** | | The title, "A Formal Framework for Molecular Interaction HyperNetworks and Molecular Interaction SuperHyperNetworks," is suitable as it clearly reflects the manuscript's focus on extending molecular interaction networks using hypergraph and superhypergraph structures. However, a more concise alternative could be: "Modeling Molecular Interactions with HyperNetworks and SuperHyperNetworks." | | Thank you for your valuable comment. I have revised the title of the paper accordingly. |
| Is the abstract of the article comprehensive? Do you suggest the addition (or deletion) of some points in this section? Please write your suggestions here. | | The abstract is comprehensive but could benefit from briefly mentioning potential applications or implications of the proposed frameworks, such as their utility in drug discovery or systems biology. For example, adding a sentence like "These frameworks offer new insights into multi-scale biochemical systems, with potential applications in drug target identification and pathway analysis" would enhance its impact. | | Thank you for your valuable comment.  I have revised and expanded the abstract.  The benefit you pointed out has also been incorporated. |
| Is the manuscript scientifically, correct? Please write here. | | The manuscript is scientifically sound, with rigorous definitions, theorems, and illustrative examples. The mathematical foundations are well-established, and the biological examples are relevant and accurately described. The logical flow from classical structures to hyperstructures and superhyperstructures is clear and well-supported. | | Thank you for your valuable comment. |
| **Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form.** | | The references are sufficient and include recent works, though a few additional citations on applications of hypergraphs in bioinformatics (e.g., recent papers on hypergraph neural networks for biological data) could further strengthen the manuscript. For example, citing *"Hypergraph Neural Networks for Molecular Property Prediction"* (2022) would align with the manuscript's focus. | | Thank you for your valuable comment.  I have added citations to recent publications throughout the paper. |
| Is the language/English quality of the article suitable for scholarly communications? | | The language is suitable for scholarly communication, with clear and precise technical writing. Minor grammatical or typographical errors (e.g., "0.ninety" instead of "0.90") are present but do not detract from the overall quality. A thorough proofreading would ensure polish. | | Thank you for your valuable comment.  The indicated issues have been thoroughly corrected.  In addition, I have fixed typographical and grammatical errors as much as possible. |
| Optional/General comments | |  | | Thank you for your valuable comment. |
| **PART 2:** | | | | |
|  | **Reviewer’s comment** | | **Author’s Feedback** (It is mandatory that authors should write his/her feedback here) | |
| **Are there ethical issues in this manuscript?** | *(If yes, Kindly please write down the ethical issues here in details)* | | Thank you for your valuable comment. | |