|  |  |
| --- | --- |
|  | |
| Journal Name: | [Advances in Research](http://www.sciencedomain.org/journal/31) |
| Manuscript Number: | **Ms\_** **AIR \_136474** |
| Title of the Manuscript: | **A Unified Formal Framework for Brain HyperGraphs and Symptom HyperNetworks** |
| Type of the Article | **Original Research Article** |

|  |  |  |
| --- | --- | --- |
| 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 study, regarded as a major advancement in the modeling of complex biomedical systems, goes about establishing a unified framework of hypergraphs and superhypergraphs. This encapsulates the lacuna in traditional graph models, as the latter cannot properly capture topological interactions with multi-way features or hierarchical folding concerning brain activities and symptom co-occurrence. The author(s) approach the problem with mathematical rigor to determine formal definitions for Brain HyperGraphs and Symptom SuperHyperNetworks, thereby paving a new way for considering the structural-functional correlation of the brain and diseases. Consequently, the proposed model could affect neuroscience, clinical diagnostics, and computational medicine by providing finer representations of data and promoting interdisciplinary collaboration between mathematics, computer science, and healthcare. | Thank you very much for your valuable comment. |
| **Is the title of the article suitable?**  **(If not please suggest an alternative title)** | Yes | Thank you very much for your valuable comment. |
| 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. | Yes, the abstract is largely comprehensive, as it introduces the motivation, context, key contributions, and the broader relevance of the work. | Thank you very much for your valuable comment. |
| Is the manuscript scientifically, correct? Please write here. | From the abstract, the presented manuscript appears to be scientifically valid in its conceptual foundation and scope. The use of hypergraphs and superhypergraphs to model complex higher-order relations in biomedical systems is mathematically proper and goes along the lines of current systems neuroscience and computational medicine.  The definitions of Brain HyperGraphs and Symptom HyperNetworks seem to be logically developed as a structured extension of existing models, and the manuscript promises formal definitions, examples, and analysis, implying rigorous mathematical treatment. Hence, provided that the full manuscript delivers on these promises—with explicit definitions, well-supported theoretical claims, and illustrative use cases—the work can be considered scientifically valid.  It is necessary, however, for full scientific validity, that:  The mathematical formalism is stated precisely and is internally consistent;  Any claims of a real-world nature are either supported by data or are explicitly stated as theoretical implications; and  The proposed models are compared, at least conceptually, with existing graph-based approaches to emphasize their improvements or novel capabilities. | Thank you very much for your valuable comment. Since experimental validation using data is not feasible, we have explicitly added a remark in the Introduction stating that this study is based solely on theoretical considerations, with the hope that future research will include empirical investigation.  Additionally, we carefully reviewed all definitions and supplemented them with further concrete examples to ensure their mathematical correctness. For the proposed models, we improved the Introduction by adding several comparative tables to facilitate clarity and comparison.  Furthermore, we thoroughly revised the manuscript to ensure that all content is as scientifically accurate and correct as possible. |
| **Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form.** | Yes, remove unwanted references. | Thank you very much for your valuable comment. |
| Is the language/English quality of the article suitable for scholarly communications? | Good | Thank you very much for your valuable comment. |
| Optional/General comments |  | Thank you very much 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 detail)* | Thank you very much for your valuable comment. |