Review of: "On Optimal Linear Prediction"

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Potential competing interests: No potential competing interests to declare.

The paper presents an innovative approach to statistical modeling, drawing inspiration from quantum theory. The theoretical framework is well-developed and offers a fresh perspective on the problem of model selection and prediction. Given a positive assessment of the paper, it would, however, benefit from a more practical focus and a clearer connection to real-world applications.

Strengths:

- **Novelty:** The paper introduces a novel framework that combines statistical modeling and quantum theory, joining two apparently far fields of science.
- **Theoretical Rigor:** The theoretical underpinnings of the paper are sound and well-supported by mathematical arguments.
- **Clear Writing Style:** The paper is generally well-written and easy to follow, making it accessible to a broad audience.

Areas to further improve the paper:

- **Assumption of Large Parameter Space:** The assumption of a larger number of parameters than data points may limit the applicability of the proposed methods in many practical scenarios.
- **Lack of Real-World Examples:** The paper could benefit from the inclusion of real-world examples to illustrate the practical implications of the theoretical framework.
- **Limited Visual Aids:** The absence of visual aids, such as diagrams or plots, can hinder the understanding of complex concepts and the overall flow of the paper. An overall view of main keywords in their domain of application, and the links among them, can be beneficial.
- **Overemphasis on Theoretical Aspects:** While the theoretical foundation is important, a stronger emphasis on the practical implications and applications of the proposed methods would enhance the paper's impact.
- **Missing Connection to Chemometrics:** The paper references chemometrics theories in the introduction but does not explicitly link them to the subsequent development.

Recommendations / suggestions to improve the article:

- **Consider Regularization Techniques:** To address the issue of overfitting in high-dimensional settings, consider incorporating regularization techniques like L1 or L2 regularization. How would they affect the derived results? Does a link to quantum theory exist?

- **Explore Feature Selection:** Employ feature selection methods to reduce the dimensionality of the data and improve the model's performance.
- **Enhance Visualizations:** Use diagrams, plots, and other visual aids to improve the clarity and understanding of the paper.
- **Strengthen the Connection to Chemometrics:** Explicitly connect the theoretical framework to established chemometrics concepts and methodologies.

By addressing these points, the paper can significantly enhance its impact and appeal to a wider audience.