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## Artificial Intelligence Approaches for Epidemiological Modeling and Pathology Prediction: A Hybrid Approach

### Communication Info

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### Abstract

Epidemiological modeling requires both the interpretability of dynamical systems (SIR/SEIR) and the flexibility of machine learning when dealing with the complexity of real-world data. This work proposes an innovative hybrid framework integrating these two paradigms [1]. Relying on architectures such as Physics-Informed Neural Networks (PINNs), our approach assimilates real-time data while respecting the mathematical laws governing the spread of pathologies [2-3]. The integration of mechanistic models as regularization constraints helps reduce overfitting and ensures the biological consistency of the models [4]. Our results demonstrate that this synergy significantly improves the dynamic estimation of critical parameters [3-4] and the accuracy of epidemic forecasts, thereby providing a robust decision-support tool for public health interventions.

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