

Application of Markov chains in building predictive models

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Abstract: This study explores the application of Markov chains in constructing predictive models for sequential data. By leveraging the fundamental property of Markov processes—where future states depend solely on the present state—the research develops a probabilistic framework capable of forecasting short-term trends and transitions. The methodology involves defining state spaces, estimating transition probability matrices from historical data, and validating model accuracy through empirical testing. The findings demonstrate that Markov chain-based models offer a computationally efficient and interpretable approach for prediction in domains such as finance, weather patterns, and user behavior analysis. While the model excels in scenarios with clear state dependencies, limitations arise in long-term forecasting due to the memoryless assumption. This paper contributes to the field by providing a structured evaluation of Markov chains as a predictive tool, highlighting both their practical utility and inherent constraints. The results suggest that integrating higher-order Markov chains or hybrid models could enhance predictive performance for complex systems.

Keywords: Markov chain, predictive modeling, application, model building