Chapter 9
Generative AI Techniques for Predictive Analytics in Solving Environmental and Social Problems

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ABSTRACT

Generative AI is a transformative technology for predictive analytics, offering robust methodologies for analyzing complex data in environmental problems. This chapter explores the application of Generative AI techniques in modeling and predicting environmental phenomena and social trends. These techniques aid in environmental sciences like climate modelling and disaster prediction, while in social problems, they aid in sentiment analysis, behavioral predictions, and trend forecasting. Important

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challenges in generative AI include data quality and model interpretability, but case studies demonstrate its effectiveness in these areas. The combination of predictive analytics and generative AI will provide deeper insights and make more informed decisions related to both environmental management and social policy.

INTRODUCTION

Predictive analytics has emerged as an important tool for understanding and predicting complex systems, from environmental and social sciences to most other such fields. Generative AI has already made heavy strokes in this process of development by further enhancing predictive analytics, and now it enables the analysis of intricate patterns within large datasets. This introduction tries to delve into exactly how Generative AI, as a subdomain of machine learning involving neural networks with multiple layers, has made it possible to revolutionize predictive analytics by providing potent methods for forecasting and decision-making within such domains(Zhong et al., 2021a).

Notably, predictive analytics plays a very essential role in addressing such critical topics in environmental sciences as climate change, natural disasters, and management of ecosystems. While traditional statistical models are useful, they often fall short when dealing with the size and complexity of the more modern data sources. With the increasing number of remote sensing technologies, like satellites and ground-based sensors, enormous datasets are generated that capture various environmental phenomena. Generative AI does a great job processing these high-dimensional data and provides very efficient methods for meaningful insights and prediction with accuracy(Hälterlein, 2021). For instance, Convolutional Neural Networks are excellent in spatial data analysis, such as satellite image analysis, for monitoring changes in land use, detection of deforestation, or the extent of damage from natural disasters. They process complex visual data, interpreting information that gives detailed assessment—a question of prime importance in environmental monitoring and management.

It is in the same way that the recurrent neural networks are good at handling time-dependent data, which becomes critically necessary in making predictions of weather patterns and climate dynamics. RNNs can scan the past sequences of weather data to identify periodic trends and tendencies in the forecast, helping to undertake more accurate predictions of extreme weather events such as hurricanes, floods, and heat waves. This, in turn, will create an ability very important in enhancing disaster preparedness and response strategies, hence minimizing the impact of such events on communities and ecosystems. Generative AI will enable researchers to come up with models that integrate diverse sources of data, such as atmospheric measurements

Analysis of Key Factors Influencing Academic Productivity: Insights From LASSO Regression and AI-Driven Techniques

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