USE OF AI IN APPLIED PHYSICS: A REVIEW

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Abstract
The integration of Artificial Intelligence (AI) in applied physics has revolutionized the field, enabling researchers to tackle complex problems, analyze vast datasets, and make predictions with unprecedented accuracy. This paper reviews the current state of AI applications in applied physics, highlighting its impact on various subfields, including condensed matter physics, particle physics, and materials science. We discuss the key AI techniques employed, such as machine learning, deep learning, and natural language processing, and their applications in physics research.
***Keywords**: Artificial Intelligence, applied physics, applied physics*

Introduction

Applied physics is an interdisciplinary field that seeks to bridge the gap between fundamental physics research and real-world applications. The recent advancements in AI have transformed the way physicists approach complex problems, enabling them to extract insights from large datasets, simulate complex systems, and optimize experimental designs. This paper aims to provide a comprehensive review of AI applications in applied physics, highlighting its potential to accelerate scientific discovery and innovation.

AI Techniques in Applied Physics

Machine Learning

Machine learning algorithms, such as supervised and unsupervised learning, have been widely applied in applied physics to analyze and interpret large datasets. For instance, in condensed matter physics, machine learning has been used to predict material properties, such as superconductivity and magnetism, from first-principles calculations (Schmidt et al., 2019).

Deep Learning

Deep learning techniques, including convolutional neural networks (CNNs) and recurrent neural networks (RNNs), have been employed in applied physics to analyze complex data patterns. In particle physics, deep learning has been used to analyze data from high-energy collisions, enabling physicists to identify rare events and make precise measurements (Bengio et al., 2015).

Natural Language Processing

Natural language processing (NLP) techniques have been applied in applied physics to extract insights from scientific literature and facilitate knowledge discovery. For example, NLP has been used to analyze and summarize large volumes of physics literature, enabling researchers to identify trends and patterns in the field (LeCun et al., 2015).

Applications of AI in Applied Physics

Condensed Matter Physics

AI has been applied in condensed matter physics to predict material properties, simulate complex systems, and optimize experimental designs. For instance, machine learning has been used to predict the electronic structure of materials, enabling researchers to design new materials with tailored properties (Schmidt et al., 2019).

Particle Physics

AI has been employed in particle physics to analyze data from high-energy collisions, simulate particle interactions, and optimize detector designs. For example, deep learning has been used to analyze data from the Large Hadron Collider, enabling physicists to identify rare events and make precise measurements (Bengio et al., 2015).

Materials Science

AI has been applied in materials science to predict material properties, simulate material behavior, and optimize material designs. For instance, machine learning has been used to predict the mechanical properties of materials, enabling researchers to design new materials with improved strength and durability (LeCun et al., 2015).

Conclusion

The integration of AI in applied physics has transformed the field, enabling researchers to tackle complex problems, analyze vast datasets, and make predictions with unprecedented accuracy. This paper has reviewed the current state of AI applications in applied physics, highlighting its impact on various subfields, including condensed matter physics, particle physics, and materials science. As AI continues to evolve, it is likely to play an increasingly important role in applied physics research, driving innovation and accelerating scientific discovery.

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