

The logo for RADemics, featuring the text "RADemics" in white on a blue arrow-shaped background pointing to the right. The arrow is part of a larger blue horizontal bar that is attached to a dark blue vertical bar on the left side of the page.

RADemics

# Deep Learning Techniques for Consumer Behaviour Analysis

A decorative graphic consisting of several thin, curved lines in shades of blue and grey, originating from the bottom left corner and extending upwards and to the right, resembling stylized grass or reeds.

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# Deep Learning Techniques for Consumer Behaviour Analysis

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## Abstract

This book chapter explores the transformative role of deep learning techniques, particularly Autoencoders and Generative Adversarial Networks (GANs), in analyzing consumer behavior. With the increasing complexity and volume of consumer data, traditional analytical methods are often inadequate to capture the intricate patterns and dynamics of modern consumer behavior. Deep learning models, such as Autoencoders, offer powerful solutions for dimensionality reduction, anomaly detection, and segmentation, enabling businesses to derive meaningful insights from large, high-dimensional datasets. GANs, on the other hand, facilitate the generation of synthetic consumer data, helping to simulate consumer behavior and predict future trends, thereby providing valuable insights for strategic decision-making. This chapter also delves into the application of these techniques in fraud detection, risk management, and personalized marketing, highlighting their potential to revolutionize the way businesses understand and engage with their customers. By offering practical insights and case studies, this chapter presents an in-depth analysis of how deep learning techniques can enhance consumer behavior modeling, making it a vital resource for researchers and practitioners in the field of data science and marketing analytics.

Keywords: Autoencoders, Generative Adversarial Networks, Consumer Behavior Analysis, Dimensionality Reduction, Anomaly Detection, Fraud Detection.

## Introduction

The field of consumer behavior analysis has been undergoing a significant transformation due to advancements in deep learning techniques [1]. Traditional methods of consumer data analysis, which primarily rely on statistical models and heuristic approaches, have often struggled to cope with the growing volume and complexity of data generated by modern consumers [2]. With the proliferation of digital platforms, social media, and e-commerce, consumer data has become multifaceted, comprising not only transactional data but also behavioral, demographic, and social data [3]. As such, new methodologies are required to extract meaningful insights from this complex data [4]. Deep learning models, such as Autoencoders and Generative Adversarial Networks (GANs), offer innovative solutions that go beyond traditional approaches, providing businesses with the ability to uncover intricate patterns in consumer behavior, make data-driven predictions, and personalize customer experiences [5].

Autoencoders, as a form of unsupervised learning, are particularly adept at identifying underlying structures in consumer behavior [6]. These models are designed to compress high-dimensional data into lower-dimensional representations, thus facilitating a more efficient analysis of large consumer datasets [7]. By learning to encode and decode data, Autoencoders are capable of detecting important features in consumer interactions, such as purchasing trends, product preferences, and brand loyalties [8]. This ability to reduce the dimensionality of data while preserving key information makes Autoencoders an invaluable tool in consumer behavior analysis, allowing businesses to identify emerging trends, predict future behavior, and optimize marketing strategies [9, 10].

Another powerful deep learning technique used in consumer behavior analysis is the Generative Adversarial Network (GAN) [11]. GANs consist of two neural networks a generator and a discriminator that work in an adversarial manner to produce realistic synthetic data [12]. In the context of consumer behavior modeling, GANs can simulate a wide range of consumer behaviors, helping businesses understand how consumers might react to different marketing strategies or product offerings [13]. By generating synthetic data that mirrors real consumer behavior, GANs enable businesses to test and refine marketing campaigns, optimize product recommendations, and forecast future market trends without relying solely on historical data [14, 15].