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"A COMPREHENSIVE REVIEW OF PREDICTIVE MODELLING TECHNIQUES FOR PURCHASING BEHAVIOUR IN SOCIAL NETWORK ADS TARGETING"

Neelima Sheikh

RITEE, Chatona, Raipur (C.G.)

neelima.sheikh@gmail.com

Mahadev Bag

RITEE, Chatona, Raipur (C.G.)

Bagmahadev1010@gmail.com

Abstract

In this study summarizes the evolution of social network advertising, highlighting key developments such as the rise of social media platforms, advancements in ad targeting, and the integration of native advertising. It emphasizes the importance of understanding purchasing behaviour and the role of predictive modelling in optimizing ad targeting. Additionally, it outlines relevant literature covering social media's impact on communication, predictive modelling techniques, internet recommendation systems, and consumer behaviour in social commerce. Finally, it provides insights into common data sources, preprocessing techniques, and predictive modelling methods, addressing challenges like data privacy compliance and imbalanced data.

Keywords: Social network advertising, Ad targeting, Native advertising, Purchasing behaviour, Predictive modelling, Social media impact.

• INTRODUCTION

- **Overview of social network advertising**: Social network advertising, per Kaplan, involves targeting specific audiences on social media platforms through diverse ad formats, fostering engagement, tracking metrics, optimizing for mobile, leveraging social proof, building

communities, and participating in ad auctions for effective placement. (Kaplan & Haenlein, 2010)

- **Importance of predictive modelling in ads targeting**: Predictive modelling revolutionizes ad targeting by analyzing vast datasets to forecast consumer behaviour. By identifying receptive audience segments, advertisers can allocate budgets more effectively, enhancing ROI. Tailored ads based on predictive insights boost conversion rates by delivering relevant content to specific audiences. Proactive identification of churn risks enables personalized retention strategies, fostering customer loyalty. Real-time campaign optimization ensures ads remain relevant and impactful. Overall, predictive modelling empowers advertisers to make data-driven decisions, refine strategies, and gain a competitive edge in a dynamic market landscape, maximizing the efficiency and effectiveness of their advertising efforts. (Hosseini et al., 2020)
- **Background:**

2.1 Evolution of social network advertising:

The evolution of social network advertising has been marked by significant developments and trends over the years:

- **Emergence of Social Media Platforms**: The early 2000s saw the rise of social media platforms like MySpace, LinkedIn, and Friendster. These platforms provided the groundwork for social interaction online, laying the foundation for social network advertising.
- **Introduction of Ad Features**: Social media platforms began experimenting with advertising features to monetize their user base. Initially, this included simple banner ads and sponsored content.
- **Targeting Advancements**: Platforms started offering more sophisticated targeting options based on user demographics, interests, and behaviours. This allowed advertisers to reach specific audience segments with greater precision.
- **Native Advertising Integration**: Social media platforms integrated ads seamlessly into users' feeds, blurring the line between organic and sponsored content. Native advertising became a prevalent form of social network advertising, offering a more engaging and non-disruptive experience for users.

- **Rise of Mobile Advertising**: With the proliferation of smartphones, social network advertising shifted towards mobile optimization. Advertisers began prioritizing mobile-friendly ad formats and targeting strategies to reach users on their mobile devices.
- **Video and Visual Content Dominance**: The importance of visual content, particularly videos, surged in social network advertising. Platforms like Facebook, Instagram, and TikTok prioritized video content, prompting advertisers to incorporate video ads into their strategies for higher engagement.
- **Influencer Marketing**: Influencer marketing emerged as a prominent trend in social network advertising, leveraging individuals with large followings to promote products or services. Influencers became powerful advocates for brands, driving authenticity and credibility among their followers.
- **Data Privacy and Regulation**: Growing concerns over data privacy led to increased scrutiny and regulation of social network advertising practices. Platforms implemented stricter policies around data collection, ad targeting, and user consent to address privacy concerns and comply with regulations like GDPR and CCPA.
- **AI and Machine Learning Integration**: The integration of artificial intelligence and machine learning technologies enabled more sophisticated ad targeting, optimization, and personalization. Advertisers leveraged AI algorithms to analyze vast amounts of data and deliver highly relevant ads to individual users in real-time.
- **E-commerce Integration**: Social media platforms expanded their capabilities to facilitate e-commerce transactions directly within their platforms. Features like shoppable posts and in-app checkout became popular, enabling a seamless shopping experience for users and driving direct conversions for advertisers.

2.2 Importance of understanding purchasing behaviour:

Understanding purchasing behaviour is crucial as it allows businesses to tailor their marketing strategies, product offerings, and customer experiences to meet consumer needs effectively. By analysing buying patterns, preferences, and decision-making processes, businesses can identify opportunities for product development, optimize pricing strategies, and enhance customer satisfaction. Moreover, understanding purchasing behaviour enables targeted advertising and personalized messaging, leading to higher conversion rates and increased customer loyalty.

Ultimately, a deep understanding of purchasing behaviour empowers businesses to make data-driven decisions, adapt to changing market dynamics, and stay competitive in the ever-evolving marketplace.

2.3 Role of predictive modelling in ads targeting:

Predictive modelling plays a pivotal role in ads targeting by leveraging data analytics to forecast consumer behaviour and preferences accurately. By analyzing historical data, demographic information, and user interactions, predictive models identify patterns and trends that help advertisers anticipate how specific audiences will respond to ads. This enables advertisers to target the right audience segments with personalized and relevant content, increasing the likelihood of engagement and conversion. Moreover, predictive modelling allows for dynamic adjustments to ad campaigns in real-time, optimizing targeting parameters to maximize advertising effectiveness and return on investment. Overall, predictive modelling enhances precision, efficiency, and effectiveness in ads targeting, driving better outcomes for advertisers.

• LITERATURE REVIEW

- Kaplan and Haenlein (2010) explore the challenges and opportunities presented by social media in their article "Users of the world, unite!" They argue that social media has transformed the way people communicate, collaborate, and consume information. While social media offers opportunities for businesses to engage with customers on a more personal level, it also poses challenges such as managing online reputation and privacy concerns. The authors advocate for businesses to embrace social media as a strategic tool for building relationships with customers and enhancing brand visibility.
- Hosseini, Pourfakhimi, and Ganjali (2020) provide a comprehensive review of predictive modelling in advertising in their article published in the Journal of Advertising Research. They discuss the various predictive modelling techniques used in advertising, including machine learning algorithms and statistical models. The review covers topics such as data sources, preprocessing techniques, modelling approaches, and evaluation metrics. The authors highlight the importance of predictive modelling in optimizing advertising campaigns and improving ROI for advertisers.
- Ansari, Essegaier, and Kohli (2000) focus on internet recommendation systems in their study published in the Journal of Marketing Research. They examine the mechanisms

behind recommendation systems and their impact on consumer behaviour in online environments. The authors discuss different types of recommendation systems, such as collaborative filtering and content-based filtering, and explore their applications in e-commerce platforms. They highlight the role of recommendation systems in enhancing user experience and driving sales for online retailers.

- Niu, Yu, and Lee (2018) provide a review of predictive modelling of consumer choice from the perspective of big data in their article published in Decision Support Systems. They discuss how big data analytics and predictive modelling techniques can be used to understand and predict consumer behaviour. The review covers topics such as data sources, modelling approaches, evaluation metrics, and practical applications in marketing and business decision-making. The authors emphasize the importance of leveraging big data for gaining actionable insights into consumer preferences and improving marketing strategies.
- Zhang and Benyoucef (2016) examine consumer behaviour in social commerce in their literature review published in Decision Support Systems. They explore how social media platforms have integrated e-commerce functionalities, enabling users to engage in social interactions while shopping online. The authors discuss various factors influencing consumer behaviour in social commerce, such as social influence, trust, and perceived value. They highlight the importance of understanding these factors for businesses to effectively engage with consumers and drive sales in social commerce environments.
- Provost and Fawcett (2013) provide insights into data science for business in their book "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking." They discuss fundamental concepts and techniques in data science, such as data mining, machine learning, and predictive modelling. The book covers topics such as data preprocessing, feature selection, model evaluation, and practical applications in business decision-making. The authors emphasize the importance of adopting a data-driven approach to gain actionable insights and drive business value.

• PROPOSED METHODOLOGY

4.1 Data Sources and Preprocessing Techniques:

- **Common data sources**: Common data sources for predictive modelling and ads targeting include first-party data (from a company's own interactions), third-party data (external sources), social media data, web analytics, CRM systems, transactional data, surveys, location data, search data, and ad campaign data. These sources provide insights into consumer behaviour, preferences, and interactions, helping advertisers tailor their targeting strategies for maximum effectiveness.
- **Preprocessing steps**: preprocessing steps for social network ads data involve cleaning (removing duplicates, handling missing values), feature selection/engineering, normalization/standardization, handling imbalanced data, text processing (if applicable), encoding categorical variables, feature scaling, data splitting, dimensionality reduction, and data transformation to prepare the data for analysis or modelling. These steps ensure data quality, reduce noise, and improve the effectiveness of predictive models or analytical insights derived from the data.
- **Challenges and considerations**: challenges and considerations in social network ads data analysis and modelling include data privacy compliance, data quality, bias and fairness, algorithm selection, interpretability, overfitting, feature selection, imbalanced data, the dynamic nature of social media, evaluation metrics, resource constraints, and A/B testing. Addressing these requires expertise in data science, domain knowledge, and a holistic approach to ensure accurate, ethical, and effective outcomes.

4.2 Predictive Modelling Techniques:

Predictive modelling techniques encompass various methods used to analyze data and make predictions about future outcomes. Common techniques include:

- **Linear Regression**: Predicts a continuous variable based on one or more independent variables, assuming a linear relationship between them.
- **Logistic Regression**: Used for binary classification problems, predicting the probability of an event occurring based on input features.
- **Decision Trees**: Hierarchical tree-like structures that recursively split the data based on feature values to make predictions.

- **Random Forest**: Ensemble learning method that constructs multiple decision trees and combines their predictions to improve accuracy and reduce overfitting.
- **Gradient Boosting Machines (GBM)**: Ensemble learning technique that builds sequential decision trees, with each tree learning from the errors of the previous ones.
- **Support Vector Machines (SVM)**: Supervised learning models that find the hyperplane that best separates classes in high-dimensional space.
- **Neural Networks**: Deep learning models consisting of interconnected layers of nodes that learn complex patterns from data.
- **K-Nearest Neighbors (KNN)**: Classifies data points based on the majority class among their k nearest neighbors in feature space.
- **Naive Bayes**: Probabilistic classification method based on Bayes' theorem, assuming independence among features.
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5. CONCLUSION

- **Recap of key findings**: Summarize the key findings from the review paper, emphasizing the importance of predictive modelling in social network ads targeting and its impact on advertising effectiveness.
- **Implications for the industry**: Discuss the implications of the review for the advertising industry, including recommendations for advertisers and marketers to leverage predictive modelling techniques to optimize their ad campaigns.
- **Future research directions**: Highlight potential avenues for future research, such as addressing challenges related to data privacy, developing more accurate predictive models, and exploring innovative approaches to personalized advertising.

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