探勘金融消費資料於客戶消費行為預測與個人化電子廣告標題生成

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隨著網際網路普及與各項資訊技術發展革新，國內外許多產業都乘上了資訊化的浪潮，迎向「數位經濟」新時代。從資訊化的作業流程，到虛擬化的產品服務、數位化的金融交易，以及電子化的商業行為，系列新型態的生產、消費模式轉變，不僅為生活帶來高度的便利性，同時也成為帶動產業創新、優化產業結構的原動力。本院資工系的彭文志教授與其團隊，順應數位經濟發展趨勢，開發出一款「可剖析顧客行為模式以提供個人化自動服務」之廣告標題生成技術，讓商家在精準投放廣告的同時，高效促進顧客消費行為之實踐。

「數位經濟」之具體應用形式之一，即是將大數據與人工智慧技術運用於既有的金融消費模式上，達到預測消費者消費行為之目的。彭文志教授於受訪時提到，早期金融產業如銀行與各商家在選擇行銷手法時，多半只針對具備會員身分的用戶進行廣告投放。但近年來，運用統計與機率的方式，銀行逐步能透過分析報告了解其客群的消費模式；此外，隨著資料的大量累積與演算法不斷地進步，若配合機器學習與深度學習等相關技術，還能做到「對單一消費者進行消費行為分析」這般細膩且精準的操作。如此一來，商家便能針對消費者進行客製化的廣告投放，而個人化 EDM（Electronic Direct Mail）就是其中一種實踐手法，同時也是彭文志教授與其團隊所開發技術的應用範疇。

EDM 行銷主要藉由發送電子郵件達到通知、促銷、行銷等目的，儘管電子郵件技術問世至今已逾數十載，該行銷手法仍未被新興的社群媒體所取代，主要可歸功於其技術成熟、成本穩定的特性。彭文志教授團隊所開發之技術內容主要包含「建立顧客行為預測與推薦系統」與「協同吸引力文章標題產生」兩大方向，前者透過消費資料庫為顧客建檔，發掘行為特徵，強化行銷策略與消費行為分析的連結；後者藉由解析顧客的社群點擊紀錄與消費關聯，剖析「顧客一意圖一金融產品」三者錯綜複雜之關係，進而生成個人化標題，作為 EDM 行銷用途。

運用團隊開發技術進行個人化廣告投放，一方面能讓商家針對特定消費族群投其所好，提供最合適之廣告內容；另一方面，消費者也能精準獲取其所需的商品通知，不受多餘資訊打擾，進而提升簽帳比例與消費行為轉換率。此外，於廣告持續投遞過程中，系統會透過檢視消費者與該則廣告的互動情形，作為人工智慧模型調整的依據，透過不斷地循環、學習產製出最精準、客製化的 EDM 內容。

目前彭文志教授團隊已透過與 KKDAY 及玉山銀行的合作，驗證該技術之產業應用性，搭配前述兩者所提供之時空資料庫、金融語意及圖像資料庫、社群網路身分資料庫，統整使用者瀏覽、消費紀錄等數據，分析出客戶喜好、行為模式等特徵，使得精確且個人化的 EDM 內容投放成為可能，同時大幅提升消費行為轉換率，一舉為供需雙方營造雙贏局面。本技術之開發團隊能將商業金融與資訊科技雙領域之學識經驗結合，創造可能並加以應用，實為跨域合作之成功典範！

Predicting Consumer Behavior and Generating Personalized Titles with Data Analytics

With the rapid development of information technology and popularization of the world-wide Internet, many industries, both domestically and abroad, have been riding the wave of informatization and embracing a new era of digital economy. Including information technology workflow, product service virtualization, digital transactions, and electronic business, the transformation of production and consumption pattern not only brings the next level of convenience, but also becomes the driving force of industrial innovation and industrial structure optimization. Following the development trend of the digital economy, Professor Wen-Chih Peng and his team of the Department of Computer Science at NYCU, developed advertising headlines generation technology, which can analyze customer behavior patterns to design and produce customized automated services, to help merchants not only improve the effectiveness of advertising, but also promote consumption efficiently.

One of the forms of work in the Digital Economy is to apply big data and artificial intelligence technology to accurately predict consumer behavior. In the interview, Professor Peng said that financial industries such as banks and merchants in the past only targeted users with membership status for advertising. Nowadays, statistics and probability methods can help banks with analytics to deeply recognize the consumption patterns of their customers. In addition, with the accumulation of large amounts of data and continuous improvement of algorithms, it is possible to achieve precise operation as "analyzing the individual consumer behavior" when we combine technologies such as machine learning and deep learning. In this way, merchants can carry out custom advertising to their target customers. One of the practices is Personalized EDM (Electronic Direct Mail), which is also the application field of the technology developed by Professor Peng and his team.

EDM marketing is a type of marketing that sends email to generate more leads, build relationships, and increase sales. Although being used for over decades, email marketing is not replaced by the emerging social media due to the mature technology and easy-to-estimate cost. The applications developed by Professor Peng and his team include "A Customer Behavior Prediction and Recommendation System" and "Collaborative Eye-Catching Title Generator". The former builds customer profile database to discover behavioral traits to strengthen the link between marketing strategy and consumer behavior analysis, while the latter analyzes the intricate relationship between customer, intention, and financial product by establishing the relation between customers' ad clicks on social media and their purchase, thereby creating a custom title for EDM Marketing campaign.

While using the technology developed by the team to carry out custom advertising to their target customers, on the one hand, merchants can target their marketing messages to specific individuals; on the other hand, consumers can receive accurate product notification without redundant information to increase consumer conversion rate and spending. In addition, during continuous advertising, the system will keep adjusting the artificial intelligence model according to the interaction between consumers and advertisers, thereby creating the most accurate and customized EDM content.

At present, Professor Peng and his team have verified the industrial applicability of this technology through the collaboration with KKDAY and E.SUN BANK. Combining with spatiotemporal database, financial semantics and image database, as well as social network identity database provided by the above two companies, the team consolidates user browsing and consumption records to analyze customer preferences and behavior patterns and make accurate and customized EDM content accordingly, thereby greatly increasing customer conversion rate and creating win-win situations for both customers and suppliers. Professor Peng and his team integrate the knowledge and experiences of business finance and information technology to innovate with new applications, which successfully builds a model of cross-domain collaboration!