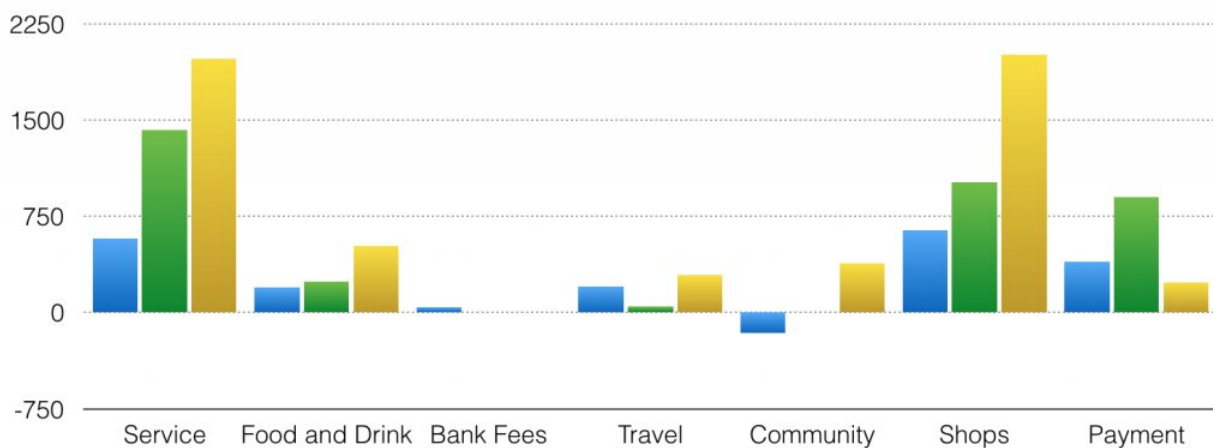


# AI-based financial advisor for low-wage workers

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Credit: IBM

Workers with lower-than-median wages are often prone to financial instability and affected by bank policies such as penalty and overdraft fees, leading to a vicious cycle of debt and poor credit. During 2016 alone, banks made over \$30 billion from overdraft fees. The workers with the least financial cushion are typically the most vulnerable in these situations.

This summer, as a part of our Science for Social Good program, we partnered with New York City-based organization Neighborhood Trust

Financial Partners to tackle this problem. One of the main goals of Neighborhood Trust is to empower low-income individuals and families to become productive participants in the financial system. We developed a financial advisor system with several artificial intelligence (AI) capabilities to achieve this goal. This system learns from historical data to predict the account balances of individuals for a future time period, identify the recurring charges in their spending, determine unexpected large expenses, and analyze the category-wise spending behavior of user groups. Our team consisted of a graduate student from Cornell University, Wenyu Zhang, along with several [artificial intelligence](#) and data science researchers from IBM Research.

The data for this project was provided by Neighborhood Trust and consisted of financial transactions of customers over a one year period in checking, savings, and credit card accounts. We trained the advisor by selecting historical account balance sequences that were similar to the query sequence from the immediate past period for the user. The combination weights for the selected sequences to approximate the query sequence were learned using an optimization procedure. The same weights were used with the future balances of the selected sequences to predict the future balances of the user.

The advisor also learns to quantify the uncertainty of these predictions. Using these estimates, we can inform the users if their balances will dip below zero in the near future. To further improve the predictions provided by the advisor, we used a hybrid approach that combined predictions from our proposed scheme along with those from the method already used by Neighborhood Trust.

Besides predicting balances, the advisor can analyze the spending patterns of users and provide key insights into their financial health. It automatically identifies the recurring charges of each user and category-wise spending behavior of groups of users. These groups are identified

by clustering the users according to their spending patterns. For example, we found that the least well-off (blue) group spend less and also incur more bank fees compared to moderate (green) and most well-off (yellow) groups (see Figure below). Such insights can be used to customize recommendations per group, and attend to those in most need of assistance.

By providing personalized financial recommendations, the advisor can help users modify their spending behavior and avoid debt. Just like wearable health monitors provide visibility into our vitals and reinforce healthy habits, the AI-based financial advisor can monitor users' financial vitals to improve their financial health. Such small, but meaningful changes can add up and empower the economically weaker section of our society.

Neighborhood Trust is already planning for opportunities to create enhanced impact using the advisor. Kryn Anderson, Associate Director of Business Development comments, "As a leader in financial empowerment for over 20 years, Neighborhood Trust understands that our clients have unique financial challenges and require solutions customized to meet their needs. Through the IBM Science for Social Good program, we have gained tools to make our guidance even more targeted and timely, helping people to manage their volatile cash flow and identify opportunities for debt reduction and savings. By leveraging data and technology to give each client the right advice at the right time, we can begin to replicate the trusted relationship we see in our in-person counseling sessions, and extend our impact far beyond our current geographical reach."

Provided by IBM

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