Machine learning helps researchers identify hit songs with 97% accuracy

June 20 2023

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Every day, tens of thousands of songs are released. This constant stream of options makes it difficult for streaming services and radio stations to choose which songs to add to playlists. To find the ones that will

resonate with a large audience, these services have used human listeners and artificial intelligence. This approach, however, lingering at a 50% accuracy rate, does not reliably predict if songs will become hits.

Now, researchers in the US have used a comprehensive machine learning technique applied to brain responses and were able to predict hit songs with 97% accuracy.

"By applying machine learning to neurophysiologic data, we could almost perfectly identify hit songs," said Paul Zak, a professor at Claremont Graduate University and senior author of the study published in *Frontiers in Artificial Intelligence*. "That the neural activity of 33 people can predict if millions of others listened to new songs is quite amazing. Nothing close to this accuracy has ever been shown before."

Machine learning with neurologic data

Study participants were equipped with off-the-shelf sensors, listened to a set of 24 songs, and were asked about their preferences and some demographic data. During the experiment, the scientists measured participants' neurophysiologic responses to the songs. "The brain signals we've collected reflect activity of a brain network associated with mood and energy levels," Zak said. This allowed the researchers to predict market outcomes, including the number of streams of a song—based on the data of few.

This approach is called "neuroforecasting." It captures neural activity from a small group of people to predict population-level effects without having to measure the brain activity of hundreds of people.

After data collection, the researchers used different statistical approaches to assess the predictive accuracy of neurophysiological variables. This allowed for direct comparison of the models. To improve

predictive accuracy, they trained a ML model that tested different algorithms to arrive at the highest prediction outcomes.

They found that a linear statistical model identified hit songs at a success rate of 69%. When they applied machine learning to the data they collected, the rate of correctly identified hit songs jumped to 97%. They also applied machine learning to the neural responses to the first minute of the songs. In this case, hits were correctly identified with a success rate of 82%.

"This means that streaming services can readily identify new songs that are likely to be hits for people's playlists more efficiently, making the streaming services' jobs easier and delighting listeners," Zak explained.

Methods for replication

"If in the future wearable neuroscience technologies, like the ones we used for this study, become commonplace, the right entertainment could be sent to audiences based on their neurophysiology. Instead of being offered hundreds of choices, they might be given just two or three, making it easier and faster for them to choose music that they will enjoy," Zak said.

Despite the near-perfect prediction results of his team, the researchers pointed to some limitations. For example, they used relatively few songs in their analysis. Furthermore, the demographics of the study participants were moderately diverse, but did not include members of certain ethnic and age groups.

Nevertheless, the researchers expect that their approach can likely be used beyond hit song identification, in part due to its easy implementation. "Our key contribution is the methodology. It is likely that this approach can be used to predict hits for many other kinds of

entertainment too, including movies and TV shows," Zak concluded.

More information: Accurately Predicting Hit Songs using Neurophysiology and Machine Learning, *Frontiers in Artificial Intelligence* (2023). DOI: 10.3389/frai.2023.1154663, www.frontiersin.org/articles/1 … ai.2023.1154663/full

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