

Hot streak: Finding patterns in creative career breakthroughs

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You've likely heard of hot hands or hot streaks—periods of repeated successes—in sports, financial markets and gambling. But do hot streaks exist in individual creative careers?

A team of researchers, including two from Penn State's College of Information Sciences and Technology, examined the works of nearly

30,000 scientists, artists and film directors to learn if high-impact works in those fields came in streaks.

According to Lu Liu, a doctoral student in the College of IST and member of the research team, they found a universal pattern.

"Around 90 percent of professionals in those industries have at least one hot hand, and some of them have two or even three," she said.

The team's paper, "Hot streaks in artistic, cultural, and scientific careers," recently appeared in *Nature*.

Liu says that there are two previous schools of thought regarding [hot streaks](#) in individual careers. According to the "Matthew effect," the more famous you become, the more likely you'll have success later, which supports the existence of a hot streak. The other school of thought—the random impact rule—implies that the success of a career is primarily random and is primarily driven by levels of productivity.

"Our findings provide a different point of view regarding individual careers," said Liu. "We found a period when an individual performs better than his normal career, and that the timing of a hot streak is random."

She added, "Different from the perception [in innovation literature] that peak performance occurs in an individual's 30s or 40s, Our results suggest that individuals have equal chance to perform better even in their late careers."

The researchers also wanted to learn if individuals were more productive during their hot streak periods, which last an average of four to five years. Unexpectedly, they were not.

"Individuals show no detectable change in productivity during hot streaks, despite the fact that their outputs in this period are significantly better than the median, suggesting that there is an endogenous shift in individual creativity when the hot streak occurs," wrote the team in their paper.

Through their research, the team analyzed data they collected from a variety of sources. They looked at scientists' most-cited papers from Web of Science and Google Scholar, auction prices for artists, and Internet Movie Database (IMDB) ratings to gauge popularity of films and their directors. Then, they reconstructed a career path for each individual based on that data.

"The question starts from looking at the random impact rule," said Liu. "We start from that to analyze if it applies to different domains. To our surprise, we found something more interesting."

She explained that when the researchers looked at a scientist's highest-impact work through their most-cited papers, its timing was random, as well as the timing of the second-most cited paper. But in looking at the relative timing of these highest-impact works, the researchers found that they are correlated.

"That's how we find a hot streak period," said Liu. "We then analyzed [this finding] in other creative domains, like artists and movie directors, to see if there are similar patterns in these careers."

Liu said that there are many cases when the most famous works of an individual came in sequence. She cited Peter Jackson, director of "The Lord of the Rings" film series; Vincent Van Gogh, whose most famous paintings were completed late in his [career](#); and Albert Einstein, whose four published papers in his "miracle year" of 1905 contributed significantly to the foundation of modern physics.

"[A hot streak] doesn't just matter to these individuals," said Liu. "It matters to society as well."

Liu said that this could help to understand the innovative process, and have the potential to discover and cultivate individuals during a hot streak.

As the research shows that hot streaks do in fact exist in creative careers, the researchers hope to apply the research methods to more domains, including musicians, inventors and entrepreneurs.

"We know that these domains have different natures," Liu said. "For example, scientists collaborate with each other and artists work alone. If we can find the triggers and drivers behind the universal pattern, that would be much more interesting."

More information: Lu Liu et al, Hot streaks in artistic, cultural, and scientific careers, *Nature* (2018). [DOI: 10.1038/s41586-018-0315-8](https://doi.org/10.1038/s41586-018-0315-8)

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