

Study traces the origins and diffusion of image memes online

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An example image meme. The researchers' method automatically groups memes with similar images and text, accounting for differences in encoding, resolution, watermark, visual filter, or aspect ratio. Credit: Morina & Bernstein.

Memes, images or videos with text overlays that convey funny messages to specific audiences are a well-known global phenomenon. As they tend to rapidly circulate online and become viral quickly, memes are also sometimes included in marketing and social engagement strategies.

Due to the speed at which they circulate online, tracing the origin of memes is not always easy. Some [media researchers](#) believe that they are first diffused in marginal [internet](#) communities and then introduced into mainstream platforms, while behavioral scientists feel that they often stem from intermediate networks that connect peripheral and mainstream communities.

Researchers at Stanford University have recently carried out a large web-scale analysis aimed at testing these two different hypotheses and determining the typical sources of image memes online. Their findings are set to be presented at the ACM Conference on Computer-Supported Cooperative Work and Social Computing, a top-tier international event showcasing the latest human-computer interaction research.

"Our paper arose from the question: Where does internet culture come from?" Michael S. Bernstein, one of the researchers who carried out the study, told Tech Xplore. "We're surrounded by memes and other forms of internet culture; but which communities are originating the content that we see around us every day? The research narrative—including my own prior research—suggests that lots of influential memes come from communities outside of the mainstream, while [sociological research](#) suggests that communities bridging between the mainstream and the periphery are the most influential culturally."

While many past papers have discussed the possible origins of viral content on the internet, so far no-one had conducted a web-scale analysis of memes to clearly track down their source. Bernstein and his colleague Durim Morina set out to fill this gap in the literature, specifically examining the origin and dissemination of image memes.

Firstly, the researchers started browsing the web to identify [online communities](#) that post image memes in English. Subsequently, they used [computer vision techniques](#) embedded in modern cloud vision APIs to track the dissemination of each image backward, to determine which communities they were circulated by and where they originated from.

"This ended up giving us a large set of communities that we could track," Bernstein explained. "We then manually wrote scripts that would monitor all the activity on any of those communities on the web, pull down copies of every [meme](#) that got posted to it, and use the cloud

vision API to verify that it had never been seen before on the public web. This gave us what we needed: the ability to track each copy of an image meme back to the community that first posted it on the public web and to identify every time it was later spread elsewhere."

Overall, the findings gathered by Bernstein and Morina suggest that internet memes do not originate from peripheral communities, but that they are extremely centralized. More specifically, they found that most image memes are first published on Reddit and then shared on other platforms.

These findings could have interesting implications for media-related research. For instance, they may ultimately inspire the development of more specific, evidence-based theories about the trends with which image memes are disseminated online.

"Our analysis showed that rare transformative memes may still be coming from the periphery, but day-to-day, most of the content you're seeing is first posted on a mainstream platform," Bernstein added. "Our next work will involve making memes, but I think it's also important for us to consider whether we're happy with the centralization of internet culture. You get large audiences by posting on Reddit, TikTok, and so on, but subcommunities play important roles in our culture and it's not clear that our social media designs are supporting that as well as they could yet."

More information: Durim Morina et al, A Web-Scale Analysis of the Community Origins of Image Memes, *Proceedings of the ACM on Human-Computer Interaction* (2022). [DOI: 10.1145/3512921](https://doi.org/10.1145/3512921)

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