AI analysis finds that in-app ad issues are fixed faster on Android than iOS
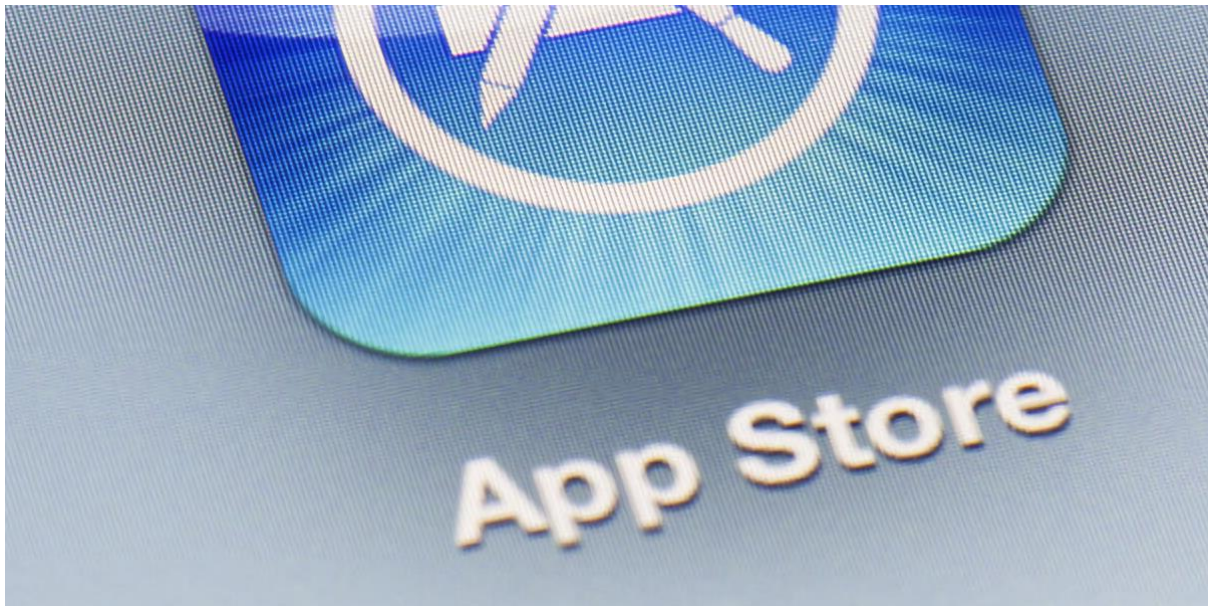
A new study finds evidence that in-app ad issues are addressed more quickly for popular Android apps on Google Play than their iOS counterparts on Apple's App Store. In what the researchers claim is a first-of-its-kind survey, they investigated the ads in 32 cross-platform apps that rank the top 100 lists from Google Play and the App Store. They say the results imply developers should pay attention to platform differences during ad design and consider ways to automatically customize and test apps to improve ad experiences.

The study is noteworthy for its use of supervised multi-label classification, an AI technique that predicts the labels of unseen instances (in this case ads) by analyzing labeled training data. The researchers say it enabled them to canvass and categorize far more information than in previous studies, laying the groundwork for automated analysis tools. Large-scale perceptual studies on mobile ads could help developers prioritize their work by, for example, spending more time fixing problems on iOS.

In-app ads are massive revenue drivers on mobile. In 2016, mobile ad revenue accounted for 76% of Facebook's total sales in the first quarter. Many free apps, which make up more than 68% of the over 2 million apps on Google Play, leverage some form of in-app advertising for monetization. But previous research suggests users find these ads intrusive. Growth Tower reports that almost 50% of users said they would uninstall apps just because of mobile ads.

In selecting which apps to analyze, the researchers, who hail from the Harbin Institute of Technology (Shenzhen, China), the Chinese University of Hong Kong, Singapore Management University, and Melbourne's Monash University, looked at apps across 15 categories with over 100,000 reviews on both app stores. They built a simple web crawler to automatically scrape user reviews, downloading 3,243,450 reviews from Google Play and 1,840,349 reviews from the App Store published between September 2014 and March 2019. Using a filter and several post-processing steps, they isolated reviews containing keywords related to ads (e.g., "ad," "ads," "advert"), extracting 18,302 ad-related reviews in total.

To determine how quickly developers addressed in-app ad complaints, the researchers recorded the number of versions of apps released between the time issues were reported and the time they were fixed.

The coauthors report it took an average of 1.23 updates per app before problems were addressed on Google Play, while it took nearly two updates (1.78) per app on the App Store. But certain issues were fixed faster on iOS compared with Android. For instance, iOS developers were quick to address orientation, auto-play, and notification complaints. Android developers responded more quickly to orientation, volume, and non-skippable ad issues.

The researchers categorized each review into one or more ad issue types, using a combination of keyword matching and AI classifier models. They found that:

- 8.81% (1,613) of the reviews mentioned ad content as an issue.
- 25.02% (4,580) of the reviews mentioned ad frequency, or how often the ads appeared, as an issue.
- 13.52% (2,475) of the reviews took issue with the way the ads suddenly "popped up."
- 45.51% (8,329) of the reviews mentioned there were too many ads.
- 3.84% (703) of the reviews complained about non-skippable ads.
- 12.11% (2,216) of the reviews said ads were too lengthy.
- 2.10% (385) of the reviews said the ads were too large.
- 6.47% (1,233) of the reviews complained about ad placement and position.
- 1.96% (359) of the reviews complained about auto-playing ads.
- 0.87% (159) of the reviews were frustrated about ad volume.

Interestingly, complaints varied across Google Play and the App Store. Security (i.e., unauthorized data collection or permission usage), orientation (the orientation of app screens impacted by ads), timing, and auto-play complaints were more common among iOS users, while Android users reported obtrusive notifications in the status bar, volume, and app slowdowns as top sources of frustration.

The researchers urge developers to prioritize ad issues on platforms differently and optimize ad display settings — like the number of ads, display frequency, and display style. They also suggest designing strategies to manage ads with a long display period. "Inappropriate ad design could adversely impact app reliability and ad revenue," the coauthors wrote. "Understanding common in-app advertising issues can provide developers practical guidance on ad incorporation."