

December because this parameter is slower to respond to seasonal changes than p_1 .

Counter-intuitively, in the case of heavy users we see that reports of lawsuits or threats of legal action against file-sharers (the three earliest events) correspond with *increases* in users becoming active. One explanation for this effect may simply be that publicity surrounding BitTorrent is sufficient to bring heavy users back to the system.

In the United States, we find that neither typical nor heavy users reduce their downloading behavior even while over 50,000 other users are actively being sued.

Overall, these results of the New Zealand and United States case studies suggest that legal threats and copyright infringement laws have at best a short-term impact of reducing file-sharing behavior.

5.3 Discussion

By basing our analysis on a model of user behavior, we get insights that one cannot possibly get by measuring aggregate quantities such as overall traffic. Consider, for example, the passing of the “three-strikes law” in New Zealand (Fig. 6). According to our analysis, heavy users react to the passing of the law by immediately reducing both their probability of becoming active (which implies longer inactive periods) and of staying active (shorter active periods). However, median users only react to the publicizing of the law weeks later, and only respond by reducing the probability of staying active but not the probability of becoming active; that is, they shorten their sessions but they connect with the same frequency as before.

We argue that the benefits one gets from such a nuanced user-based description justifies the complexity introduced by having to define a model of user behavior.

6. CONCLUSION

We introduce a novel approach, based on hidden Markov models, to characterize the behavior of different types of users at scale. We detect shifts in user activity patterns by studying the evolution of the model parameters over time.

We apply this approach to detect the impact of copyright infringement legislation and legal action on user behavior, focusing on periods following the enactment of New Zealand’s three-strikes law and some highly-publicized lawsuits against file-sharers brought in the United States. Copyright infringement laws can be seen as punishment strategies puzzlingly looking for long-term behavioral changes. Our analysis shows that, at best, they attain short-term compliance and suggests it may be time to explore positive reinforcement strategies to achieve lasting behavioral changes.

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