

Mobile notifications are the primary mechanism for communicating new information to smartphone users. However, the ubiquity of mobile devices and high volume of mobile notifications prompted research into how mobile notifications can have a negative impact on user emotions, reduce work effectiveness and decrease current task performance while also outlining how direct reduction of notifications increases user mobile interaction.

For these reasons, mobile notification management systems (NMSs) were developed. Currently implemented NMS solutions such as OS level control, do not disturb mode and app specific importance learning are relatively ineffective prompting the development of state-of-the-art systems by (Corno et al., 2015), (Mehrotra et al., 2017), (Pradhan et al., 2017), and (Huang and Kao, 2019).

These systems primarily research supervised learning with “in-the-wild” datasets and do not investigate the areas of reinforcement learning for NMSs or fully synthetic notification datasets for NMS training and evaluation.

To investigate these areas, a Q-Learning and Deep Q-Learning system were developed using a synthetic notification dataset created by (Fraser, 2018). Evaluation was performed using 10-fold cross-validation for precision, accuracy, recall, F1 Score and computation time when the parameters of notification dataset size and number of notification features were changed. Analysis of different single feature spaces was also performed for the Q-Learning implementation.

The results found that the Q-Learning and Deep Q-Learning systems obtained a maximum performance in machine learning metrics of approximately 80%. The results also indicate that a Q-Table implementation should be used for systems with small to medium datasets, a computation time requirement or the need for real-time implementation. In addition, DQN implementations should be used for large datasets, GPU optimized systems or large feature spaces with memory constraints.

Overall the project found an effective privacy conscious methodology for the training and implementation of reinforcement learning mobile NMSs using synthetic notification datasets.