Traffic Classification of Mobile Apps through Multi-classification

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Mobile Traffic Classification
- Massive usage of mobile devices has changed significantly the network traffic
- 10X growth in mobile data traffic between 2013 and 2019 [1]
- Traffic classification (TC) of mobile apps provides valuable information for advertisement, insurance, safety, etc.
- Raises privacy and security issues

Multi-classification System for Mobile Traffic
- Classification Object Extractor: Service Burst (SB) → group of all network packets occurring within a threshold of time (burst threshold) and sharing the same destination IP address and port number
- Feature Extractor: statistics and joint histogram of packet sizes in both incoming and outgoing directions
- Base Classifiers: integration of state-of-the-art classifiers → Tay_RF, Tay_SVC [2], Her_Pure, Her_TF, Her_Cos [3], Lib_NB [4], CART
- Combiner: implementation of various hard (decision as input) and soft (class probabilities as input) combination techniques

Preliminary Experimental Results
- Various burst threshold values in [0.5, 5] s
- Removal of zero-payload packets before and after the SB extraction
- Tay_RF shows the highest performance
- Improvements with both NB (hard) and KL weights (soft) combiner for every threshold
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Best Base Classifier
- Tay_RF → Random Forest fed with 40 statistical features on packet sizes
- Misclassification biased to most-represented classes
- Accuracy → 72.8%
- F-measure → 72.3%

Improvement with MCS
- KL Weights → Class Conscious linear combination of decision probabilities
- Reduced occurrence of misclassification patterns
- Accuracy → 79.2% (+6.4%)
- F-measure → 79.1% (+6.8%)

References
[1] Ericsson Mobility Report: Global 4G/LTE divide will be wide in 2019