DATI, AI E ROBOTICA @POLITO

RICERCA, TRASFERIMENTO TECNOLOGICO E SUPPORTO ALLE AZIENDE SUI TEMI FONDAMENTALI DEI BIG DATA, INTELLIGENZA ARTIFICIALE, ROBOTICA E RIVOLUZIONE DIGITALE

ML FOR VIDEO-CONFERENCE TRAFFIC CLASSIFICATION

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SmartData CISCO

Webex Meetings

zoom

Webex Teams

jitsi.org

SCENARIO

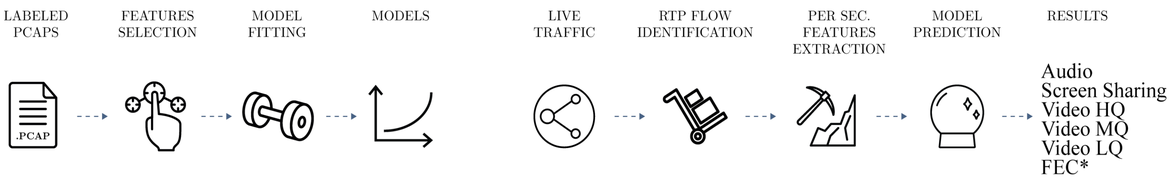
In the last period, the use of specific video-conferencing applications has seen a dizzying increase, making it increasingly necessary to improve the quality of experience, to make this new type of communication ever more realistic and immediate.

IDEA AND METHODOLOGY

Develop a machine learning-based application to classify traffic generated by RTC applications, in order to improve the Quality of Experience (QoE) of their users.

How?

1. Data collection, pcap from Webex and Jitsi
2. Feature extraction from the RTP flow
3. Feature selection (Correlation + RFECV)
4. Model training
5. Validation

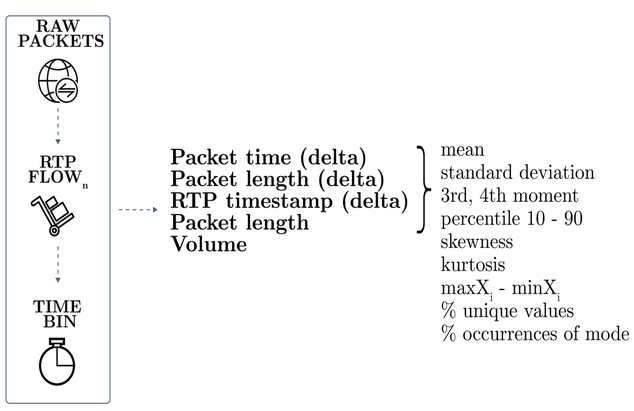


a) Offline Training Of Models *b) Live Classification*

Some data:

- 62 hours of call collected
- 127 features extracted per flow
- Around 10 features selected from the initial set
- Best model is Decision Tree classifier
- Using other 20 hours of calls

Focus on feature extraction

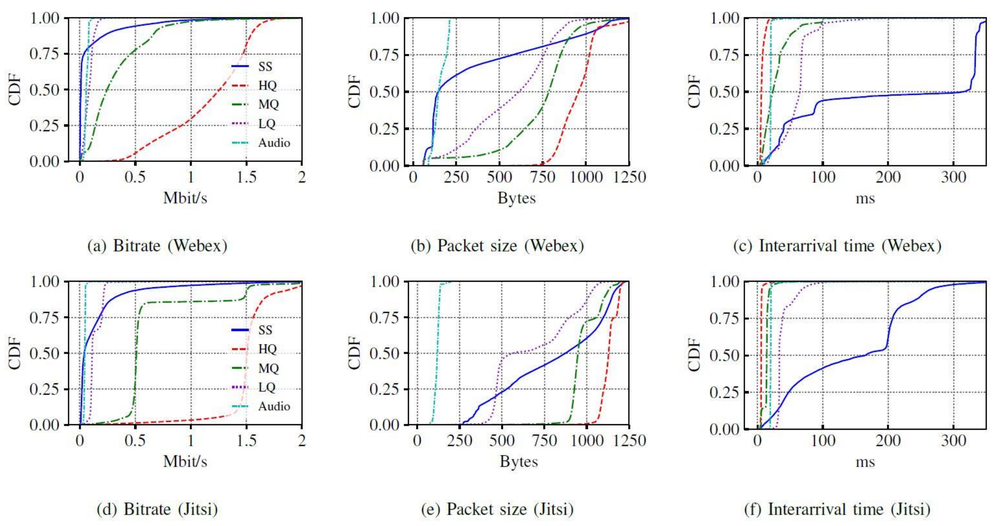


DATASET AND CHARACTERIZATION

Comparison between Webex and Jitsi data collected, analyzing the cumulative distribution functions

TABLE I: Dataset summary

Class	No. of seconds			
	Webex		Jitsi	
	Train	Test	Train	Test
Audio	224 295	80 781	123 745	30 180
Video LQ	200 380	76 825	84 134	20 192
Video MQ	55 112	18 156	34 708	7 817
Video HQ	59 073	19 526	33 049	7 920
Screen Sharing	41 170	8 800	29 216	6 870
FEC Audio	146 567	41 247	-	-
FEC Video	45 591	2 164	-	-

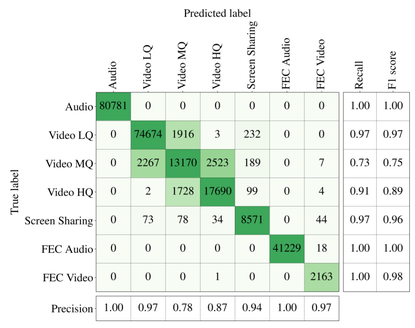


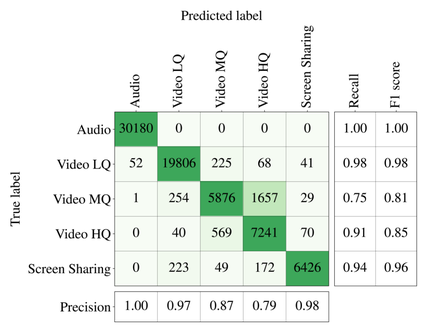
(a) Bitrate (Webex) (b) Packet size (Webex) (c) Interarrival time (Webex)

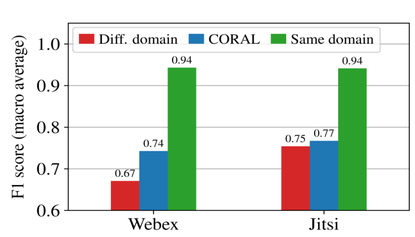
(d) Bitrate (Jitsi) (e) Packet size (Jitsi) (f) Interarrival time (Jitsi)

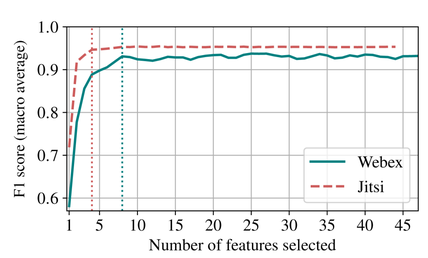
RESULTS

We reach an overall accuracy of 96% for Webex and 95% for Jitsi, using a lightweight decision tree model that makes decisions using only 1 second of real-time traffic.









CONCLUSIONS AND FUTURE WORK

Our approach is conceived to operate as a building block of a network management system that optimizes traffic engineering for RTC applications.

Our final goal is the measurement and optimization of the QoE perceived by the users of RTC applications and we release our code and dataset to foster research in this direction.