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Connection quality analysis for live video

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ABSTRACT

Video chat or streaming applications depend on the availability of reliable and high-speed network connections to maintain quality. When the quality is poor, it is often difficult for users to diagnose the cause, and hence, the poor quality of experience may be misattributed to the video chat or streaming application. This disclosure describes use a trained classifier model to detect low quality during a video call or video streaming session. With user permission, the classifier model is trained using data from prior video calls or sessions. When low quality is detected, the classifier model determines one or more likely causes and possible remedial actions that a user can take. The causes and remedial actions are provided to the user.

KEYWORDS

- Video chat
- Video streaming
- Call quality
- Classifier model
- User feedback

BACKGROUND

Video pre-buffering is not feasible for applications such as video chat services and live video streaming. Therefore, these applications depend on the availability of reliable and high-speed network connections to maintain quality. When the quality is poor, it is often difficult for users to diagnose the cause. The poor quality of experience in such instances may be misattributed to the application in use, when in fact the source of the problem are other factors such as the quality of the Wi-Fi connection of the user device, network quality provided by the

internet service provider (ISP), etc. The perception of quality for live video services is vulnerable to conditions outside the explicit control of the service provider.

DESCRIPTION

This disclosure describes techniques to detect the cause of low quality in video chat and live video streaming applications. The detected cause is used to provide feedback to users. The feedback can include suggested actions that a user can take to remedy the problem. Providers of video chat and live video streaming services benefit from these techniques.

The techniques described herein classify video quality based on data from video chat or video streaming, based on data provided by users that consent to such analysis. A classifier model, e.g., a trained machine learning model is used to analyze connections and user experience. The classifier model can be implemented using various techniques, such as decision trees, neural networks, support vector machines (SVM), and logistic regression.

The model is trained to classify video chat sessions based on quality. Further, when the detected quality is low, the model is configured to the likely cause for the low quality. The determined causes are associated with a confidence score. When users that view a live video streaming session, e.g., via an over-the-top (OTT) video service, the session is treated as a one-way system.

Call quality is labeled based on the number of dropped (skipped) video and audio frames. Quality buckets, such as poor, good, or excellent, are created and mapped to the number of dropped frames. The classifier model attributes call quality to one of multiple features, e.g., list of plausible causes. For example, the features can include - the user's ISP; a vector of the network topology between the origin and destination points of the video session; signal strength indicators from user’s client device (when permitted by the user); speed metrics, e.g., packet

drop rates, packet latency, etc. measured between different nodes of the network; with user consent, features of the user's Wi-Fi router such as make, model, router settings; etc.

Further, with user permission, the classifier model is pre-trained using human analysis of call records when available. The data indicative of human analysis of call records is obtained with survey-type questions that are provided to users within the video chat interface. With user consent, the options presented during the survey are tailored for the particular user context. For example, the options are filtered such that only questions and options relevant to the particular user are presented. For example, survey questions related to Wi-Fi quality are not presented to users that use the video service on a cellular connection. With user permission, user responses to the survey are used to train the classifier model. For example, the user responses include user-indicated reasons for low call quality such as "I get weak Wi-Fi in this part of my house."

With user consent, the trained model is used during a video chat or video streaming session when the session is detected to be of low quality, e.g., when frame rates drop below a threshold that results in the session being classified as having poor quality. At moments when high rates of dropped frames are detected, the techniques of this disclosure utilize the trained classifier model to determine and present the likely cause to the user. Fig. 1 illustrates an example process to determine video quality and provide feedback to the user during a video session, e.g., a video call or a video streaming session.

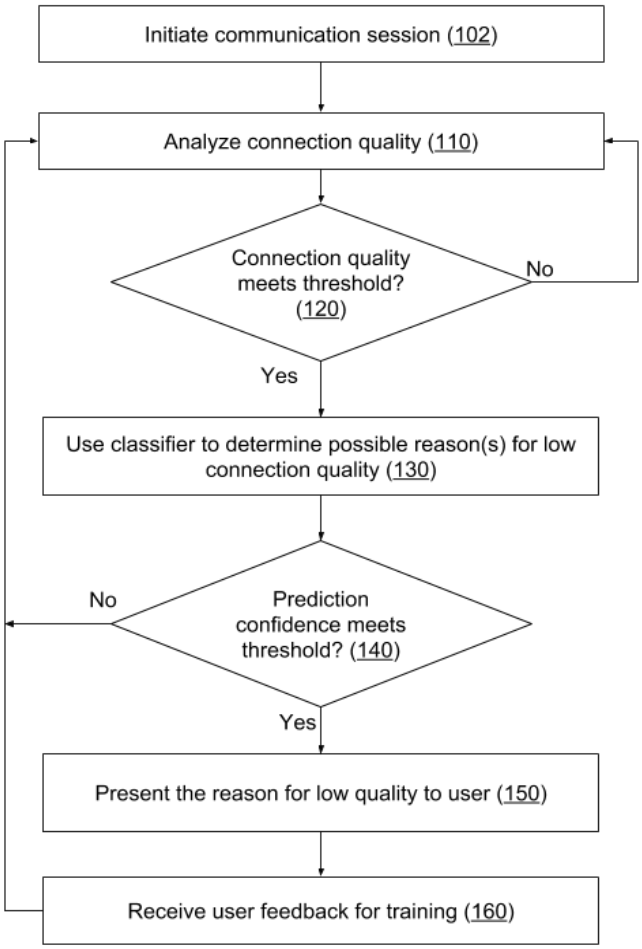

Fig. 1

With user permission, after initiating a communication connection (102), the connection quality is analyzed (110) as the session is in progress. If it detected that the connection quality does not meet a quality threshold (120), the trained classifier model is used to determine possible reason(s) (130) for the poor quality. If the diagnosis identifies a reason with a confidence score that meets a threshold confidence (140), the determined reason for the low quality of the call is presented to the user (150).

The information provided to the user can include recommendations for remedial actions that a user can take. For example, messages such as "Move closer to your Wi-Fi router," "Your internet service provider seems to be having issues, consider switching," and "We think the

person you're talking to has a weak connection, you may have to complete the call at a later time" can be displayed. Further, an option is presented to enable the user to report misclassifications (160), e.g., the user interface can enable the user to select an option “No, this isn't the problem”. When users select the option to report such misclassifications, the feedback is used to update the classifier model. The described techniques can be used by providers of video chat applications, providers of live video streaming services, etc.

Further to the descriptions above, a user may be provided with controls allowing the user to make an election as to both if and when systems, programs or features described herein may enable collection of user information (e.g., information about a user’s social network, social actions or activities, profession, a user’s preferences, or a user’s current location), and if the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user’s identity may be treated so that no personally identifiable information can be determined for the user, or a user’s geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of a user cannot be determined. Thus, the user may have control over what information is collected about the user, how that information is used, and what information is provided to the user.

CONCLUSION

This disclosure describes use a trained classifier model to detect low quality during a video call or video streaming session. With user permission, the classifier model is trained using data from prior video calls or sessions. When low quality is detected, the classifier model determines one or more likely causes and possible remedial actions that a user can take. The causes and remedial actions are provided to the user.