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Title:

Evaluating the use of deep learning to predict temporal anomalies in acoustic signals

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Abstract:

In many practical applications, the saliency of an acoustic pattern can provide crucial relevant information when something is wrong or deserves additional attention, often defined as an anomaly. The success of the Relative Approach Analysis is a testament to this. The Relative Approach Analysis uses classical signal processing in order to predict values of audio signals based of previous steps. Saliency is then calculated as the difference between the real signal and the prediction, and rests on the assumption that signals that are easily predictable are not salient. This is an excellent approach to find tonal and impulsive events. However, for very complex patterns the modularity of those prominent components may be too high. Thus, complex patterns become salient even if they are easily predictable or represent the normal operation condition of a machine. More complex prediction models could therefore improve the general results of the method if the goal is to find anomalies instead of individual tonal and impulsive atomic patterns. In this work, we study the use of neural networks as predictive models, which have a considerably higher representation power and could, in theory, be more adequate to the task of temporal anomaly detection.

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