Low Level Texture Features for Snore Sound Discrimination

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INTRODUCTION

- Association between snoring and serious health risks, such as obstructive sleep apnea and heart disease.
- Adaption of **spectral** and **energy features** in particular for the task of snore sound detection.
- Motivation: recently proposed **Deep Spectrum** approach which utilised pre-trained image classification CNNs as feature extractor [1].
- Investigation of the use of **low level image texture features** extracted from spectrograms for snore sound classification.

DOWNLOAD

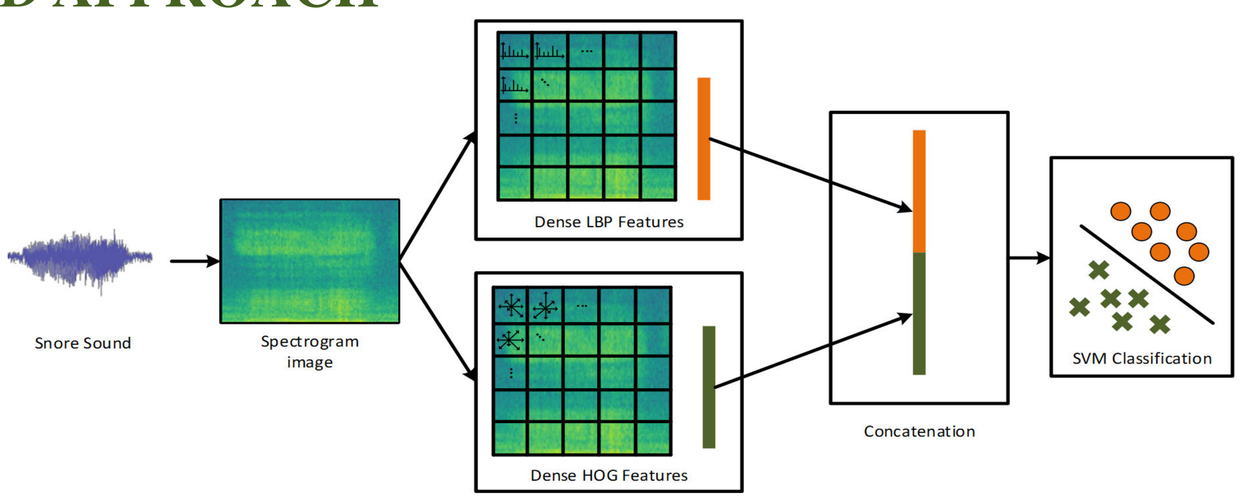
- The paper and poster are available to download via:

DATABASE

- The **Munich-Passau Snore Sound Corpus** (MPSSC), the database of the ComParE-2017 challenge [2].
- The dataset contains **828** snore audio files grouped into four categories: (i) **V**elum, (ii) **O**ropharyngeal lateral walls, (iii) **T**ongue base and (iv) **E**piglottis.

PROPOSED APPROACH

- First, the recorded snore sounds are converted to **spectrograms** images.
- We then extract **local binary pattern (LBP)** and **histogram of oriented gradients (HOG)** image descriptors from the spectrogram.
- Finally, classification is perform using a **Support Vector Machine (SVM)**.



RESULTS

- All results given in terms of *Unweighted Average Recall*

Feature	# Features	Channel	C (SVM)	Devel.	Test
LBP features	2891	Grey	0.1	33.0	-
	2891	R channel	10	34.2	-
	2891	G channel	0.01	34.5	-
	2891	B channel	1	34.2	-
	5782	R, G channels	0.1	33.1	-
	5782	**R, B channels**	**1**	**35.4**	**62.7**
	5782	G, B channel	10	33.9	-
	8673	**R, G and B**	**0.01**	**34.6**	**64.4**
HOG features	1296	Gray	1	37.7	60.2
	1296	R channel	0.1	36.1	-
	1296	G channel	0.01	37.1	-
	1296	B channel	0.1	34.4	-
	2592	R, G channels	0.1	37.3	-
	2592	R, B channels	100	35.5	-
	2592	G, B channel	0.01	35.0	-
	3888	**R, G and B**	**0.1**	**35.0**	**59.5**
LBP + HOG	**8374**	**R, B channels**	**0.1**	**36.8**	**69.0**
	8374	**G, B channel**	**0.1**	**37.8**	**72.6**
	12561	R, G and B	0.01	35.6	-

COMPARITIVE ANALYSIS

- All results given in terms of *Unweighted Average Recall*

Method	Devel.	Test
Baseline End-to-End	40.3	40.3
Baseline functionals	40.6	58.5
Deep Spectrum [1]	44.8	67.0
Deep Spectrum & CSO [3]	57.6	66.5
Proposed method	37.8	**72.6**

CONCLUSIONS

- LBP features appears better suited than the HOG features for snore sound classification.
- A combination of the color channels yields stronger results over using a single channel.
- Concatenation of the LBP and HOG descriptors achieved the highest score.
- Compared to the ComParE 2017 baseline, our approach achieved a **relative percentage increase** in unweighted average recall of **23.1%**.

REFERENCES

[1] S. Amiriparian, et al., "Snore Sound Classification Using Image-based Deep Spectrum Features," in Proceedings INTERSPEECH 2017, Stockholm, Sweden, pp. 3512–3516, ISCA, August 2017.
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[3] M. Freitag, et al., "An 'End-to-Evolution' Hybrid Approach for Snore Sound Classification," in Proceedings INTERSPEECH 2017, Stockholm, Sweden, pp. 3507–3511, ISCA, August 2017.

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