SIFT texture description for understanding breast

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Abstract

Texture is a powerful cue for describing structures that show a high degree of similarity in their image intensity patterns. This paper describes the use of Self-Invariant Feature Transform (SIFT), both as low-level and high-level descriptors, applied to differentiate the tissues present in breast US images.

For such a task, a subset of 16 images has been randomly selected from a larger dataset of 700 Ultra-Sound (US) images acquired at the *UDIAT Diagnostic Centre of Parc Taulí* in Sabadell (Catalunya), between 2010 and 2012. This subset has been complemented with multi-label Ground Truth (GT), as illustrated in figure 1.

Experimental results are provided showing the validity of the proposed approach for describing the tissues in breast US images.

Fig. 1: Dataset sample. From left to right: image sample, accompanying multi-label GT, tissue label GT color-coding.

SIFT as a low-level descriptor

For the low-level texture descriptors case, SIFT descriptors are extracted from a regular grid. The high-level texture descriptor is build as a Bag-of-Features (BoF) of SIFT descriptors.

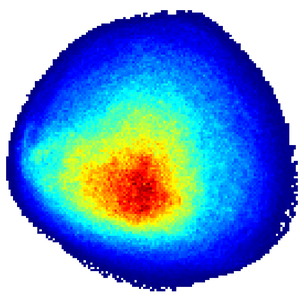

Fig. 2: SIFT space. (a) Projected space colored according to GT tissue labeling. (b) $P(\bar{x}_a)$. (c) $P(\omega)$.

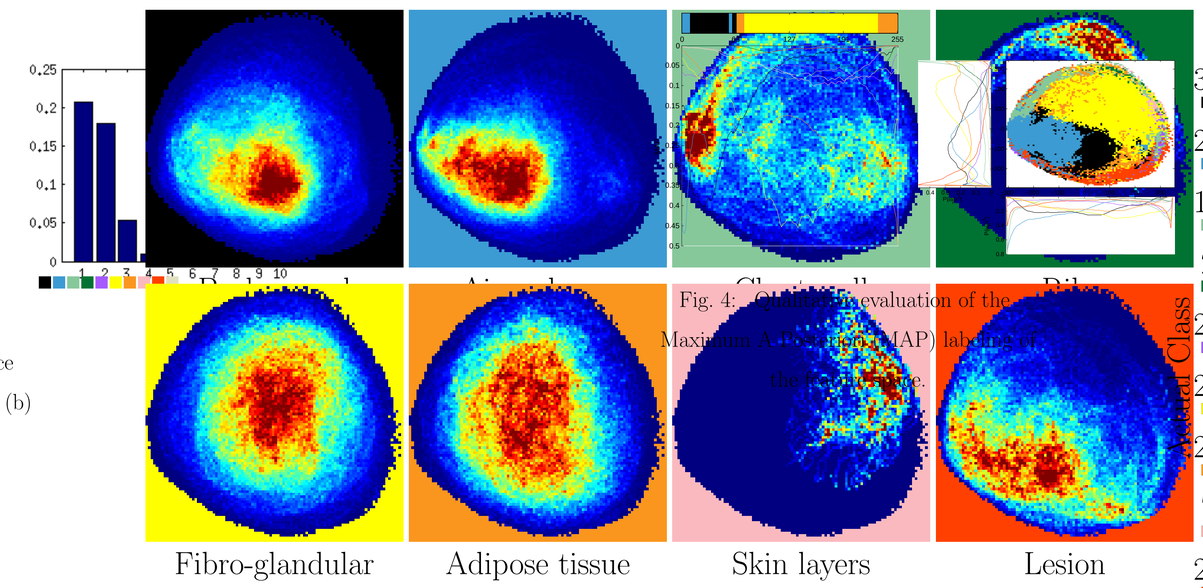

Fig. 3: Distribution of the SIFT descriptors for some classes in the GT.

Fig. 4: Qualitative evaluation of the Maximum A Posteriori (MAP) labeling of the feature space.

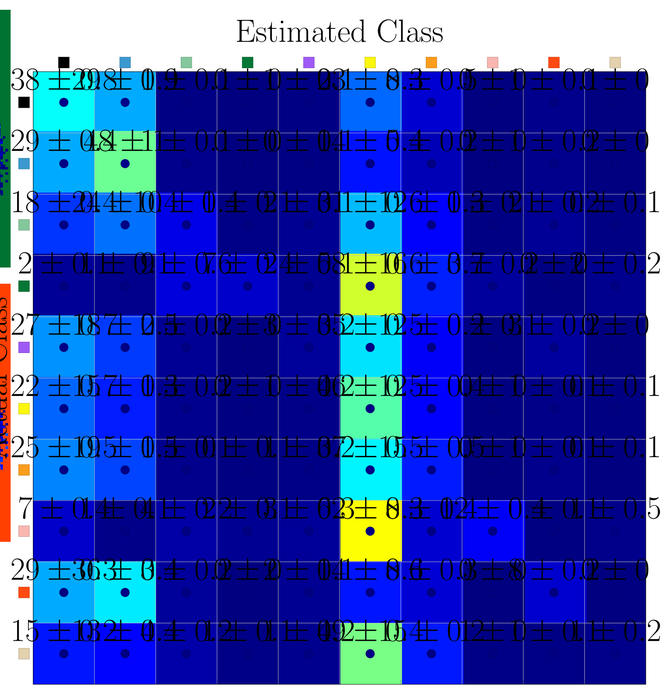

Fig. 5: some caption

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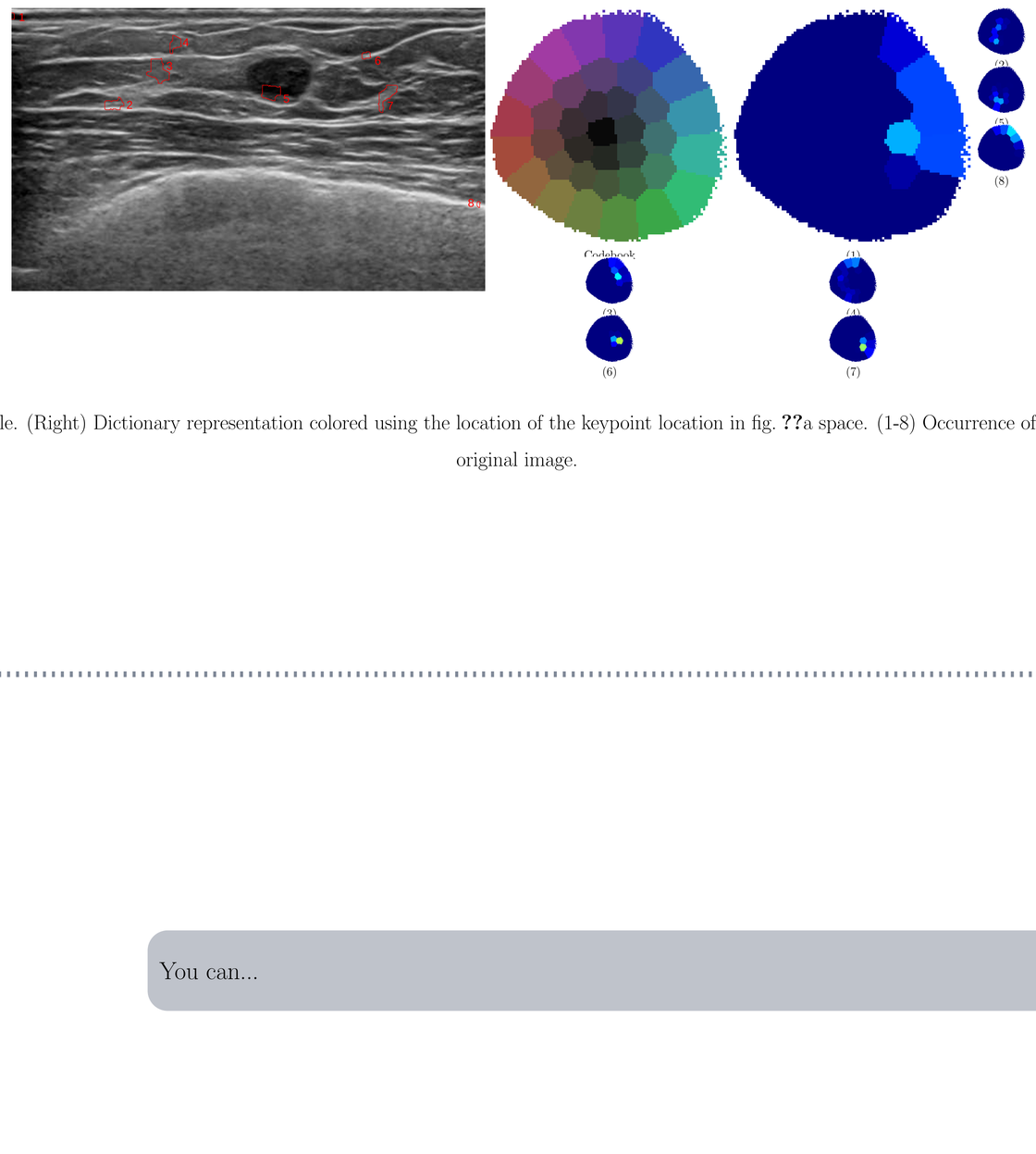

Fig. 6: SIFT-BoF descriptors qualitative analysis. (Left) image example. (Right) Dictionary representation colored using the location of the keypoint location in fig. **??**a space. (1-8) Occurrence of the dictionary's key-points associated to each region highlighted in the original image.

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