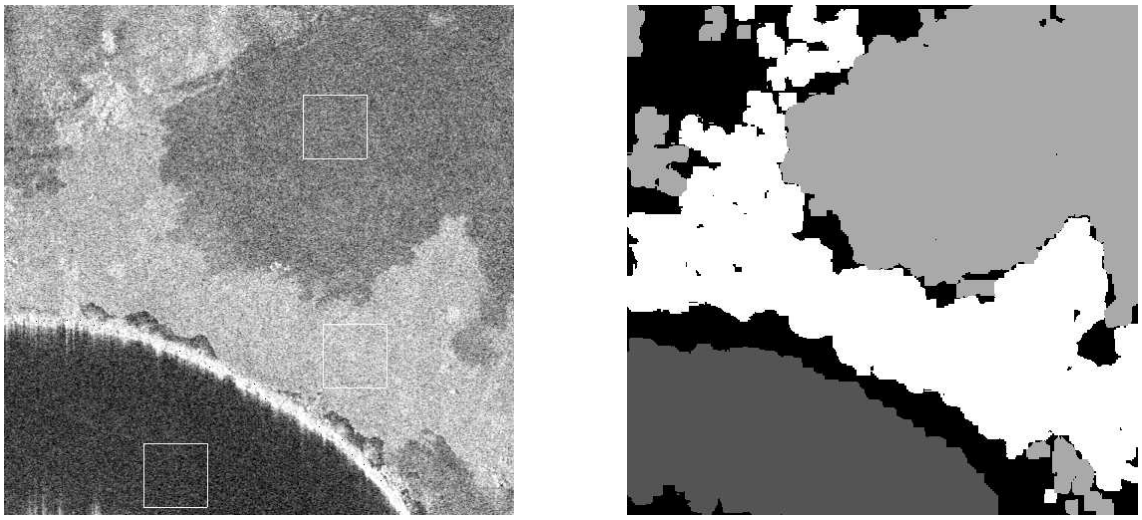
C.2 Open ended classification of terrain

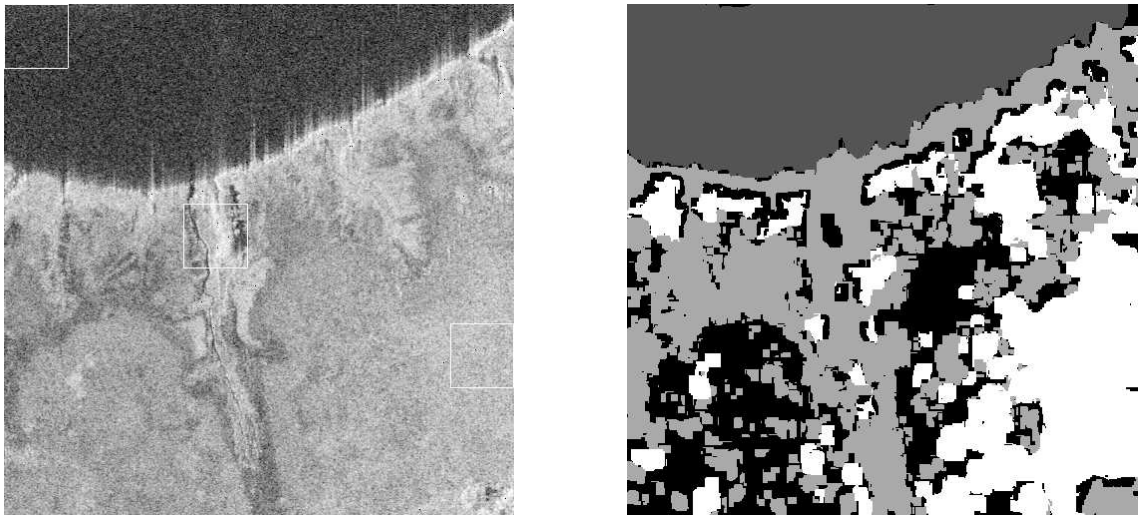
The goal of this research was to produce a method by which an operator may be able to take a radar satellite image; segment a small portion from the image where the terrain was known; use this as the training texture to an ideal texture model. Then with respect to the texture model, find other similar terrain types within the image, without the need for defining what background textures are present. Here, in Figs. C.33–C.39, we show the results of such an application using the open ended classification scheme for the terrain recognition of DSTO SAR images [143].

Each DSTO SAR image is 512×512 pixel image. From which several small patches were taken for texture modelling. These patches are indicated by white boxes on the original SAR image. Instead of presenting each probability map for each separate training texture, we have combined the probability maps into one. Basically labelled image is presented, where each pixel represents the label of the training texture that had the highest likelihood for that pixel. Where there was a tie, the pixel was left black.



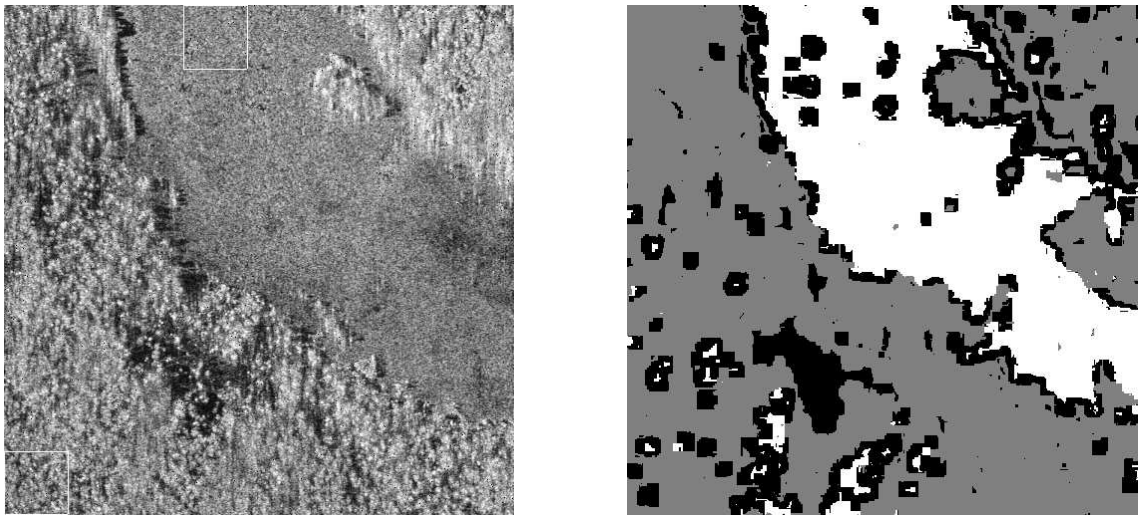
(a) DSTO SAR image (b) Combined probability map

Figure C.33: Open ended terrain recognition of a DSTO SAR image. (a) DSTO SAR image `e-all-riv-15005-rtp-1025_1536-1537_2048` of size 512×512. The training textures used for obtaining the probability maps were 64×64 subimages taken directly from the SAR image as indicated by the white boxes. (b) The combined probability map of all the probability maps resulting from the training textures.



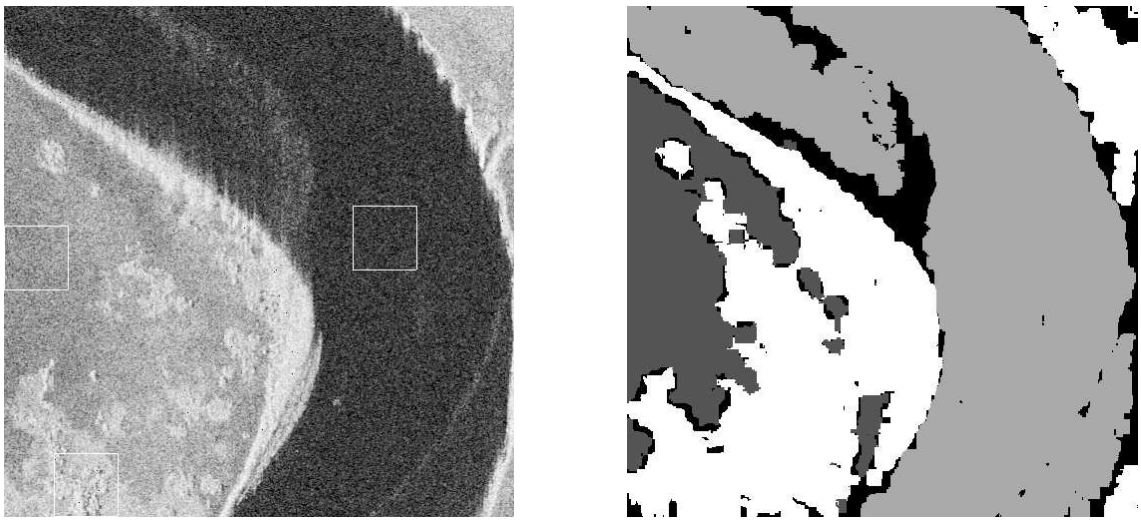
(a) DSTO SAR image (b) Combined probability map

Figure C.34: Open ended terrain recognition of a DSTO SAR image. (a) DSTO SAR image `e-all-riv-15005-rtp-1537_2048-3073_3584` of size 512×512. The training textures used for obtaining the probability maps were 64×64 subimages taken directly from the SAR image as indicated by the white boxes. (b) The combined probability map of all the probability maps resulting from the training textures.



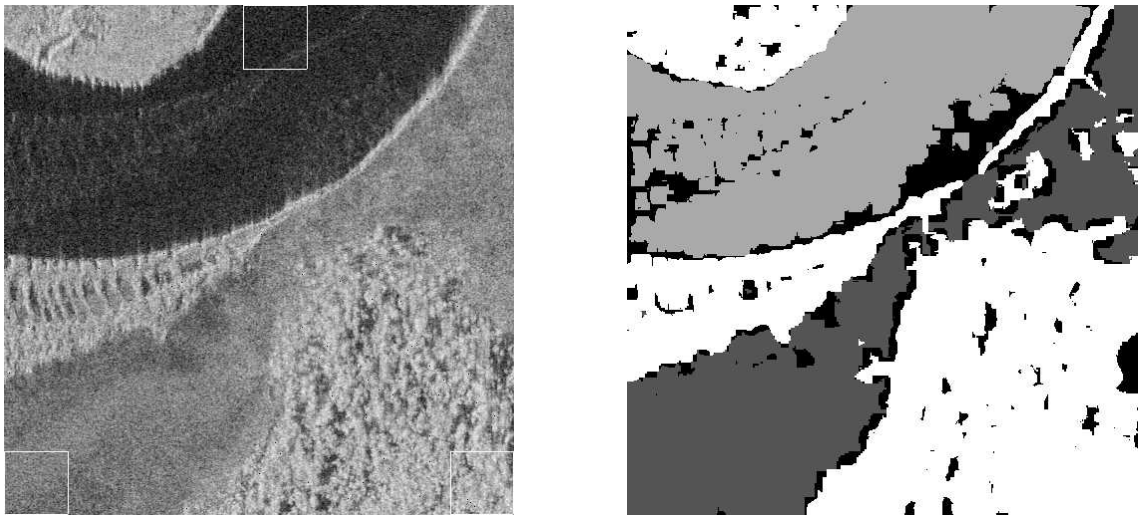
(a) DSTO SAR image (b) Combined probability map

Figure C.35: Open ended terrain recognition of a DSTO SAR image. (a) DSTO SAR image `e-all-riv-15005-rtp-1537_2048-5633_6144` of size 512×512. The training textures used for obtaining the probability maps were 64×64 subimages taken directly from the SAR image as indicated by the white boxes. (b) The combined probability map of all the probability maps resulting from the training textures.



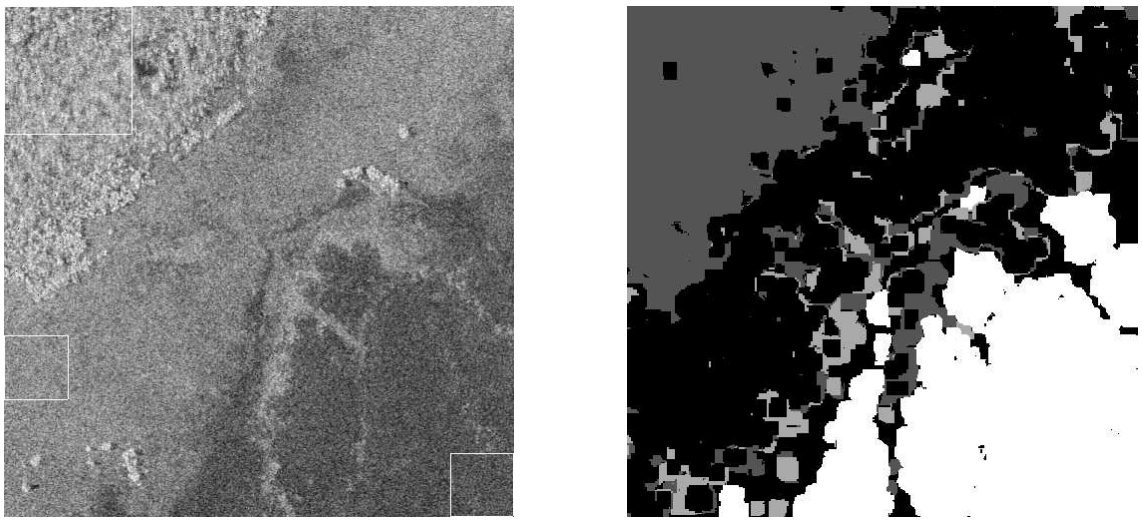
(a) DSTO SAR image (b) Combined probability map

Figure C.36: Open ended terrain recognition of a DSTO SAR image. (a) DSTO SAR image `e-all-riv-15005-rtp-1_512-2561_3072` of size 512×512. The training textures used for obtaining the probability maps were 64×64 subimages taken directly from the SAR image as indicated by the white boxes. (b) The combined probability map of all the probability maps resulting from the training textures.



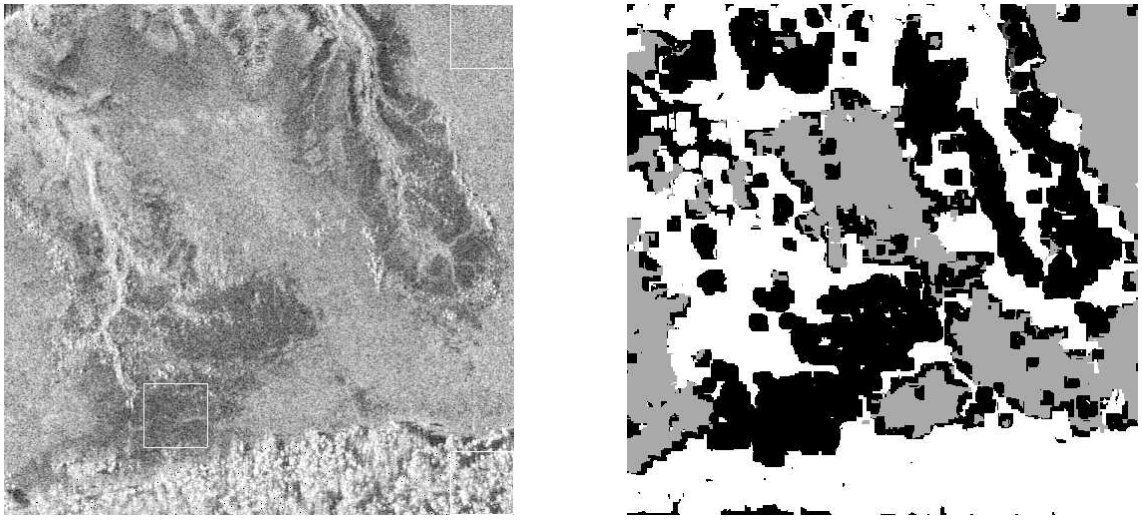
(a) DSTO SAR image (b) Combined probability map

Figure C.37: Open ended terrain recognition of a DSTO SAR image. (a) DSTO SAR image `e-all-riv-15005-rtp-1_512-3073_3584` of size 512×512. The training textures used for obtaining the probability maps were 64×64 subimages taken directly from the SAR image as indicated by the white boxes. (b) The combined probability map of all the probability maps resulting from the training textures.



(a) DSTO SAR image (b) Combined probability map

Figure C.38: Open ended terrain recognition of a DSTO SAR image. (a) DSTO SAR image `e-all-riv-15005-rtp-1_512-513_1024` of size 512×512. The training textures used for obtaining the probability maps were 64×64 subimages taken directly from the SAR image as indicated by the white boxes. (b) The combined probability map of all the probability maps resulting from the training textures.



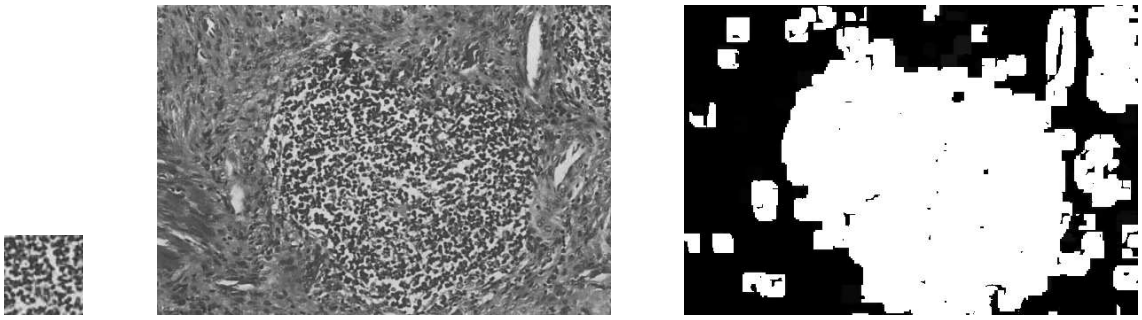
(a) DSTO SAR image

(b) Combined probability map

Figure C.39: Open ended terrain recognition of a DSTO SAR image. (a) DSTO SAR image `e-all-riv-15005-rtp-2049_2560-3073_3584` of size 512×512. The training textures used for obtaining the probability maps were 64×64 subimages taken directly from the SAR image as indicated by the white boxes. (b) The combined probability map of all the probability maps resulting from the training textures.

C.3 Open ended classification as a medical diagnostic

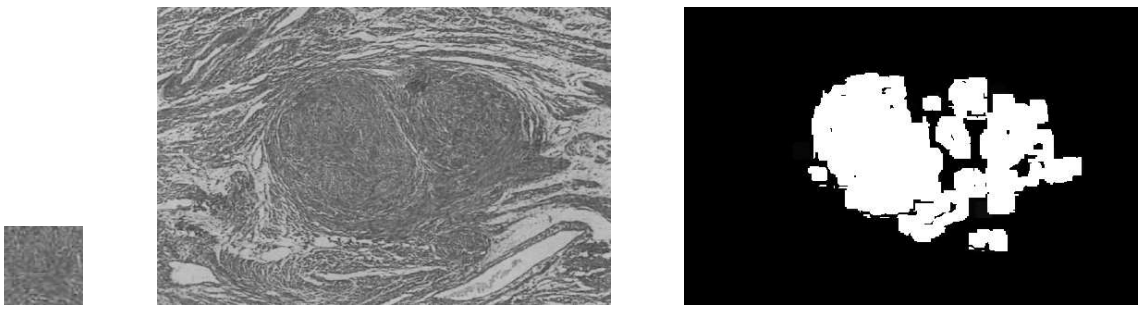
The open ended texture classification is not only applicable to terrain recognition. Quite the contrary, it can be used for a whole suite of new applications. One such application that has spawned from this classification scheme, is the medical diagnosis for certain types of cell formations. The advantage for using such a classification scheme for this type of application, is that the cell formation can be recognised from a background of a myriad of different textures. Which of course will occur in such an application. In the following figures, Figs. C.40–C.42, we use a small training texture to find the relevant texture from the medical image [209].



(a) Training texture (b) Medical image (c) Probability map

Probability scale 0 1

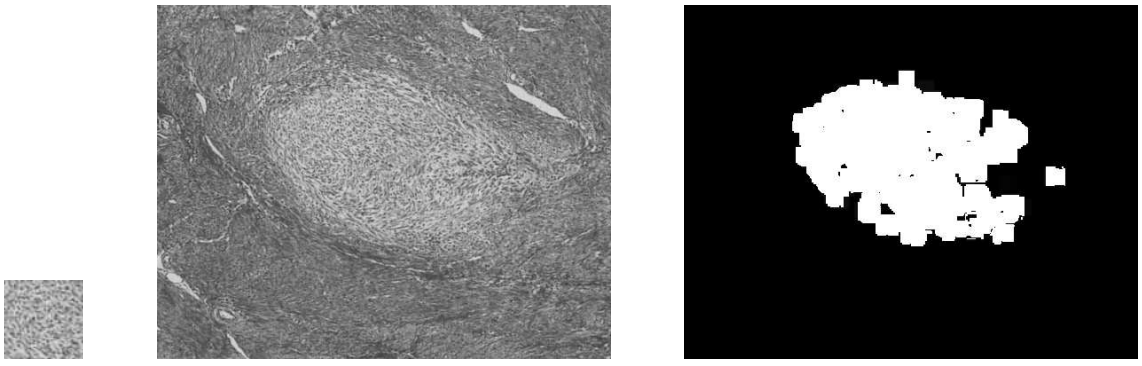
Figure C.40: Medical diagnostic of lymphoid follicle in the cervix [209], using open ended texture classification



(a) Training texture (b) Medical image (c) Probability map

Probability scale 0 1

Figure C.41: Medical diagnostic of small myoma [209], using open ended texture classification



(a) Training texture (b) Medical image (c) Probability map

Probability scale 0 1

Figure C.42: Medical diagnostic of focus of stromal differentiation in the myometrium [209], using open ended texture classification

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