

Confidence Maps implementation in MONAI

Klinisches Anwendungsprojekt

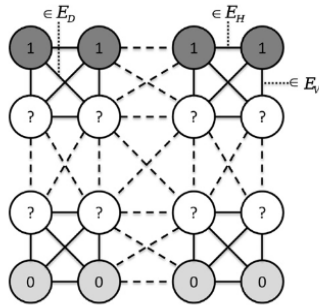
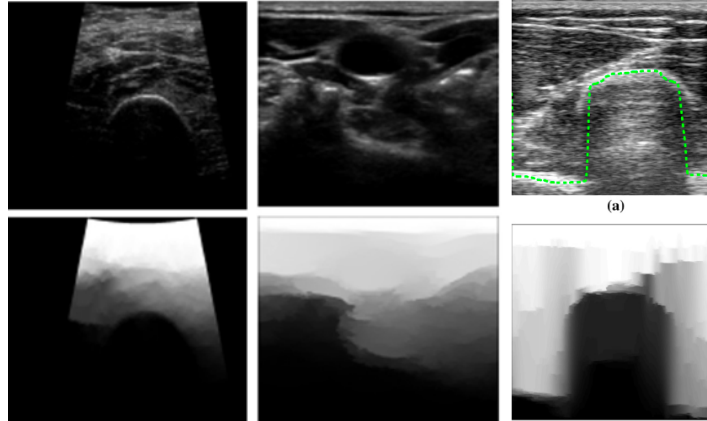


Fig. 1. Illustration of graph setup for confidence maps using an 8-connected lattice. The first row resembles the virtual transducer elements with the probabilities set to unity (shaded dark gray). The last row resembles the 'no signal' region, i.e., the necessary boundary condition, with the probabilities set to zero (shaded bright gray). For all the nodes in-between we compute the probability that a random walk starting from each node would first reach one of the virtual transducer elements.



General Info

The goal of this project is to implement [Confidence maps](#)[1] in Monai, in order to contribute to [Monai core](#) [2]. To successfully complete the project, the student needs to know python and will learn Monai. We encourage to apply students with good time management skills.

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Project Abstract

Confidence maps for ultrasound images are representations of the interaction of sound with the tissues it passes through. Refraction or absorption are problems that can be seen in the images as areas of increased brightness or increased darkness. The code that calculates them already exists in matlab and c++[3]. The main task of the student will be to translate this code to python and make it available to the community through a contribution to the MONAI library.

Some ultrasound datasets will be available to test the implementation and our hospital server and the GPUs resources will be given in person or distantly. Good results on this project could open the possibility of a Master thesis in the laboratory.

Background and Motivation

There are many pre-processes that can be done to the images to extract features of interest. However, every time a researcher wants to apply

them, he/she is forced to use libraries that are not standardized. Our purpose is to provide the implementation of the confidence map computation as open source code that can be used directly by researchers working with ultrasound.

Student's Tasks Description

1. Understand the paper and the matlab code, 2. Run the code on ultrasound data. 3. Refactor the code in python. 4. Fill the requirements to contribute to monai, 6. Write a blog about the learnings.

Technical Prerequisites

Languages: Python,

We will learn: Monai, Git

We will use as IDE: visual Studio or pycharm.

References

[1] Karamalis, A., Wein, W., Klein, T., & Navab, N. (2012). Ultrasound confidence maps using random walks. *Medical image analysis*, 16(6), 1101-1112.

[2] <https://github.com/Project-MONAI/>

[3] <https://reader.elsevier.com/reader/sd/pii/S1361841512000977?token=91B97A87B09672DA33EC3F920CF33D4726A68FD84F8A94B04424FADFD155F538AAF545C3A8733F56ED54E3C004BDB392&originRegion=eu-west-1&originCreation=20230328093458>