

# Automatic Non-rigid Histological Image Registration

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## Introduction

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This project is a challenge which is about Automatic Non-rigid Histological Image Registration (ANHIR). And this is a part of the IEEE International Symposium on Biomedical Imaging (ISBI) 2019.

Image registration is an image processing technique which can be used to align two or more images into a single scene. The visual comparison of successive tissue slices that align multiple images to a common frame is one of the simplest but the most useful features in digital pathology. Image registration gives the possibility for pathologists to assess the histology and expression of multiple markers in a patient in a single region.

This project focuses on the registration accuracy and speed of the registration algorithm which automatically registers a set of large images from the same tissue samples but stained with different biomarkers.

## Dataset and ethical use of data:

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The Dataset is downloaded from [dataset webpage](#) which is offered by IEEE International Symposium on Biomedical Imaging (ISBI) 2019. It contains a set of images and a landmarks file. More detailed information about the provider of each image can be found [Dataset Information](#). This dataset will be only used in this challenge and never be used in commercial. The dataset license is [CC-BY-NC-SA](#).

## Bibliography must be followed:

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- [Benchmarking of Image Registration Methods for Differently Stained Histological Slides](#) Borovec J, Munoz-Barrutia A, Kybic J.
- [Independent segmentation of whole slide images: A case study in renal histology](#) Gupta L, Klinkhammer BM, Boor P, Merhof D, Gadermayr M. Stain
- [AIDPATH: Academia and Industry Collaboration for Digital Pathology](#) Bueno G., Deniz O.

## Evaluation:

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The evaluation function is based on the rTRE for each pair of landmarks in registered images pairs which is the competition criteria function. Detailed algorithm can be found in [Evaluation webpage](#).

## Designed Solution:

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The designed solution is to use deep learning and ConvNets to solve the problem which is a kind of supervised learning. However, the unsupervised learning also can be used in Image Registration.

## Current state

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- To get familiar with the ConvNets used in image processing, the top solution of the challenge [cat vs dog] on kaggle is being followed to learn the keras using and tensorflow using. The [code](#), [training result](#) and [training model](#) can be found in my [github page](#).
- The Bibliography paper is currently being read these days.
- The next step is to write a simple CNN program for [kaggle histopathologic cancer detection competitions](#). Because of this

competitions is similar to the cat and dog competitions, and the training data set is easy to use.