Liver is main abdominal organ of our body and this is really often place where tumors are located. Liver segmentation is the means through which medical doctors perform diagnosis and plan treatment, surgery or any additional intervention. The segmentation is not obvious because in CT images liver has really similar pixel intensities as another abdominal structures like kidney or spleen. It is really challenging to extract it with good accuracy. Liver segmentation from CT images is still a state of art research problem. In current solution the problem is solved by modeling liver in two methods atlas based segmentation and segmentation based on Gaussian Process Morphable Models. Data set was taken from MICCAI challenge 2007. 10 images were taken to training data set and 10 as new cases to segment liver. The developed method of segmentation of the liver is fully automatic. Results achieved through this method are promising. For atlas based segmentation method the following results were obtained: dice (0.59 - 0.61) mean surface distance (MSD) 2.92 mm and Haussdorf distance (HD) above 5 mm. For method based on Gaussian Process Morphable Models dice was 0.72 - 0.85 HD: 4.45 - 3.7 and MSD: in range of 1.95 - 2.65. The second method looks promising. Much better results were achieved than for the first time. Results varied amongst between different cases. The shape of liver has a lot of variability. It was noticed that increasing number of points can improve significantly accuracy, but on the other hand it affects calculation time. The implementation of the objective required the development of a solution for specific issues identified, which constitute new elements in relation to the existing state of the art and which I consider to be my personal contribution to the development of segmentation methods (more broadly computer-assisted medical diagnosis):

- developing a method to find the correspondence of liver surface points,
- development of a method for assessing the similarity of liver shape on the training set,
- adaptation of the method of a generalized shape model based on the multi-dimensional Gaussian distribution of the shape deformation field to the segmentation of the liver organ,
- development of a method for the separation of liver segments based on information contained in the masks of vascular structures in the liver.

The obtained results in presented fully automatic method are comparable to dedicated methods for liver segmentation. In addition, the deformation features of the model can be modeled mathematically by using various kernel functions, which allows to segmenting the liver on a comparable level using a smaller learning set.