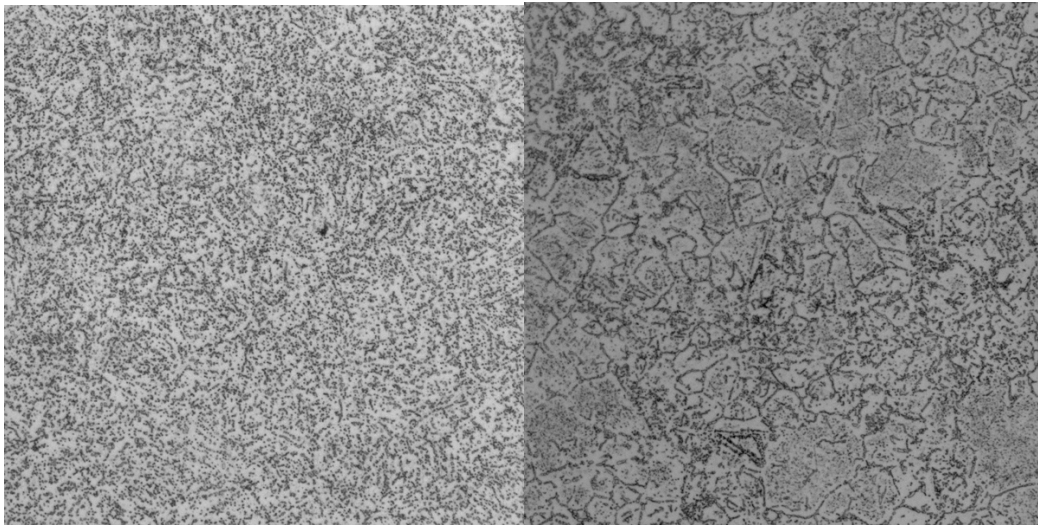# UDDEHOLM PROBLEM

Images showing carbide distributions over steel samples are provided as in the Figures below. The images are taken in 500x magnification. The carbides-filled parts (precipitations) are black and the steel parts (often referred to as the matrix) are white. The most relevant process for the distribution is the heat treatment.

Left: Good image. *Right*: Bad image. *Is a reliable automatic image classification possible?*

 An even distribution with as small carbides as possible is desired, while large carbides together with clustering (uneven distributions, big white areas) are unwanted. Also long regular structures are not too good.   In order to see carbide distributions under a microscope, the samples need to be etched after polishing. One notices a difference in grayscale on the image that has to do with the etching process is irrelevant. The images are visually compared by an operator with a rating chart and the steel sample is classified accordingly.

A challenge is to design an efficient way to control the grayscale information. For a trained human eye, 'normalizing' grayscale images is done on the fly.

Key questions are:

Can we add some measurements on these images to quantify them in an absolute (objective) way? Could we parameterize the images according to a limited number of parameters with the purpose of making this type of measurement more objective?