**Another way: Deep Learning-Based crack detection using CNN and Naïve Bayes Data Fusion**

The research proposes another way to detect cracks on different types of materials, as a consolidate blocks or metal walls. The research has main scope to detect cracks on nuclear reactors, places where a human-made work cannot be possible. They collect images that was made with a mechanic robot and a waterproof camera. The challenging task is how algorithm detects cracks considering that they are tiny and there are noisy patterns components around. The other problems are that the cracks cannot fit into only one video frame or some images contain low contrast with complex background. The researcher proposes a new algorithm that is composed by CNN, that detects cracks, and the Naïve Bayes that determines whether a crack tubelet is a real crack or not.

To train and validate the CNN, this study generated crack and noncrack image patches of 120 × 120 pixels from the video frames, being rotated with different percents, and in the end, they obtain about d 150 000 crack and 150 000 noncrack image patches.

Data fusion aggregates the information obtained from multiple frames. It consists of three parts: spatiotemporal registration registers crack patches to a global spatiotemporal coordinates and forms crack tubelets, Na¨ıve Bayes decision making determines whether a crack tubelet is a real crack or not, and tubelet clustering groups tubelets into crack clusters then generates crack bounding boxes.

In the end, the researchers obtain more that 98% of correct detections, more than previous algorithm, named LBP-SVM which gives 87% correctness. On the other hand, one disadvantage is that the CNN needs lots of training data (e.g., more than 100 000 samples) to make the training converge and prevent overfitting.