Good Morning everyone,

First of all, I want to introduce myself , I am Mohamed Amine Marnissi a Ph.D student , registered at ENIS Sfax and a research member at LATIS LAB. I am going to present our accepted paper at ICPR conference entitled "Thermal Image Enhancement using Generative Adversarial Network for Pedestrian Detection".

So, the main motivation of this work, that thermal cameras often suffer from low contrast, low resolution, and blurred detailed and for sure this kind of problems could limit the feasibility of infrared camera applications.

That's why, in this work, we intend to enhance the visual quality of thermal image in order to improve the detection performance.

About the stat-of-the-art in this field, we can found some traditional methods such as the histogram equalization and also we can make use deep learning methods such as VDSR and SRCNN. The main problem of the existing methods that they try to handle one single problem, which could essentially be the limited contrast and the low resolution.

However, in this paper we intend to handle different problems in one single architecture, that we call TE-GAN to refer to thermal enhancement–GAN. So, this architecture is basically inspired from Enlighten GAN and DNCNN and it based on the generative adversarial network. For more details, the proposed architecture is composed of two models with a post-processing step to cover the different limitations that we mentioned at the beginning. So the first module is to improve the contrast using U-NET generator and global and local discriminators. Here, we used a perceptual loss. In the second model, we remove the noise level by a CNN generator and by a global discriminator, so, here we use a content loss. Then, we add a post-processing step, which aims to highlight the edge and to decrease the visual blurred effects by means of an edge enhancement filter. At the end, we combined the different losses in one overall function.

For experiments, we used KAIST dataset, which is a multispectral dataset, however, we are going to use only thermal images.

In the first step, we evaluate the visual quality of the images by computing PSNR and SSIM, and here we compare our obtained results to the histogram equalization method and to CLAHE method and as you can see in this table, we obtained better results. Also, in figure n°2, we show some qualitative results of the same methods. In the second step, we are going to prove the impact of enhancement on the detection results. So, here, we compare the performance of yolov3 detector with and without enhancement in terms of log average miss rate and mean average precision. As you can see from this table we have an improvement of 3% in terms of mAP and 2 % in terms of LAMR. In figure n°4, we show some results of this detection method with and without enhancement.

So, to conclude in this paper, we proposed a new architecture called TE-GAN. We showed the effect of this architecture by obtaining better qualitative and quantitative results compared to the original thermal images and to other existing enhancement methods. Also, we proved the impact of this enhancement architecture by obtaining better results using yolov3 detector. As perspective, we can extend the proposed approach to other applications such as people tracking and activity recognition. Also we can consider other module to augment the resolution of the image.

Thank you.