ERCIM fellowship Programme
Final scientific report

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Host Organisation	Fraunhofer IIS, Erlangen

Scientific coordinator	Heiko Sparenberg

I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

The total fellowship duration can be divided into two phases. During the first phase, I spent most of the time on literature survey related to the problem and understanding importance of the problem. I also look at the possible applications of video super-resolution in the field of computer vision.

Super-resolution has wide range of real-world applications, such as medical imaging, surveillance and security, amongst others. Other than improving image perceptual quality, it also has place as the end module in many computer vision tasks, like segmentation and image/video compression. This problem is very challenging and inherently ill posed since there are always multiple HR images corresponding to a single LR image. In literature, a variety of classical SR methods has been proposed, including patch-based, prediction-based, edge-based, statistical methods, and sparse representation methods, etc. A variety of deep learning-based methods have been applied to tackle SR tasks, ranging from the early Convolutional Neural Networks (CNN) based method to recent promising SR approaches using Generative Adversarial Nets (GAN), transformers. In this program duration, I have trained the following models and tested on different datasets.

SRGAN

BasicVSR++

Swin2sr

VRT: A video Restoration Transformer

RSTT: Real-time Spatial Temporal Transformer for Space-Time Video Super-Resolution

RealBasicVSR

To accomplish the above-mentioned tasks, I learnt deep learning library, PyTorch and optimization methods. I compared the performance of these methods on the standard datasets. I also used LPIPs, and PSNR metrics for comparison.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

No publications till date

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

- *The 7th Summer School on AI with Focus on Computer Vision and Machine Learning (Online Mode) organized by IIIT Hyderabad will be held from 01 August to 31 August, 2023.*

- *The conference on Computer Science and Intelligence Systems FedCSIS 2023, Warsaw, Poland*

IV – RESEARCH EXCHANGE PROGRAMME (REP)

I thank my management and scientific coordinator for allowing me to visit two wonderful labs as part of the REP. I am also thankful to Catherine and Emma for the support in finding the host.

REP1: From 4th to 15th Sep 2023. I visited NTNU Gjovik, Norway hosted by Prof Kiran Raja.

I got the opportunity to meet several research scholars (PhD and post-doc) from His lab, also includes meeting former ERCIM fellow (Kishor Upla) and current fellow as well. There are many wonderful works published by Prof Kiran which has common interest with me. We discussed works related to image forensics, different types of possible forgeries. Focussed discussions on the image/video splicing problem and the possible cues to detect splicing forgery. We also discussed about recent deep learning models for image/video super-resolution(SR). The possibilities to apply frame-wise super-resolution for video SR and the possible artifacts result in time axis. How to harness motion information between consecutive frames for better SR results. This research visit helped me to interact with various research groups at NTNU and to build collaborative partnerships.

REP2: From 18th to 29th Sep 2023. I visited University of Warsaw, Poland hosted by Prof Dominik Slezak.

Prof Dominik is expert in machine learning and rough sets. He introduced me rough set and math behind it. During my visit, I had the opportunity to meet many researchers of diverse areas of interest. Prof recommended to attend the conference on Computer Science and Intelligence Systems FedCSIS 2023. It's wonderful experience to be part of huge gathering and interacting with them. These discussions helped me to understand the math behind decision making and also introduced me to many new research problems. The two main interesting areas include AI for agriculture and AI for medical applications lead to fruitful discussions.