Face recognition (FR) system is a basically computerised algorithm which enables identification and/or verification of face from a digital image or from a video data. It is very popular and most active area of research as it received importance in many practical or real world applications. The most important application of FR is in video surveillance for security applications which demands accurate face recognition as time progresses. It is also very challenging due to variations of the faces with different poses, unique expression of faces, facial occlusions and also with the low resolution (LR) nature of acquired data. The nature of low resolution comes since data is normally acquired from a distance and it also depends on the different environmental conditions. The research of FR for low resolution images has great scope as it is more practical scenario in almost all data acquisition devices. During one year stay at NTNU, Gjovik as ERCIM fellow, I have done research on the topic of low resolution face recognition and its related applications.

Many FR approaches consists pre-processing of data including super-resolution of LR image in order to increase its accuracy. Super-resolution (SR) is an algorithmic technique to increase the spatial resolution of the given LR observation. Literature shows that the SR using machine learning algorithms outperform than the existing traditional methods.
In machine learning, specifically convolutional neural networks (CNNs) obtain breakthrough results in the SR task. CNN has ability to learn abstract representation of input image. During this fellowship duration, I worked on SR of face image with the focus to improve the FR accuracy. In this directions, we proposed to apply solution based on compact CNN network which is capable to obtain SR of face image of size as small as 8x8 pixels for upscaling factor of 8. This work is extended for FR system with the motivation to increase its accuracy. Further, the idea of SR is also applied for thermal imagery which are very useful for surveillance applications during night-time. During my stay as an ERCIM fellow, I have published five conferences papers, participated in two challenges and also written two journal papers which are currently under reviewed. Further, our work has been recognised as a winner of the Perception Beyond the Visible Spectrum (PBVS) challenge and also received best paper award in the PBVS workshop of CVPR-2020 conference. Our future directions focus in designing generative adversarial network (GAN) which has an ability to generate visually appealable solutions. In GAN, discriminator network forces the generator network to produce the perceptually visible solutions. Use of GAN in order to obtain SR image allows to extract more features from the LR image which results in accurate FR algorithm.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

Journal Papers:


Conference Papers:


- Kalpesh Prajapati, Vishal Chudasama, Heena Patel, Kishor Upla, Raghavendra Ramachandra, Kiran Raja, Christoph Busch. “Unsupervised Single Image Super-


Challenge participation:

III – ATTENDED SEMINARS, WORKSHOPS, CONFERENCES
- Attended one day NBL workshop at NTNU, Gjøvik on 4th March, 2020.
- Attended and presented our works in CVPR-2020 during 14-20th June, 2020.
- Attended and presented our work in INTAP 2020 held at NTNU, Gjovik during during 28-30th, September, 2020.

IV – RESEARCH EXCHANGE PROGRAMME (REP)

- One week Research Exchange Programme (REP) at INESCTEC, Porto, Portugal during 1-5th October, 2020.
- One week Research Exchange Programme (REP) at IGD, Fraunhofer, Germany during 19-23rd, October, 2020.