MULTI-MODAL HISTOLOGY IMAGE REGISTRATION THROUGH ADVERSARIAL NETWORK

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Background

- Registration of WSI from different modalities (multi-modal) : H&E and IHC image

- Traditional deep learning-based registration methods: DirNet, FCN, Unet Voxelmorph etc. does not perform well for multi-modal registration

- Several existing methods converted different modality image into one single modality by image translation method followed by registering the synthetic and original images

- In our study, we converted multi-modal images into one modality (synmono-modal) i.e. translated H&E to synthetic IHC image by modified CycleGAN model followed by registering original IHC images w.r.t. syn IHC images

- Demonstrated that the registration performance is better for synmono-modal image pairs compared to the multi-modal image pairs

- Extended FCN registration model by incorporating multi-scale features recovering better IHC registered images
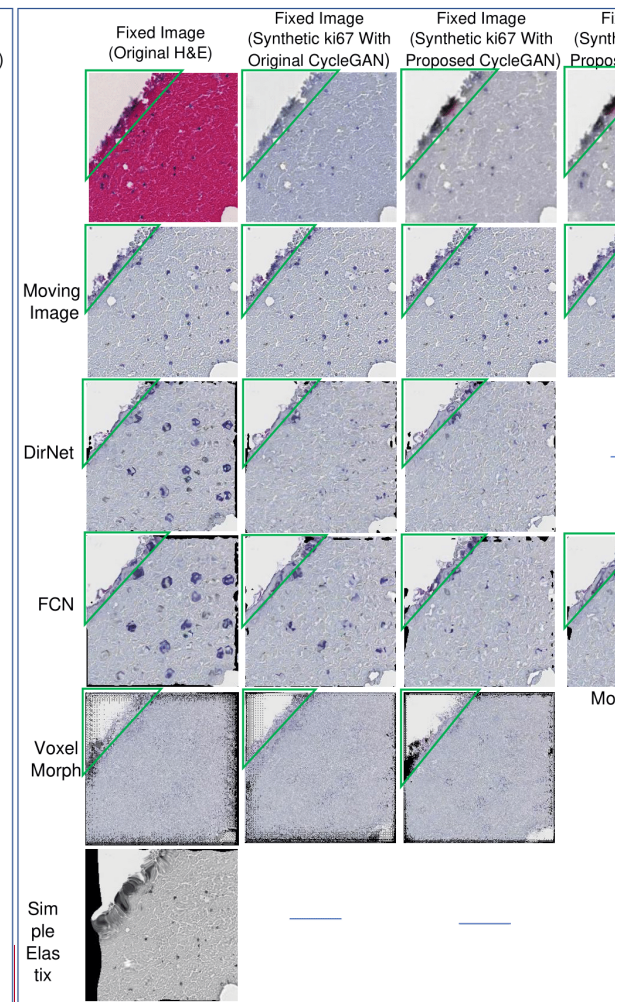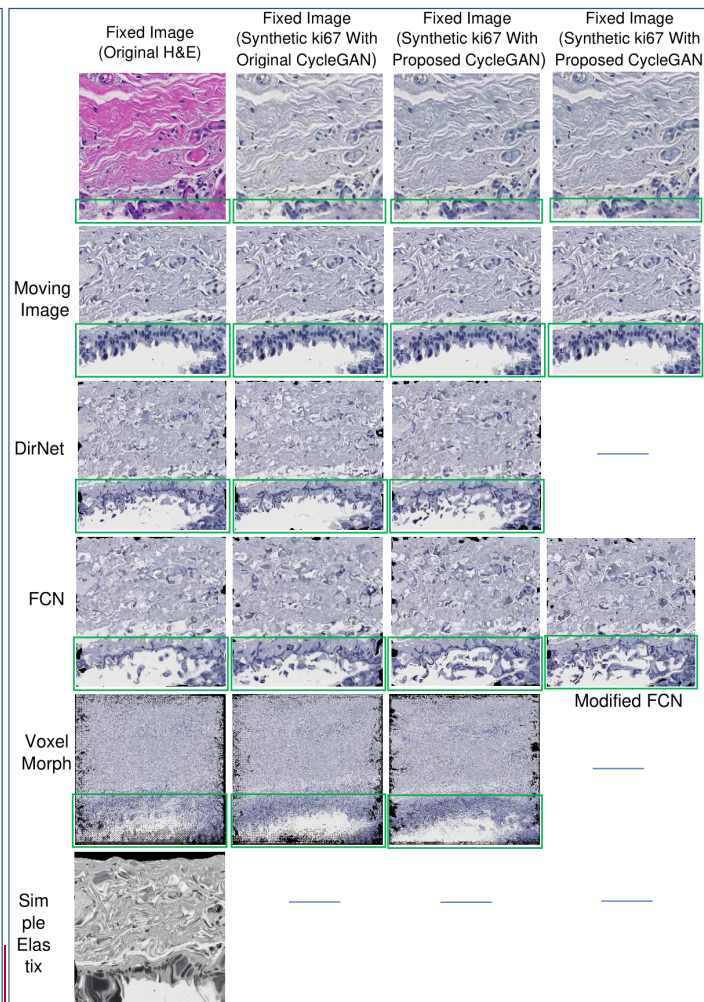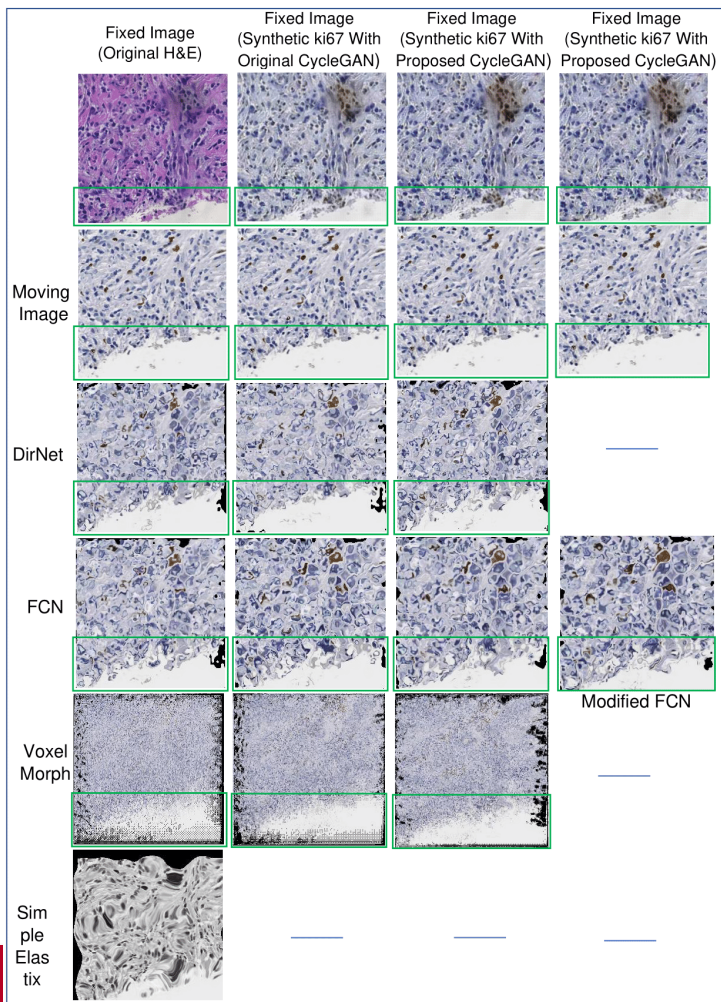
Registration pipeline & Analysis
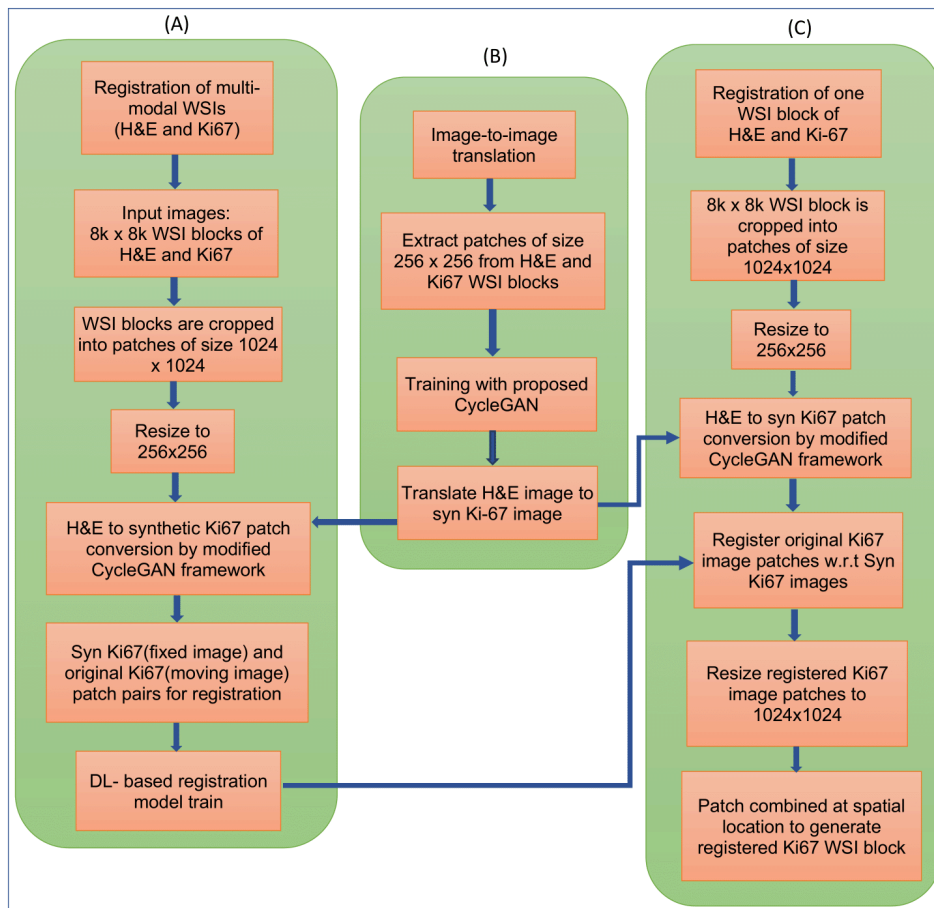
- Each WSI block of size 8K×8K is divided into small patches and passed through the traditional deep learning models to predict DVF to register the moving IHC image w.r.t the H&E image / syn IHC image
- Registered IHC patches are spatially combined to generate registered IHC WSI blocks
- The pictorial as well as quantitative values suggest that FCN and our proposed multi-scale FCN with syn IHC (fixed) generated by our proposed CycleGAN and original IHC (moving) image pairs demonstrate better registration performance compared to the other model variations
- For each model variations synmono-modal data (syn IHC with our proposed CycleGAN and original IHC) performs better registration than the multi-modal (original H&E and original IHC) data

Peliminary Registration results

Thank you