# RayEmb: Arbitrary Landmark Detection in X-Ray Images Using Ray Embedding Subspace
## (Supplemental Material)

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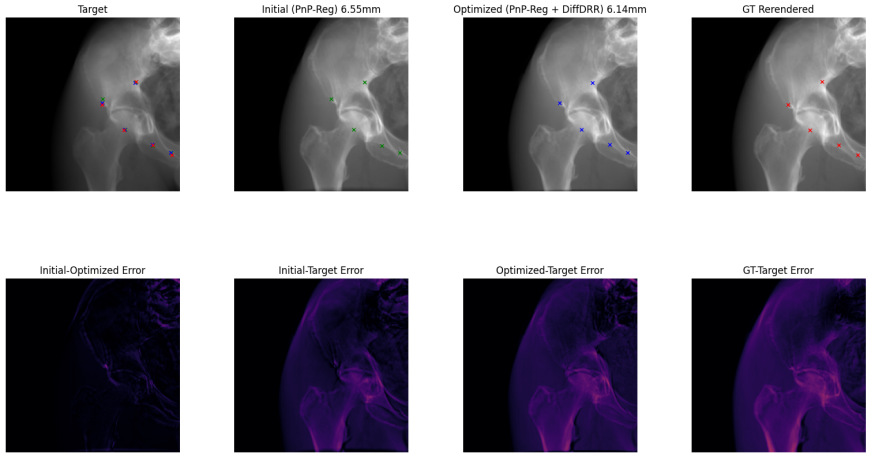
## 1 Registration Results

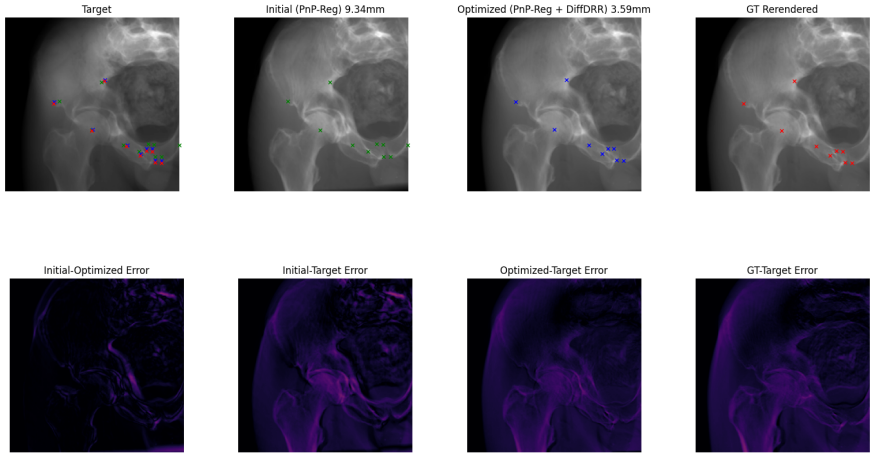
In Fig. 1, We present registration results of specimen 6 from the DeepFluoro [1] dataset using the proposed method RayEmb method trained on CTPelvic1K CLINIC [2] dataset. The top section of each figure is structured as follows: the input image, the initial pose estimate from RayEmb, the pose estimate after optimization with DiffDRR, and the ground truth rendered using DiffDRR for comparison of discrepancies between the real X-ray image and the CT scan.The bottom section displays difference images in the following order: the difference between the renderings of the initial and optimized poses, the difference between the rendering of the initial pose and the input image, the difference between the rendering of the optimized pose and the input image, and the difference between the rendering of the ground truth pose and the input image.

## References

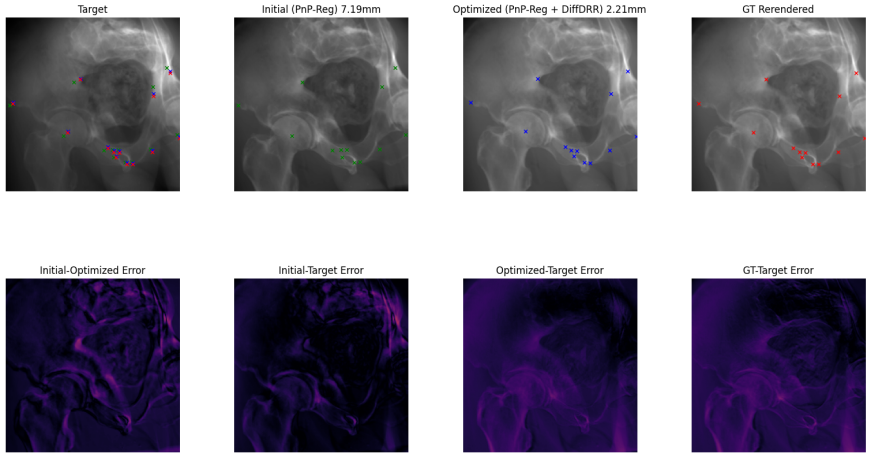
1. Grupp, R.B., Unberath, M., Gao, C., Hegeman, R.A., Murphy, R.J., Alexander, C.P., Otake, Y., McArthur, B.A., Armand, M., Taylor, R.H.: Automatic annotation of hip anatomy in fluoroscopy for robust and efficient 2D/3D registration. Int. J. Comput. Assist. Radiol. Surg. **15**(5), 759–769 (May 2020)
2. Liu, P., Han, H., Du, Y., Zhu, H., Li, Y., Gu, F., Xiao, H., Li, J., Zhao, C., Xiao, L., Wu, X., Zhou, S.K.: Deep learning to segment pelvic bones: large-scale CT datasets and baseline models. Int. J. Comput. Assist. Radiol. Surg. **16**(5), 749–756 (May 2021)




**(a)** Specimen 6 #0000

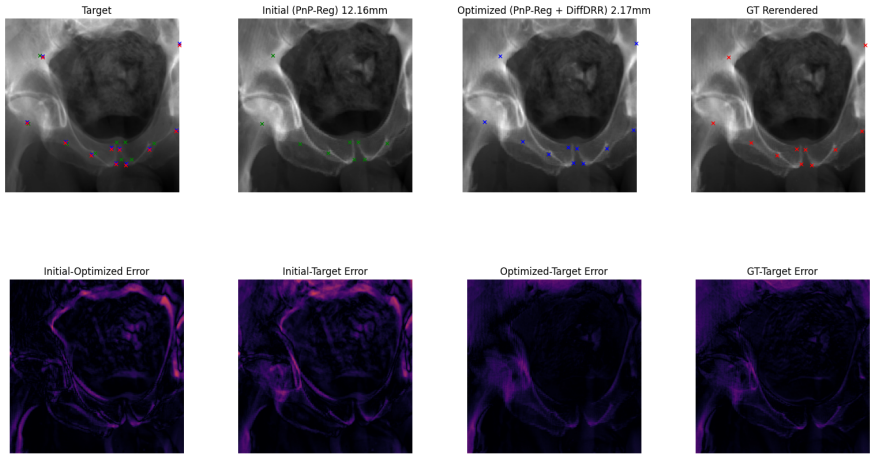



**(b)** Specimen 6 #0002

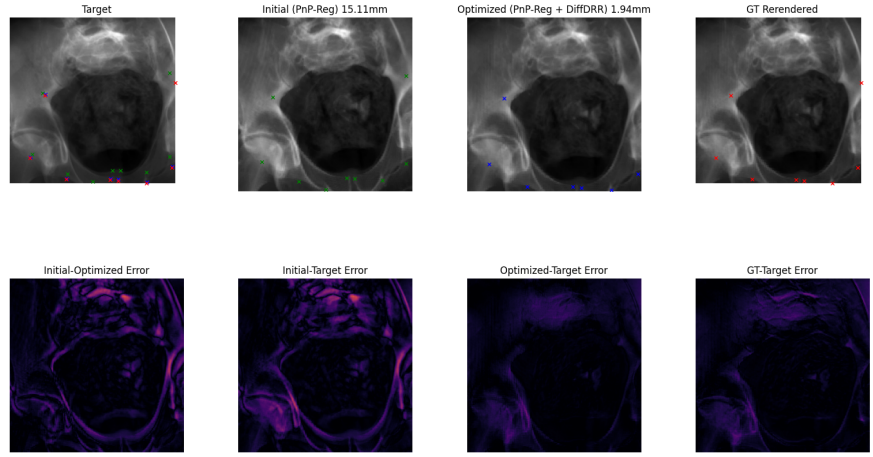



**(c)** Specimen 6 #0006

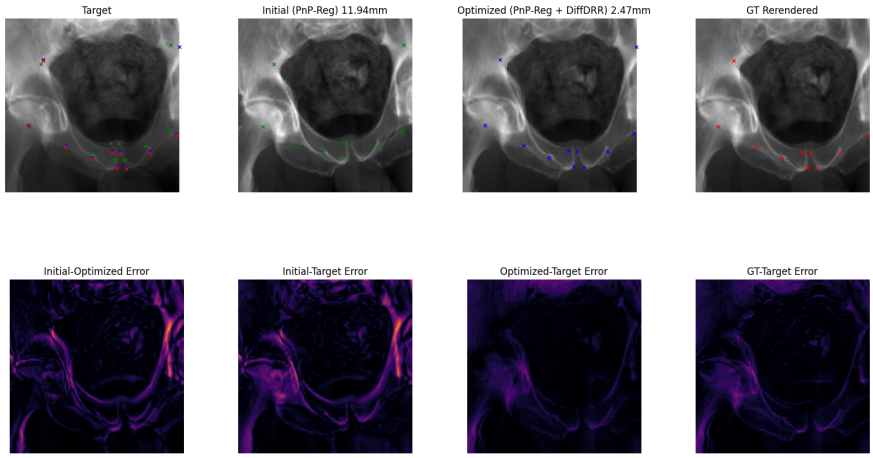
**Fig. 1:** Registration results for Specimen 6. Continued on the next page.




**(d)** Specimen 6 #0012




**(e)** Specimen 6 #0014




**(f)** Specimen 6 #0015

**Fig. 1:** Registration results for Specimen 6 (continued).