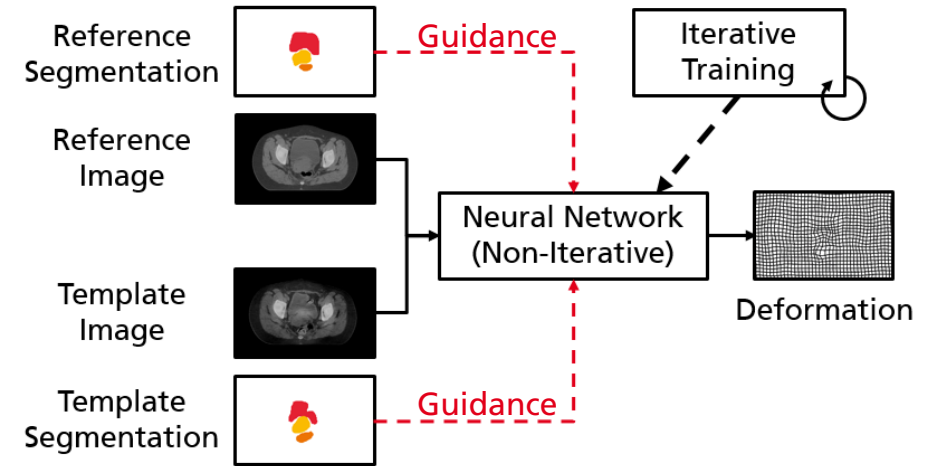


LEARNING DEFORMABLE IMAGE REGISTRATION (DIR) WITH STRUCTURE GUIDANCE CONSTRAINTS FOR ADAPTIVE RADIOTHERAPY

- Successful learning of DIR, minimizing objective function from variational image registration:

$$D(R, T(y)) + \alpha S(y) \stackrel{!}{=} \min$$

- Structure guidance constraints improve learning of DIR
- Providing segmentations only on one image already improves registration
- Comparable results to state-of-the-art iterative variational approaches with structure guidance
- Faster than conventional variational methods
 - Registration in a single forward pass
 - Easy to parallelize and implement on GPU



| Registration Method | Dice | Surface Distance [mm] | Runtime |
|----------------------------------|-----------|-----------------------|--------------|
| Affine Prealignment | 0.64±0.15 | 5.49±2.87 | - |
| Variational | 0.72±0.13 | 4.13±2.50 | 15s (CPU) |
| Variational with Guidance | 0.91±0.09 | 1.07±0.96 | 20s (CPU) |
| Learning | 0.76±0.15 | 3.34±2.40 | < 0.1s (GPU) |
| Learning with Guidance | 0.91±0.08 | 1.28±1.16 | < 0.1s (GPU) |