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Improving CBCT image quality in adaptive radiation therapy using deep learning

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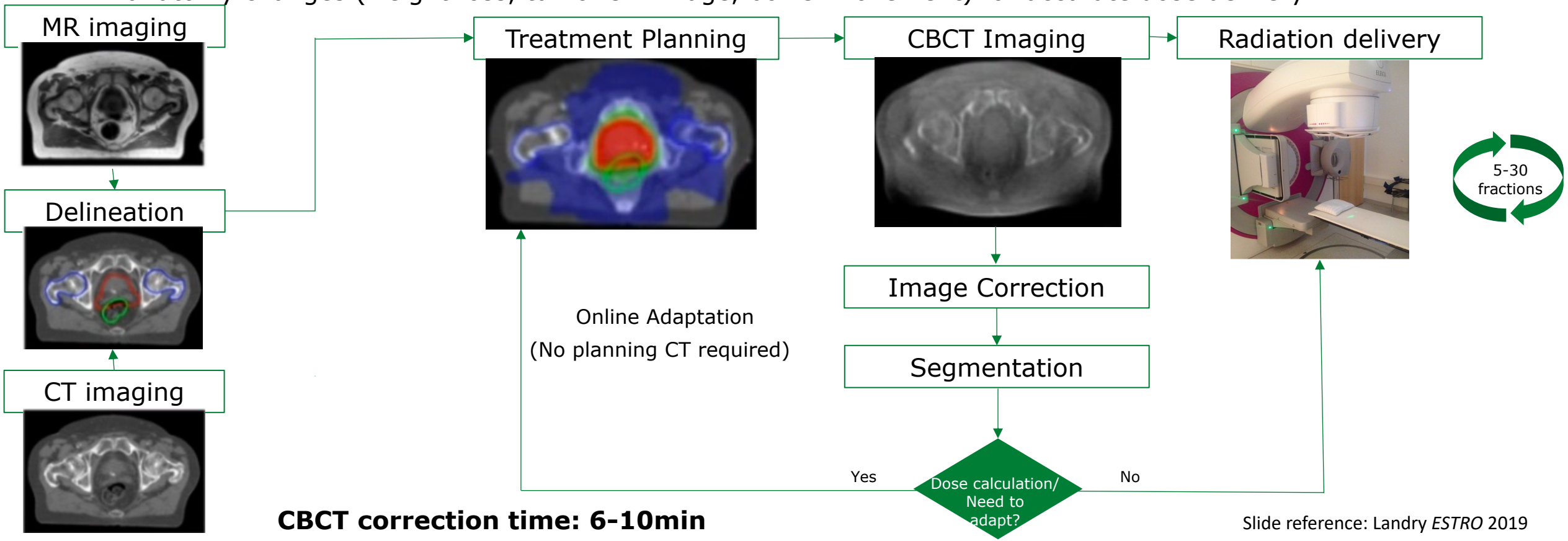
Introduction

CBCT-guided Online Adaptive Radiation Therapy

- **Aim of Radiation Therapy:** deliver prescribed ionizing radiation (proton/photon) dose to cancer cells without damaging organs–at-risk or adjacent healthy cells
- **Online Adaptive Radiation Therapy**: replan at each fraction based on in-room imaging, adapting the dose to the anatomy changes (weight-loss, tumor shrinkage, bowel movement) for accurate dose delivery



CBCT correction time: 6-10min

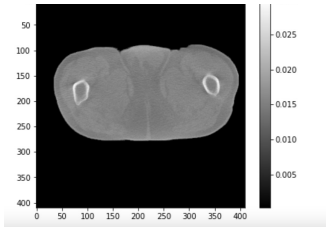
Slide reference: Landry *ESTRO* 2019

Project 1: Correct CBCT using ScatterNet

Project Overview

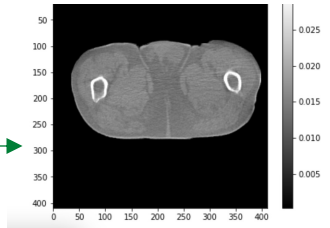
- Objective: To improve original CBCT image quality with the corrected images
- Methods and Materials: U-net Paired Training; 42 prostate patient datasets(27 training, 7 validation, 8 testing)

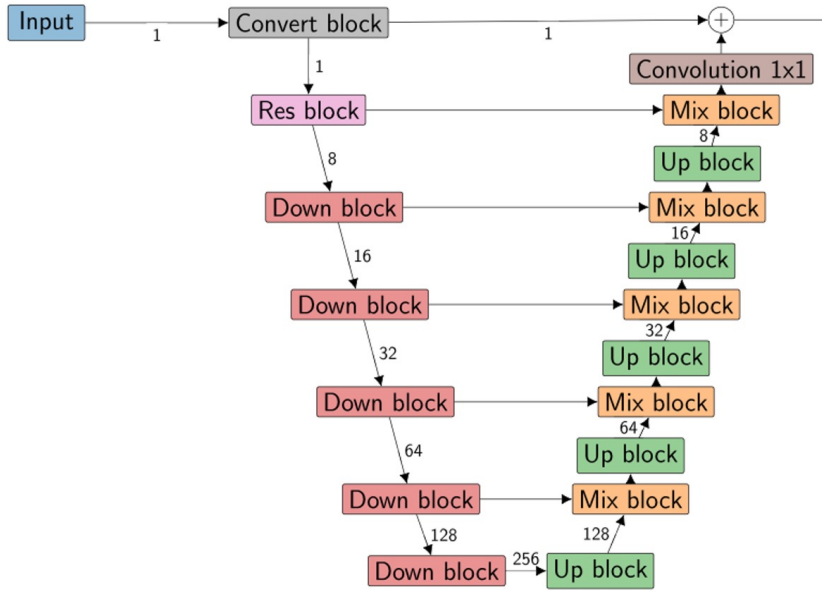
Original CBCT

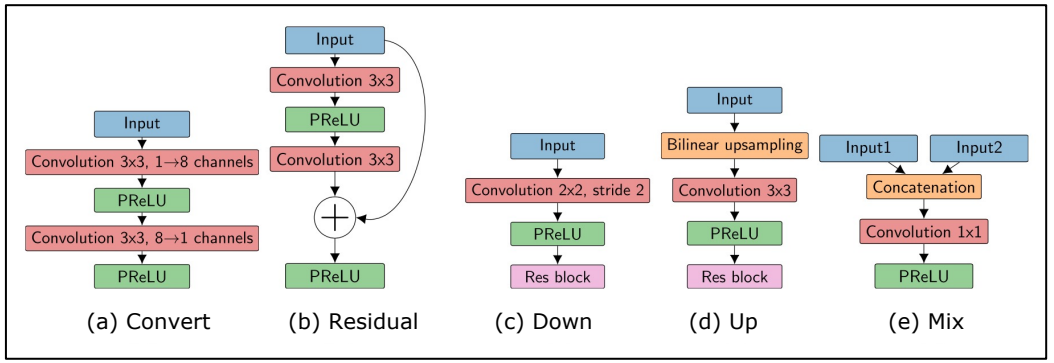


ScatterNet

Corrected CBCT







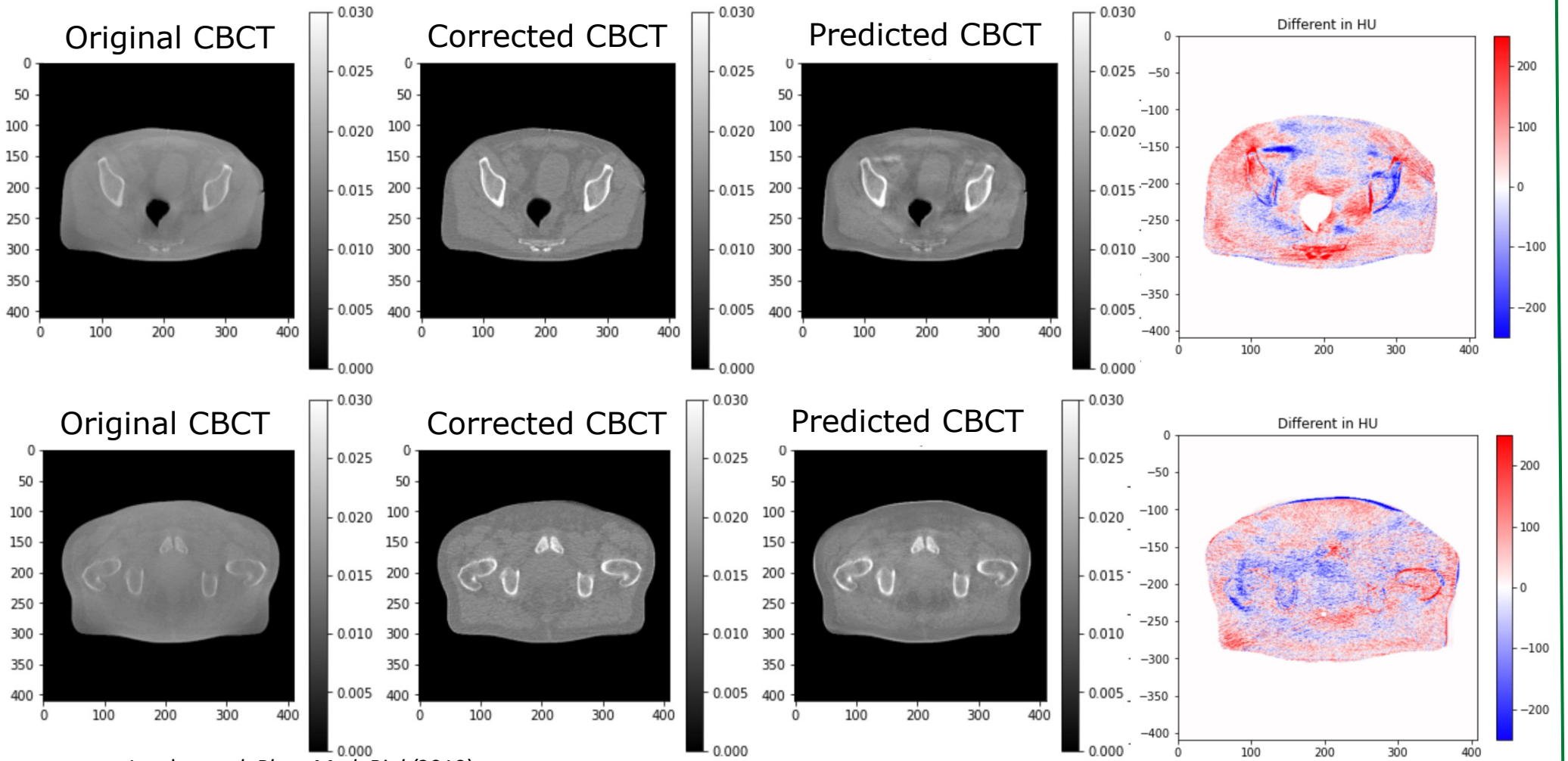
Loss function: Mean Square Error

Landry *et al. Phys. Med. Biol (*2019)

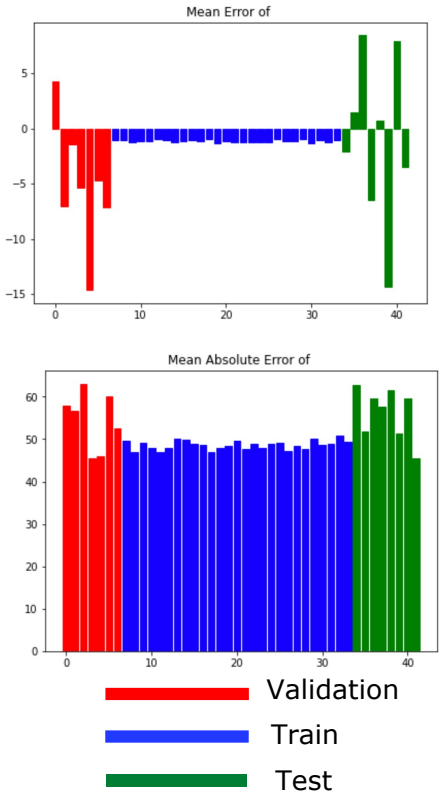
Plan 1: Correct CBCT using ScatterNet

Result: Test data and Analysis

Test Results



Analysis



State-of-the-art:
ME -1 MAE 58
This experiment:
ME -0.98 MAE 56.3

Landry *et al. Phys. Med. Biol (*2019)

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The End

Thank you for your attention!

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