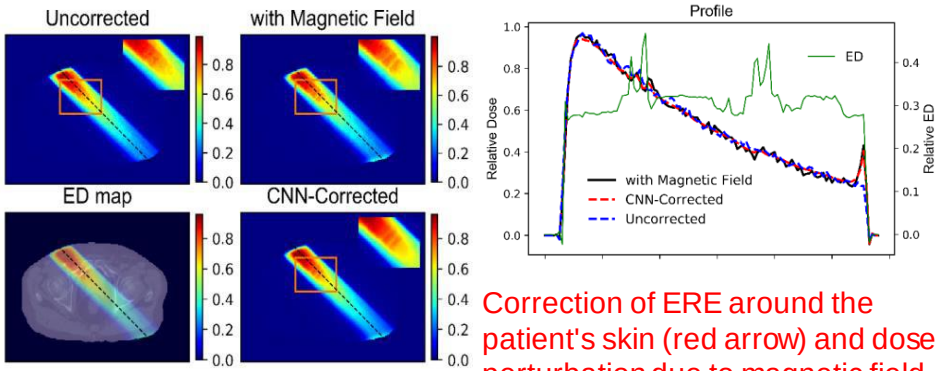
Tohoku Univ. Technology

Quick dose calculation algorithm under magnetic field using deep learning

Quick and accurate dose calculation under magnetic field



Correction of ERE around the patient's skin (red arrow) and dose perturbation due to magnetic field around the bone (green arrow)

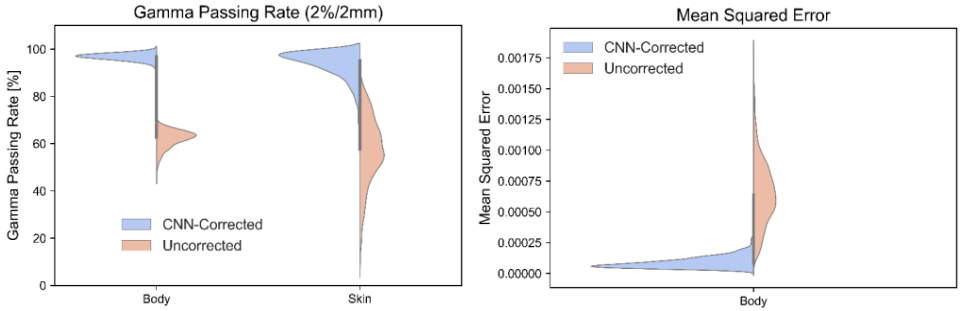
Overview

MR-Linac, which combines MR device that uses magnetic field and radiotherapy device (Linac), has begun to develop as a new treatment device for radiotherapy. On the other hand, since the therapeutic radiation is bent by the magnetic field emitted from the device, it is necessary to create a treatment plan based on the dose distribution in order to take into account magnetic field influence, but existing methods require time-consuming.

In general, calculation algorithm such as convolution / superposition is quick (about 1-2 minutes), but it cannot take into account magnetic field influence. On the other hand, high precision algorithm such as the Monte Calro Algorithm can take into account magnetic field influence, but the calculation is slow (about 10 to 20 minutes).

This invention solves above issue by using deep learning technology to perform dose calculation. Currently, there is no accurate and quick dose calculation algorithm under magnetic field, so this invention is essential for MRI guided radiotherapy.

Features･Outstandings



The CNN-corrected (CNN-corrected) dose distribution shows good agreement with the true value which is the dose distribution with magnetic field, compared to uncorrected one (uncorrected).

Product Application

- MR-Linac
- Intensity-modulated radiation therapy : IMRT
- Adaptive radiotherapy : ART

Related Works

[1] Tomohiro K, Noriyuki K, et al: *Phys Med*, 80, 186-192, 2020.

IP Data

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