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A Computational Model for Radiotherapy Studies with Proton Mini-Beams

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Radiotherapy is a cornerstone of both curative and palliative cancer care. It is estimated that half of all cancer patients will receive radiotherapy during the course of their treatment. However, radiotherapy is severely limited by radiation-induced toxicities. Irradiation of noncancerous "normal"tissues during the course of therapeutic radiation can result in a range of side effects including self- limited acute toxicities, mild chronic symptoms, or severe organ dysfunction. These side effects of the used radiation treatments are the reason that the research for new types of radiation treatments continue to be investigated.
Mini-beam radiotherapy is a new type of radiotherapy that has been presenting very good results in the reduction of the effects of radiation in healthy tissues. This new type of treatment, studied with for both X-ray and proton therapy, uses a combination of spatial fractionation of the dose and millimetric filed sizes. In mini-beam radiotherapy the tumor is both radiated with very high doses and low doses. The main goal of this work is to develop a new computational model for mini-beam radiotherapy and compare the results with previous studies, to help understand how it is possible that parts of the tumor that receive almost no dose show sterilization of the cancer cells and lower ability to multiply and spread, what ultimate leads the tumor to shrink.

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