iPC: IndividualizedPaediatricCure: Cloud-based virtual-patient models for precision paediatric oncology

Description

Effective personalized medicine for paediatric cancers must address a multitude of challenges, including domain-specific challenges. To overcome these challenges, we propose a comprehensive computational effort to combine knowledge-base, machine-learning, and mechanistic models to predict optimal standard and experimental therapies for each child. Our approach is based on virtual patient models in-silico avatars whose analysis can inform personalized diagnostics and recommend treatments. Our platform will also allow care givers to query models and infer benefits and drawbacks for specific treatment combinations for each child. To construct these models, we will combine state-of-the-art computational methods and data from molecular assays, and clinical and preclinical studies. We will test their predictions prospectively on data from clinical trials and test therapies in pre-clinical settings. We will focus on a select panel of paediatric tumours including both high-incidence and high-risk tumour types.

To accomplish our goals, we have assembled an interdisciplinary team that consists of basic, translational, and clinical researchers who are all amongst the leaders in their respective fields and who have established strong relationships with European Centres of Excellence, patient organizations, and clinical trials focusing on personalized medicine for our proposed case studies. We will produce, assemble, standardize, and harmonize accessible high-quality multi-disciplinary data and leverage the potential of Big Data and HPC for the personalized treatments of European citizens. We will make our models and data available through a cloud-based platform, whose exploitation will be maximised through a collaboration with the European Open Science Cloud initiative. In summary, iPC will address the critical need for personalized medicine for children with cancer, contribute to the digitalization of clinical workflows, and enable theDigital Single Market of the EU data infrastructure.

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