PREFACE

The book covers the recent research and applied solutions in the area of computational oncology and personalized medicine, being the topic of the *Priority Research Area* #1 (POB1) of the *Silesian University of Technology*. The chapters are the result of the research conducted by the staff of the Silesian University of Technology and cooperating partners of the socio-economic environment. It aims to present research results and interests and to exchange information on scientific activities related to the topics of POB1.

The idea behind the monograph is to promote the paradigm change from delayed reactive medical services to evidence-based Predictive, Preventive & Personalised Medicine (3PM / PPPM; www.epmanet.eu). We hope that this publication will help to spread the conducted research with the external scientific community.

The chapters of this book cover topics that are the response of the scientific community to the needs raised by clinical partners, including such up-to-date and critical research like solutions helping to fight against the COVID-19 pandemic. The presented research can be grouped in several frames:

Medical image processing (removing compression artefacts and tumour detection in histopathological images) and **segmentation** (angiography blood vessel segmentation; chondromalacia lesions of the femoral head).

Bioinformatics applications (genome sequencing; counting all substrings of specific length occurring in the set of input sequences; tumour subclonal reconstruction pipelines).

Modelling in biomedicine: bioheat transfer (in oncological hyperthermia and tissue cryopreservation) as well as modelling of reaction – diffusion – precipitation reactions.

Classification systems (head and neck cancer biopsy) and **visualization of the large datasets** (in chest X-ray imaging, in COVID-19 patients, that allows differentiating the covid patients).

Personalized medicine (effective personalized therapy in neurological patients) and **novel software** applied in rehabilitation (hemispatial neglect syndrome; measurement/diagnostic station for auditory processing disorders diagnosis and therapy).

The book ends with a chapter on **biomaterials research** (polymeric materials in regenerative medicine).

The publication of the book is one of the activities carried out by the *Silesian University of Technology* It is published, among others, as a result of *The Excellence Initiative - Research University programme.* As one of ten Polish universities, *The Silesian University of Technology* obtained the status of a *research university* and commenced the implementation of the programme aimed at increasing its scientific excellence and international significance.

Editors would like to express their gratitude to the authors who have submitted their original research chapters as well as all the reviewers for their valuable comments. Your effort has contributed to the high quality of the book that we pass on to the readers.

We also hope that the book can also help to ignite a new, joint, interdisciplinary and challenging research and will lead to the implementation of novel diagnostic tools, drugs, therapies, etc. that could lead to an increase in life quality.

Sylwia Bajkacz
Ziemowit Ostrowski
Gliwice, September 2021