Dr. Sarah C. Brüningk

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I am a highly skilled and ambitious postdoctoral researcher working on the interface computational biology, machine learning and oncology. My expertise in both, practical biological lab work and computational implementations sets me apart from other computational biologists. This experience and my motivation to further scientific progress enable me to pursue challenging projects where multidisciplinary team work is key.

Employment

since 4/20 — **Postdoctoral research fellow,** *Swiss Federal Institute of Technology, Zurich, CH*
- Projects: Transfer learning for Alzheimer's Disease onset prediction based on magnetic resonance imaging; Mathematical modelling for personalized radiotherapy treatment optimization for recurrent high-grade glioma patients; Spatio-temporal modelling of the spread of the Sars-Cov-2 epidemic in Basel city.

09/2019 – 3/20 — **Postdoctoral research fellow,** *Swiss Federal Institute of Technology, Zurich, CH*
- Project: Response prediction of metastatic melanoma patients to immunotherapy combination treatments based on CyTOF, flow cytometry and scRNAsq data.

10/2018 – 08/2019 — **Postdoctoral research fellow**, *The Institute of Cancer Research,* London, UK
- Project: Computational modelling of tumour response to multimodality cancer therapies of radiation, chemotherapy and hyperthermia in advanced bladder cancer patients.

05/2014 – 09/2014 — **Medical physicist**, *Klinikum rechts der Isar*, Munich, DE
- Radiotherapy treatment planning in Eclipse, Linear accelerator and patient IMRT QA, radiotherapy plan approval, treatment delivery supervision

07/2012 – 04/2013 — **Working student in radiotherapy research**, *Klinikum rechts der Isar*, Munich, DE
- Data analysis of cell irradiation experiments in MATLAB
- Contribution to a research treatment-planning platform for particle cancer therapy

03/2011 – 05/2011
10/2011 – 12/2011 — **Working student in soft matter research**, *Technische Universität München*, DE
- Analysis of polymer solutions using dynamic light scattering

Education

10/14 – 01/19 — **PhD in Biophysics**, *The Institute of Cancer Research*, London, UK
- Final result: no corrections, received in 1/19
- Title: "Biological Dosimetry for multimodality therapies" – *In vitro* experiments, systems oncology simulations, and cell survival modelling to quantify the biological effects of combination treatments of therapeutic ultrasound and radiation therapy

10/2011 – 05/2014 — **M.Sc. in Physics (Biophysics)**, *Technische Universität München*, Germany
- Final result: 1.1 (passed with high distinction)
- Thesis: "EUD-based biological optimization for carbon ion therapy" – Implementation of an EUD-based treatment optimization algorithm for particle therapy
- 01/2012 – 05/2012 **Semester abroad,** National University of Singapore, Singapore
  Supported by the PROMOS stipend of the German Academic Exchange Service

10/2008 – 0/2011 — **B.Sc. in Physics**, *Technische Universität München*, Germany
- Final result: 1.7 (passed with merit)
- Thesis: "New Systems for drug delivery" – Dynamic light scattering experiments on amphiphilic block copolymer solutions
- 01/2010 – 05/2010 **Semester abroad**, Université de Rennes I, France
  Supported by the EU Erasmus stipend

Scientific Recognition

- Oral conference presentations at >20 national and international conferences
- Seven first author publications in leading scientific journals in the field of biology, biophysics, mathematical modelling and machine learning
- Reviewer for leading medical physics journals (Medical Physics, Physica Medica, Ultrasound in Medicine and Biology, Cancers)

Scholarships and Fellowships

10/2021	**Postdoctoral Fellowship**, Botnar Research Centre for Child Health Postdoctoral Excellence Program - 350,000CHF
09/2014-09/2018	**PhD Studentship**, The Institute of Cancer Research PhD Studentship - (£84 000 (salary) + 29 000 (consumables))
2017	**Student internship**, Focused Ultrasound foundation Global Internship Program,1000$
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Awards and Honors

07/2021	**Travel Award**, European Congress of Clinical Microbiology and Infectious Diseases, virtual Meeting: "Determinants of SARS-CoV-2 transmission in an urban area"
11/2019	**Travel award** and **Competition Winning Team Member**, The Institute of Mathematical Oncology workshop on Evolutionary Tumor Boards, Tampa, USA – 50k $ to continue the proposed project on personalized therapy approaches for recurrent glioblastoma
07/2019	**Institute of Cancer Research Postdoctoral Travel Award**, to attend the Annual Meeting of the Society for Mathematical Biology, Montreal, Canada
07/2017	**Sensius Young Investigator Award**, European conference of Hyperthermic Oncology, Athens, Greece
06/2017	Travel award and Nadine Barrie Smith Student Award, International Society for Therapeutic Ultrasound, 17th Annual Symposium, Nanjing, China
06/2017	**Poster prize,** The Institute of Cancer Research Annual Meeting, London, UK
05/2017	**Best presentation**, Workshop on Prediction and Modelling of response to Molecular and External Beam Radiotherapy, Le Bono, France
07/2016	**Travel award** by the University of London Scholarship Fund to attend the European Conference on Mathematical and Theoretical Biology, Nottingham, UK
04/2016	**New Investigator Travel Award**, International Congress of Hyperthermic Oncology, New Orleans, USA
02/2015	**Best Newcomer,** Therapeutic Ultrasound winter school, Les Houches, France
09/2014	**Travel award**, Joint Conference of the SGSMP, DGMP, OGMP, Zurich, Switzerland

Invited Speaker

07/2019	**Invited Speaker**, AAPM, San Antonio, USA
06/2019	**Invited Speaker**, International Society for Therapeutic Ultrasound, 19th Annual Symposium, Barcelona, Spain
04/2019	**Invited Speaker**, Medical Imaging Convention, Birmingham, UK
12/2018	**Seminar**, Aarhus University, Aarhus, Denmark
12/2018	**Seminar**, OncoRay, Dresden, Germany
11/2018	**Seminar,** University of Oxford, Oxford, UK
03/2018	**Seminar**, Fraunhofer Mevis, Bremen, Germany
03/2017	**Invited Speaker**, Workshop on Mathematical Medicine and Pharmacology, Swansea, UK

Institutional Responsibilities and Service to the community

07/2021-06/2022	**Group leader** of 'Effective Communication and Visibility for Women in Science' Mentoring Group, ETH Zurich
03/2021	**Organizing Committee member** of the Applied Machine Learning Days track on "Clinical Machine Learning"
10/2019	**Seminar Speaker** to present my career path to new PhD Students funded by Cancer Research UK
12/2016-08/2019	**Journal Club organizer**, Radiotherapy Modelling Team at the Institute of Cancer Research. Monthly meeting to discuss a latest publication in the field.
01/2015-01/2016	Initiator and organizer of the **Translational Science Student Club** at The Institute of Cancer Research. Organization of monthly meetings for multidisciplinary PhD students to fascilitate knowledge exchange and multidisciplinary collaboration.
04/2015-08/2019	**Vaulting Coach** at the RDA Diamond Center, Sutton, UK. Weekly coaching of a team of disabled children/teenagers and accompanying them to competitions and shows.

Supervision of junior researchers

Supervisor

09/2020-11/2020	**Merel Kuijs**, Master's Thesis, ETH Zurich (D-BSSE);
12/2020-06/2021	**Merel Kuijs**, Lab Rotation, ETH Zurich (D-BSSE);
10/2018-03/2019	**Sophie Duque**, Internship, The Institute of Cancer Research; 'Systems Oncology Simulations for in vitro response of microbeam therapy'
06/2018-08/2018	***Jie Man Low***, Summer student, The Institute of Cancer Research ' Combined treatments of radiotherapy and focused ultrasound in 3D tumour spheres'
07/2017-09/2017	**Jannat Ijaz,** Summer student, The Institute of Cancer Research 'Biological dosimetry for combined treatments of radiotherapy and focused ultrasound'

Co-Supervisor/ Mentor

Since 08/2019	**Lisa Braunstein**, Phd candidate, The Institute of Cancer Research, 'Poly (vinyl alcohol) (PVA) hydrogels as acoustic and thermal tissue mimic for therapeutic ultrasound'
12/2018-03/2021	**Douglas Brant**, Phd Thesis, The Institute of Cancer Research, 'Dosimetric and Radiobiological Predictors of Toxicity in Prostate Hypofractionation Clinical Trials'
10/2017-03/2018	**Amber Inman**, Master's Thesis, The Institute of Cancer Research, 'Acoustic and Thermal Characterisation of PVA Cryogels for use as Soft Tissue Mimics in HIFU Therapy'
10/2016-03/2017	**James Au**, Master's Thesis, The Institute of Cancer Research 'Design and characterization of an experimental set-up to study the cytotoxic effects of therapy ultrasound *in vitro*'

Skills

Computational skills

- **MATLAB**: >6 years experience, optimization toolbox, data visualization, processing, and fitting. Worked on a radiation treatment planning software, evaluation of biological data, and implementation of ODE models.
- **C++**: >3 years experience, standard library, STL containers, HPC implementation using OpenMP, multithreading and vectorization. Implementation of a high performance cellular automaton model.
- **Python**: >2year experience, single cell data processing (imputation, batch correction, clustering, visualization), ode solvers, optimization, machine learning using keras and tensorflow libraries for the implementation of a wide range of models including CNNS, CAEs, LR.

Lab skills

- Mammalian 2D/3D cell culture and aseptic technique
- Cell viability and survival testing (clonogenic assay, MTT, alamar blue, Cell titreGlow)
- Histological preparation and (IHC/IF) staining of tissue and spheroid sections
- (Fluorescent) microscopy, live cell analysis, flow cytometry
- Preparation of tissue mimicking materials and cell scaffolds
- DNA and protein extraction, western blotting

Outreach Activity

Since 05/2021	**Skype a scientist.** I regularly (~1 per month) introduce children, adolescents, and adults to my research projects and I teach them basic concepts of science, oncology, and physics.
12/2018-03/2021	**School visit and Science Fair** at local institutions in Sutton, UK. I introduced 5th and 6th graders to the concept of cancer biology and cancer treatments during a school visit, including hands on demonstration of "sound waves".
10/2017-03/2018	**Lab tour guide** for local politicians, and school groups to present the work at the Institute of Cancer Research. Event were performed approximately 2-3 times a year for individuals and groups of up to 5 participants.

Referees

- Prof. Dr. K. Borgwardt, Swiss Federal Institute of Technology, Zurich, CH; karsten.borgwardt@bsse.ethz.ch
- Prof. Dr. G. ter Haar, The Institute of Cancer Research, London, UK; gail.terhaar@icr.ac.uk
- Prof. Dr. U. Oelfke, The Institute of Cancer Research, London, UK; uwe.oelfke@icr.ac.uk
- Dr. G.G. Powathil, Swansea University, Swansea, UK; g.g.powathil@swansea.ac.uk
- Prof. Dr. Jan J. Wilkens, TU München, München, Germany; wilkens@tum.de