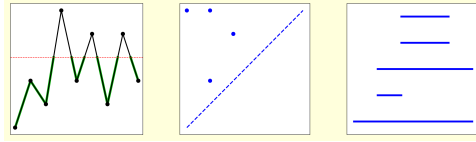# Workshop on Topological Analysis of Medical Data

Gdańsk University of Technology, December 1–3, 2021

Aims and scope: Computational topology has been recently finding applications in a variety of fields, including medical data analysis. The purpose of the workshop is to stimulate dialogue between researchers that work in the fields of computational topology, dynamical systems, applications of mathematics, and the analysis of medical data. In particular, selected scientists from Gdańsk University of Technology, Medical University of Gdańsk, and Dioscuri Centre in Topological Data Analysis are going to deliver talks in the workshop and discuss current and future ways of academic collaboration and joint research projects.

Organizing Committee: Grzegorz Graff, Justyna Signerska-Rynkowska, Paweł Pilarczyk.

Speakers (in the alphabetical order):

- Beata Graff (Medical University of Gdańsk)
- Davide Gurnari (Dioscuri Centre in Topological Data Analysis)
- Frank Llovera (Gdańsk Tech)
- Grzegorz Graff (Gdańsk Tech)
- Jan Senge (Institute ALTA, Department of Mathematics, University of Bremen)
- Justyna Signerska-Rynkowska (Gdańsk Tech & Dioscuri Centre in Topological Data Analysis)
- Marek Maryański (Gdańsk Tech)
- Marta Marszewska (Gdańsk Tech)
- Michał Lipiński (Jagiellonian University & Dioscuri Centre in Topological Data Analysis)
- Paweł Dłotko (Dioscuri Centre in Topological Data Analysis)
- Paweł Pilarczyk (Gdańsk Tech)

Wednesday, December 1, 2021
Informal meetings, preliminary discussions
19:00 – dinner

Thursday, December 2, 2021
(all talks in the Faculty Council room in the Nanotechnology Center building)
9:30–9:50 – Grzegorz Graff (Gdańsk Tech): *Persistent homology and the analysis of heart rate variability*
10:10–10:30 – Paweł Pilarczyk (Gdańsk Tech): *Topological analysis of breathing patterns*
10:50–11:30 – coffee break
11:30–11:50 – Paweł Dłotko (Dioscuri Centre in Topological Data Analysis): *Symbolic dynamics and topology – a few ideas on reconstruction of dynamics from finite time series*
12:10–12:30 – Michał Lipiński (Jagiellonian University & Dioscuri Centre in Topological Data Analysis): *Multivector fields thoery for data analysis*
12:50–14:30 – visit at the Medical University of Gdańsk (Beata Graff, Medical University of Gdańsk)
14:30–16:00 – lunch
16:00–16:20 – Davide Gurnari (Dioscuri Centre in Topological Data Analysis): *Distributed algorithms for Euler Characteristic Curves (and Profiles)*
16:40–17:00 – Jan Senge (Institute ALTA, Department of Mathematics, University of Bremen): *Persistence-based descriptors for surface roughness and its relation to bio-interface characteristics*
19:00 – dinner

Friday, December 3, 2021
(all talks except 11:15–12:15 in the Faculty Council room in the Nanotechnology Center building)
9:30–9:50 – Frank Llovera (Gdańsk Tech): *Periodic and chaotic dynamics in a map-based neuron model*
10:15–10:35 – Justyna Signerska-Rynkowska (Gdańsk Tech & Dioscuri Centre in Topological Data Analysis): *Topological-numerical analysis of a 2-dimensional dynamical model of a neuron*
11:15–12:15 – Talk at the Departmental Seminar (**room 121 GG**) – Paweł Dłotko (Dioscuri Centre in Topological Data Analysis): *Data, their shape and relations – why can we gain by understanding it?*
12:15–13:00 – coffee break
13:00–13:20 – Marta Marszewska, Marek Maryański (Gdańsk Tech): *Searching for most useful metrics in automatic comparison between radiotherapy treatment plans and high-definition 3D gel dosimetry images*
13:40–15:00 – discussion panel (lead by Paweł Dłotko and Grzegorz Graff)
15:00–16:00 – lunch