Annex No. 1 to the Rules for Submitting Research Topics for the Admission to the Interdisciplinary Education Programme in the Doctoral School of Medical and Health Sciences for the academic year 2025/2026

Research Topic Submission Form for the Interdisciplinary Education Programme	
Discipline ***Please indicate***	**x medical sciences** **☐ pharmacology and pharmacy** **☐ health sciences**
Submitter - a person willing to act as a supervisor:	
Title/degree **Full Name**	**Dr. hab. n.med. inż. Klaudia Proniewska**
Category *please select the relevant category according to the DSMHS Regulations*	**x A person employed at the Jagiellonian University Medical College (JU MC), holding a post-doctoral habilitation degree or professor's degree, who has submitted a declaration of at least 75% affiliation with the discipline in which the research topic is being proposed** **☐ A person employed in Poland at a university or another entity listed in Article 7(1) of the Act – Law on Higher Education and Science, who holds the title of professor or a post-doctoral habilitation degree, has submitted a declaration of at least 25% affiliation with the discipline in which the research topic is being proposed, and has presented the written consent of a person meeting the conditions specified in item 1 to assume the role of supervisor, following a positive opinion of the School Board** **☐ A person employed at a foreign university or academic institution, provided that the relevant research discipline board recognises that the person has a significant record of achievement in the academic field to which the research topic pertains**
Date of obtaining **a) doctoral degree**	**18 December 2014**
b) post-doctoral habilitation degree	**10 December 2024**
c) professor's degree	**NA**
Place of employment	**Jagiellonian University Medical College, Center for Digital Medicine and Robotics**
E-mail address	**klaudia.proniewska@uj.edu.pl**
Contact phone	**+48793060785**
Academic achievements: **List of max 5 publications from the last three calendar years**	Atkinson Andrew, Chen Weixuan, Aminu Abimbola J., Kuniewicz Marcin, Karaesmen Irem, Duong Neal, **Proniewska Klaudia**, van Dam Peter Michael, Iles Tinen Lee, Hołda Mateusz K., Walocha Jerzy, Iaizzo Paul A., Colman Michael Alan, Dobrzynski Halina High-resolution 3D visualisation of human hearts with emphases on the cardiac conduction system components -a new platform for medical education, mix/virtual reality, computational simulation Frontiers in Medicine

2025 : Vol. 12, id. art. 1507005, il., bibliogr.
Autor korespondencyjny: Halina Dobrzynski

artykuł zagraniczny
praca oryginalna
IF: 3.100
Min.: 70.000

Matusik Paweł T., Szotek Michał, Komar Monika, van Dam Peter, Czunko Agnieszka, **Proniewska Klaudia**
His bundle pacing in a patient with complete atrioventricular block and congenitally corrected transposition of the great arteries : potential of the use of extended reality and cardiac electrical activity projected into 3D heart model
Polskie Archiwum Medycyny Wewnętrznej
2025 : Vol. 135, nr 1, id. art. 16856, il., bibliogr. 5 poz.
Autor korespondencyjny: Paweł T. Matusik

Online First 2024-10-03
artykuł polski
praca kazuistyczna
IF: 3.800
Min.: 200.000

Rudnicka Zofia, Pręgowska Agnieszka, Glądys Kinga, Perkins Mark, **Proniewska Klaudia**
Advancements in artificial intelligence-driven techniques for interventional cardiology
Cardiology Journal
2024 : Vol. 31, nr 2, s. 321-341, il., bibliogr. 100 poz., abstr.
formerly Folia Cardiologica.
Autor korespondencyjny: Klaudia Proniewska
Online First 2024-01-18

artykuł polski
praca poglądowa
IF: 2.500
Min.: 100.000

Potyagaylo Danila, van Dam Peter M., Kuniewicz Marcin, Dolega-Dolegowski Damian, Pregowska Agnieszka, Atkinson Andrew, Dobrzynski Halina, **Proniewska Klaudia**
Interactive teaching of medical 3D cardiac anatomy : atrial anatomy enhanced by ECG and 3D visualization
Frontiers in Medicine
2024 : Vol. 11, id. art. 1422017, il., bibliogr. 38 poz.
Autor korespondencyjny: Danila Potyagaylo

artykuł zagraniczny
praca oryginalna
IF: 3.100
Min.: 70.000

Proniewska Klaudia K., Abacherli Roger, van Dam Peter M.
The ΔWaveECG : the differences to the normal 12-lead ECG amplitudes
Journal of Electrocardiology
2023 : Vol. 76, s. 45-54, il., bibliogr., abstr.

	Autor korespondencyjny: Peter M. van Dam Open Access Creative Commons Attribution License CC-BY 4.0 Online First 2022-11-05 artykuł zagraniczny praca oryginalna IF: 1.300 Min.: 70.000
Impact Factor summary	**13,8 IF (uwzględniono tylko 5 publikacji powyżej)**
Web of Science Core Collection index	**347 Sum of Times Cited** **59 publications**
Hirsch index	**H=10**
Number of promoted doctoral degree holders	**0**
Number of promoted MA degree holders	**0**
Current number of PhD students in the Doctoral School of Medical and Health Sciences	**0**
Proposed research topic	**Accurate 3D reconstruction methods for clinical and teaching support of the cardiovascular system**
Reasons for the compatibility of the proposed research topic with the selected discipline (maximum 100 words)	Within the department Center for Digital Medicine and Robotics we work actively on the development of 3D tooling to support teaching and the clinical field. The aim of this project is to optimize the 3D reconstruction of the cardiovascular system supporting the anatomical teaching of difficult cardiovascular procedures as well as the support of these difficult procedures. For this purpose the development of novel tools to create accurate 3D models in a reliable but fast way is required.
Brief description of research methods (max. 250 words)	Within this project, the process of 3D reconstruction of the cardiovascular system is being thoroughly optimized to enhance both accuracy and clinical usefulness. Medical imaging data, originating from various modalities such as MRI, CT, echocardiography, and OCT, present different characteristics in terms of resolution, contrast, and noise. Each of these imaging techniques requires specific, tailored optimization methods to achieve reliable and precise 3D reconstructions of complex cardiovascular structures such as the atria, ventricles, aorta, and coronary arteries. The goal is to ensure that the reconstructed models accurately represent the patient's anatomy and are suitable for use in clinical decision-making, surgical planning, or further research. Numerous segmentation techniques are currently available to extract relevant anatomical features from medical images, ranging from traditional manual or semi-automated methods to state-of-the-art artificial intelligence-based algorithms, including deep learning approaches. In this project, a thorough investigation will be conducted into the advantages and limitations of these different segmentation methods. The selection of the optimal method will depend not only on the image modality but also on the specific clinical objective of the 3D reconstruction. For instance, different accuracy requirements may apply if the model is used for diagnosis, intervention planning, or patient-specific simulation.

	Therefore, close collaboration with clinicians is essential throughout the project to clearly define the clinical goals and corresponding accuracy thresholds. This collaborative and multidisciplinary approach aims to create a flexible, high-quality reconstruction pipeline that can adapt to different clinical contexts and deliver reliable, patient-specific cardiovascular models.
Expected location of project implementation:	**Jagiellonian University Medical College, Center for Digital Medicine and Robotics, and the Universiy hospital in Krakow**
Description of tasks for the PhD student	**1. Data Collection** • The initial phase will involve working with retrospective medical data obtained from existing hospital archives and databases. Upon obtaining approval from the institutional ethics committee, prospective data collection will be incorporated, following all ethical standards, including informed patient consent and secure data handling protocols. The collected data will form the foundation for algorithm development and validation. **2. Data Preprocessing** • Preprocessing will involve cleaning and structuring the raw data to ensure consistency, quality, and compatibility with machine learning pipelines. Tasks may include normalization, de-identification, annotation (e.g., labeling medical images), and handling missing values. In the case of imaging data, preprocessing may also include standardizing formats, improving image quality, and performing spatial alignment. **3. Interviewing Physicians** • Interviews with physicians, such as radiologists and clinical specialists, will be conducted to gather domain expertise and practical insights. These interactions will help define clinically relevant use-cases, validate interpretations of the data, and guide the development of algorithms to ensure alignment with real-world medical workflows. This qualitative input is essential for ensuring the translational value of the research. **4. Algorithm Development (AI, Segmentation, Immersive Techniques)** This phase focuses on the creation and implementation of advanced computational tools: • **AI Models:** Development and training of machine learning and deep learning algorithms for tasks such as diagnosis, risk prediction, or clinical decision support. • **Segmentation Techniques:** Design of methods for automated detection and delineation of anatomical structures or pathological findings within medical images. • **Immersive Technologies:** Exploration of AR/VR-based visualization tools for enhanced data interpretation, surgical planning, or physician training. All algorithms will be evaluated using quantitative performance metrics and refined through iterative testing and clinician feedback.

Expectations towards the PhD student: specific skills and experience *(the description of expectations cannot indicate a specific candidate)*	• Knowledge of medical data formats (e.g. DICOM)
	• Experience with medical imaging processing methods:
	  • Image-based tissue segmentation (preferably the cardiovascular system)
	  • Removal of imaging artifacts
	  • Ability to do 3D reconstruction of heart and brain tissue
	• Experience with 3D objects:

	• Knowledge of 3D model structure and formats (vtk, obj, stl, ...) • Ability to manipulate the model segmentations(e.g. decimation or editing materials) • Programming Experience: • Knowledge of programming languages (C++, Phyton, Matlab,...) • Ability to analyze medical data • Experience with developing immersive apps • Good comprehension of AI algorithms • Fluent in English, verbal and in writing • Physics background is preferable	
Temporary availability of the PhD student (number of hours per week) required for the implementation of the project	*If the project requires working non-standard hours (e.g. late afternoons, Saturdays) - please describe here* *40h/week*	
Does the research project require PhD student's independent performance of medical procedures? ***Underline the applicable***	**<u>NO</u>**	**YES** *Please **specify the required professional licence** and provide a brief justification*
Date 23 kwietnia 2025	Klaudia Pawełek ..... ***Submitter's signature***	

* If the research topic requires the PhD student to independently perform medical procedures, then in accordance with the admission procedures (Annexes 1 and 2 to Resolution No. 14/II/2024 of the Jagiellonian University Senate, dated 28 February 2024), the candidate must hold the appropriate professional licence. The type of licence (e.g. licence to practise as a doctor, nurse, physiotherapist, etc.) must be clearly indicated and justified. In the DSMHS admission procedure, a licence to practise as a medical doctor or dentist issued for the duration of a postgraduate internship shall be considered equivalent to a full licence to practise as a medical doctor or dentist in the Republic of Poland.

The research topic submitted must not overlap thematically or conceptually with any current project being undertaken by the PhD student under the supervision of the submitter.

The completed form should be printed, signed in the appropriate sections, scanned together with the signed annexed statements into <u>a single PDF file</u>, and submitted electronically **<u>by 30 April 2025</u>** to:

in the discipline of medical sciences: <u>rekrutacja.nmedyczne@cm-uj.krakow.pl</u>

in the discipline of pharmacology and pharmacy: <u>rekrutacja.nfarmaceutyczne@cm-uj.krakow.pl</u>

in the discipline of health sciences: <u>rekrutacja.nozdrowiu@cm-uj.krakow.pl</u>

The email should include **the title of the proposed research topic.**

Oświadczenie osoby zgłaszającej temat badawczy

Oświadczam, że realizacja tematu badawczego pt.

Accurate 3D reconstruction methods for clinical and teaching support of the cardiovascular system

przez doktoranta

Szkoły Doktorskiej Nauk Medycznych i Nauk o Zdrowiu

~~**wiąże się/**~~ **nie wiąże się** z działalnością objętą ochroną – należy przez to rozumieć określoną /niepotrzebne skreślić/

w art. 21 ustawy z dnia 13 maja 2016 r. o przeciwdziałaniu zagrożeniom przestępczością na tle seksualnym i ochronie małoletnich (Dz.U. z 2023 r. poz. 1304 ze zm.) działalność związaną z wychowaniem, edukacją, wypoczynkiem, leczeniem, świadczeniem porad psychologicznych, rozwojem duchowym, uprawianiem sportu lub realizacją innych zainteresowań przez małoletnich, lub opieką nad nimi.

.....

/podpis osoby zgłaszającej temat badawczy/

Oświadczenie osoby zgłaszającej temat badawczy

Potwierdzam, że znane mi są zasady rekrutacji do Szkoły Doktorskiej Nauk Medycznych i Nauk o Zdrowiu na Uniwersytecie Jagiellońskim w roku akademickim 2025/2026 określone w uchwale nr 15/II/2025 Senatu Uniwersytetu Jagiellońskiego z dnia 26 lutego 2025 roku.

W szczególności przyjmuję do wiadomości, że:

W sytuacji zakwalifikowania się do szkoły dwóch lub więcej kandydatów wskazujących w rekrutacji ten sam wybrany temat badawczy, temat badawczy zostaje przyznany kandydatowi z największą liczbą punktów. Kolejnym kandydatom oferowane są do wyboru inne pozostałe tematy badawcze, nieobsadzone przez zrekrutowanych kandydatów.

23 kwietnia 2025
.....
/data/

Klaudia Pławecka
.....
/podpis osoby zgłaszającej temat badawczy/