

# Prospective supervisor's form

Name of the supervisor: Jacek Rumiński

Academic title: dr hab. inż.

Orcid ID number: <https://orcid.org/0000-0003-2266-0088>

Faculty of Electronics, Telecommunications and Informatics

Gdańsk University of Technology Department of Biomedical Engineering

Phone: +48 3472670

E-mail: jacek.ruminski@pg.edu.pl

Personal web page: <https://pg.edu.pl/jacrumin>

Discipline: technical informatics and telecommunication. none

Optional

Key words (obligatory four key words describing research interests / expertise):

# machine learning

# computer vision pattern recognition

# human-system interaction

# healthcare informatics

## Bibliometric indicators

1. Number of journal publications in WoS/ Scopus WoS= 21 / Scopus=23 (ALL: 93/106)

2. Citations excluding self-citations WoS 252 Scopus 563

3. Hirsch index WoS 12 Scopus 14

1. The number of PhD students who have graduated under your supervision: 1

2. The number of PhD students currently supervised:

a. within the current doctoral school 0

b. within doctoral studies (previous system) 4

3. Are you currently accepting new PhD students:

a. Polish Yes/No Yes

b. Foreign Yes/No Yes

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**Research interests or topics offered for PhD research (no more than 2000 characters)<sup>ii</sup>**

My current research topics are focused on machine learning, computer vision and pattern recognition methods applied for healthcare and well-being. I am especially interested in smart methods of information extraction from image sequences and from still images. Examples include: reliable extraction of pulse rate and pulse waveform from visible light, face video, reliable extraction of respiratory rate and respiration waveforms from thermal, face video, emotion recognition based on analysis of facial (visible/infrared) image sequences. Many special research problems and questions are related to these examples. For instance: How to improve the resolution and quality of thermal images (e.g., development of super-resolution models and algorithms)? How to accurately detect facial regions like a nose, mouth in thermal images?

Other machine learning fields of interest include application of ML for medical image processing and analysis, biomedical signal analysis, physical activity analysis, human security and safety, etc.

My interest in human-system interaction methods is also focused on the data processing methods to classify gestures or design new interaction methods (e.g. using smart glasses). Other research topics are focused on color processing in images. I cooperate with different companies like Lab4Life, Brainscan, etc., where we are working on practical applications of machine learning.

Finally, we are currently starting a cooperation with the BioBank in Poland (a member of the European BioBank’s network) to use machine learning methods for the processing (classification, recommendation, etc.) of multimodal medical data.

**Funding or special equipment needed to carry out a PhD project <sup>iii</sup>:**

- 1. Is funding available for experimental work: *Yes/No/not needed*
- 2. Is the equipment needed to complete a PhD project available in your lab/department: *Yes/No/not needed*

**Most important publications – no more than 5 published after 1.01.2018**

No	Authors/title/journal	Number of points according to the current list of the Ministry of Science and Higher Education	Publication year
1.	Czuszynski, K., Ruminski, J., Kwasniewska, A., Gesture recognition with the linear optical sensor and recurrent neural networks , 2018, IEEE Sensors Journal,18(13), pp. 5429-5438	100	2018
2.	Kwasniewska, A., Ruminski, J., Szankin, M., Improving accuracy of contactless respiratory rate estimation by enhancing thermal sequences with deep neural networks, Applied Sciences (Switzerland), 9(20),4405, 2019	70	2019

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3.	Kwasniewska, A., Ruminski, J., Szankin, M., Kaczmarek, M. Super-resolved thermal imagery for high-accuracy facial areas detection and analysis, Engineering Applications of Artificial Intelligence, 87,103263, 2020.	140	2020
4.	Mazur-Milecka, M., Ruminski, J., Deep learning based thermal image segmentation for laboratory animals tracking , Quantitative InfraRed Thermography Journal, 2020, Article in Press, <a href="https://doi.org/10.1080/17686733.2020.1720344">https://doi.org/10.1080/17686733.2020.1720344</a>	100	2020
5.	A. Drewek-Ossowicka, M.Pietrolaj, J. Ruminski, A Survey of Neural Networks usage for Intrusion Detection Systems, Journal of Ambient Intelligence and Humanized Computing, DOI: 10.1007/s12652-020-02014-x, in press, 2020.	70	2020

**Most recent externally funded projects you were involved in – no more than 3**

No	Project title, the name of the Principal Investigator (PI) and the institution the project was carried out	Years	Role in the project <sup>iv</sup>
1.	eGlasses, The interactive eyeglasses for mobile, perceptual computing, EU Era-Net CHIST-ERA, project with 5 international partners, PI of the entire project: prof. Jacek Ruminski	2013-2016	PI
2.	Research activities focused on face detection under the cooperation with Oculaudio, Norway. PI: prof. Jacek Rumiński	2020	PI
3.	Ella4Life, your virtual personal assistant for home and on the road, AAL2/4/Ella4Life/2019 EU Active Assistive Living project with 6 international partners, PI in Poland: prof. Mariusz Kaczmarek	2018-2021	R

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### Additional relevant information – (no more than 1600 characters)<sup>v</sup>

We are intensively developing an ecosystem and infrastructure for artificial intelligence. The researchers at our group have access to NVIDIA DGX-1 and DGX-Station servers for intensive computations required in machine learning (especially deep learning) tasks. Additionally, we are intensively cooperating with industrial partners under Digital Innovation Hub or due to organization of the International Summer School on Deep Learning ([www.dl-lab.eu](http://www.dl-lab.eu)).

- <sup>i</sup> You may select up to two disciplines out of 12 disciplines represented in the Doctoral School
- <sup>ii</sup> Observe the limit of not more than 2000 characters
- <sup>iii</sup> Leave only one answer
- <sup>iv</sup> Select the role in the project: PI stands for principal investigator (refers to the holder of an independent grant and the lead researcher for the grant project), Co-I for co-investigator (Co-I assists the principal investigator in the management and leadership of the research project), R for researcher
- <sup>v</sup> Add any other relevant information e.g. awards for PhD students whom you supervised (no more than 1600 characters)