

# Prospective supervisor's form

Name of the supervisor: Rafał Szlapczyński (Rafal Szlapczynski)

Academic title: Sc.D., GUT professor

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Gdańsk University of Technology Faculty of Ocean Engineering and Ship Technology

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Discipline: technical informatics and telecommunicator control, electronic and electrical engineerir

Optional

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

# Multi-objective meta heuristics (MOMH)

# Evolutionary multi-objective optimisatio

# Decision maker's preferences in optimi

# Optimisation in marine transport

## Bibliometric indicators

1. Number of journal publications in WoS/ Scopus 32 / 35

2. Citations excluding self-citations WoS 363 Scopus 445

3. Hirsch index WoS 13 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) 1

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>

Artificial Intelligence and optimisation:

1. Evolutionary Multi-objective Optimisation (EMO) and other Multi-objective Optimisation Meta-Heuristics (MOMH)
2. Preference-based approach to EMO and Multi-Criteria Decision Making (MCDM): dominance relations etc.

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AI methods and optimisation algorithms in marine transport, especially applied to autonomous ships

1. Routing, collision avoidance and control of Marine Autonomous Surface Ships (MASS)
2. Ship collision risk measures and methods of assessing or visualizing ship collision risk
3. Planning or determining collision avoidance manoeuvres
  - a) by means of deterministic algorithms (graph-based algorithms, maze routing algorithms etc.)
  - b) by means of AI-based meta-heuristics - evolutionary computation methods (evolutionary algorithms, genetic algorithms, ant colony algorithms etc.), other AI tools (neural networks, reinforcement learning etc.)
4. Ship Weather routing
  - a) by means of deterministic algorithms
  - b) by means of AI-based meta-heuristics
5. Applying various other AI tools and methods in related marine navigation problems (especially in solving optimisation tasks)

### 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*

Yes

2. Is the equipment needed to complete a PhD project

available in your lab/department: *Yes/No/not needed*

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.	Szłapczyńska J., Szłapczyński R. / Preference-based evolutionary multi-objective optimization in ship weather routing/ APPLIED SOFT COMPUTING -Vol. 84, (2019), s.1-21	200	2019
2.	Nejabatbakhsh Esfahani H., Szłapczyński R., Ghaemi M. H. / High performance super-twisting sliding mode control for a maritime autonomous surface ship (MASS) using ADP-Based adaptive gains and time delay estimation / OCEAN ENGINEERING -Vol. 191, (2019), s.1-19	140	2019

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3.	Szłapczyński R., Krata P.: Determining and visualizing safe motion parameters of a ship navigating in severe weather conditions// OCEAN ENGINEERING. -Vol. 158, (2018), s.263-274	140	2018
4.	Szłapczyński R., Krata P., Szłapczyńska J.: Ship domain applied to determining distances for collision avoidance manoeuvres in give-way situations// OCEAN ENGINEERING. -Vol. 165, (2018), s.43-54	140	2018
5.	Szłapczyński R., Krata P., Szłapczyńska J. / Ship Domain-Based Method of Determining Action Distances for Evasive Manoeuvres in Stand-On Situations / JOURNAL OF ADVANCED TRANSPORTATION. -Vol. 2018, nr. ID 3984962 (2018), s.1-19	70	2018

#### 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.	„Collision Avoidance Domain-Method Used by Ships and aShore”, MARTERA-2/CADMUSS/2020 (ERA-NET Cofund), projekt rekomendowany do finansowania, Rafał Szłapczyński, Gdańsk University of Technology	2020 - 2023	PI
2.	„Ship Routing Accounting for Changable Sea Conditions”, MARTERA-1/ROUTING/3/2018 (ERA-NET Cofund), Rafał Szłapczyński, Gdańsk University of Technology	2018 - 2021	PI
3.	„Evolutionary sets of safe ship trajectories in solving collision situations at sea”, umowa: 1867/B/T02/2009/37 (KBN), Rafał Szłapczyński, Gdańsk University of Technology	2009 - 2011	PI

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

The doctoral dissertation prepared under my supervision by dr. Marcin Życzkowski has been nominated for the award of the Polish Navigational Forum.

Another doctoral dissertation (by a foreign PhD candidate) has just been completed and is about to be officially submitted.

One more doctoral dissertation is under work, expected to be submitted in the fall of 2022.

In general, I am interested in artificial intelligence (particularly soft computing) applied to wide array of technical problems. A PhD candidate might work on its own or may join young, multidisciplinary team, whose members graduated in computer science, robotics, ocean engineering and marine transport. A new research topic may be related to current or envisaged projects, but I am also open to any new ideas related to modelling and solving optimisation, prediction and classification problems. As for now, we have:

- one ongoing project,
- one project to be started in September
- one project proposal to be submitted this spring.

I am open to PhD candidates' input and ideas. I am also willing to supervise PhD candidates from other countries and I do have some experience in that

<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)