

PhD Position Signal Processing for Low-power Digital Radars

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Challenge: *Design waveforms and develop receiver algorithms for low-power radars.*

Change: *Apply advanced techniques from statistical signal processing and robust optimization.*

Impact: *Enhance detection performance of low-power automotive radars.*

Job description

Currently, automotive radars use fully digital receiver architectures with up to 16 antennas. While increasing the number of antennas enhances angular resolution, fully digital radars with large arrays suffer from high power consumption. This project will explore emerging low-power radar designs and develop signal processing techniques optimized for these architectures.

Signal processing with low-power digital radars is challenging due to the stringent waveform constraints imposed by low-power components. Additionally, these components often lead to severe hardware imperfections that perturb the measurements acquired at the radar receiver. To address these challenges, we seek a talented individual to develop signal processing techniques capable of effectively operating under both waveform constraints and hardware imperfections.

As part of this project, you will tackle this challenge by developing cutting-edge solutions that will push low-power automotive radars to their limits. Specifically, your focus will be on two key research themes:

1. A) Designing multi-dimensional radar waveforms that are suitable for low-power radars.
2. B) Developing robust signal processing algorithms for low-power radars.

By joining our team, you will contribute to the advancement of automotive radar technology, enabling higher resolution and improved detection performance, all while operating under stringent constraints in low-power radars.

The Delft Center for Systems and Control (DCSC) is offering one PhD vacancy under the newly funded 'Digitally modulated radars' (DiMoRA) project. The project will be carried out in the research group of Dr. N. J. Myers, in collaboration with researchers at the faculty of EEMCS and experts from NXP Semiconductors.

Dr. Myers's group at TU Delft develops and analyzes novel signal processing techniques for communications and sensing with wireless systems. We focus on both applied and theoretical aspects of challenging problems in connected automotive and radars.

Relevant research from our lab members:

- [1] P. Kumari, N. J. Myers, and R. W. Heath Jr., "An adaptive and fast beamforming design for automotive millimeter-wave joint communication-radar," IEEE Journal on Selected Topics in Signal Processing, vol. 15, no. 5, June 2021 (Top 25 most downloaded articles of the IEEE Signal Processing Society in 2022)
- [2] H. Masoumi, N. J. Myers, G. Leus, S. Wahls, and M. Verhaegen, "Structured Sensing Matrix Design for In-sector Compressed mmWave Channel Estimation," IEEE SPAWC 2022. (Best Student Paper Award)
- [3] E. Focante, N. J. Myers, G. Joseph, A. Pandharipande, "Situation-aware adaptive transmit beamforming for automotive radars," in Proc. of IEEE ICASSP 2024
- [4] E. Focante, N. J. Myers, G. Joseph, A. Pandharipande, "Adaptive beamforming for situation-aware automotive radars under uncertain side information," IEEE Transactions on Radar Systems 2024
- [5] A. Pandharipande, N. J. Myers, E. Focante, G. Joseph, "Occupancy map aware transmitter beamforming for automotive radar," US Patent Appl. 18/367427, Sep 2023

Requirements

- A solid understanding of statistical signal processing and optimization.
- A background in radar and wireless communication is desirable.
- An experience in programming e.g., Python, MATLAB, R.
- A good command of English (verbal and written).
- Excellent communication and interpersonal skills.
- Ability to work in a collaborative environment.

Doing a PhD at TU Delft requires English proficiency at a certain level to ensure that the candidate is able to communicate and interact well, participate in English-taught Doctoral Education courses, and write scientific articles and a final thesis. For more details please check the [Graduate Schools Admission Requirements](#).

Conditions of employment

Doctoral candidates will be offered a 4-year period of employment in principle, but in the form of 2 employment contracts. An initial 1,5 year contract with an official go/no go progress assessment within 15 months. Followed by an additional contract for the remaining 2,5 years assuming everything goes well and performance requirements are met.

Salary and benefits are in accordance with the Collective Labour Agreement for Dutch Universities, increasing from € 2872 per month in the first year to € 3670 in the fourth

year. As a PhD candidate you will be enrolled in the TU Delft Graduate School. The TU Delft Graduate School provides an inspiring research environment with an excellent team of supervisors, academic staff and a mentor. The Doctoral Education Programme is aimed at developing your transferable, discipline-related and research skills.

The TU Delft offers a customisable compensation package, discounts on health insurance, and a monthly work costs contribution. Flexible work schedules can be arranged.

For international applicants, TU Delft has the [Coming to Delft Service](#). This service provides information for new international employees to help you prepare the relocation and to settle in the Netherlands. The Coming to Delft Service offers a [Dual Career Programme](#) for partners and they organise events to expand your (social) network.

TU Delft (Delft University of Technology)

Delft University of Technology is built on strong foundations. As creators of the world-famous Dutch waterworks and pioneers in biotech, TU Delft is a top international university combining science, engineering and design. It delivers world class results in education, research and innovation to address challenges in the areas of energy, climate, mobility, health and digital society. For generations, our engineers have proven to be entrepreneurial problem-solvers, both in business and in a social context.

At TU Delft we embrace diversity as one of our core [values](#) and we actively [engage](#) to be a university where you feel at home and can flourish. We value different perspectives and qualities. We believe this makes our work more innovative, the TU Delft community more vibrant and the world more just. Together, we imagine, invent and create solutions using technology to have a positive impact on a global scale. That is why we invite you to apply. Your application will receive fair consideration.

Challenge. Change. Impact!

Faculty Mechanical Engineering

From chip to ship. From machine to human being. From idea to solution. Driven by a deep-rooted desire to understand our environment and discover its underlying mechanisms, research and education at the ME faculty focusses on fundamental understanding, design, production including application and product improvement, materials, processes and (mechanical) systems.

ME is a dynamic and innovative faculty with high-tech lab facilities and international reach. It's a large faculty but also versatile, so we can often make unique connections by combining different disciplines. This is reflected in ME's outstanding, state-of-the-art education, which trains students to become responsible and socially engaged engineers and scientists. We translate our knowledge and insights into solutions to societal issues, contributing to a sustainable society and to the development of prosperity and well-being. That is what unites us in pioneering research, inspiring education and (inter)national cooperation.

Click [here](#) to go to the website of the Faculty of Mechanical Engineering. Do you want to experience working at our faculty? These [videos](#) will introduce you to some of our researchers and their work.

Additional information

For more information about this vacancy, please contact Nitin Jonathan Myers at n.j.myers@tudelft.nl.

Candidates are also encouraged to look at other PhD vacancies, within the project DiMoRA, in the groups of Prof. Geert Leus and Prof. Alexander Yarovoy.

Application procedure

Are you interested in this vacancy? Please apply before **5 November 2024** via the application button and upload:

- A cover letter stating your motivation (max 1 page).
- A detailed curriculum vitae.
- Name and contact information of two professional referees.
- A list of courses taken with grades obtained in Bachelors and Masters degree.
- A list of publications (if any).

For information about the application procedure, please contact Giedo Kocken, HR advisor, recruitment-me@tudelft.nl.

Please also note:

- A pre-employment screening can be part of the selection procedure.
- You can apply online. We will not process applications sent by email and/or post.
- Please do not contact us for unsolicited services.

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