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STADIUS
Center for Dynamical Systems, Signal Processing and Data Analytics




# October 2025

RESEARCH ▪ AWARDS ▪ NEWS ▪ EVENTS ▪ STAFF UPDATE ▪ DEFENDED PHD ▪ PUBLICATIONS

## Welcome to the October edition of the STADIUS!

Get ready for some great STADIUS events ahead!
**Newcomers Seminar & STADIUS Colloquium**
Don't forget to register for the Newcomers event and join us for an unforgettable afternoon!

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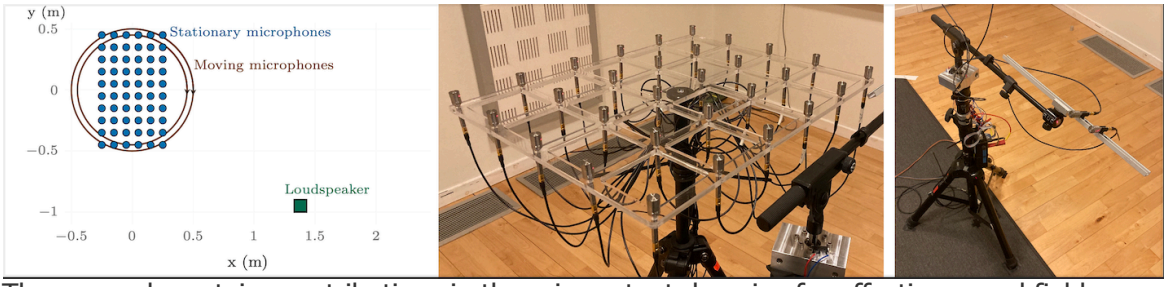
## Research of the month by Jesper Brunnström

### "Sound field estimation and control over continuous regions"

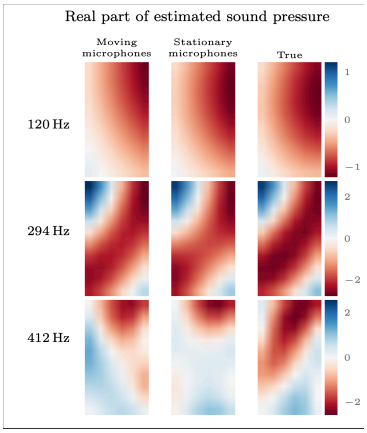
Work under the supervision of Marc Moonen, Toon van Waterschoot, and Jan Østergaard

The goal of this research is to enable effective sound field control over continuous regions. Sound field control includes applications like sound zone control, spatial active noise control and sound field reproduction. With a number of loudspeakers distributed in a room, the sound field control task consists of constructing loudspeaker signals such that the desired sound field is produced. In order to determine the loudspeaker signals, information from the acoustic environment is needed, such as room impulse responses from the loudspeakers to the continuous region of interest. Therefore, an essential part of sound field control is sound field estimation and spatial covariance estimation, both of which are methods for obtaining the required information from the acoustic environment.




The research contains contributions in three important domains for effective sound field control.

1. Sound field control methods that provides loudspeaker signals for sound zone control and spatial active noise control, improving flexibility, robustness, and computational cost over conventional approaches.
2. Sound field estimation methods based on kernel ridge regression and Bayesian inference that allows for measurements with moving and directional microphones.
3. Spatial covariance estimation methods that respect the underlying physics of sound, and are suited for time-varying acoustic environments.




One of the primary challenges in sound field control is obtaining accurate information about the acoustic environment in a practical manner. Compared to traditional methods which require a stationary microphone, a more flexible and faster method of acquiring measurements is to use a moving microphone. Therefore, we have developed such sound field estimation methods that can make use of moving microphones. The proposed methods guarantee that the estimates satisfy Helmholtz equation, meaning that the sound fields are physically realizable. Using both simulated and real data, these methods are shown to be more robust and provide more accurate estimates compared to traditional truncated or discretized basis expansion methods. The methods enable the use of directional microphones, as well as ways of incorporating prior knowledge of the sound field.

Many sound field control algorithms make use of spatial covariance matrices, a quantity related to the room impulse responses and the audio content that should be reproduced. Specifically the sound zone control methods we have proposed require acoustic information in the form of spatial covariances. Therefore we propose spatial covariance estimation methods based on kernel ridge regression, ensuring that the physical properties of the underlying sound field are respected, and taking the continuous region of interest into account. In addition, because the acoustic environment is commonly time-varying, we make it possible to effectively combine new measurements with previous estimates, leading to shorter measurement times.

**For more detailed reading on sound field estimation with moving microphones:**
Sound field estimation with moving microphones using kernel ridge regression
https://arxiv.org/abs/2509.16358
Bayesian sound field estimation using moving microphones
https://ieeexplore.ieee.org/abstract/document/10830478/
Rotating Moving Microphone Sound field (RoMMS) dataset
https://github.com/pvjesper/romms

## News

## Nokia Bell Scientific Award 2025



We are happy to invite you to the Nokia Bell Scientific Award 2025 event on Tuesday December 16 to honour the laureate, **Elisabeth Heremans** from KU Leuven, STADIUS, with her PhD entitled "Automated sleep analysis: from the hospital to the home environment."
This work was supervised by Maarten De Vos and co-supervised by Wim Van Paesschen.

Every year Nokia Belgium awards a PhD to promote ICT research and stimulate interaction between the academic and industry community.

Please join us for an exciting program where KU Leuven and Nokia Bell Labs experts will share their latest research findings.

The event will take place in Antwerp (Copernicuslaan 50, 2018 Antwerp, next to the Antwerpen-Centraal railway station)
**Register here**

## EUSIPCO 2026 in Bruges - Call for Papers

After the splendid 2025 edition in Sicily, we are delighted to announce that the 2026 edition of EUSIPCO is around the corner!
The 34th European Signal Processing Conference will take place in the beautiful historic city of **Bruges, Belgium** from **August 31** to **September 4, 2026.**




Please note the following important dates:

- Special session proposals deadline: Nov. 30, 2025
- Satellite workshop proposals deadline: Dec. 15, 2025
- Conference paper submission deadline: Feb. 6, 2026
- Tutorial proposals deadline: Mar. 1, 2026
- Journal paper submission deadline: Apr. 30, 2026
- Conference paper notification of acceptance: May 12, 2026
- Journal paper notification of acceptance: May 19, 2026
- Early bird registration deadline: June 2, 2026

Visit the Submissions page on EUSIPCO 2026 website for more details.

Please share this announcement with your colleagues and peers.
Looking forward to your contributions and participation to EUSIPCO 2026!

Kind regards,
*Toon van Waterschoot and Richard Heusdens,*
*General co-chairs EUSIPCO 2026*

# Events @ STADIUS

For more information about STADIUS events please visit the STADIUS Event webpages.

Don't forget to check the website of VAIA for a wide choice of courses on (aspects of) AI: www.vaia.be

### PhD Defense - Renzi Wang
**Title:** Embedded learning and optimization for interaction-aware Model Predictive Control
**Promotor:** Panos Patrinos
**When:** 07/11/2025, 13:30
**Location:** Aula Jozef Heuts, 00.215, Kasteelpark Arenberg 20, 3001 Heverlee

### STADIUS Newcomers Seminar and Reception
**When:** 12/11/2025, 14:00 – 20:00
**Location:** Aula R & ESAT Cafeteria

### PhD Defense - Nicolas Heintz
**Title:** Fast and Adaptive Auditory Attention Decoding with application in neuro-steered hearing devices
**Promotor:** Alexander Bertrand, Tom Francart
**When:** 17/11/2025 – 15:30 - 11:00
**Location:** Promotiezaal, Universiteitshal: Naamsestraat 22, Leuven

### Kurtosis-based projection pursuit for matrix-valued data
**Speaker:** Joni Virta
**When:** 21/11/2025 – 10:00 - 11:00
**Location:** ESAT, B00.35

# STADIUS Colloquium Series

### An Introduction to Optimization on Manifolds
**When:** 27/11/2025, 10:00 – 11:00
**Speaker:** Pierre-Antoine Absil (UC Louvain)
**Location:** Aula R

**Abstract:** This talk gives an introduction to the area of optimization on manifolds – also termed Riemannian optimization – and its applications in engineering and the sciences. Such applications arise when the optimization problem can be formulated as finding an optimum of a real-valued cost function defined on a smooth nonlinear search space. Oftentimes, the search space is a "matrix manifold", in the sense that its points admit natural representations in the form of matrices. In most cases, the matrix manifold structure is due either to the



presence of nonlinear constraints (such as orthogonality or rank constraints), or to invariance properties in the cost function that need to be factored out in order to obtain a nondegenerate optimization problem. Manifolds that come up in applications include the rotation group SO(3) (e.g., for the generation of rigid body motions from sample points), the set of fixed-rank matrices (appearing for example in low-rank models for recommender systems), the set of 3×3 symmetric positive-definite matrices (e.g., for the interpolation and denoising of diffusion tensors in brain imaging), and the shape manifold (involved notably in morphing tasks).

**Bio**: Pierre-Antoine Absil is a professor of applied mathematics at the University of Louvain, Louvain-la-Neuve, Belgium. He received an engineering degree (ingénieur civil physicien, 1998) and a PhD in applied sciences (2003) from the University of Liège, Belgium. In 2003-2005, he was a Postdoctoral Associate with the School of Computational Science at Florida State University. He was a Research Fellow with Peterhouse, University of Cambridge (UK) in 2005-2006. His main research areas are in numerical optimization, with particular interests in algorithms on manifolds and biomedical applications.

# Other Events

### Trustworthy and Federated Learning with Medical and Imaging Applications

**When:** 04/11/2025, 9:00 - 17:00
**Speakers:** Kaouther Mouheb (Erasmus MC), **Adam Arany** (STADIUS - KU Leuven), **Maarten De Vos** (STADIUS - KU Leuven), Antti Honkela (Helsinki), Juho Kannala (Aalto), Matthew Blaschko (KU Leuven), Edwige Cyffers (Institute of Science and Technology Austria), and Martin Jaggi (EPFL).
**Location:** Thermotechnical Institute, Arenberg campus of KU Leuven

Registration is required as the event will be catered:
https://www.esat.kuleuven.be/psi/seminars/trustworthy-and-federated-learning-with-medical-and-imaging-applications

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## New colleagues

***A warm welcome to new personnel at STADIUS!***

Hi!



I am Alice Marraffa. I studied Physics in my undergraduates and obtained a MSc in Neural Systems and Computations from ETH Zurich and the University of Zurich. In the last year, I worked for one year as a research assistant in Haller's group in ETH Zurich for Data-Driven Modelling of Nonlinear Dynamical Systems. As a PhD student in Gonçalves lab, I will work on characterizing the geometry and dynamics of robust neural circuits with probabilistic modeling.
In my free time, I go to ballet classes. I also love going to the cinema or theatre and live music performances.

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Hi,

My name is Alejandro. I am from Colombia, and I am a Postdoctoral researcher in the Yves Moreau Research Group. I am a bioinformatician who works in the field of genomics and translational research. My research interests are statistical genetics, artificial intelligence and personalized medicine. In my post doc, I will be working synthetic genomic data generation and privacy risk methodologies to enable real-world use. Outside research, I play the saxophone and compose electronic music.

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Hello,

I'm Azim Givron, a computer engineer by training from the École Polytechnique de Bruxelles. I started my career as a data scientist in R&D and later worked in nuclear engineering at a startup. Last year, during my AI Master's program at KU Leuven, I had the chance to meet Yves Moreau and Susan Gadheri. I'm now starting my PhD under Yves' supervision, focusing on developing new optimization methods for drug discovery and gene prioritization. Outside of research, I enjoy creative activities such as cooking and photography. I'm really excited to be part of ESAT, contribute to the community, and get to know all of you!

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Hi,

My name is Basil Liekens. After graduating last year as an electrical engineer at KU Leuven, I started a PhD here under supervision of Marc Moonen. In this research I will be investigating the design of integrated DSP algorithms in the context of audio applications. In my spare time, you'll most likely find me running, cycling or swimming, training for a next triathlon.

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Hello everyone,

I'm Clement, after studying applied math and doing a master in AI and data science in PSL in Paris, I have



started working in academia. I'm currently doing a joint PhD between Lille/Rijsel, France and Leuven under the supervision of Prof. Maarten De Vos on the topic of computer vision for microscopy images. My research interests are vast and include multiple instance learning, large language models and their applications to healthcare and (multi-)omics analysis. In my free time I like to crochet and I am always down to discuss about food and learn about different cultures !

Clement Chauvet

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Hello!

I am Lorenzo Viano, and this past academic year I graduated from the Advanced Master of Artificial Intelligence at KU Leuven. I have now started my PhD at STADIUS in the research group of Prof. Johan Suykens, where I will be working on the analysis and development of novel Transformer models, with a focus on duality principles and interpretability.
In my free time, I enjoy hiking, photography, chess, and more recently, padel!

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Hi,
My name is Marie Deferme.
I completed my Bachelor's degree in Mathematics at UHasselt and then continued in the Master's program in Mathematical Engineering at KU Leuven. I recently started my PhD with Prof. Bart De Moor, where I work on realization theory for polynomial and rational systems. Outside of my research, I'm active in the Scouts, and I also enjoy scuba diving and playing badminton.

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Hi,
I'm Matisse Teuwen, and I recently joined STADIUS. I graduated as a Master of Mathematical Engineering at KU Leuven and have now joined the research group of Professor Panos Patrinos. I will be working on the AIGGREGATE project, which focuses on human-like and robust collective decision-making for autonomous systems. During my studies, I also spent an exchange semester in Zürich, and in my free time I enjoy traveling, sports, and hiking. I'm also active as a speelpleinwerking animator.
Matisse

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Hi, I'm Najlaa Mohamed.

I studied Electrical Engineering at the University of Khartoum, then joined Gonçalves lab for my master's thesis on modeling early-life stress in mice with probabilistic machine learning. Now, continuing as a PhD



student I'll be integrating Bayesian methods with representation learning techniques to study the functional organization of neural systems in health and disease.



My name is Pedro, freshly graduated as a Biomedical Engineering student. Since Biomedical Engineering is more applied, I was looking for something fundamental to work on, which brought me to my topic of my PhD: efficient deep learning using autonomous linear state space models. This PhD is supervised by prof. Alexander Bertrand and copromotor prof. Reto Wildhaber. Besides serious stuff like work and studies I really like to do fun activities with friends like playing sport and board games, but also going to concerts etc. If you ever see me around you can always talk to me about music, books or you can also challenge me to beat me in table tennis.
Pedro



I am Ward Janssens,

born in the city of Antwerp, Belgium. In 2020 I graduated with a masters in mathematics here at KU Leuven. After 4 years in industry working in Banking and Media I came back last academic year to study the master after masters in AI, where I did my thesis with Yves Moreau and Adam Arany on Hamiltonian monte carlo in an active larning setting. I will continue my research with them both in my phd, where we will look at the use of Bayesian methods in both a bioinformatics and gravitational wave analysis context. As for my hobbies I am a keen traveller and (amateur) hiker and also like to play some video games in my spare time.

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***We wish the best of luck to the researchers who are leaving STADIUS***

## Best of luck!

- Mohit Sharma, a PhD graduate from Marc Moonen's group, will continue his academic research path at Politecnico di Milano, where he will be joining the Department of Manufacturing Technologies and Systems as a non-tenured assistant professor (RTDa).
- Sonny Achten, a researcher from the group of Johan Suykens, has left STADIUS this month.

# Recently defended PhDs

Congratulations to the new PhD graduate:

- **16/10/2025 Raphaël Widdershoven,** Fast and Robust Methods for Noisy Overdetermined Systems of Multivariate Polynomial Equations
  PhD thesis, Faculty of Engineering
  - Supervisor: Lieven De Lathauwer
  - Link to thesis: https://lirias.kuleuven.be/4259867&lang=en

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# Publication Digest

Here's the monthly STADIUS Publications Digest, including new reports that have been added to the publications database.
Please remember to have your own reports added in the publications database and make sure your entries are kept up to date (status submitted/accepted/published) at all times.

Contact Ida for new additions and updates, do not add/update database content yourself.

**25-154**
Quan J., Suykens J., Patrinos P., ``Rethinking PCA Through Duality'', Technical Report 25-154, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025. Accepted for publication in *Advances in Neural Information Processing Systems 38*.
Lirias number: 4269360.

**25-155**
Vermeylen C., Vervliet N., De Lathauwer L., Van Barel M., ``Exploiting Generalized Cyclic Symmetry to Find Fast Rectangular Matrix Multiplication Algorithms Easier'', *MDPI Mathematics*, Special Issue Spectral Theory of Tensors, Tensor (Rank) Decompositions, and Their Applications, vol. 13, no. 19, Sep. 2025, pp. 1-20.
Lirias number: 4269364.

**25-156**
Michiels J., *Towards Meaningful Post-Hoc Explanations for End-Users of Predictive Models*, PhD thesis, Faculty of Engineering, KU Leuven (Leuven, Belgium), sep 2025
Lirias number: 4245579.

**25-157**
Oikonomidis K., Quan J., Patrinos P., ``Nonlinearly Preconditioned Gradient Methods: Momentum and Stochastic Analysis'', Technical Report 25-157, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025. Accepted for publication in *Advances in Neural Information Processing Systems 39 (NeurIPS 2025)*.
Lirias number: 4269371.

**25-159**
Wong I. C. F., Cireddu F., Wils M., Colemont T., Narola H., Van Den Broeck C., Li T. G. F., ``Bayesian Calibration of Gravitational-Wave Detectors Using Null Streams Without Waveform Assumptions'', Technical Report 25-159, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.

**25-160**
Kumari A., Suykens J., Tanveer M., ``Informative Core Sampling for Scalable Restricted Kernel Machines'', Technical Report 25-160, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.

**25-161**

Widdershoven R., *Fast and Robust Methods for Noisy Overdetermined Systems of Multivariate Polynomial Equations*, PhD thesis, Faculty of Engineering, KU Leuven (Leuven, Belgium), Oct. 2025
Lirias number: 4259867.

**25-162**

Sunjaya A., Edwards G.D., Harvey J., Sylvester K., Purvis J., Rutter M., Shakespeare J., Moore V., El-Emir E., Doe G., Van Orshoven K., Patel S., De Vos M., Elmahy A., Cuyvers B., Desbordes P., Sehdev S., Evans R.A., Morgan M.D., Russel R., Jarrold I., Spain N., Taylor S., Scott D.A., Prevost A.T., Hopkinson N.S., Kon S., Topalovic M., Man W.D.C., ``Validation of artificial intelligence spirometry diagnostic support software in primary care : a blinded diagnostic accuracy study", *ERJ Open Research*, vol. 11, 2025, 00116 p.
Lirias number: 4264061.

**25-163**

De S., De Moor B., ``State Elimination in polynomial models : A linear algebraic approach", Technical Report 25-163, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.

**25-165**

Ashtari P., Noei S., Haredasht F.N., Chen J.H., Jurman G., Pizurica A., Van Huffel S., ``Deconver : A deconvolutional network for medical image segmentation", Technical Report 25-165, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.
Accepted for publication in *IEEE Journal of Biomedical and Health Informatics*.
Lirias number: 4270272


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