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STADIUS
Center for Dynamical Systems, Signal Processing and Data Analytics

STADIUS Newsletter

September 2025

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

Welcome to STADIUS Newsletter after the summer break!

We hope you enjoyed a restful summer break and are ready for an inspiring new academic year.

In this edition, we are pleased to introduce our new members, including Professor Jona Beysens, and to highlight the upcoming activities within STADIUS.

We are excited to announce the **Newcomers' Seminar and Reception on 12/11**, a wonderful opportunity to meet both new and familiar faces. We warmly encourage everyone to join and take part in this occasion to connect and exchange ideas!

We are also happy to announce that a new season of the **STADIUS Colloquium Series** is currently in preparation. You will receive a separate email with the schedule in the coming weeks.



New STADIUS PI - Jona Beysens

Nice to meet you!
I am Jona Beysens, a new Assistant Professor at STADIUS, in the e-Media Research group at Group T in Leuven. In my research, I aim to explore hardware-aware AI algorithms tailored to (low-power) embedded systems. The aim is not to design new hardware, but to optimize AI algorithms such that the hardware is best utilized, improving the system's efficiency. Before joining STADIUS, I was a Senior Researcher at the research institute CSEM in Switzerland, working on Embedded AI applications. I obtained my PhD at KU Leuven on Visible Light Communication Networks in 2020, under the supervision of Prof. Sofie Pollin. In my free time, I enjoy running and cycling while taking in the beauty of nature.

I am looking forward to working with you!

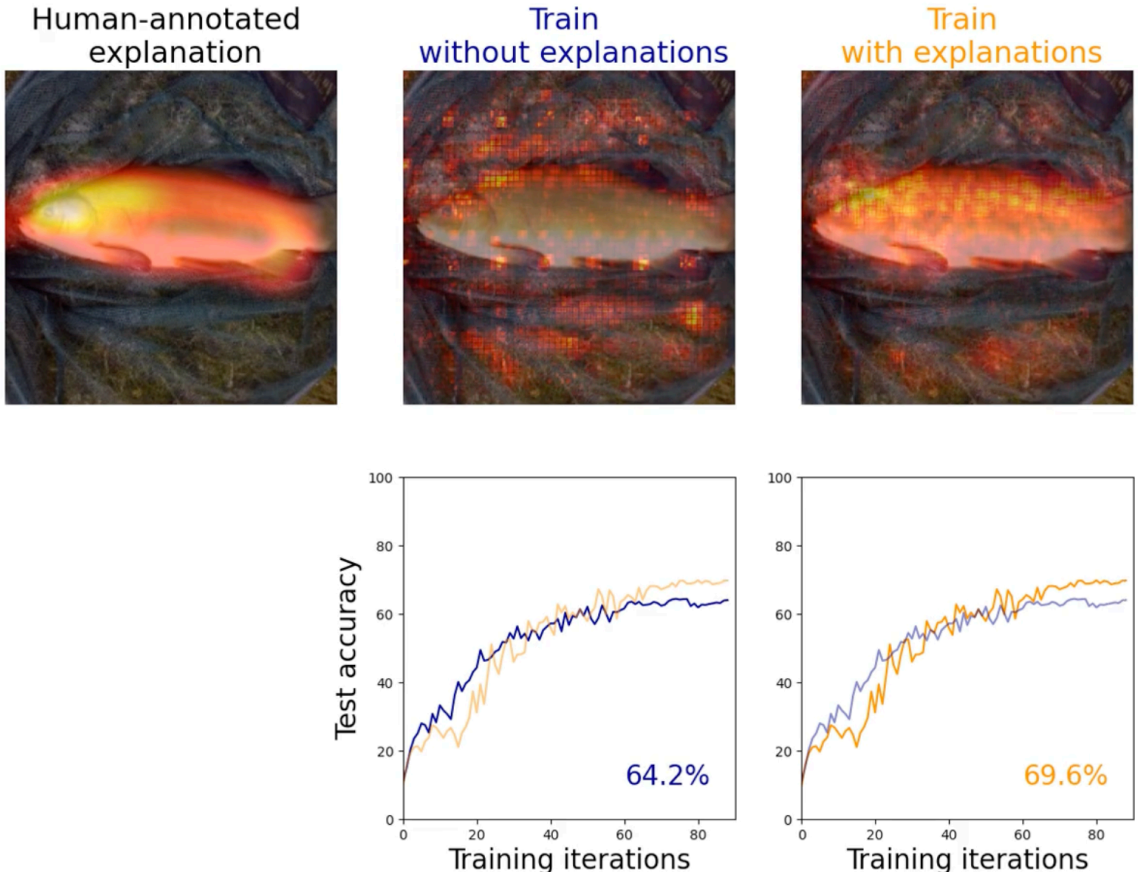
Research of the month by Joran Michiels

"Towards meaningful post-hoc explanations for end-users of predictive models."

Work under the supervision of Maarten De Vos and Johan Suykens

With the rise of **machine learning** in crucial applications such as **healthcare**, the need for insight into the model's decision-making process has become paramount. **Local post hoc explanations** have emerged as a popular approach to provide insight into the model's predictions. These are techniques that highlight which parts of the input were most important for a specific prediction. Their simple and seemingly intuitive nature makes them accessible to a wide audience, including the end-users (e.g., clinicians) associated with the applications. However, the explanations are **poorly understood**, leading to misinterpretation and limiting their usefulness. Additionally, explanations are not used to their full potential, as they are often only used to explain the model's predictions, rather than to actually improve the model. This hinders the true potential of local post hoc explanations in machine learning applications, limiting adoption in sensitive but very important domains such as healthcare.

In his PhD research, Joran addresses these challenges by deepening our understanding of local post hoc explanations and exploring their potential to **improve machine learning models**. The first part of his research focuses on **interpretation**. He compares modern explanation techniques with classical local linear approximations and shows that newer methods capture a broader portion of the model's decision boundary — which means they should be interpreted with greater care and nuance. To further clarify how explanations connect to feature dependencies, he introduces a **new way of decomposing explanation values**, offering a more complete picture of how different features interact in shaping predictions.



The second part of his thesis shifts from passive interpretation to **active interaction**. Here, Joran introduces **model-agnostic interactive explanations** that allow end-users to correct explanations of any model by augmenting its training data — potentially improving both **predictive performance** and **explanation quality**. To make this interactive setup feasible for complex neural networks and high-dimensional data, he implements efficient versions of techniques that directly highlight important input features from the model's inner workings. Across a variety of simulated and real-world datasets, these interactive explanations consistently show a dual benefit: enhancing model predictions while simultaneously improving explanation quality. An experiment on a subset of ImageNet data (see figure) illustrates this "**win–win**" outcome in practice: better explanations and higher test accuracy. Interestingly, simpler explanation approaches often outperformed more complex and theoretically validated ones.

In summary, Joran's research **advances the understanding of local post hoc explanations** by linking them to linear approximations and feature dependencies, while also introducing practical interactive implementations of the most popular methods. His benchmarking results highlight the importance of focusing on how explanations are actually used, rather than solely on their theoretical validation.

Read the thesis here!

Awards

Lore Van Santvliet (and her team) wins PhysioNet Challenge on Chagas



Disease Detection

A team from Biomed, STADIUS **(Lore Van Santvliet, Phu Nguyen,** and their supervisors **Prof. Maarten De Vos** and Prof. **Bert Vandenberk**) has won this year's **George B. Moody PhysioNet Challenge**, an international competition addressing open problems in cardiology. The 2025 edition focused on **designing a pre-screening tool for Chagas disease using ECG signals**. Chagas, a parasitic disease endemic to Latin America, remains one of the world's major neglected tropical diseases despite its significant health burden. At the **Computing in Cardiology Conference 2025 in São Paulo, Brazil**, the Biomed team was awarded first prize for their algorithm, which leverages a vision transformer-based ECG foundation model to detect Chagas disease.

If you are interested in more information about the challange, or in the work of the winner's team click on the links below:
https://moody-challenge.physionet.org/
https://moody-challenge.physionet.org/2025/
https://cinc.org/2025/Program/accepted/19_Preprint.pdf



Master Thesis Prize Siemens Industry Software 2024–2025

We proudly congratulate 🎓 Matisse Teuwen for winning the Siemens Industry Software master thesis prize with his work "Combining Model Predictive Control with Machine Learning for Autonomous Racing".
The thesis was supervised by Prof. **Panagiotis Patrinos** and daily supervisor **Renzi Wang** (STADIUS).

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News



STADIUS Expertise Supports Medieval Music Research

STADIUS professor **Toon van Waterschoot** contributes to the Alamire Foundation's (**Bart De Moor** being the chairman) research by **applying advanced acoustic modeling techniques** to reconstruct historical sound environments. His team measures how sound propagates in cathedrals and churches, creating mathematical models of these spaces. These models are then used in the Alamire Interactive Sound Lab, where singers can perform with the **virtual acoustics of medieval buildings** in real time. This approach allows researchers to explore how **polyphonic music**—with multiple independent voices—would have resonated in its original architectural context, providing insights into historical performance practice. Toon

van Waterschoot's work also supports **extended reality applications**, enabling immersive experiences that combine acoustics, live performance, and 3D visualizations of historical spaces.
Read more (in Dutch).



STADIUS Alumni Bart De Schutter of TU Delft becomes the new chairman of DISC

Prof. **Bart De Schutter**, currently at TU Delft, has been appointed as the new chairman of the **Dutch Institute of Systems and Control** (DISC). Bart was a researcher at ESAT from 1991 to 2004, defending his PhD thesis in 1996 under the supervisionof **Bart De Moor.** His doctoral work introduced significant advances in max algebra for discrete event systems, including state space models, realization theory, and even an SVD formulation in this unconventional algebra.
These developments built on earlier research at STADIUS on the **Generalized Linear Complementarity Problem**, co-authored with Lieven Vandenberghe. For those interested, relevant publications can be found via the STADIUS publication engine.



Capricorn Healthtech Fund II kicks off with first investment in Aspect Analytics' € 10 million Series A round

Aspect Analytics Secures €10M Series A with Support from Capricorn Healthtech Fund II
Aspect Analytics, a **KU Leuven STADIUS spin-off,** has closed a €10 million Series A funding round, led by Capricorn Partners through their Healthtech Fund II, alongside PMV and other existing investors. The company develops AI-powered software for spatial biology data analysis.
Both co-founders, Marc Claesen (CTO) and Nico Verbeeck, were former STADIUS researchers supervised by **Prof. Bart De Moor.** The spin-off builds on several generations of STADIUS PhD research, including the theses of Raf Van de Plas, **Nico Verbeeck, Tina Smets, Wanqui Zhang** (who also joined AA), and **Melanie Nijs**. Their expertise in machine learning and spatial biology continues to shape the company's technological direction.
The new funding will support international growth and further development of the Weave platform, enabling large-scale multi-omic data integration for pharmaceutical and academic research.
Read more.

STADIUS Alumni Patrick Vandenameele Appointed Next CEO of imec



We are delighted to share that **Patrick Vandenameele**, former STADIUS researcher and PhD student under the supervision of Hugo De Man and **STADIUS Professor Marc Moonen,** has been appointed as the next CEO of imec. He will assume the role on April 1, 2026, succeeding Luc Van den hove, who will become Chairman of the Board.

Patrick began his career at imec in 1996 as a researcher in **wireless communication** and has since built an impressive international career in deeptech entrepreneurship and R&D leadership. Since 2021, he has played a key role in shaping imec's research strategy, preparing him to guide the organization into its next chapter at the forefront of **nanoelectronics and digital technologies.**

We warmly congratulate Patrick on this remarkable achievement and are proud to see a former STADIUS member leading such a globally influential research hub.

Click here to readthe PhD thesis of Patrick.

Telraam: Empowering Citizens to Count Traffic

Teleraam, a spin-out of the **STADIUS spin-off TML** (Traffic and Mobility Leuven), has been recognized for its **innovative approach** to **citizen-driven traffic monitoring**. The platform enables individuals to collect and share traffic data, fostering community engagement and informed urban planning. This initiative underscores the growing impact of citizen science in shaping sustainable mobility solutions.

Click here for a short video.

Events @ STADIUS

Meet the Jury Seminar: Model-Based and Learning-Based Approaches for Speech Enhancement
Speaker: Simon Doclo
When: 02/10/2025, 10:00
Location: B00.35

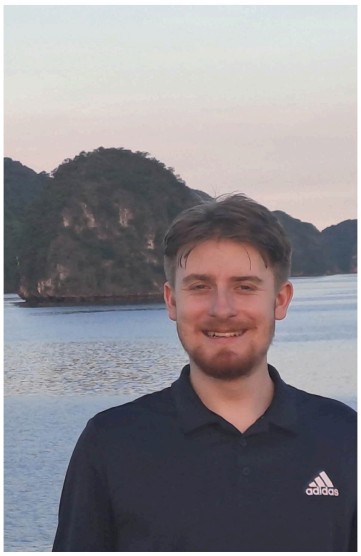
STADIUS Newcomers Seminar and Reception
When: 12/11/2025, 14:00 – 20:00
Location: Aula R

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

New colleagues

A warm welcome to new personnel at STADIUS!



Hello,

My name is Matthias Campling, and I recently started my PhD at STADIUS under the supervision of Professor Johan Suykens. My research explores synergies between deep learning architectures and the framework of Restricted Kernel Machines, with the aim of advancing our understanding of how these can complement each other. Before starting my PhD, I completed a Master's degree in Computer Science at KU Leuven, followed by a Master's degree in Artificial Intelligence. Outside of academia, I enjoy staying active through sports such as football, tennis, and padel. I am very excited to begin this PhD and look forward to working together with other researchers within STADIUS!

Matthias



Hello everyone,

I am Anuradha Kumari from India. I recently joined KU Leuven as a postdoctoral fellow, working with Prof. Johan Suykens as promoter and Dr. Panagiotis Patrinos as co-promoter. I completed my Ph.D. in May 2025 at IIT Indore, India, where my research focused on support vector machines and neural networks. At KU Leuven, I'm excited to expand my work by exploring attention mechanisms in transformers, particularly from the perspective of kernel machines. Outside of research, I love spending my free time reading novels. I am looking forward to learning, collaborating, and growing with all of you.

Anuradha

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

Best of luck!

- **Joran Michiels** - who has just defended his PhD last week (under supervision of Maarten De Vos and Johan Suykens), has started as a post-doc researcher on explainable AI in genomics at the lab of Alejandro Sifrim (KULeuven Department of Human Genetics).

Recently defended PhDs

Congratulations to the new PhD graduates:

- **25/09/2025 Joran Michiels "***"Data-Efficient Machine Learning for the Analysis of Dynamic Acoustic Scenes"*, PhD thesis, Faculty of Engineering
  - Supervisor: Maarten De Vos, Johan Suykens
  - Link to thesis: https://lirias.kuleuven.be/4245579&lang=en

- **21/08/2025 Stefano Damiano "***Towards meaningful post-hoc explanations for end-users of predictive models*, PhD thesis, Faculty of Engineering"
  - Supervisor: Toon van Waterschoot, Andre Guntoro
  - Link to thesis: https://lirias.kuleuven.be/4245666&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.

25-132
Shahhosseini A., Burger T., Sepulchre R., ``Variable Metric Splitting Methods for Neuromorphic Circuits Simulation'', Technical Report 25-132, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025. Accepted for publication in *2025 IEEE 64th Conference on Decision and Control (CDC)*.
Lirias number: 4249092.

25-133
Shahhosseini A., Chaffey T., Sepulchre R., ``Operator-Splitting Methods for Neuromorphic Circuit Simulation'', Technical Report 25-133, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.

25-134
Cadavid J., Moller M.B., van Waterschoot T., Bech S., Ostergaard J., ``Effects of reduced information in the performance of low-frequency sound zones'', *J. Aud. Eng. Soc.*, vol. 73, no. 7/8, Jul. 2025, pp. 429-445.
Lirias number: 4248606.

25-135

de la Rosa E., Wiestler B., Reyes M., Liew S.L., Hutton A., Wiest R., Kaesmacher J., Hanning U., Hakim A., Zubal R., Valenzuela W., Robben D., Sima D., Anania V., Brys A., Meakin J., Mickan A., Broocks G., Heitkamp C., Gao S., Liang K., Zhang Z., Siddiquee M.R., Myronenko A., Ashtari P., Van Huffel S., Jeong H., Yoon C., Kim C., Huo J., Sparks R., Ourselin S., Clerigues A., Oliver A., Llado X., Chalcroft L., Pappas I., Bertels J., Heylen E., Moreau J., Hattami N., Frindel C., Qayyum A., Mazher M., Puig D., Lin S.C., Juan C.J., Hu T., Boone L., Goubran M., Liu Y.J., Wegener S., Kofler F., Ezhov I., Shit S., Petzsche M.H., Menze B., Kirschke J., Muller M., ``DeepISLES : A clinically validated Ischemic Stroke Segmentation Model from the ISLES'22 Challenge", *Nature Communications*, vol. 16, Aug. 2025, pp. 14 - art nb 7357.
Lirias number: 4251465.

25-137

Wang M., Lou X., Cui B., Suykens J.A.K., ``An attention-based approach for Koopman modeling and predictive control of nonlinear systems", *ISA Transactions*, vol. 162, Jul. 2025, pp. 47-63.
Lirias number: 4244275.

25-139

Vanhemel T., Nijs M., Birmpili A. Hendriks T., Cuypers E., De Moor B., ``A Novel Peak Shape-Aware Approach for Mass Alignment in Mass Spectrometry", Technical Report 25-139, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.

25-140

Pirmani A., De Brouwer E., Arany A., Oldenhof M., Passsemiers A., Faes A., Kalincik T., Ozakbas S., Gouider R., Willekens B., Horakova D., Kubala Havrdova E., Patti F., Prat A., Lugaresi A., Tomassini V., Grammond P., Cartechini E., Roos I., Boz C., Alroughani R., Amato M.P., Buzzard K., Lechner-Scott J., Guimaraes J., Solaro C., Gerlach O., Soysal A., Kuhle J., Sanchez-Menoyo J.L., Spitaleri D., Csepany T., Van Wijmeersch B., Ampapa R., Prevost J., Khoury S.J., Van Pesch V., Nevin J., Maimone D., Weinstock-Guttman B., Laureys G., McCombe P., Blanco Y., Altintas A., Al-Asmi A., Garber J., Van der Walt A., Butzkueven H., de Gans K., Rozsa C., Taylor B., Al-Harbi T., Sas A., Rajda C., Gray O., Decoo D., Carroll W.M., Kermode A.G., Fabis-Pedrini M., Mason D., Perez-Sempere A., Simu M., Shuey N., Singhal B., Cauchi M., Hardy T.A., Ramanathan S., Lalive P., Sirbu C.A., Hughes S., Castillo Trivino T., Peeters L.M., Moreau Y., ``Personalized federated learning for prediciting disability progression in multiple sclerosis using real-world routine clinical data", *npj Digital Medicine*, vol. 8, no. 478, 2025, pp. 1-15.
Lirias number: 4253189.

25-141

Verplaetse N., Fariselli P., Moreau Y., Raimondi D., ``Explainable deep learning for stratified medicine in inflammatory bowel disease", *Genome Biology*, vol. 26, no. 223, 2025, pp. 1-30.
Lirias number: 4253182.

25-142

Tonin F., Lambert A., Suykens J.A.K., Cevher V., ``Accelerating Spectral Clustering under Fairness Constraints", Technical Report 25-142, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025. *International Conference on Machine Learning (ICML 2025)*.
Lirias number: 4257845.

25-143

Rosseel H., *Spatial recording, processing and auralization of historical worship space acoustics*, PhD thesis, Faculty of Engineering, KU Leuven (Leuven, Belgium), Sep. 2025, 300 p.
Lirias number: 4245435.

25-144

Rosseel H., van Waterschoot T., ``Accelerated Interactive Auralization of Highly Reverberant Spaces using Graphics Hardware", Technical Report 25-144, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.

25-145

Damiano S., *Data-efficient machine learning for the analysis of dynamic acoustic scenes*, PhD thesis, Faculty of Engineering, KU Leuven (Leuven, Belgium), Aug. 2025
Lirias number: 424566.

25-146

Allamaa J.P., *Embedded learning and optimization for autonomous vehicle control*, PhD thesis, Faculty of Engineering, KU Leuven (Leuven, Belgium), Sep. 2025
Lirias number: 4245035.

25-147

Schott J., *System identification based detection of electrically evoked auditory steady-state responses in electroencephalography recordings for objective cochlear-implant fitting*, PhD thesis, Faculty of Engineering, KU Leuven (Leuven, Belgium), Sep. 2025
Lirias number: 4245577.

25-148

Angelou A., Behmandpoor P., Moonen M., ``Master-Assisted Distributed Uplink Operation for Cell-Free Massive MIMO Networks", Technical Report 25-148, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.

25-149

Yao Y., Geirnaert S., Tuytelaars T., Bertrand A., ``Efficient Solutions for Mitigating Initialization Bias in Unsupervised Self-Adaptive Auditory Attention Decoding", Technical Report 25-149, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.

25-150

Ashtari P., Behmandpoor P., Haredasht F.N., Chen J.H., Patrinos P., Van Huffel S., ``Quantization-aware matrix factorization for low bit rate image compression"
Lirias number: 4262290.

25-151

Huremagic B., Sattanathan N., Geysens M., Harwood J., Verbesselt J., Meynants S., Swillen A., Van den Bogaert K., Drakulic D., Cuturilo G., van Amelsvoort T., Linden D., Oliva-Teles N., Jorge P., van den Bree M.B.M., Hall J.H., Chizari H., Ardeshirdavani A., Harwood A.J., Vandeweyer G., Moreau Y., Vermeersch J., ``MINDDS-connect : a federated data platform integrating biobanks for meta cohort building and analysis", *European Journal of Human Genetics*, Aug 2025, pp. 1-8.
Lirias number: 4255283.

25-152

De Smedt S., Evens B., Ravichandran P., Patrinos P., Van Loock F., Cardinaels R., ``SMaRT Stacking : A methodology to produce optimally layered EMI shields with maximal green index using fused deposition modeling", *Advanced Functional Materials*, 2025, e12713 p.
Lirias number: 4255484.

25-153

Chuma A.T., Asmare M.H., Varon C., Kassie D.M., Wang C., Vanrumste B., ``Machine learning for classification of advanced rheumatic heart disease using electrocardiogram in cardiology ward", *Research Square*, jun. 2025, pp. 1-30.
Lirias number: 4244785.

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