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STADIUS
Center for Dynamical Systems, Signal Processing and Data Analytics

STADIUS Newsletter

February 2026

Research of the month by Mustafa Enes Aydın

"Resurfacing the Instance-only Dependent Label Noise Model through Loss Correction"

Work under the supervision of Alexander Bertrand and Maarten De Vos

Label noise is one of the culprits for low-quality data in supervised classification settings where some of the labels deviate from their true values. While it is relatively easy to collect data, it is as laborious to label them correctly in a time-efficient manner, which inevitably results in errors in annotations. One area affected by wrong annotations is automated seizure detection where, e.g., non-standard EEG montages in behind/around the ear can severely affect the label quality. The machines are prone to overfitting these mislabels, which results in poor generalization. The need for tackling noisy labels is therefore in order.

Loss correction is one prominent way of handling label noise in a machine-agnostic manner: given a possibly *noise intolerant* loss function (e.g., cross entropy), "correct" it by devising a new loss which is robust to label noise. These methods are easy to implement: usually the correction of the base loss takes a few lines of code with very little computational overhead, compared to, say, modifying an entire machinery.

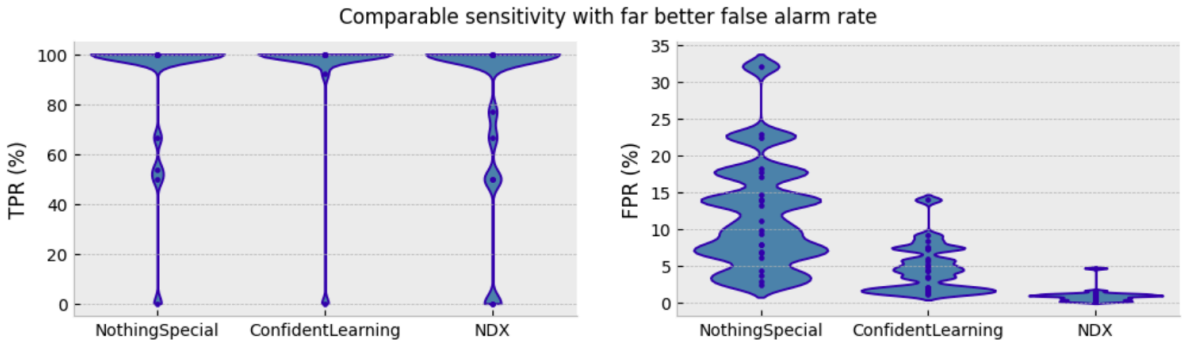
Our loss correction design is based on risk equivalence: seeking a path from *empirical noisy risk minimization* to *true clean risk minimization*:

$$R_{\ell_{01}}(h) \underset{\text{Classification Calibratedness}}{\leftarrow} R_{\ell}(h) \underset{\text{Our } \widetilde{\ell} \text{ design}}{\leftarrow} \widetilde{R}_{\widetilde{\ell}}(h) \underset{\text{Law of Large Numbers}}{\leftarrow} \widehat{\widetilde{R}}_{\widetilde{\ell}}(h).$$

One needs a *transition probability* design to go from the noisy domain to the clean (unknown) one. While the literature is dominated by *y-dependent* and *X- and y-dependent* noise models, we take a different approach: *X-only-dependent* noise model, which is driven by the plausible assumption that *y*, being an aggregate statistic of *X*, does not convey any more information than X on the transition rate. This way, we estimate a scalar instead of a matrix per instance, for example.

In light of these, we devise a loss correction mechanism with instance-only dependent label noise model for binary classification tasks and test it on various domains (image, audio, tabular) with different machines (neural networks, gradient-boosted machines) against twelve other methods from the literature, and achieve promising results.

As an application, we experimented with a seizure detection problem: we use SeizeIT1 and SeizeIT2 datasets (training and testing, respectively) and correct the hinge loss to be used in a (kernel) SVM. Our model (NDX), in comparison with the "confident learning" approach and the baseline of not doing anything special for label noise, achieves considerably better false positive rates with comparable true positive rates over 39 patients over the test set:



For more detailed reading:
👉 Mustafa Enes Aydın, Maarten De Vos, and Alexander Bertrand. Resurfacing the Instance-only Dependent Label Noise Model through Loss Correction. In *International Conference on Learning Representations (ICLR)*, 2026.

Awards



Bart De Moor Appointed Honorary Doctor at KTH

We are very proud to announce that **Professor Bart De Moor** (KU Leuven, STADIUS) will be granted a doctorate Honoris Causa at KTH in Stockholm (https://www.kth.se/en).

Honorary doctorates are awarded to individuals who have made significant contributions to society while strengthening the university's activities.

Professor De Moor is recognised for his **long-standing collaboration with Swedish universities** and his leading contributions to **systems and control** specifically and **AI research** in general.
For more than 30 years, he has worked closely with Swedish institutions; teaching, lecturing, conducting assessments, and advising national initiatives such as WASP (Wallenberg AI, Autonomous Systems and Software Program).

Reflecting on Europe's role in global AI development, Professor De Moor emphasised the need for stronger ambition and faster action: "The rapid developments in the USA and China should be a wake-up call for Europe."

He will be formally promoted at the upcoming doctoral graduation ceremony on April 17, in Stockholm.

News

Aspect Analytics launches new website



One of STADIUS spinoffs (Bart De Moor), **Aspect Analytics** (AI/ML-native software for spatial biology), has launched its new website.
The site introduces **Weave®**, a platform that aligns spatial and molecular data to explore cellular neighborhoods and tissue architecture — built to accelerate discovery in drug development.
👉 Explore the site: Aspect Analytics website

Events @ STADIUS

13/03/2026 – Large Sample Approximation for LS-SVM Regression
When: 13/03/2026, 15:00 - 16:00
Where: B00.35 (ESAT)
Speaker: Kris De Brabanter

30/03/2026 - End-to-End Biomedical AI: From Data Quality to Trustworthy Clinical Decision Support
When: 30/03/2026, 14:00 - 16:00
Where: Aula van de Tweede Hoofdwet (TI 01.02)
Organisers: Axel Geysels, Alexandre Arnould, Thomas Vanhemel

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

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STADIUS Colloquium Series

Applications of Least Squares Support Vector Regression
When: 13/03/2026; 10:00 - 11:00
Speaker: Kris De Brabanter
Location: B91.100



Biomedical Applications
When: 22/04/2026; 10:00 - 11:00
Speaker: Borbala Hunyadi
Location: Aula R



Bayesian inference with physics-informed deep generative models: Applications to computational imaging
When: 17/06/2026; 15:00 - 16:00
Speaker: Marcelo Pereyra
Location: Aula C



For more information go to STADIUS Colloquium Website

Recently defended PhDs

Congratulations to the new PhD graduate!

- **5/02/2026 - Rosa Friesacher** *"Uncertainty Quantification for Trustworthy Drug-Target Interaction Predictions"* **Thesis**
  Promotor: Yves Moreau
- **9/02/2026 - Teodor Rotaru** *"Exact Performance Analysis of Fundamental First-Order Optimization Methods"* **Thesis**
  Promotor: Panagiotis Patrinos
- **11/02/2026 - Bram De Cooman** *"Constraining Model-Free Reinforcement Learning Algorithms with Application to Autonomous Driving"* **Thesis**
  Promotor: Johan Suykens

Publications

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.

26-21
Wang C., Xue Z., Kumar S., Camps G., Hallez H., Vanrumste B., ``Skeleton-based intake gesture detection with spatial-temporal graph convolutional networks", in *Proc. of the 47th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, Copenhagen, Denmark, Jul. 2025, pp. 1-6.
Lirias number: 4281162.

26-22
AydÄ±n M.E., De Vos M., Bertrand A., ``Resurfacing the Instance-only Dependent Label Noise Model through Loss Correction", Technical Report 26-22, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026. Accepted for publication in *Proc. of the International Conference on Learning Representations (ICLR 2026)*, Rio de Janeiro, Brazil, Apr. 2026.
Lirias number: 4405350.

26-23

Cakmak B., Vantorre M., Dietzen T., van Waterschoot T., ``Televic Measurements Technical Report'', Technical Report 26-23, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-24

Vanpoucke L., De Moor B., ``Globally optimal least squares misfit identification of multidimensional, autonomous, linear, shift-invariant systems'', Technical Report 26-24, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-25

Vanpoucke L., De Moor B., ``Multivariate polynomials and autonomous, scalar, linear, shiftinvariant models of finite order'', Technical Report 26-25, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-26

Vanpoucke L., De Moor B., ``Direct computation of multiplication maps'', Technical Report 26-26, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-27

Vermeersch C., De S., De Moor B., ``Perturbation Theory for Rectangular Multiparameter Eigenvalue Problems'', Technical Report 26-27, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-28

Blochberger M., Ostergaard J., Elvander F., Moonen M., van Waterschoot T., ``Physics-informed coding for sound field estimation in wireless acoustic sensor networks'', Technical Report 26-28, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-30

Lagauw S., Kayser L., De Moor B., ``Porteous Meets Walsh: Counting Critical Points for H2-Norm Model Reduction Using Algebraic Geometry Behind Multiparameter Eigenvalue Problems'', Technical Report 26-30, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-31

Kayser L., Lagauw S., De Moor B., ``Generic and specific Euclidean distance degrees of secant varieties to the rational normal curve'', Technical Report 26-31, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-32

Yao Y., Geirnaert S., Tuytelaars T., Bertrand A., ``Sample-level EEG-based Selective Auditory Attention Decoding with Markov Switching Models'', Technical Report 26-32, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-34

Geirnaert S., Ding R., Bertrand A., ``Selective Auditory Attention Decoding with a Two-Node Wireless EEG Sensor Network'', Technical Report 26-34, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-35

Sofi S. S., Vermeylen C., De Lathauwer L., ``Tomography by Design: An Algebraic Approach to Low-Rank Quantum States'', Technical Report 26-35, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-36

Damiano S., van Waterschoot T., ``Sound Field Reconstruction with an Attention-Based Deep Operator Network'', Technical Report 26-36, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-37

Liekens B., Roebben A., van Waterschoot T., Moonen M., ``On the Use of Dereverberation for Acoustic Feedback Cancellation'', Technical Report 26-37, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-38

De Cooman B., *Constraining Model-Free Reinforcement Learning Algorithms with Application to Autonomous Driving*, PhD thesis, Faculty of Engineering, KU Leuven (Leuven, Belgium), Feb. 2026, 292 p.
Lirias number: 4388493.

26-39

van Rooij H., De Moor B., ``Numerical Elimination Theory via the Macaulay Matrix'', Technical Report 26-39, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-40

van Rooij H., De Moor B., ``The Cuckoo Problem: Finding the Globally Optimal Critical Value of a Polynomial Optimization Problem using the Macaulay Matrix'', Technical Report 26-40, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-41

van Rooij H., De Moor B., ``Using Numerical Elimination Theory for Polynomial Optimization with Positive-Dimensional Solution Sets'', *European Research Network on System Identification (ERNSI) 2025 (ERNSI 2025)*, Bordeaux, France, Sep. 2025, 1 p.
Lirias number: 4405187.

26-42

van Rooij H., ``Using the Macaulay Matrix to find the Globally Optimal Critical Value of a Multivariate Polynomial Optimization Problem'', *Benelux Meeting on Systems and Control 2024 (Benelux Meeting 2024)*, Blankenberge, Belgium, Mar. 2024, pp. 0-30.
Lirias number: 4405191.

26-43

van Rooij H., De Moor B., ``From Canceling Variables to Building Polynomial Models Talk I: How to Cancel Variables Using the Macaulay Matrix'', *Flanders AI Research Day 2025*, Ghent, Belgium, Oct. 2025, pp. 1-21.
Lirias number: 4405211.

26-44

De S., De Moor B., ``Global Identifiability of parameterized nonlinear dynamical models'', *31st ERNSI Workshop in System Identification (ERNSI 2023)*, Stockholm, Sweden , Sep. 2023, 1 p.
Lirias number: 4405212.

26-45

De S., De Moor B., ``Using the SVD to compute output difference equations'', *32nd ERNSI workshop in system identification (ERNSI 2024)*, Venice, Italy, Sep. 2024, 1 p.
Lirias number: 4405234.

26-46

De S., De Moor B., ``Globally Optimal Parameter Estimation for Autonomous Nonlinear Dynamical Models is an Eigenvalue Problem'', *Proc. of the 43rd Benelux Meeting on Systems and Control*, Blankenberge, Belgium , Mar. 2024, 1 p.
Lirias number: 4405215.

26-47

De S., De Moor B., ``Realizing first-order polynomial state-space models: Using a linear algebraic framework'', *33rd ERNSI Workshop on System Identification (ERNSI2025)*, Bourdeaux, France, Sep. 2025, 1 p.
Lirias number: 4405219.

26-48

De S., De Moor B., ``From Canceling Variables to Building Polynomial Models Talk II: Realizing First Order Polynomial State-Space Model'', *Flanders AI Research Day* , Ghent, Belgium , Oct. 2025, 25 p.
Lirias number: 4405223.

26-49

Deferme M., De Moor B., ``Polynomial/Rational Models from Model-compliant Data'', Technical Report 26-49, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-50

Correa Rojo A., Moreau Y., Ertaylan G., ``PRISM-G: a interpretatle privacy scoring framework for assessing risk in synthetic genomic data'', Technical Report 26-50, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026.

26-52

Wang C., Hallez H., Vanrumste B., ``Robust multimodal learning framework for intake gesture detection using contactless radar and wearable IMU sensors'', Technical Report 26-52, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026. Accepted for publication in *IEEE Journal of Biomedical and Health Informatics*.
Lirias number: 4405148.

26-53

Chuma A.T., Voigt J.U., Youssef A.S., Asmare M.H., Wang C., Varon C., Kassie D.M., Willems R., Vanrumste B., ``Electrocardiographic digital biomarkers in asymptomatic schoolchildren with rheumatic heart disease'', Technical Report 26-53, ESAT-STADIUS, KU

Leuven (Leuven, Belgium), 2026.
Lirias number: 4402158.

26-54

Liao M., Libeert E., Van Cauwelaert J., Wang C., Brumagne S., Aerts J.M., Vanrumste B., ``IMU-based pelvic rotation detection : a novel dataset, benchmark classifiers, and sensor placement optimization", *IEEE Journal Biomedical and Health Informatics*, vol. *, no.* , 2026, pp. 1-13.
Lirias number: 4402405.

26-55

Montenegro M., Gielen J., Wang C., Vanrumste B., Ruttens D., Knevels R., Aerts J.M., ``AI en IoT for COPD remote monitoring : A systematic review of ECOPD prediction frameworks and key monitoring physiological variables", Technical Report 26-55, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2026. Accepted for publication in *JMIR Medical Informatics*.
Lirias number: 4405346.



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