Lars Doorenbos

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Nationality: Dutch

Research interests

Anomaly/Out-of-Distribution Detection, Computer Vision, Astro-informatics

Education

University of Bern 2020 – Present
PhD student, Artificial Intelligence in Medical Imaging Lab
Topic: Unsupervised out-of-distribution detection
Supervisors: Raphael Sznitman, Pablo Márquez-Neila, François Fleuret (external)

University of Groningen 2018 – 2020
Master in Computing Science
Intelligent Systems & Visual Computing track *Grade: 8.6*
Master thesis at **Rice University** on classifying hyperspectral imagery *Grade: 9*
Research project at **University of Naples Federico II** on astronomical outlier detection *Grade: 9.5*

University of Groningen 2014 – 2018
Bachelor in Computing Science, Minor in Law. *Grade: 7.8*

Selected Publications[1]

Stochastic Segmentation with Conditional Categorical Diffusion Models
Lukas Zbinden[2], **Lars Doorenbos**[2], Theodoros Pissas, Adrian Thomas Huber, Raphael Sznitman, Pablo Márquez-Neila.
International Conference on Computer Vision 2023.

Data Invariants to Understand Unsupervised Out-of-Distribution Detection
Lars Doorenbos, Raphael Sznitman, and Pablo Márquez-Neila.
European Conference on Computer Vision 2022.

Generating Astronomical Spectra from Photometry with Conditional Diffusion Models
Lars Doorenbos, Stefano Cavuoti, Giuseppe Longo, Massimo Brescia, Raphael Sznitman, and Pablo Márquez-Neila.
NeurIPS Workshop on Machine Learning for the Physical Sciences 2022.

Industry experience

Nvidia, Holoscan team Summer 2023
Machine learning internship

[1] Remaining publications at the end of the CV
[2] Equal contribution

Exploring language-controlled robotics for surgical robots. Developed sample applications for the Holoscan edge device.

Awards

2021 LSST AGN Data Challenge, 2nd place ($2000) 2021

Teaching experience

Teaching assistant, University of Bern
Deep Learning, Introduction to Signal and Image Processing, Introduction to Clinics, courses for the Masters in Artificial Intelligence in Medicine and Biomedical Engineering

Practical session on Introduction to Mathematical Optimization
Part of a series of refreshers for incoming students, organized for the Master in Artificial Intelligence in Medicine at the University of Bern.

Lab on Deep Learning based Segmentation of Retina and Fluids in Optical Coherence Tomography Volumes of Retinal Scans
Teaching a series of 3-hour labs presenting a holistic view of a deep learning project applied to a medical problem, from data labelling to model training.

Talks

Knowing what you don't know June 2023
GCB Symposium 2023 **(best presentation award)**

Generating astronomical spectra from photometry with conditional diffusion models May 2023
Bern Data Science Day 2023 **(selected as oral)**

Reviewing

Machine Learning and the Physical Sciences workshop, NeurIPS 2023

Skills

Programming
Proficient in Python, C/C++.
Familiar with MATLAB, R, Java, Haskell.
Experience with Omniverse Isaac Sim.

Languages
Dutch (native), English (fluent), German, Spanish (intermediate)

Professional memberships

Euclid Consortium. 2022 – Present
Part of the Organisation Unit for photometric redshift and the Local Universe science working group. Specifically, I work on identifying outliers to improve the downstream estimates of various parameters.

Other

EXCITE Summer School on Biomedical Imaging 2021.

Focused on recent advances and challenges in biological and medical imaging. *Grade: 5.25/6*

Remaining Publications

ULISSE: A tool for one-shot sky exploration and its application for detection of active galactic nuclei
Lukas Zbinden, **Lars Doorenbos**, Olena Torbaniuk, Stefano Cavuoti, Maurizio Paolillo, Giuseppe Longo, Massimo Brescia, Raphael Sznitman, Pablo Márquez-Neila.
Astronomy & Astrophysics (2022)

SS3D: Unsupervised Out-of-Distribution Detection and Localization for Medical Volumes
Lars Doorenbos, Raphael Sznitman, and Pablo Márquez-Neila.
International Conference on Medical Image Computing and Computer-Assisted Intervention: Biomedical Image Registration, Domain Generalisation and Out-of-Distribution Analysis. Springer, Cham, 2021.

Comparison of outlier detection methods on astronomical image data.
Lars Doorenbos, Stefano Cavuoti, Massimo Brescia, Antonio D'Isanto, Giuseppe Longo
Intelligent Astrophysics, Book eds. I. Zelinka, D.Baron, M. Brescia, Springer Nature Switzerland, 2021.

Unsupervised out-of-distribution detection for safer robotically-guided retinal microsurgery.
Alain Jungo, **Lars Doorenbos**, Tommaso Da Col, Maarten Beelen, Martin Zinkernagel, Pablo Márquez-Neila, Raphael Sznitman.
International Conference on Information Processing in Computer-Assisted Interventions (2023) - *best paper shortlist.*

Optimising and comparing source-extraction tools using objective segmentation quality criteria.
Caroline Haigh, Nushkia Chamba, Aku Venhola, Reynier Peletier, **Lars Doorenbos**, Matthew Watkins, Michael HF Wilkinson.
Astronomy & Astrophysics 645 (2021)

Hyperbolic Random Forests.
Lars Doorenbos, Raphael Sznitman, Pablo Márquez-Neila, Pascal Mettes.
arXiv preprint arXiv:2308.13279