Bram **de Wilde**

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Education & Experience

PhD Deep Learning for Medical Imaging

Nijmegen, The Netherlands

RADBOUD UNIVERSITY MEDICAL CENTER

Oct. 2019 - Oct. 2023

- Development and evaluation of deep learning models for adhesion detection on cine-MRI
- Generative medical imaging with latent diffusion models
- Uncertainty quantification for medical imaging

MSc Applied Physics + Applied Mathematics

Enschede, The Netherlands

UNIVERSITY OF TWENTE

Sep. 2016 - Jul. 2019

- Specialization Materials Science and Scientific Computing + Research Honours Track
- Numerical simulation of hopping transport in disordered dopant networks

Internship IBM Research

Zurich, Zwitserland

CLOUD AND COMPUTING INFRASTRUCTURE DEPARTMENT

Sep. 2017 - Dec. 2017

- Experiments and simulations on 1/f noise in phase-change memory devices

BSc Applied Physics

Enschede, The Netherlands

UNIVERSITY OF TWENTE

Sep. 2013 - Jul. 2016

- Minor in secondary school Physics education

Publications

First Author / Equal Contribution

1. Bram de Wilde, Anindo Saha, Richard PG ten Broek, and Henkjan Huisman. *Medical diffusion on a budget: textual inversion for medical image generation*. arXiv. 2023 | pdf

2. Bram de Wilde, Richard PG ten Broek, and Henkjan Huisman. *Cine-MRI detection of abdominal adhesions with spatio-temporal deep learning*. Medical Imaging with Deep Learning. 2021 | pdf

3. Natália Alves and Bram de Wilde. *Uncertainty-Guided Self-learning Framework for Semi-supervised Multi-organ Segmentation*. MICCAI FLARE workshop. 2022 | pdf

4. Henri Tertilt, Jesse Bakker, Marlon Becker, Bram de Wilde, et al. *Hopping-transport mechanism for reconfigurable logic in disordered dopant networks*. Physical Review Applied. 2022 | pdf

5. Bram de Wilde, Frank Joosten, Wulphert Venderink, Mirjam EJ Davidse, et al. *Inter-and Intra-Observer Variability and the Effect of Experience in Cine-MRI for Adhesion Detection*. Journal of Imaging. 2023 | pdf

6. Bastiaan AW van den Beukel, Bram de Wilde, Frank Joosten, Harry van Goor, et al. *Quantifiable Measures of Abdominal Wall Motion for Quality Assessment of Cine-MRI Slices in Detection of Abdominal Adhesions*. Journal of Imaging. 2023 | pdf

Co-author

7. Jun Ma, Yao Zhang, Song Gu, Cheng Ge, et al. *Unleashing the Strengths of Unlabeled Data in Pan-cancer Abdominal Organ Quantification: the FLARE22 Challenge*. arXiv. 2023 | pdf

8. Nikolas Lessmann, Clara I Sánchez, Ludo Beenen, Luuk H Boulogne, et al. *Automated assessment of COVID-19 reporting and data system and chest CT severity scores in patients suspected of having COVID-19 using artificial intelligence*. Radiology. 2021 | pdf

9. Tao Chen, Jeroen van Gelder, Bram van de Ven, Sergey V Amitonov, et al. *Classification with a disordered dopant-atom network in silicon*. Nature. 2020 | pdf

Certificates & Awards

2023   **University Teaching Qualification***, Radboud University, Faculty of Science (*Evaluation in fall)
2016   **ASML Technology Scholarship**, €10,000 MSc funding, ASML
2012   **Certificate of Proficiency in English (C2)**, Cambridge English

Skills

Programming   Python, Bash, Docker, SLURM, MATLAB, LaTeX
Python libraries   PyTorch, Tensorflow, scikit-learn, numpy, pandas

Teaching

Intelligent Systems for Medical Imaging (MSc)

FACULTY OF SCIENCE, RADBOUD UNIVERSITY   *Spring 2022, 2023*

- Lecturer, coordinator of assignments

Artificial Intelligence for Health (BSc)

FACULTY OF MEDICAL SCIENCES, RADBOUD UNIVERSITY   *Spring 2021, 2022, 2023*

- Lecturer, co-coordinator course

Text and Multimedia Mining (MSc)

FACULTY OF ARTS, RADBOUD UNIVERSITY   *Fall 2021*

- Exam design, coaching project groups

Data Mining (BSc)

FACULTY OF SCIENCE, RADBOUD UNIVERSITY   *Fall 2021*

- Teaching assistant

Student supervision

FACULTY OF SCIENCE, RADBOUD UNIVERSITY   *2021 - 2023*

- Nathan Golden, MSc Data Science, 6 months
- Evgenia Martynova, MSc Data Science, 6 months
- Mirjam E.J. Davidse, Juliëtte Geurts, Hanneke Kruijt, Afke Vermeulen, BSc Technical Medicine, 3 months

Notable projects

DETECTION OF ADHESIONS ON CINE-MRI WITH SPATIO-TEMPORAL DEEP LEARNING

Post-surgical adhesions can cause pain by connecting tissue and organs in the abdominal cavity. Cine-MRI is a non-invasive modality which captures dynamic motion during deep breathing, revealing adhesion presence through abnormal motion patterns. Improving adhesion diagnosis by development of AI could help bring this modality to more hospitals and help patients worldwide suffering from chronic pain. This unique medical AI challenge requires computer vision models to reason about both spatial and temporal features in order to detect tissue structures that stick together. We have investigated this problem from multiple perspectives, starting with characterizing observer variability (publication 5) and motion quality (publication 6). In terms of AI development, we experimented with recurrent neural networks (publication 2) and deep learning segmentation approaches using manual annotations and a U-Net framework, currently under review. Currently, another observer study is in draft, where radiologists are assisted by deep learning models. Throughout the project, we have shown that adhesion detection on cine-MRI is a particularly hard challenge, and we have presented the first fully end-to-end deep learning approaches for this problem. This project was my primary focus in the PhD, and consequently I led the project from hypothesis, data collection, technical development, to dissemination of the results.

ADAPTING LATENT DIFFUSION MODELS TO MEDICAL IMAGING

Latent diffusion models are popular and highly succesful in (text-to-)image generation. Generative imaging can be highly relevant for the medical domain, especially for data-scarce settings like rare diseases. We explored if pre-trained latent diffusion models (Stable Diffusion) can be adapted to the medical domain. In publication 1, we demonstrate that textual inversion allows diagnostically relevant image generation for prostate MRI, chest X-ray and histopathology, using only 100 examples on a consumer-grade GPU. I performed the main experiments and wrote the paper.

UNCERTAINTY-GUIDED SEMI-SUPERVISED SEGMENTATION

The MICCAI2022 Fast and Low-resource Semi-Supervised Abdominal Organ Segmentation (FLARE) challenge investigated two typically lacking factors in medical imaging: annotations and compute. The challenge task was to segment 13 organs on CT scans, provided 50 fully annotated cases and 2000 unannotated cases, while minimizing computational resources. With a colleague PhD, we developed a simple uncertainty-guided framework, where we use predictive uncertainty estimated via model ensembles to judge the quality of pseudo-labels generated for the unlabeled cases. We found that using uncertainty to filter out low-quality pseudo-labels leads to improved segmentation performance compared to not filtering at all (publications 3, 7). A journal paper is currently under review, where we compare uncertainty metrics in detail to multiple baselines and found that metrics tailored towards the clinical task are more informative. We shared most work equally, with emphasis an on code and experiments for me.

MSc thesis: HOPPING TRANSPORT IN DISORDERED DOPANT NETWORKS

Human brains operate at a fraction of the energy requirements of today's AI systems, and conventional 2D silicon hardware is part of the reason. Neuromorphic hardware researchers investigate novel computational substrates which can address this shortcoming. I investigated numerical simulations of dopant networks in silicon, which allow for efficient exploration of the algorithmic capabilities of such systems without the need for physical samples (publication 4). These dopant networks are a promising new hardware substrate for energy-efficient intelligent systems, which we demonstrated by classifying digits *in materio* (publication 9). I formalized and initiated the development of the numerical simulation software. Additionally, I was involved in maintaining the lab's measurement and data collection software in Python.