Data Series I: MEDICAL DATA USAGE
SPEAKERS

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How data sharing and AI play an essential role in e/MTIC

... and introducing e/MTIC and Health Data Platform
Institutionalised collaboration of regional partners

- Eindhoven MedTech Innovation Center (e/MTIC) is a large-scale research collaboration between:
  + TU/e
  + Catharina Hospital
  + Maxima Medical Center
  + Kempenhaeghe
  + Philips

- ~100 PhD students
- Cycling distance
- ‘Fast track to clinical innovation’
- Cardio-vascular, Perinatal, Sleep (extension to Oncology and Neurology)
- ICAI – Health AI-lab since March 2021
e/MTIC approach to innovation

- **Multidisciplinary research and data exchange**
- **Impactful international publications and exposure**
- **Valuable IP generation**
- **New generation of scientists, engineers, and innovators**
- **Real impact on healthcare**
e/MTIC Organisation

Supervisory Board

Steering Team

DAILY MANAGEMENT TEAMS
(projects)

Cardio-Vascular Care
Perinatal Care
Sleep Care

Supervisors & PhD students

TASK FORCES
(process)

Health Data Board
Regulatory Team
Valorization Team
Funding Team
Education Team
Communication Team
PhD Team
e/MTIC - Health Data Portal (HDP)

• Strong increase in research data & AI opportunities
  + Many unique retrospective databases
  + Increasing prospective data from remote monitoring
  + X-silo collaboration and data sharing required

• Still cumbersome to exploit
  + Privacy & Security regulation and interpretation
  + Lack of standardization, interoperability
  + Dispersed medical sector, lack of orchestration
  + Walk-around rather than break-through

• Health Data Portal to facilitate researchers
  + Hybrid FAIR/federative and local cloud
  + Best of components integration
  + Part of HealthRI network, regional node
  + Beyond e/MTIC
e/MTIC and the Health Data Portal

YouTube link: https://youtu.be/tldJA6i_OrM
Health Data Portal (under construction)

A structural solution for sharing and analysing data for research in (but not limited to) Healthcare

which

- Enables and facilitates data sharing across different legal entities
- Users/researchers and data owners unburdens
- Is maintained and updated
- Respects and incorporates data ownership
- Facilitates finding relevant data sources (metadata catalogue)
- Offers a set of analysis tools / algorithms
- Offers workflow support
- Meets all regulatory requirements (GDPR, Data Protection, reproducibility, ...)

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‘Data Lake’ vs. Federative data sharing

*methods to comply with legal requirements*

- Ownership with source, data is selectively and temporarily shared in pseudonymised way
- Algorithm/analyses on combined data
- Limited requirements on data formats
- Shared computing power

- Always: quality of data, reproducibility, catalogue, consent

- Data remains with source, access to be granted
- Circulating algorithm visits data
- Requirements on data formats (FAIR)
- Decentralized analysis, local computing power
Conclusions

• e/MTIC structural collaboration with focus on ‘fast track to clinical innovation’

• Increasingly data driven, AI applications
  + Data sharing and analysis across domains
  + Retrospective data sets
  + Prospective data sets, real time patient monitoring

• Unburdening of researchers by
  + Regulatory Team
  + Health Data Portal (as part of HealthRI network)
  + Operational in the course of 2022
Trustworthy AI for Medical Image Formation
Nicola Pezzotti
Deep Learning for Health Informatics

Daniele Ravi, Charence Wong, Fani Deligianni, Melissa Berthelot, Javier Andreu-Perez, Benny Lo.

Abstract
Deep learning algorithms, in particular convolutional networks, have rapidly become a methodology of choice for analyzing medical images. This paper reviews the major deep learning concepts pertinent to medical image analysis and summarizes over 300 contributions to the field, most of which appeared in the last year. We survey the use of deep learning for image classification, object detection, segmentation, registration, and other tasks. Concise overviews are provided of studies per application area: neuro, retina, pulmonary, digital pathology, breast, cardiac, abdominal, musculoskeletal. We end with a summary of the current state-of-the-art, a critical discussion of open challenges and directions for future research.

Keywords: deep learning, convolutional neural networks, medical imaging, survey
Acquisition and Image Formation are the foundations of the Imaging Chain.
Hybrid Models & Simulations
Artificial Intelligence: the fastMRI challenge

Organizers

Panel of Radiologists

Challenge Participants

Reconstruction Algorithm

Compare
The Philips teams

**Philips & LUMC**
Philips – LUMC

**Al-msterdam**
Philips – UvA – AUMC – NKI
Winners of the challenge

- Single-coil 4x: Philips & UvA
- Multi-coil 4x: Philips & LUMC
- Multi-coil 8x: Philips & LUMC

Presentation at NeurIPS 2019

AI enables better, faster and more precise diagnosis of disease. NYU and Facebook hosted the fast MRI AI challenge. Philips and their academic partners from universities of Leiden and Amsterdam won 2 out of 3 categories! We continue to reduce MR scan time and create better patient experiences at lower cost of diagnosis. Max Welling, Mark van Buchem, Joland Rutgers, Milan Petkovic, Richard Kemkers, Nicola Pezzotti.
A Hybrid Model to Ensure Trustworthiness
Philips SmartSpeed. No compromise.
Image quality and speed at your fingertips.
Understanding Models through Their Operating Domain

Pezzotti et al., GPGPU linear complexity t-SNE optimization, IEEE TVCG, 2019

Kastryulin et al., Image Quality Assessment for Magnetic Resonance Imaging, arXiv, 2022
Data Access and Co-Creation
Artificial Intelligence in Percutaneous Coronary Interventions (PCI)

AI has the potential to enhance PCI procedures performed in the CathLab in two areas: 1) Clinical support, 2) Operational efficiency and workflow. This project seeks to develop strongly improved AI approaches for accurate evaluation of the coronary vessel tree in X-ray angiographic images, as a basis for improved decision making in PCI. For example as Clinical support for the right sizing and deployment of stents. To increase Operational efficiency it targets automation of the case reporting by jointly identify the elements and deduce information from the data-rich environment.
LUMC, Universiteit Leiden en Philips intensiveren samenwerking voor snellere MRI door kunstmatige intelligentie

8 oktober 2021 • PERSBERICHT

Het Leids Universitair Medische Centrum (LUMC), de Universiteit Leiden en Philips vormen samen een van de 17 AI-labs binnen het ROBUST consortium dat geselecteerd is voor ondersteuning vanuit de NWO. Het doel van deze samenwerking is om met kunstmatige intelligentie MRI-scans te versnellen.

Het LUMC en Philips zijn in 2019 een samenwerking aangegaan om het maken van MRI-scans te versnellen. Op dit moment duurt een MRI-scan namelijk een kwartier tot een half uur, met uitscheters naar een uur. Al die tijd moet de patiënt stil liggen in een nauwe en luidruchte omgeving. Dit is vaak een oncomfortabele ervaring. Daarnaast levert het probleem op als de patiënt tijdens het scannen toch beweegt, de MRI-scan wordt dan minder scherp waardoor afwijkingen niet goed zichtbaar zijn.

Kwaliteit behouden

Om deze problemen te verhelpen hebben onderzoekers zich tot doel gesteld om een techniek te ontwikkelen waarmee elke MRI-scan in minder dan vijf minuten gemaakt kan worden. Dit doen ze door gebruik te maken van kunstmatige intelligentie die met minder data een MRI-beeld kan creëren. Hiermee kan de scantijd aanzienlijk verkort worden, zonder verlies van kwaliteit. Dit heeft niet alleen voordelen voor de patiënt, want een kortere scanduur zorgt ook voor meer efficiëntie op radiologie-afdelingen. Onderzoekers van het LUMC en Philips lieten al in een proof-of-concept-studie zien dat dit haalbaar is, en wonnen de internationale FASTMRI wedstrijd met hun AI.
At Philips, we are committed to ethical use of data in our mission to improve people’s lives through meaningful innovation. When using personal data [1], we aim to benefit our customers, patients, and society as a whole. To ensure we handle and use data with great care, we diligently apply the following principles.

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https://www.philips.com/a-w/about/philips-data-principles.html
Advancing cancer care with human-centered AI
Advancing Cancer Care with Human-Centered AI

Philips Research & Experience Design, CZE, TU/e | May 12th, 2022
e/MTIC oncology team

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Advancing cancer care with human-centered Artificial Intelligence

5 take-aways

1. Experience makes or breaks outcomes (and adoption)

2. Early realistic AI simulation pivoted everything (proposition, AI development, UX design)

3. Design and evaluate beyond performance (clinical value, workflow, trust, decision making)

4. Intuitive and apparently simple by really understanding how clinicians think

5. Good experience needs close interdisciplinary collaboration across institutions
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