Digital Intelligence in Health Research:

Are You Ready for the Future of Healthcare?

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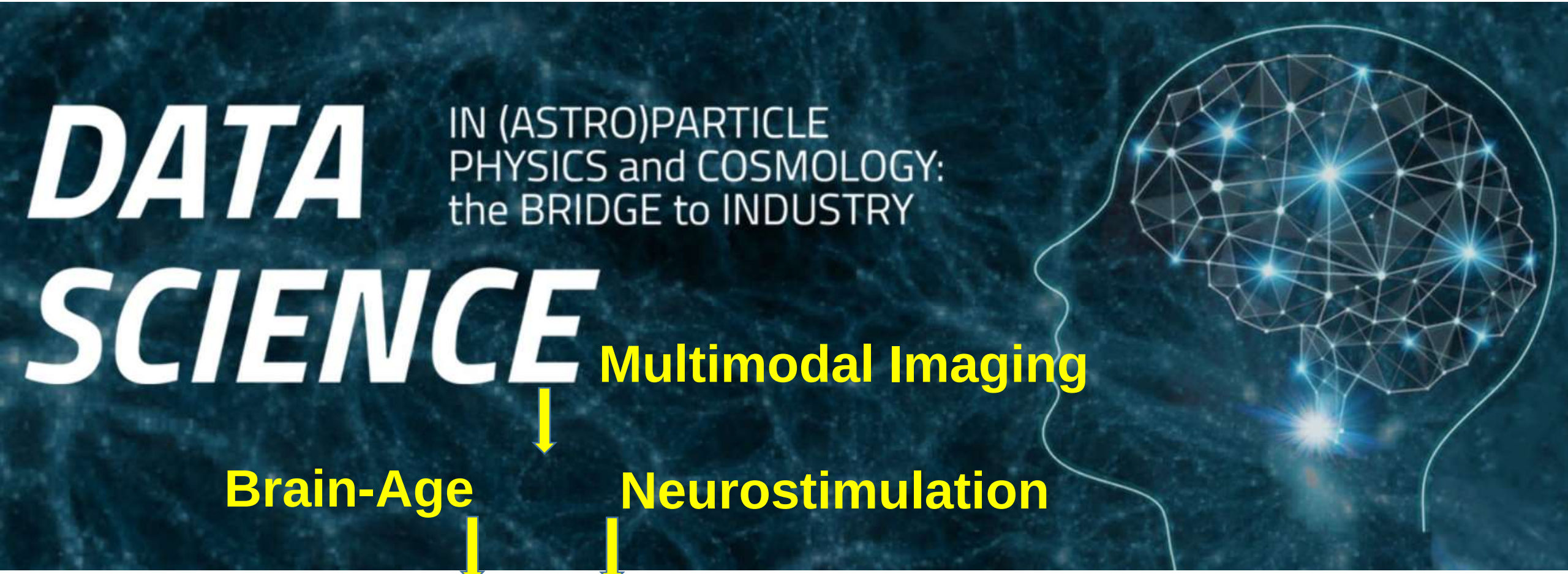
Keywords & THM

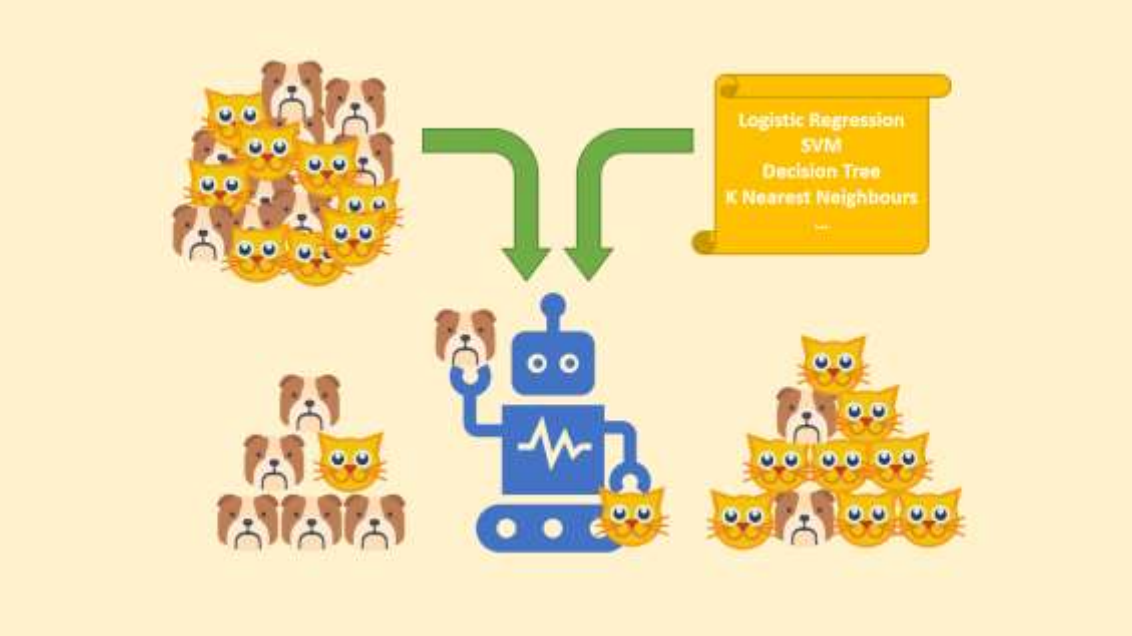


Outlook

Are You Ready for the Future of Healthcare?

- Overview of the problem
- Mobile health technology
- Electronic Health Record systems
- From Pre-clinical to clinical applications
  - Developing innovative approaches
  - Translate basic research to clinical applications using Data Science

Overview of the problem



Mobile health technology

- Eases The Day-To-Day
- Enhances The Accuracy of Communication
- Provides Faster Access to Care
- Personalizes Data and Treatment Plans

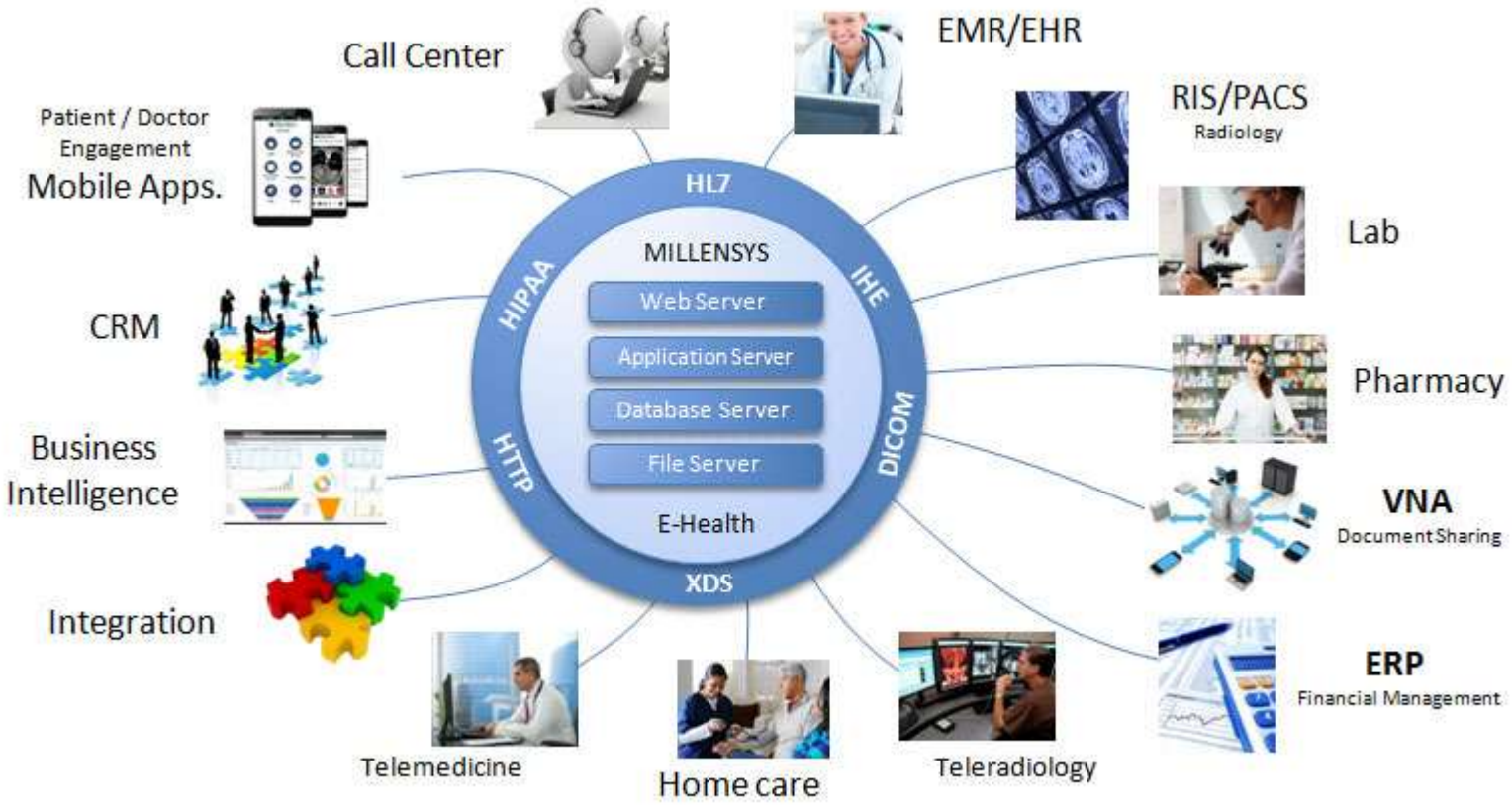
29% more efficient appointments;
60% use mobiles to explain info;
28% send info directly to patients;

Mobile health technology

Personalizes Data and Treatment Plans

- There are **wearable devices** that send data to doctors so that they can monitor their clients' health remotely
- Health data gets tracked **constantly**
- E.G. Apple Watches to monitor people with atrial fibrillation
- See how a patient is doing without needing to schedule a visit
- Encourages **preventative** care

Electronic health record (EHR)



Electronic Medical Records
Computerized medical records
Electronic clinical information system
Computerized patient records…

https://www.millensys.com/products/products_healthcare.html

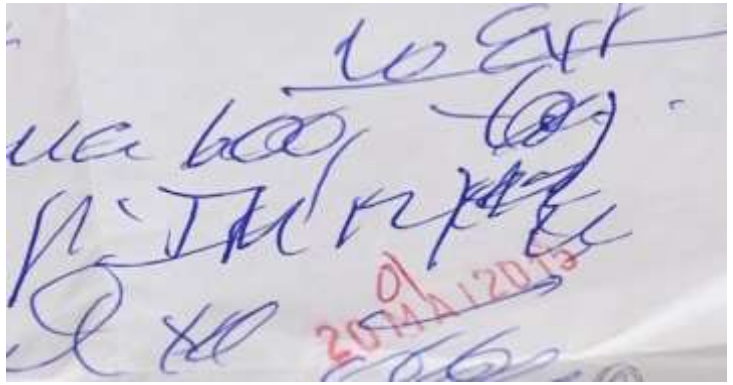
Electronic health record

- An **electronic** version of patients data (usually in paper)
- **Longitudinal** overview of patient health from distinct sources
- **Systematic** collection of electronic health information
- Facilitates **exchange** between health care providers
- **Source** for clinical and health research
- Alerts, reminders, **education**

2008 only 13% used electronic records
2020 more then 60%...

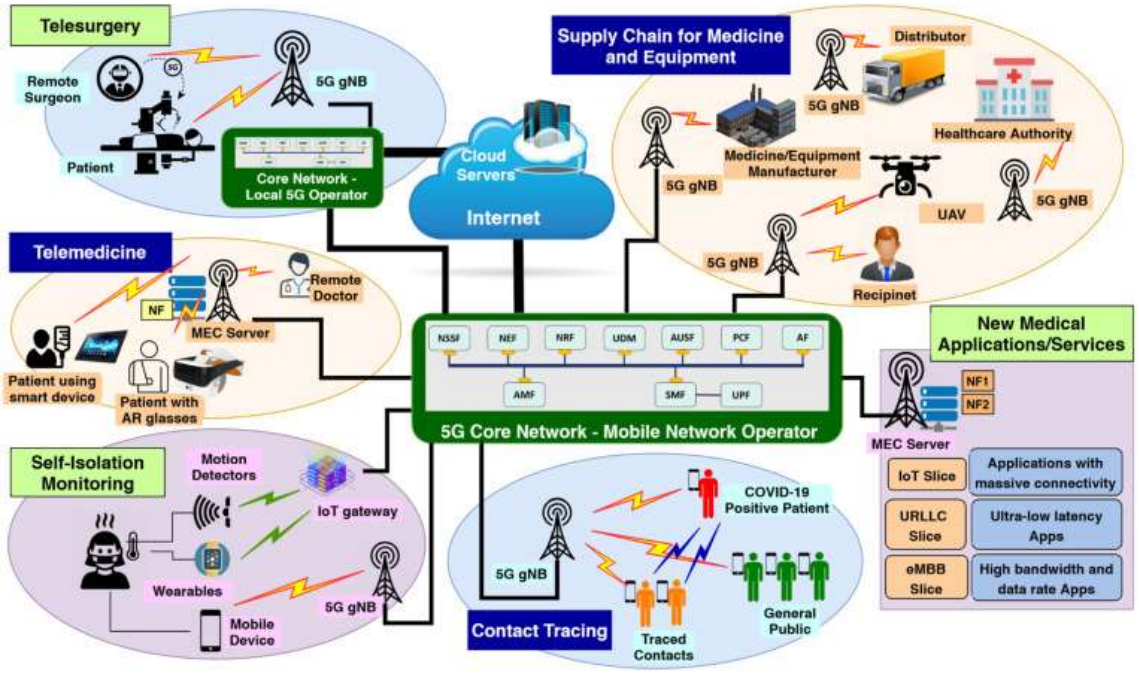
Electronic health record

- Supports clinical decisions and **avoid unnecessary tests** (**AI** based)
- **Prevention** of complications by setting reminders
- **Early** and better **treatment** options (e.g. 11% gain in hypertension)
- Decrease costs
- Computerized **prescriptions** (drugs, lab tests, radiology, therapies…)



Electronic health record

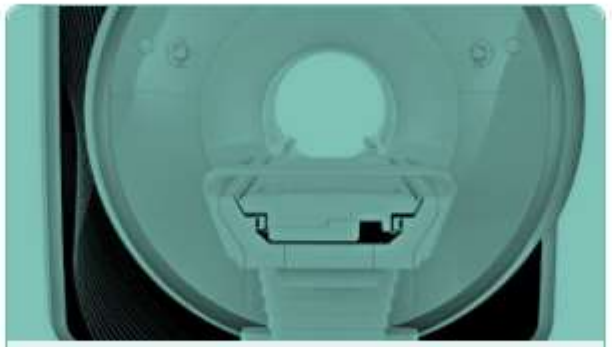
- Ultimate **management** of the healthcare organization
- Usable view of all the clinical information needed by any healthcare provider at any time or place
- Connection to mHealth apps.
  - Real-Time Remote Monitoring
  - 5G technology



https://doi.org/10.1016/j.icte.2020.10.002

Electronic health record

PET



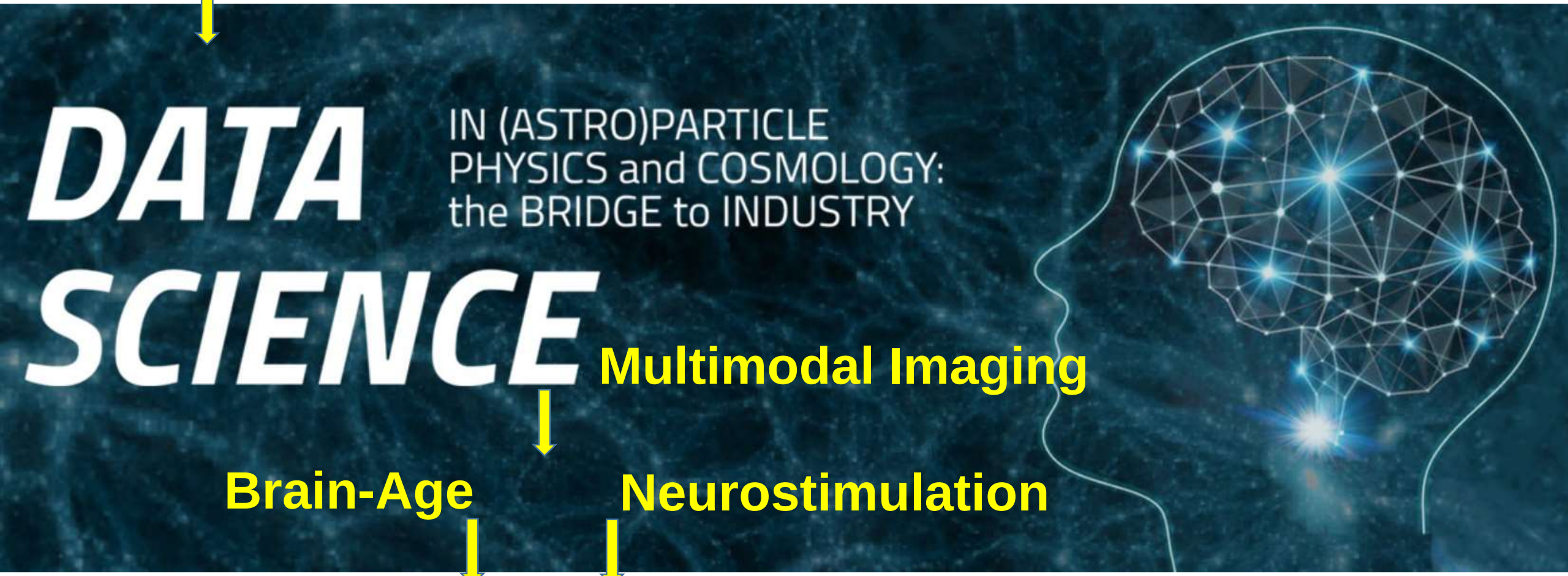
RESSONÂNCIA MAGNÉTICA

CICLOTRÃO

IMAGEM PRÉ-CLÍNICA

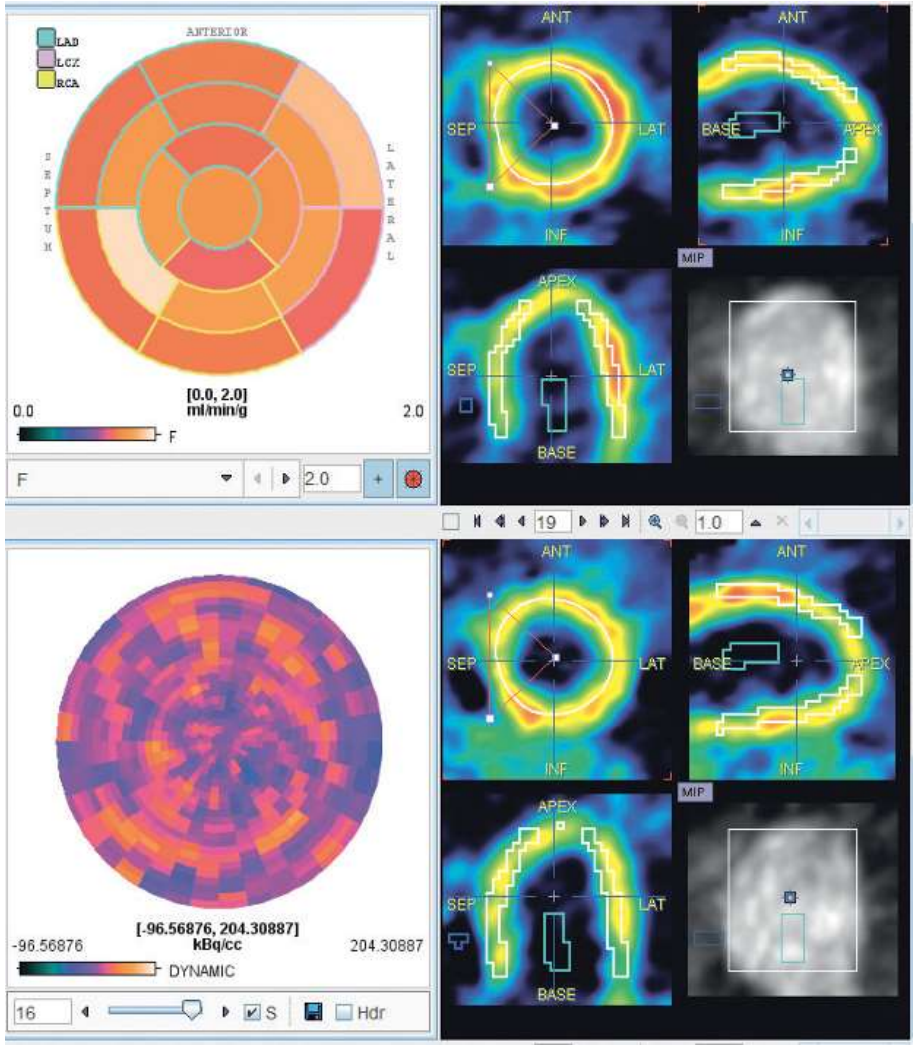
ELECTROFISIOLOGIA E ESTIMULAÇÃO

Electronic health record



From Pre-clinical to Clinical applications

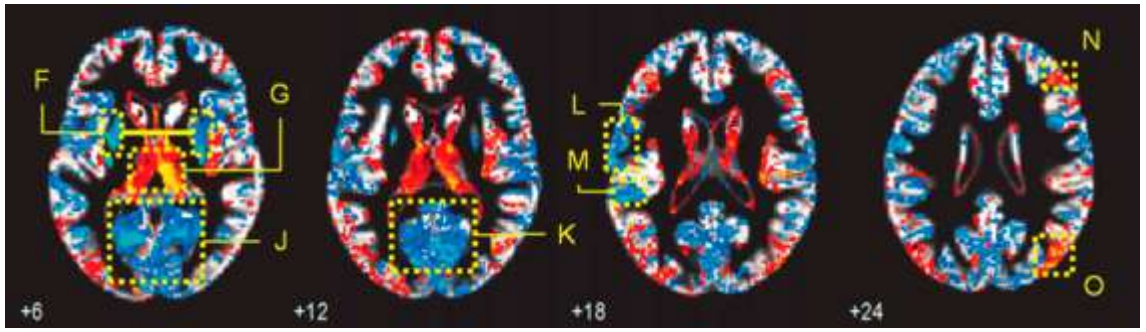
- **Translational in vivo MRI study** of diabetic cardiac phenotypes.
- **Data-driven approach** reveal a striking similarity of cardiac phenotype between the rat model used and human diabetes.
- These models can be the ground for **early testing new therapeutic or diagnostic approaches**.

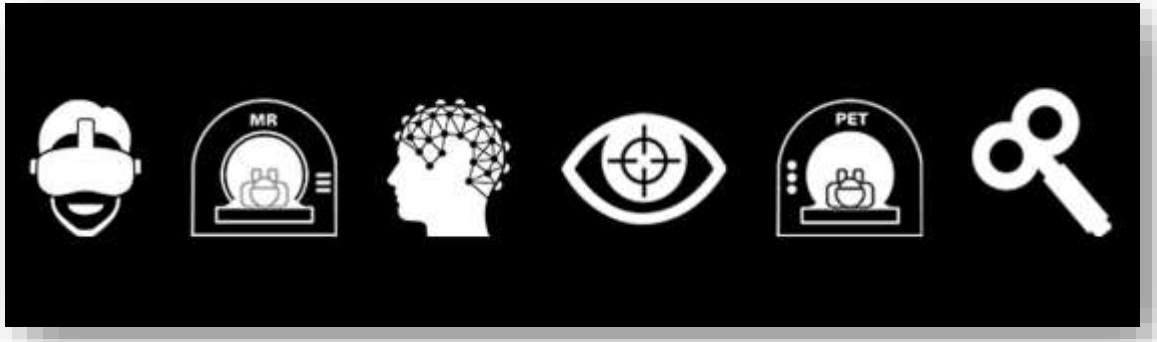


https://doi.org/10.1016/j.jdiacomp.2020.107554

Developing innovative approaches

- Translate basic research to clinical applications



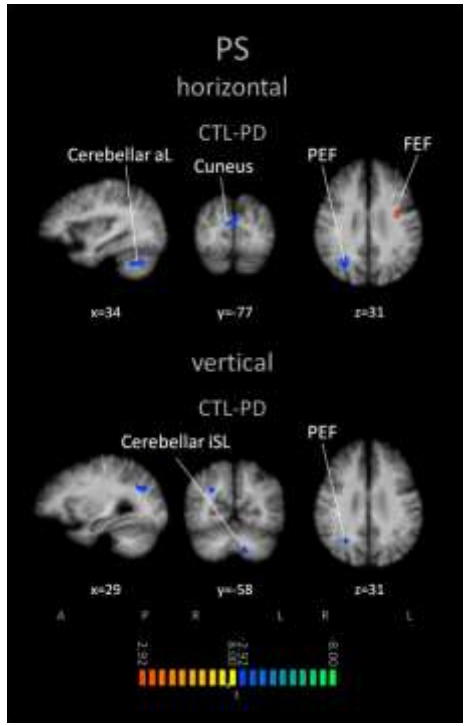


Brain Research
Volume 1648, Part A, 1 October 2016, Pages 469-484

Research report

Distinct functional properties of the vertical and horizontal saccadic network in Health and Parkinson's disease: An eye-tracking and fMRI study ☆

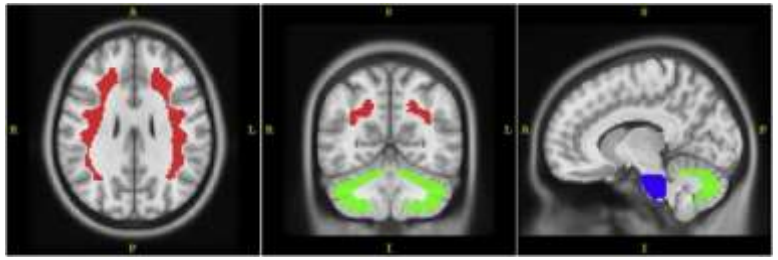
J. Lemos, D. Pereira, L. Almendra, D. Rebelo, M. Patrício, J. Castelhano, G. Cunha, C. Januário, L. Cunha, A. Freire, M. Castelo-Branco

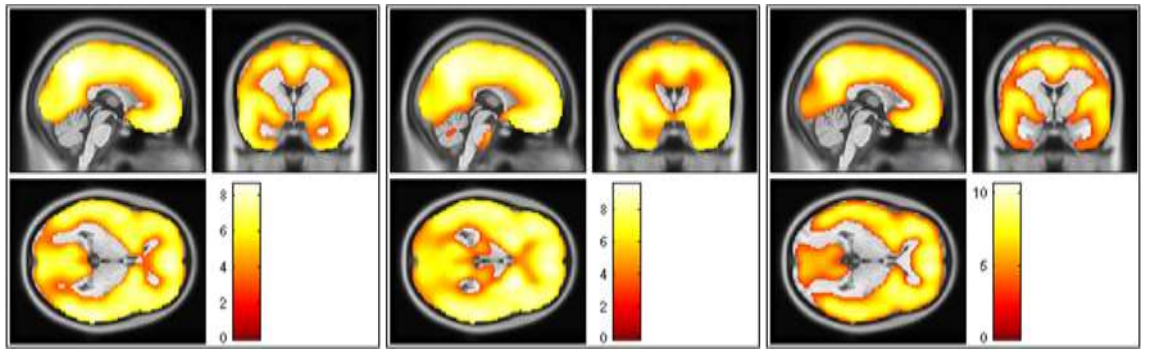


•DOI: 10.1016/j.brainres.2016.07.037

Data driven diagnostic **classification** in Alzheimer's disease on PiB-PET images

- compare **the impact of distinct reference regions** in normalization, measured by data-driven statistical analysis
- Biomarkers for Alzheimer's/Parkinson's Disease (BIOMARKAPD) initiative (N=243).
- Normalization by cerebellar gray matter and pons yielded identical **classification accuracy of AD (accuracy-96**%, sensitivity-96%, specificity-95%).

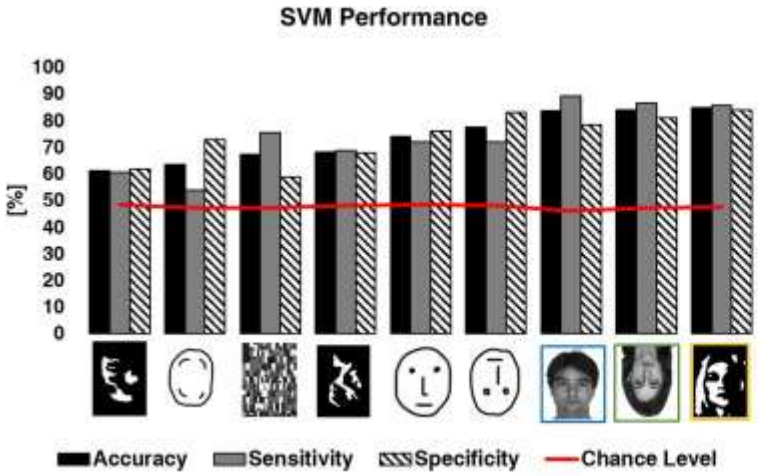


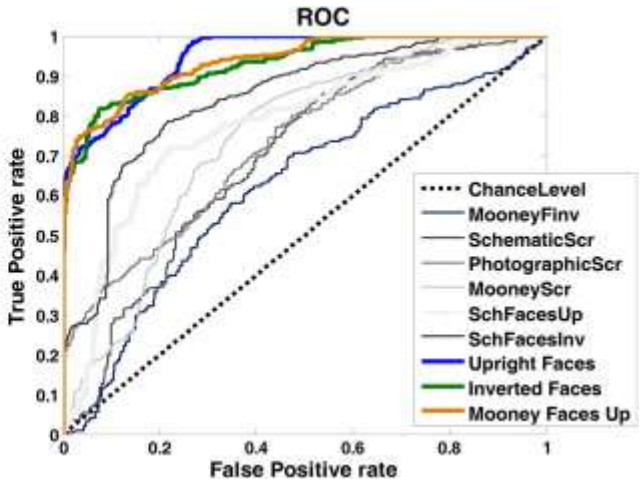


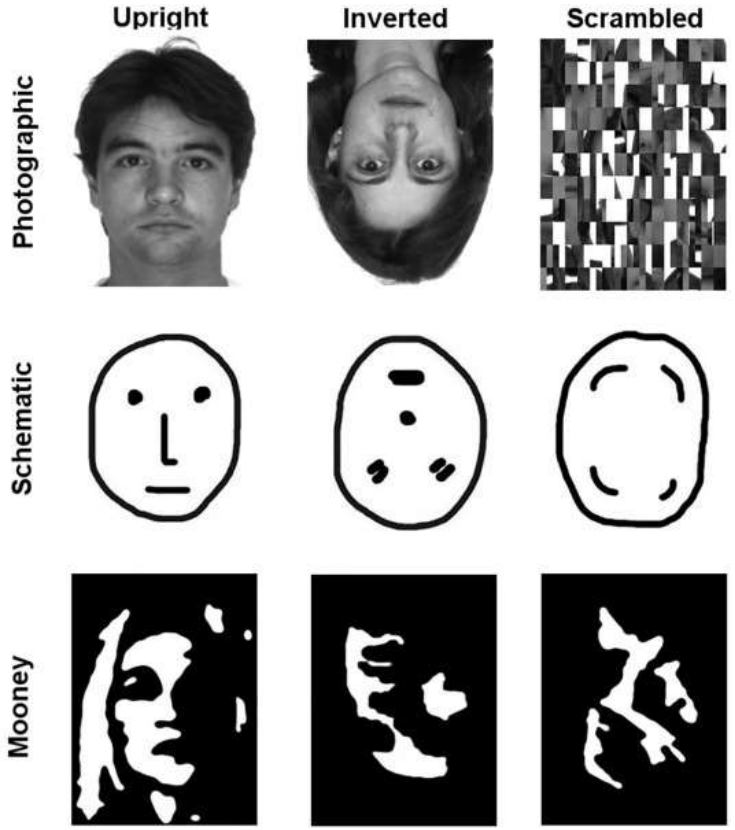
•DOI: 10.1016/j.nicl.2018.08.023

statistical identification of **autism** in a face perceptual decision task

- Data driven classification (SVM) of ASD vs. Controls with features based on the **EEG power responses**
- **Neuronal oscillatory responses** of low gamma frequency band, locked to photographic and abstract two-tone (Mooney) face stimulus presentation are **decreased** in ASD



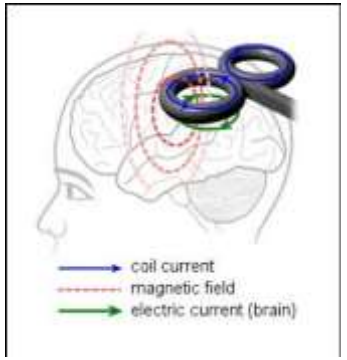


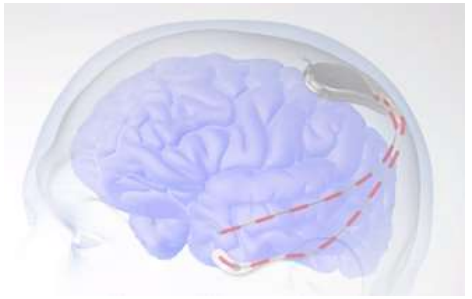


•DOI: 10.1016/j.clinph.2018.01.072

Developing innovative technology

Head-Mounted Displays, VR with BCI and Neurostimulation to train and acquire new skills/competencies





Industry of normal **Cognitive enhancement** is booming!

Digital Intelligence in Health Research:

Are the Future of Healthcare in the ‘Machines’ and Data Science?

Multimodal Imaging

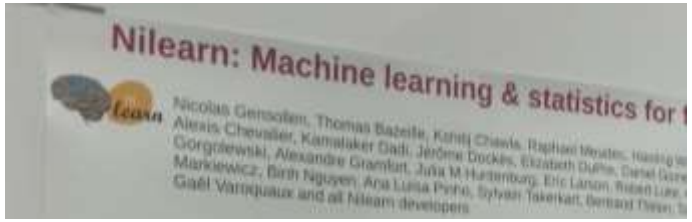
Input of EHR

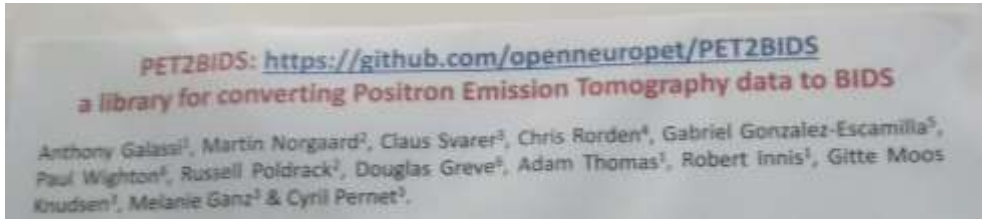
Brain-Age

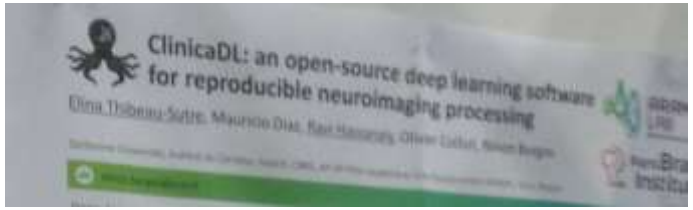
Diagnostic
Therapeutic
Personalized medicine

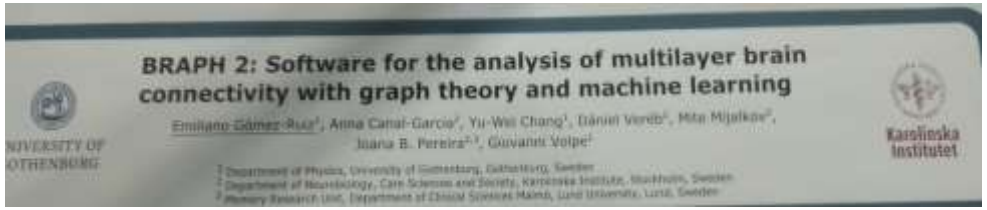
Neurostimulation

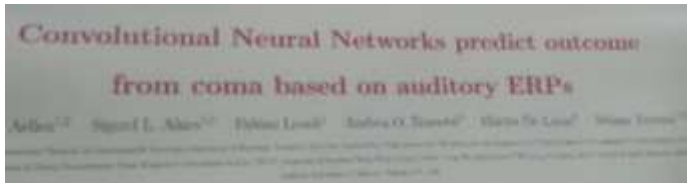
Treatment/rehabilitation
Normal Cognitive enhancement

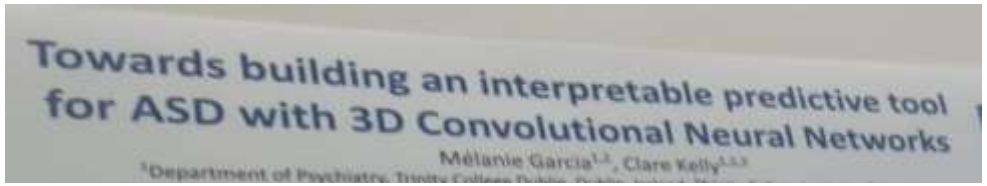












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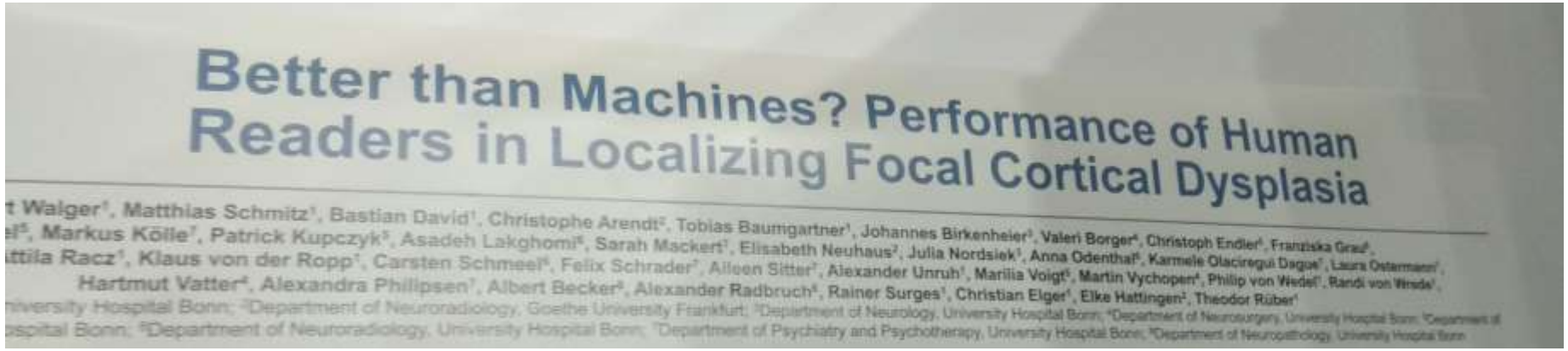

Digital Intelligence in Health Research

Volunteer here: https://voluntarios.cibit.uc.pt/

Shaping the Future of Healthcare

Thank you

and All colleagues, collaborators and funding.

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