

53^E CONGRÈS SFCCF 2021

CONGRÈS DE LA SOCIÉTÉ FRANÇAISE DE CARCINOLOGIE CERVICO-FACIALE

5-6 NOVEMBRE 2021

WTC - GRENOBLE



Intérêt de l'IRM de diffusion en cancérologie des voies aérodigestives supérieures

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**Grenoble University Hospital
GeodAIsics**



Declaration of Financial Interests or Relationships

Speaker Name: Arnaud Attyé

I have the following financial interest or relationship to disclose with regard to the subject matter of this presentation:

Company Name: GeodAlsics

Type of Relationship: Co-Founder

INTRODUCTION



Review > World J Surg Oncol. 2021 Oct 28;18(1):32. doi: 10.1186/s12943-021-02433-y

A systematic review of proteomic biomarkers in oral squamous cell cancer

Journal of Health Politics, Policy and Law, Vol. 35, No. 3, June 2010
DOI 10.1215/03616878-35-3 © 2010 by the Southern Political Science Association

Summary

340-3271-248 PG 12786-12852-021-02423

Document ID: 2023-07-11 10:30:30 UTC

Perspectives in pathomics in head and neck cancer

Yannick Gaudin,^{1,2} Hervé Léonard,^{1,2} Jean-Pierre Georges,^{1,2} Didier Barat,^{1,2}

[View All](#)

PLATE 12755586 DOI 10.1371/journal.pone.0200437

2023 RELEASE UNDER E.O. 14176 - THIS DOCUMENT IS UNCLASSIFIED

Framework for Machine Learning of CT and PET Radiomics to Predict Local Failure after Radiotherapy in Locally Advanced Head and Neck Cancers

Dorothy Dervakina¹, Coulton Early^{2,3}, Bal Kirpal Singhania², Stephan B Ewer⁴, Anilly Khatwa^{5,6}, Jayashree⁴, Khan Matthew², Arunachal¹, Suresh Ch¹,
Girish Agarwal², Subrahmin John², Harrel Mary J Thomas²

Journal of Oral Rehabilitation 2002; 29(11):838-847 © 2002 Blackwell Publishing Ltd

Explainable Boosting Machine Model with a Parallel Ensemble Design Predicts Local Failure for Head and Neck Cancer With Clinical, CT, and Delta CBCT Radiomic Features

H.F. Koenen¹, E.J. van der Maaten-Versteegh¹, M. J. Johnson¹, X. Liang¹, A.G. Eikelboom², D.J. Sher², J. Wang¹

2013-03-20

卷之三十一

Breitkopf & Härtel: <https://doi.org/10.1127/0048-5332/2021/124>

Font SANS-LI-911

Utilizing Artificial Intelligence for Head and Neck Cancer Outcomes Prediction From Imaging

Tricia Chinnery¹, Andrew Atkin², Keng Yew Teo², Andrew Young², Anthony G. Nitchie³, David A. Palmer², Steven A. Nathanson², Penelope Lang²

Affiliations + record

EMR 37535952 - 728 101120060537171063124

INTRODUCTION

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Prediction models in head and neck oncology

Prediction of survival from post-operative data

Prediction of locoregional recurrence

Prediction of distant metastasis (lymph node)



Overall survival
Progesterone receptor



Locoregional
Recurrence



Distant
metastasis



Overall
survival
Progesterone
receptor



Local-regional
relapse



Distant
metastasis

- Predictive biomarker panel
- Biomarker panel patient
- Predictive biomarker panel
- Predictive biomarker panel
- Predictive biomarker panel

Pre-treatment



CT neck
CT chest
PET
colon CT

Treatment planning



CT neck
CT chest

Treatment



CT neck
CT chest

Post-treatment



CT neck
CT chest

Follow-up

Chinnery et al., Can Assoc Radiol J, 2021

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Suv / ADC? / CT Density

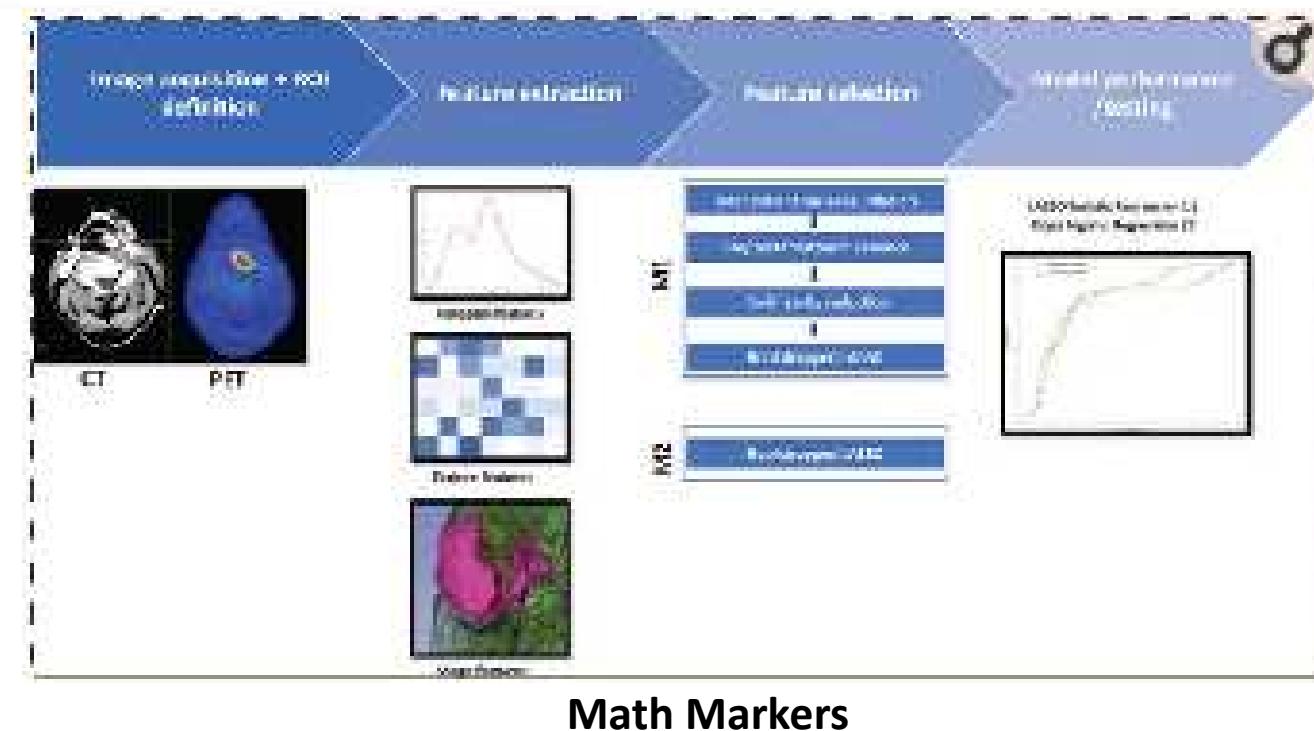
Tumor Volume

Past History

Age/Sex

Pathology

Clinical Markers



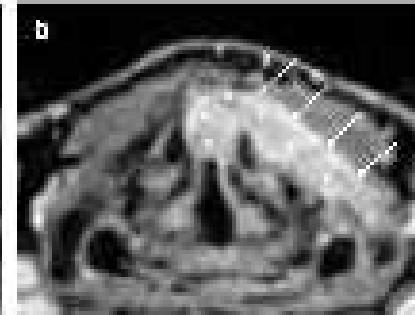
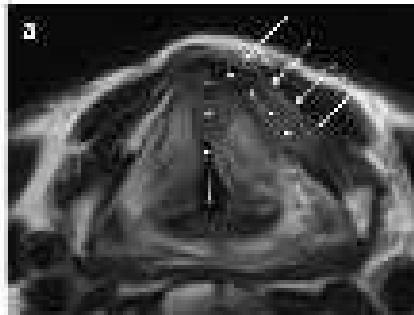
INTRODUCTION

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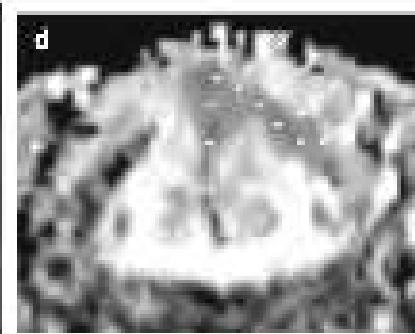
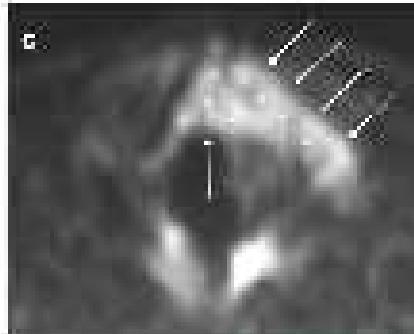


MD+rix Workshop





Morphological MRI

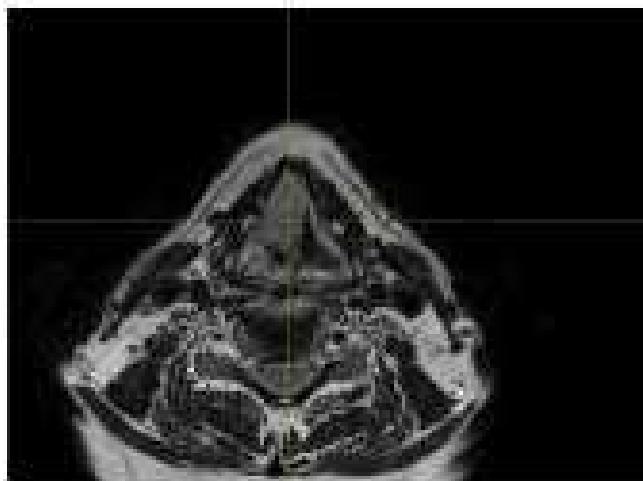
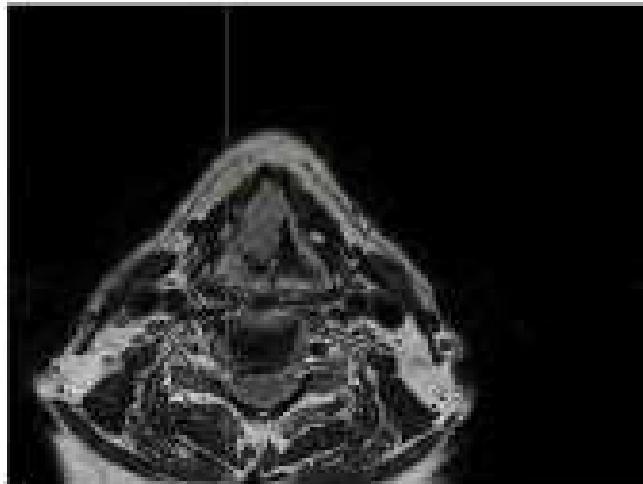


Diffusion MRI



Pathology

DWI



- ADC élevé

- (Graisse)
- Prolifération faible
- Important contingent stromal
- HPV 16 –
- Nécrose tumorale

Mauvais pronostic

- **Lésions post radiques**

- ADC faible

- Hypercellularité
- HPV 16 +

Bon pronostic

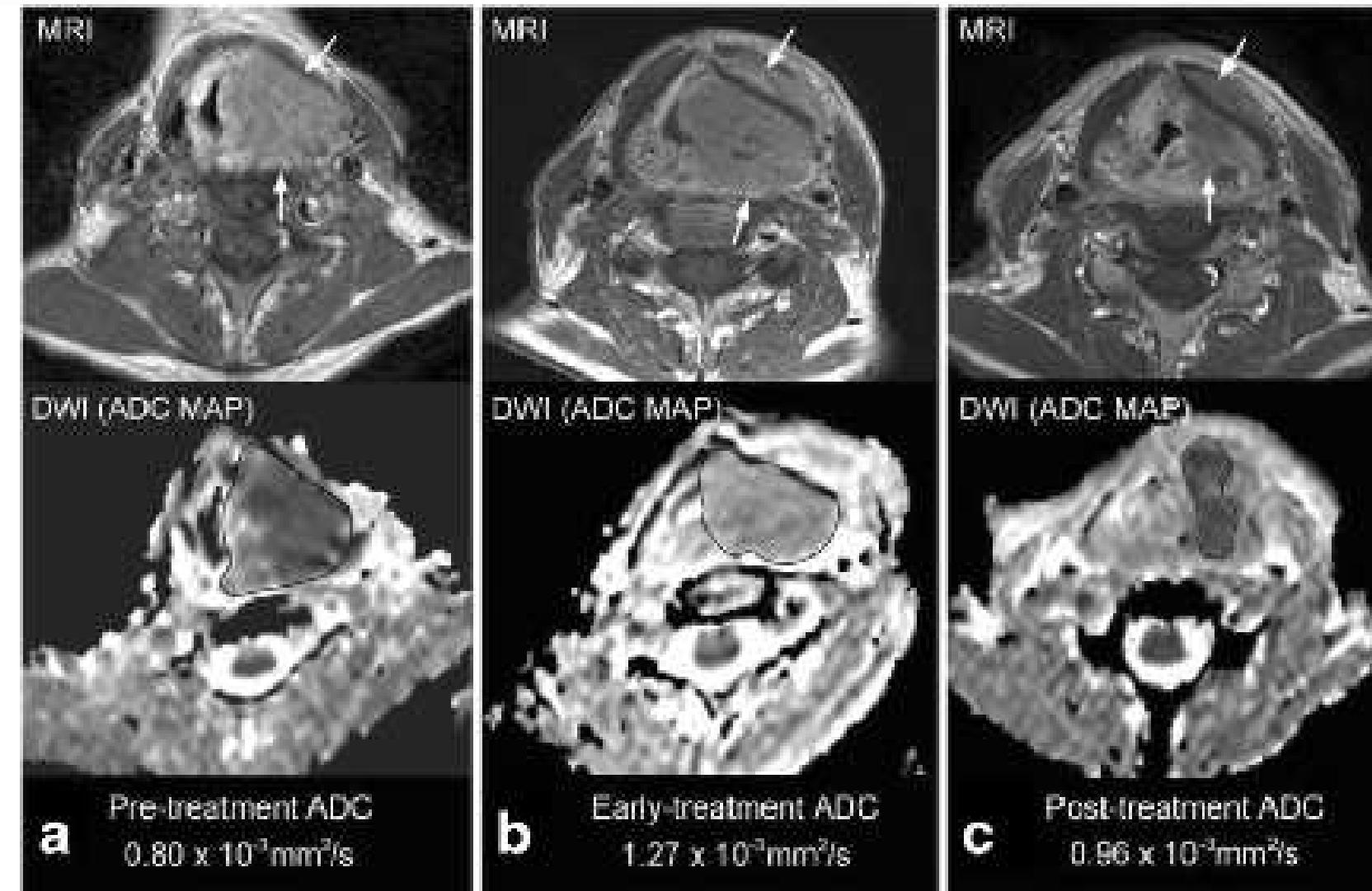
- **Récurrence tumorale**

DWI

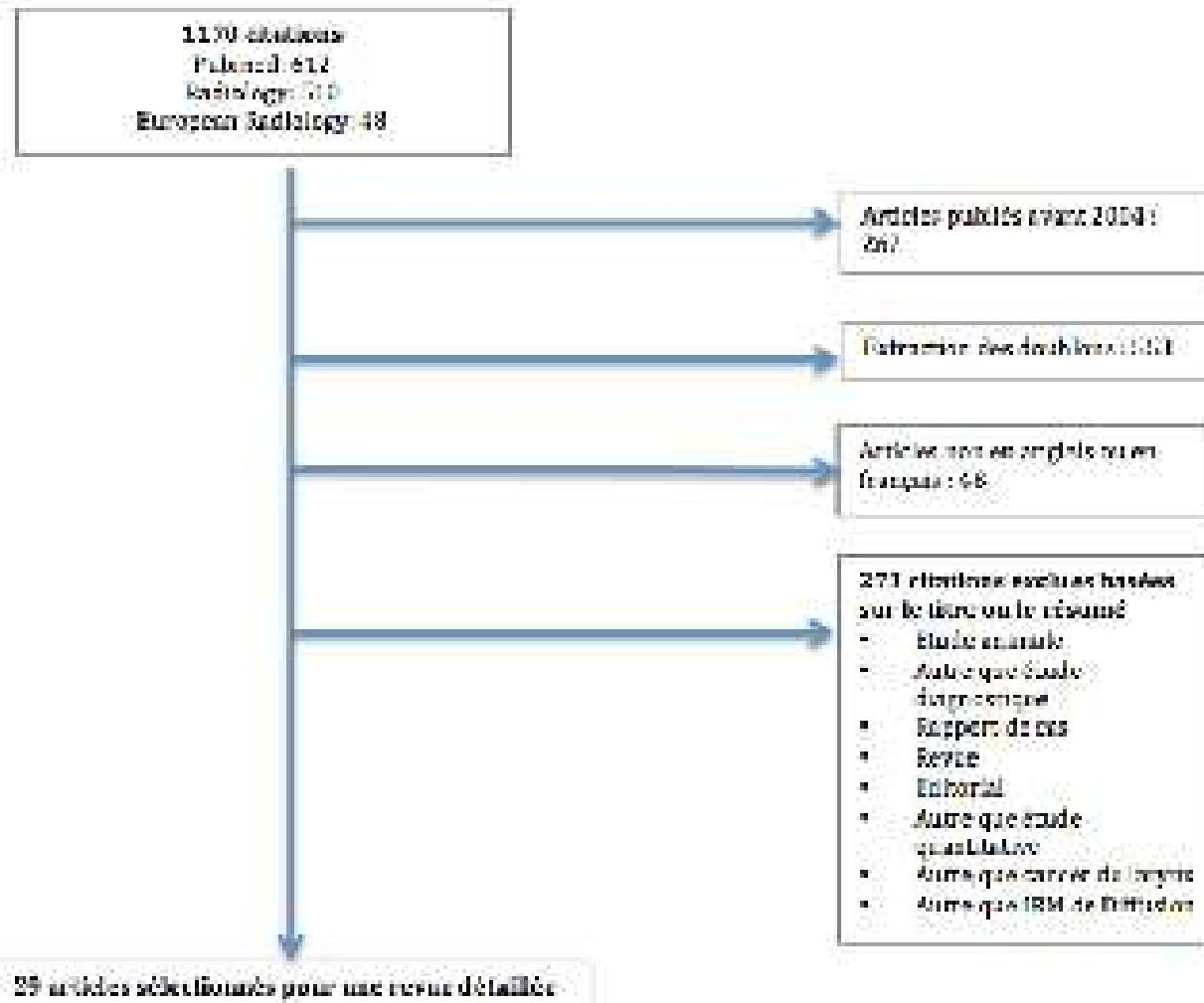
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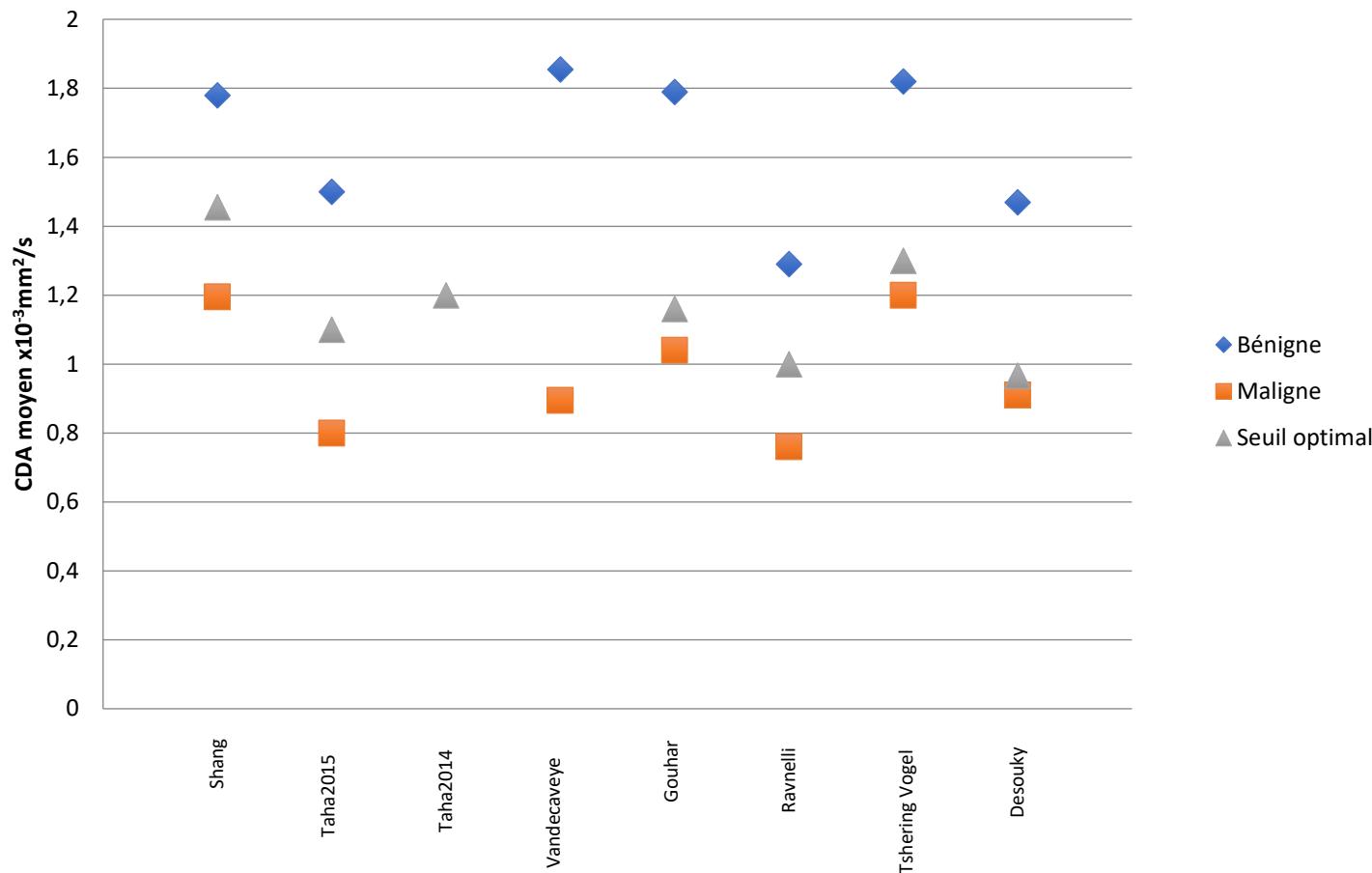


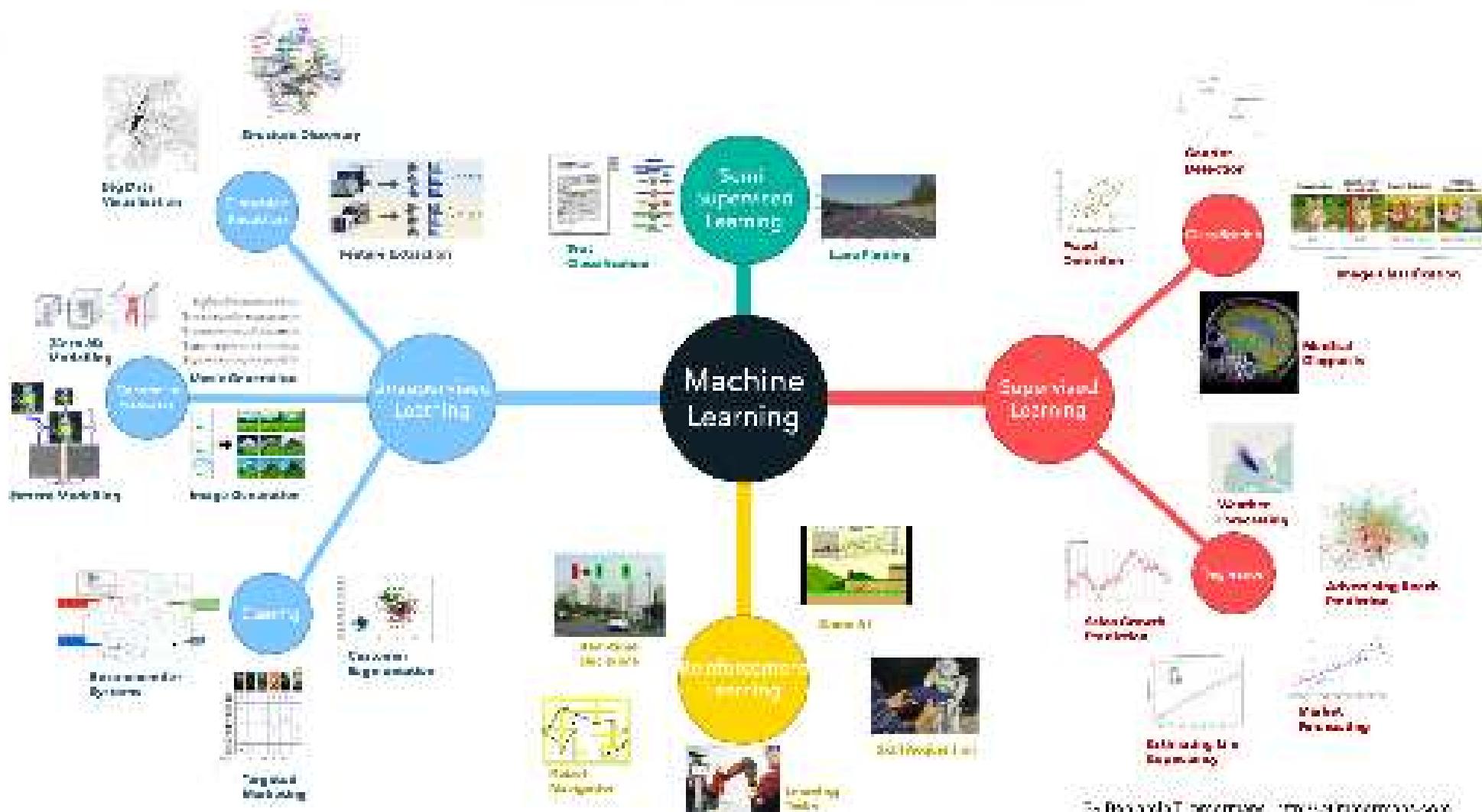
King A, Thoeny H, Cancer Imaging 2016



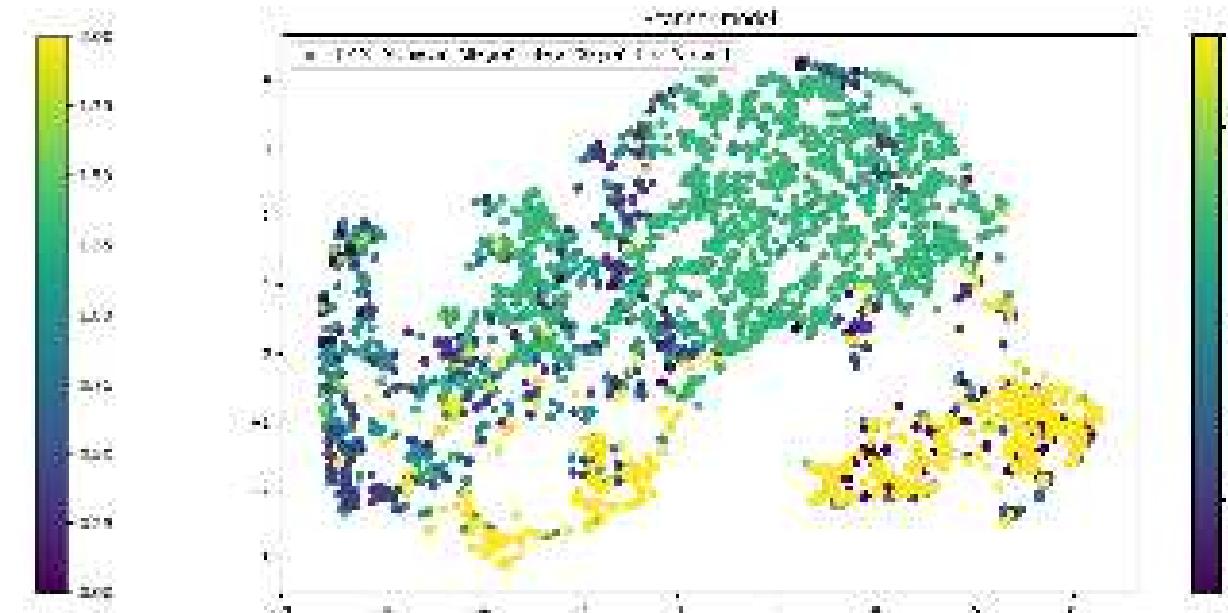
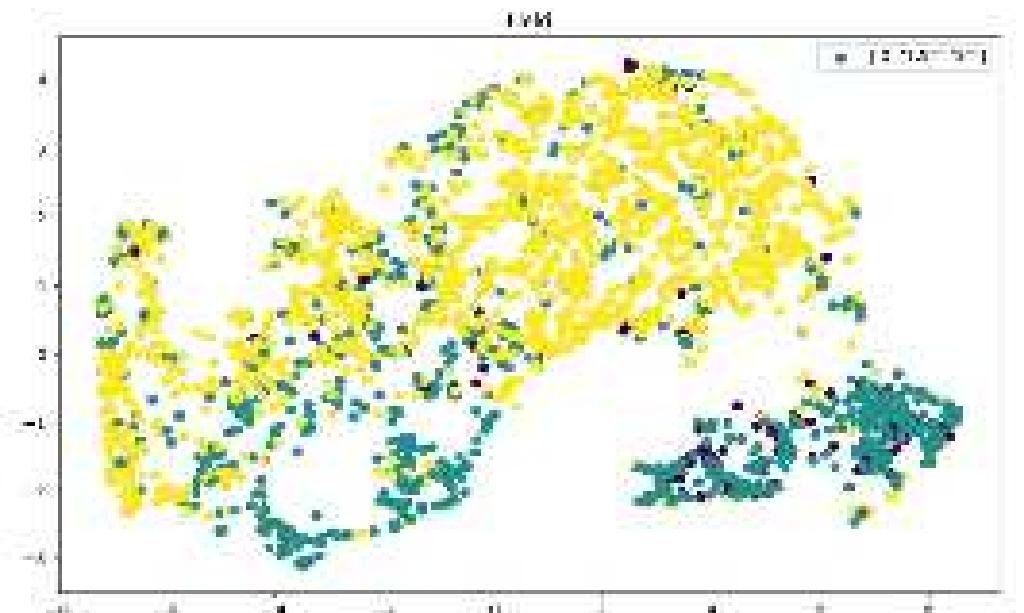
Coffre et al.



Coffre et al.



AI



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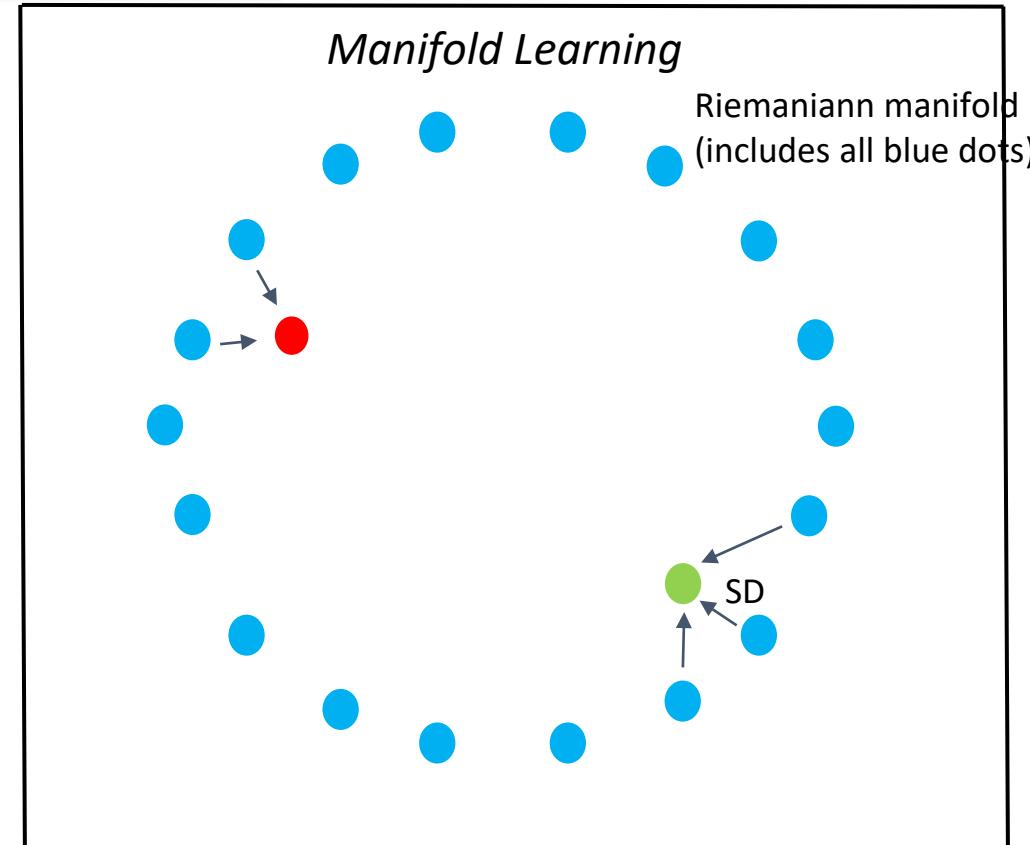
AI

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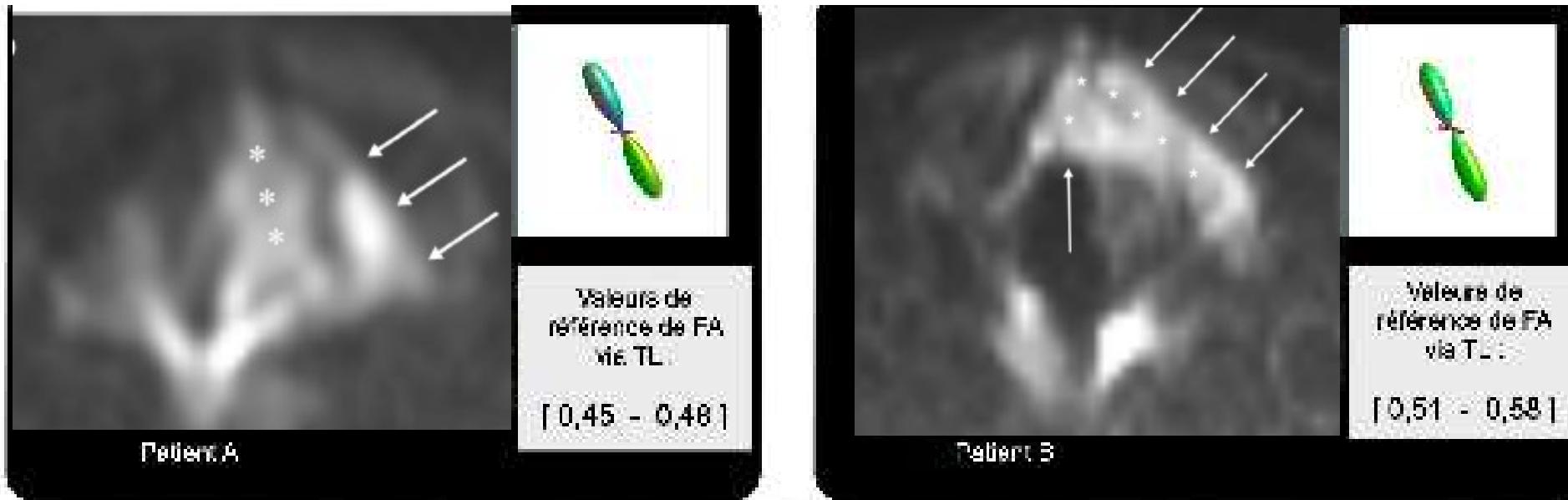


SD: Standard deviation

- Patient 1
- Patient 2
- Healthy controls



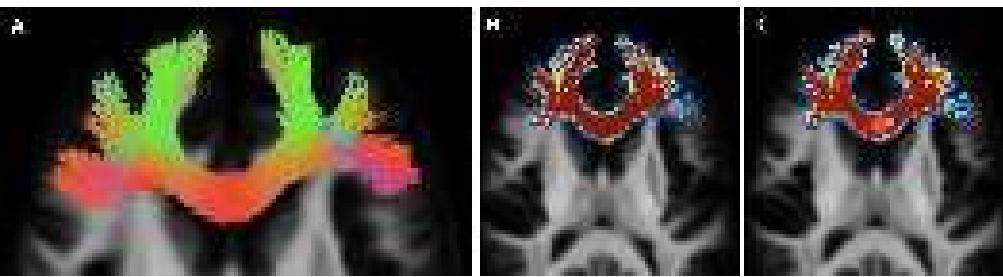
AI



Valeurs de référence selon une approche classique basée sur le GLM :

[0,45 - 0,58]

AI



DWI

Attyé et al, *Neuroimage*, 2021



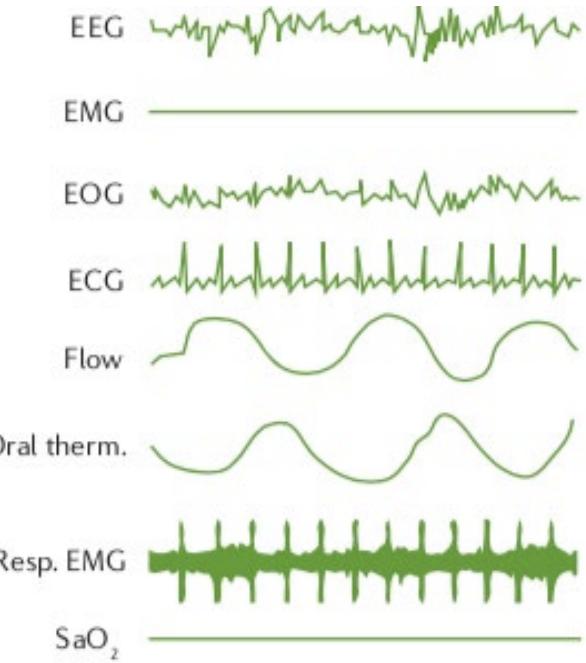
PROTEOMICS



BIOLOGY

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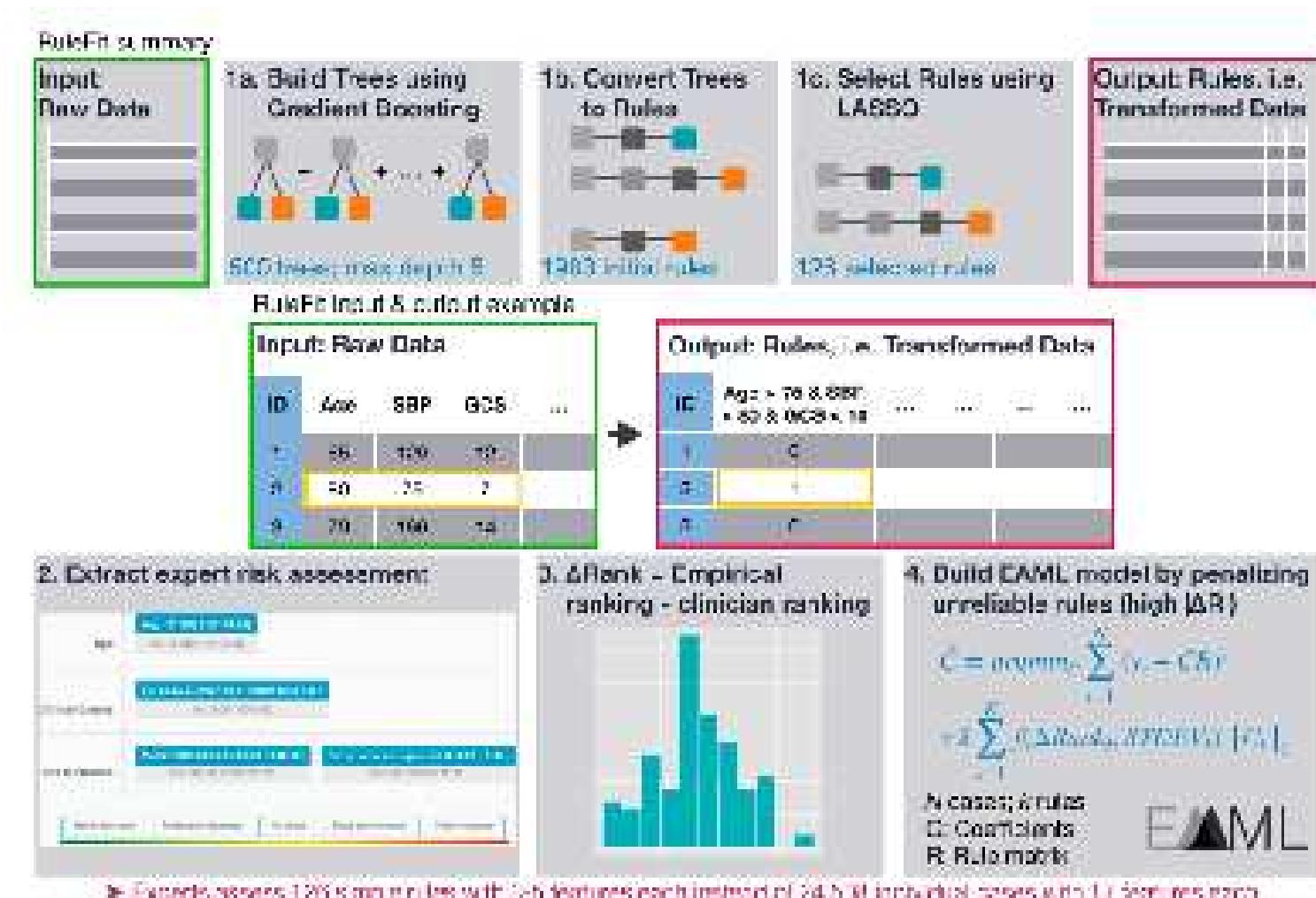
PHYSIOLOGY

RESEARCH ARTICLE

Expert-augmented machine learning

Florian D'Haeseleer, Ingrid E. Edelman, and H. Ulfarsson. *Expert-augmented machine learning for risk prediction models*. *Journal of Clinical Medicine*, 2021; 10(18): 3630.

Abstract: Machine learning has been shown to outperform traditional risk prediction models in many clinical applications. However, the lack of transparency and interpretability of these models has limited their use in clinical practice. This study proposes a novel approach to build interpretable machine learning models by combining machine learning with domain knowledge from experts. The proposed approach, called RuleFit, is based on gradient boosting trees and LASSO regression. It uses a rule-based model to explain the predictions of a machine learning model. The proposed approach is evaluated on a dataset of patients with heart failure and compared to a standard machine learning model. The results show that RuleFit can build interpretable machine learning models that are comparable to standard machine learning models in terms of performance.



Conclusion

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- IRM de Diffusion: très bon outil pour donner une information sur le grade tumoral et pour prédire la réponse thérapeutique en cancérologie des VADS
- Mais très peu pratiquée en soin courant
- Pas de modèle pronostic exportable /généralisable sans IA
- Analyse de variété: Algorithme le plus adapté à l'imagerie quantitative

Founders



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Data Scientist, PhD



Arnaud Jean
Medical Biologist, MD, MSc



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Prof Romain Couillet
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Prof Fernando Calamante
President of the ISMRM
Director of Sydney Imaging



Dr Valery Brunel
Medical Biologist PharmD
Head of biochemistry Department



Prof Christian Heinrich
Professor of Mathematics
Congrès de la société française de carcinologie cervico-faciale
ICube - IMAGeS

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