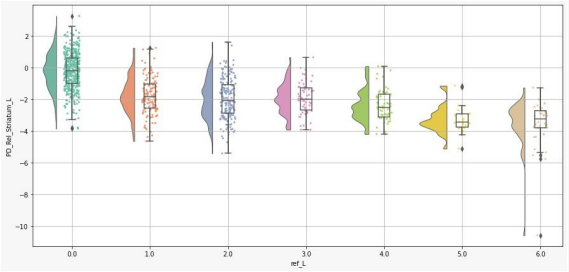
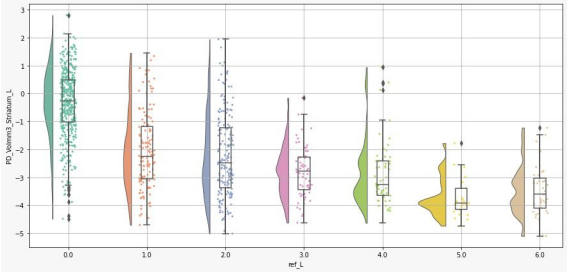
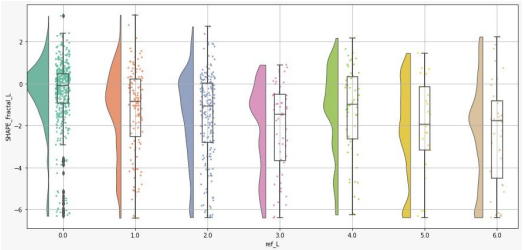
quantification & biomarker studies

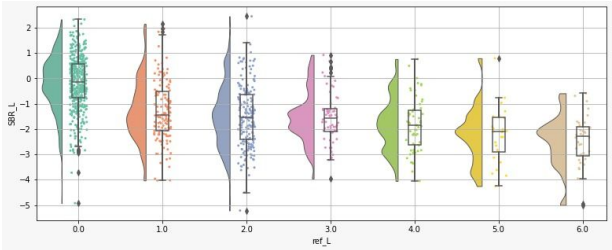




1000 cases, DATSCAN [SPECT], 7-classes clinical visual reading

4 independent quantification methods





Dopaminergic imaging

DATSCAN [SPECT]

Target: neurodegeneration linked to Parkinson's disease and related symptoms

Collaboration with:
Osp. Univ. di Padova (PD)

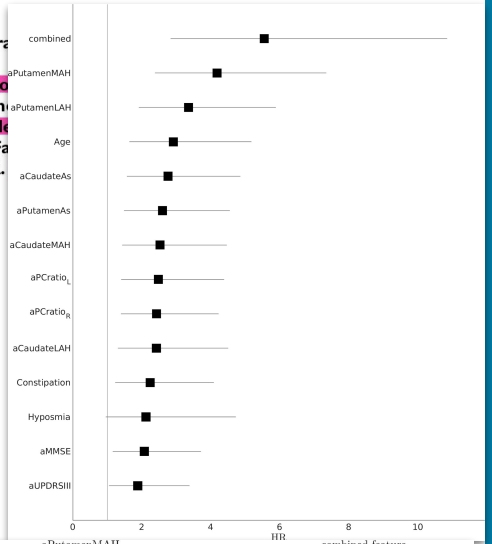
doi:10.1093/brain/awaa365 BRAIN 2020: Page 1 of 10 | 1

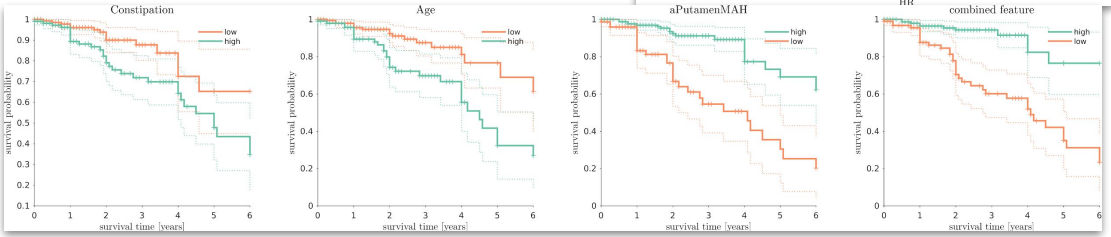
BRAIN
A JOURNAL OF NEUROLOGY

Dopaminergic imaging and clinical predictors for phenoconversion of REM sleep behaviour disorder

Dario Arnaldi,[1,2] Andrea Chincarini,[3] Michele T. Hu,[4] Karel Sonka,[5] Bra
Tomoyuki Miyamoto,[7] Monica Puligheddu,[8] Valérie Cochen De Cock,[9]
Michele Terzaghi,[10,11] Giuseppe Plazzi,[12,13] Naoko Tachibana,[14] Silvia Mo
Michal Rolinski,[4,17] Petr Dusek,[5] Val Lowe,[18] Masayuki Miyamoto,[19] Mich
Delphine de Verbizier,[20] Irene Bossert,[21] Elena Antelmi,[12,22] Riccardo Me
Thomas R. Barber,[4] Jiří Trnka,[23] Toji Miyagawa,[6] Alessandra Serra,[24] Fa
Matteo Bauckneht,[15,16] Kevin M. Bradley,[25] David Zogala,[23] Daniel R.
AQ1 Lennon Jordan,[18] Raffaele Manni[10] and Flavio Nobili[1,2]

[IF 11.4]

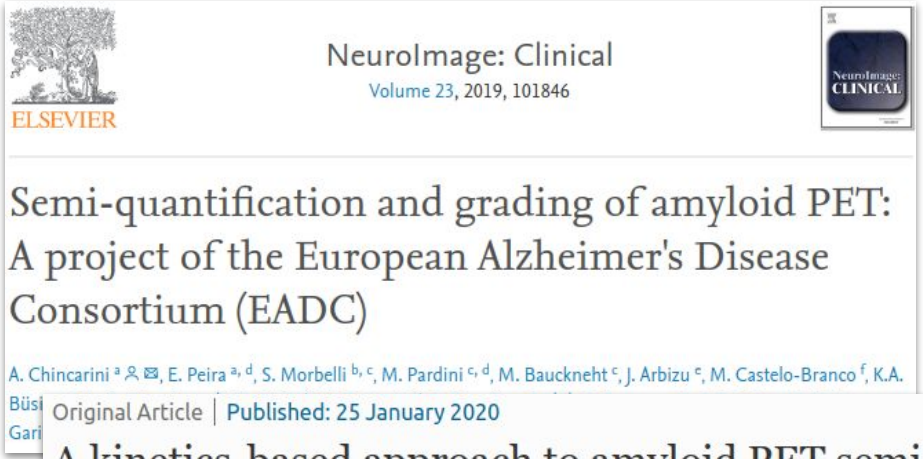




DATSCAN + NPSY + Clinics

in collaboration with:
the international group of RBD

SPECT quantification analysis + ranking the most significant predictors of phenoconversion + survival analysis up to 9 years



NeuroImage: Clinical
Volume 23, 2019, 101846

ELSEVIER

Semi-quantification and grading of amyloid PET: A project of the European Alzheimer's Disease Consortium (EADC)

A. Chincarini [a], E. Peira [a, d], S. Morbelli [b, c], M. Pardini [c, d], M. Bauckneht [c], J. Arbizu [e], M. Castelo-Branco [f], K.A. Büsi
Gari

Original Article | Published: 25 January 2020

A kinetics-based approach to amyloid PET semi-quantification

A. Chincarini, E. Peira, M. Corosu, S. Morbelli, M. Bauckneht, S. Capitanio, M. Pardini, D. Arnaldi, C. Vellani, D. D'Ambrosio, V. Garibotto, F. Assal, B. Paghera, G. Savelli, A. Stefanelli, U. P. Guerra & F. Nobili

European Journal of Nuclear Medicine and Molecular Imaging (2020) | Cite this article

Emerging topics and practical aspects for an appropriate use of amyloid PET in the current Italian context.

Nobili F[1], Cagnin A[2], Calcagni ML[3], Chincarini A[4], Guerra UP[5], Morbelli S[6], Padovani A[7], Paghera B[8], Pappatà S[9], Parnetti L[10], Sestini S[11], Schillaci O[12] *Journal of Nuclear Medicine and Molecular Imaging*

Amyloid imaging

latest papers on quantification, clinical validation, patterns

in collaboration with: italian IRCCS, EADC, AIM, EANM

ELBA

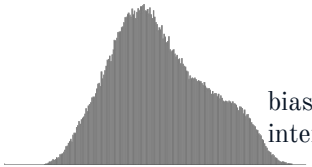
Equal mix of *geometric properties* (sphericity) of iso-intensity surfaces & *intensity statistics*.

no need for uptake ROIs, no need for reference!

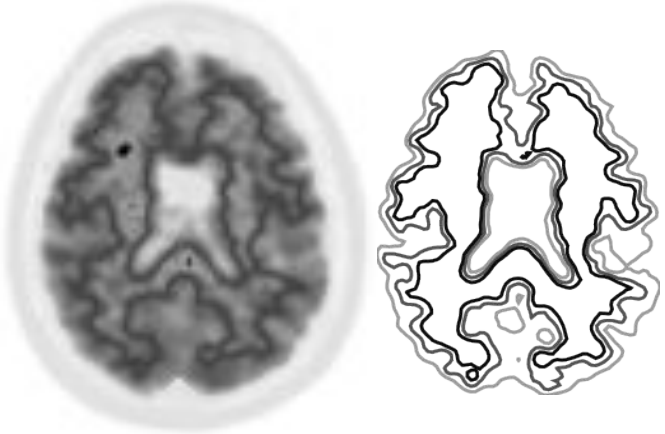
SUVr-independent evaluation of brain amyloidosis, Chincarini et. al, Journal of Alzheimer's Disease, Vol. 54-4 (2016)

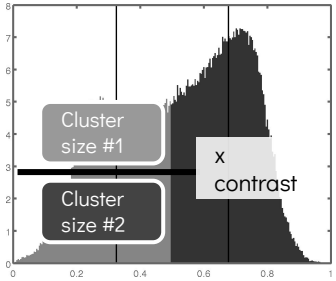
Approaches to semi-quantification: beyond SUVr in amyloid imaging, European Conference on Clinical Neuroimaging, Roma (2016)

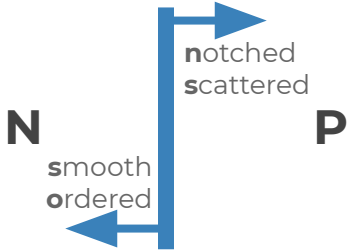
Semi-quantification and grading of amyloid PET, Chincarini et. al, Neuroimage Clinical, (2019)

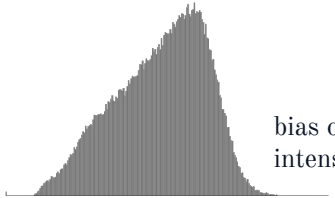


bias on lower intensities

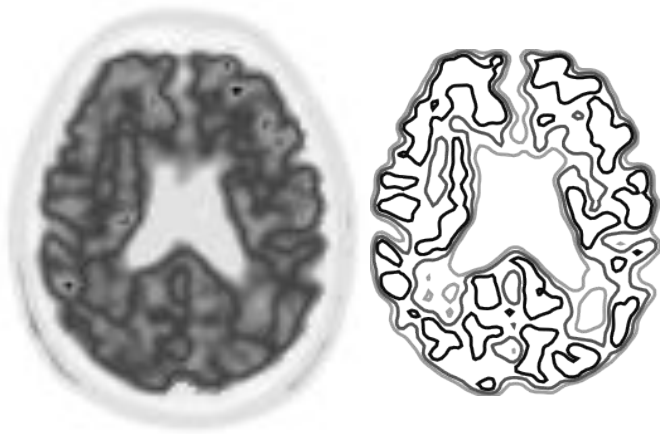






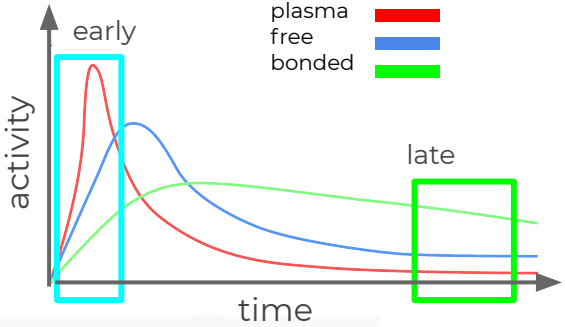


bias on higher intensities



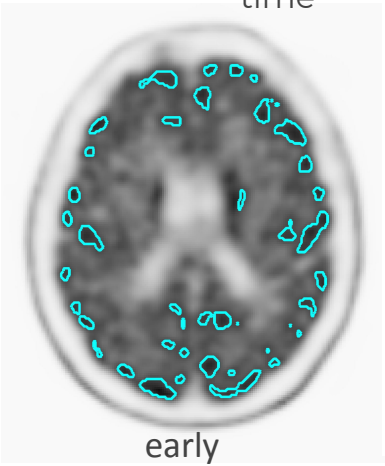
TDr

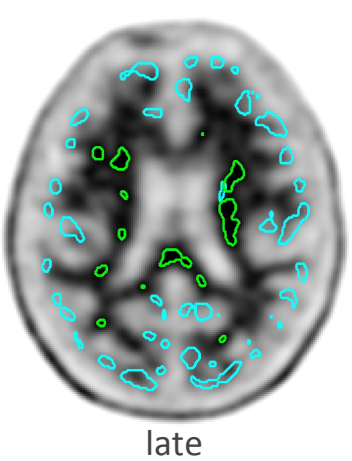
REQUIREMENT: needs the early scan (0-5' from injection)



Up	Re
highest uptake in the **early** scan (CBF)	highest uptake in the **late** scan (hot spot)

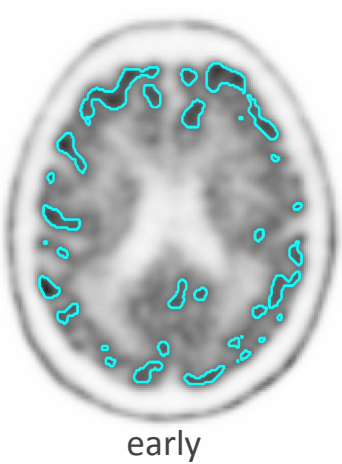
$$TDr = \frac{\langle I_{late} \rangle_{Up}}{\langle I_{late} \rangle_{Re}}$$

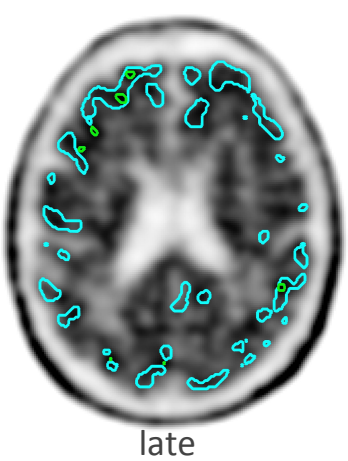




< **N**

> **P**





Quantification and ranking in amyloid-PET, R. Gianeri, Master in Physics Thesis, tutor: A. Chincarini (2017)

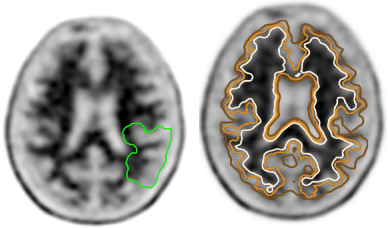
Early scans in amyloid-PET: just pretty images? A. Chincarini et. al, AIMN, Rimini (2017)

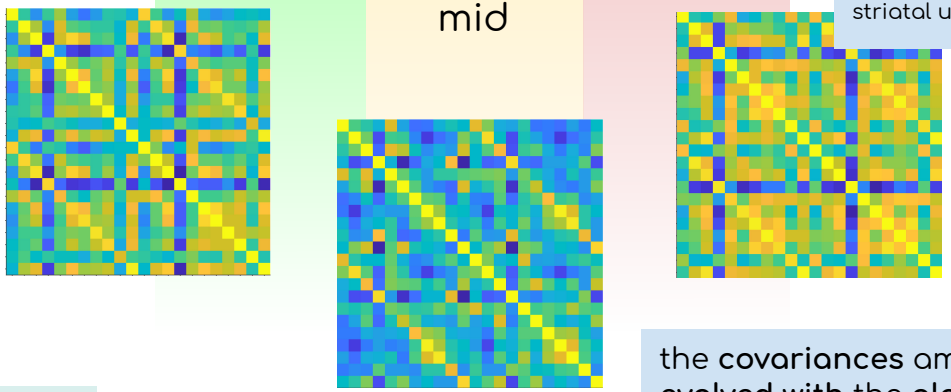
A kinetics-based approach to amyloid PET semi-quantification A. Chincarini et. al, EJNMMI, (2020)

Amyloid spreading

results

inter-regional correlation analysis





brain **regions** show **different vulnerability** to **Aβ** deposition

striatal uptake is independent of cortical

the **covariances** among brain regions **evolved with** the **global Aβ** levels

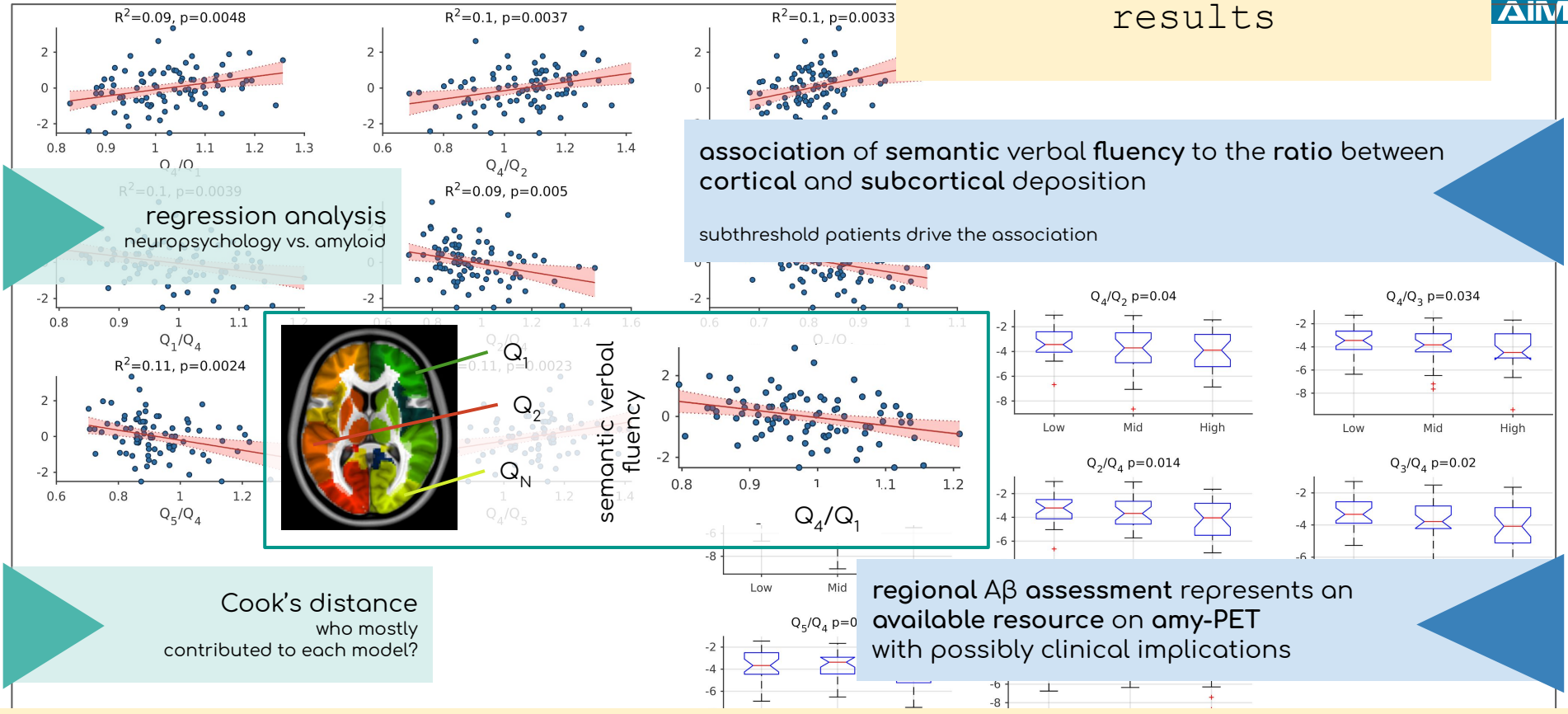
dynamic is observed not only in healthy elderly

2 **quantification**
(cortico-cerebellar **SUVr**, ELBA)
mapped to F-pir*

** Chincarini et al. Semi-quantification and grading of amyloid PET: A project of the European Alzheimer's Disease Consortium (EADC). NeuroIm. Clin. 2019*

Clinical correlates

results



association of **semantic** verbal **fluency** to the **ratio** between **cortical** and **subcortical** deposition

subthreshold patients drive the association

regression analysis
neuropsychology vs. amyloid

Cook's distance
who mostly
contributed to each model?

regional Aβ **assessment** represents an **available resource** on **amy-PET** with possibly clinical implications

under review at **Journal of Alzheimer's Disease**

[IF 9.0]

Research Article

Metabolic patterns across core features in dementia with lewy bodies

Silvia Morbelli MD, PhD, Andrea Chincarini PhD, Matthias Brendel MD, Axel Rominger MD, Rose Bruffaerts MD, PhD, Rik Vandenberghe MD, PhD, Milica G. Kramberger MD, PhD ... See all authors

[IF 8.7]

Research Article | Open Access

Metabolic Correlates of Dopaminergic Loss in Dementia with Lewy Bodies

Maria Huber, Leonie Beyer MD, Catharina Prix MD, Sonja Schönecker MD, Carla Palleis MD, Boris-Stephan Rauchmann MD, Silvia Morbelli MD, PhD, Andrea Chincarini PhD ... See all authors

Associations between education, age and the Dementia with Lewy Bodies (DLB) metabolic pattern: a European-DLB consortium project

Matteo Bauckneht[1], Andrea Chincarini[2], Mat

Bruffaerts[5,6], Rik Vandenberghe[5,6], Milica G.

Alzheimer & Dementia [IF 17.2], reviewed subm.

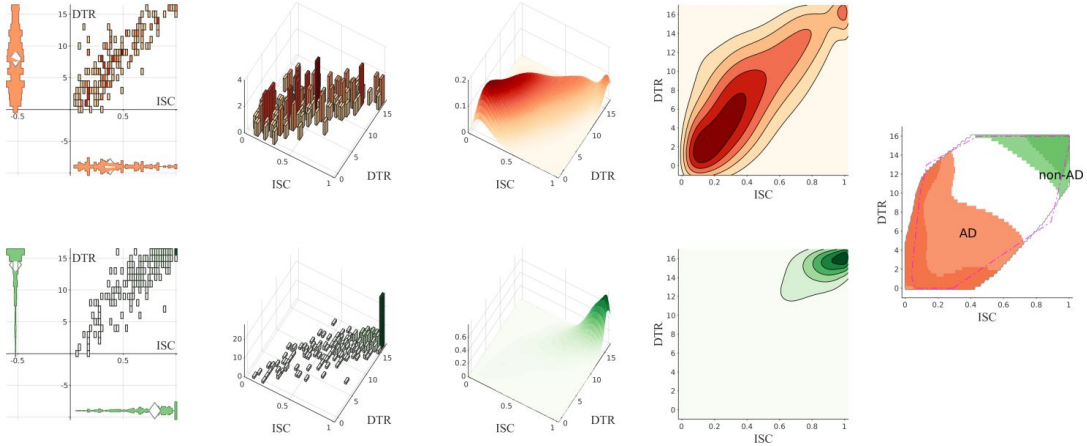
Metabolic imaging: FDG-PET

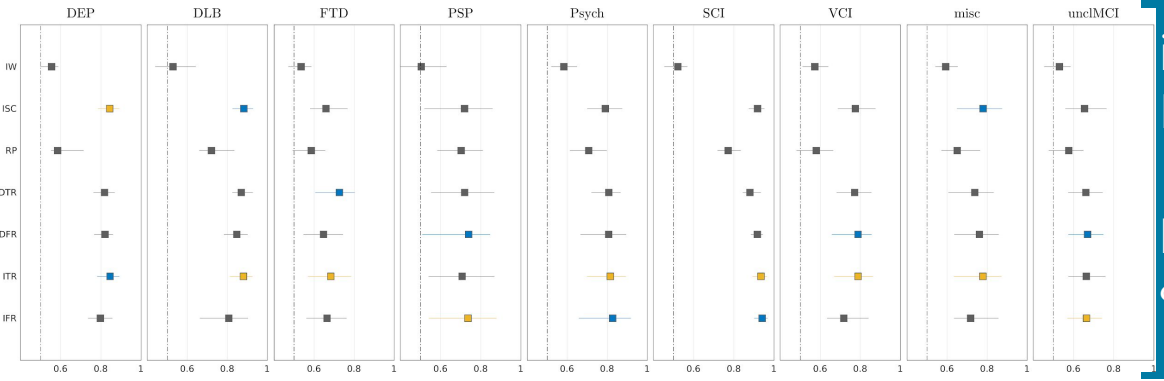
classic ML approach (PCA+clustering+GLM)

DLB patients

in collaboration with: EDLB consortium

largest DLB dataset worldwide





Neuropsychology

Innovative use of NPSY tests in the discrimination of Alzheimer concomitant pathologies (10 clinical cohorts)

multivariate KDE + odds ratio analysis

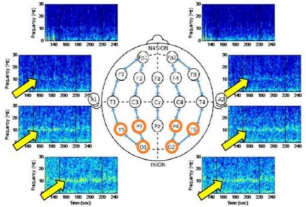
in collaboration with:
IRCCS GE

paper submitted to Alzh. res. & therapy [IF 6.1]

Towards alternative tests for brain amyloidosis

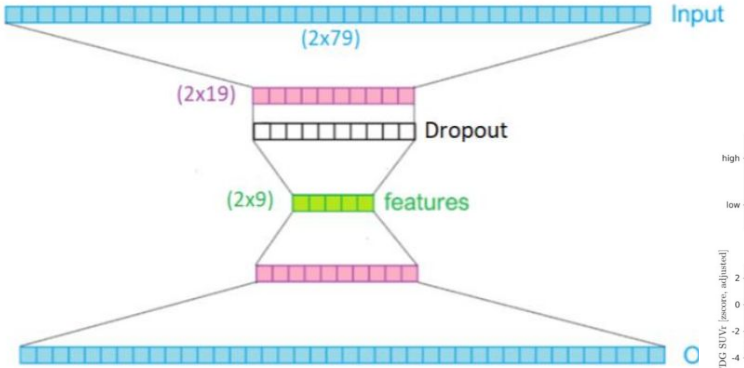
OSPEDALE POLICLINICO SAN MARTINO
Sistema Sanitario Regione Liguria

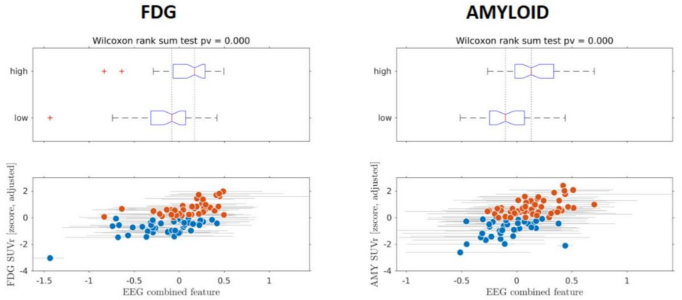
Aknowledgements to:
Prof. Flavio Nobili
Doc. Francesco Famà
Prof. Silvia Morbelli



Candidate: Gloria Pedemonte

Supervisor: Prof. Andrea Chincarini





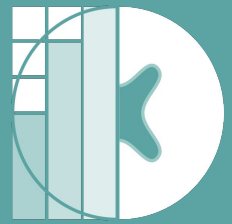
EEG analysis

DL + quantification exploratory model (autoencoders) to link EEG patterns to amyloid & FDG impairment

in collaboration with:
IRCCS GE
paper under preparation

technology transfer

DORIAN
TECHNOLOGIES



your key to better data analysis

Founders:

Andrea Chincarini
Francesco Sensi
Paolo Bosco
Mirko Corosu
Enrico Peira
Ruben Gianeri

Med advisors:

Flavio Nobili
Silvia Morbelli

Diego Cecchin
Davide Poggiali

Stelvio Sestini
Luca Fedeli

mission: NM in neurology

clinical practice

medical research

medical training

pharmaceutical trials

today

tomorrow

personalized medicine

screening

certification as medical device

To **develop** and distribute **reliable AI-driven analyses** to improve **diagnostic impact**, **reliability** and clinical **confidence**.

Two analysis pipelines currently available:

- DAT SPECT (datscan & striascan)
- amyloid-PET (all 3 fluorinated tracers)

Future efforts to include:

- FDG
- FDOPA
- tau-PET
- T1-MRI atrophy pattern
- T2-MRI WM lesions

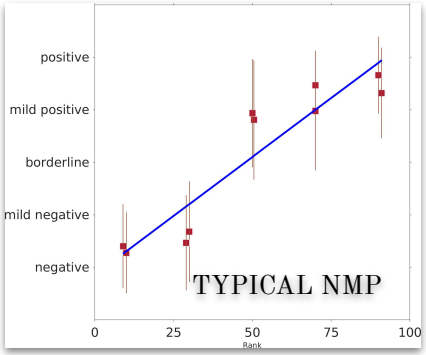
We provide a comprehensive learning environment to approach automatic analysis of amyloid PET in a typical clinical setting

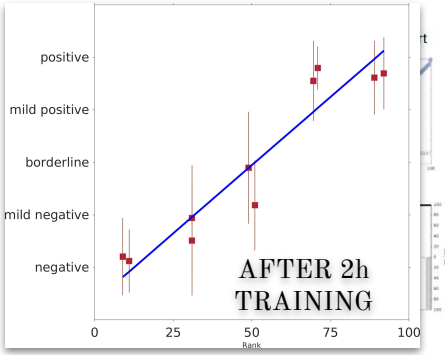
We help to write a more informed diagnosis report

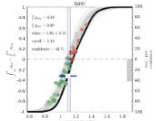
We help reducing the diagnostic error

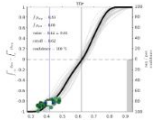
We provide on-demand continuous medical training on specific pathology

We comply with NM societies requirements









Training on amyPET

[2017 -]

AIMN national school of Nuclear Medicine in Neurology (Pesaro, September 2006-)