



@ssociazione Italiana di telemedicina ed Informatica Medica

Exposanità 2026

22-24 Aprile - Fiera di Bologna

Seminari su
FSE 2.0, Telemedicina, Digital Health,
Intelligenza Artificiale

TOOLS DI IA IN NEURORADIOLOGIA

G.Pellicanò

Neuroradiologia Diagnostica ed Interventistica

Istituto Prosperius

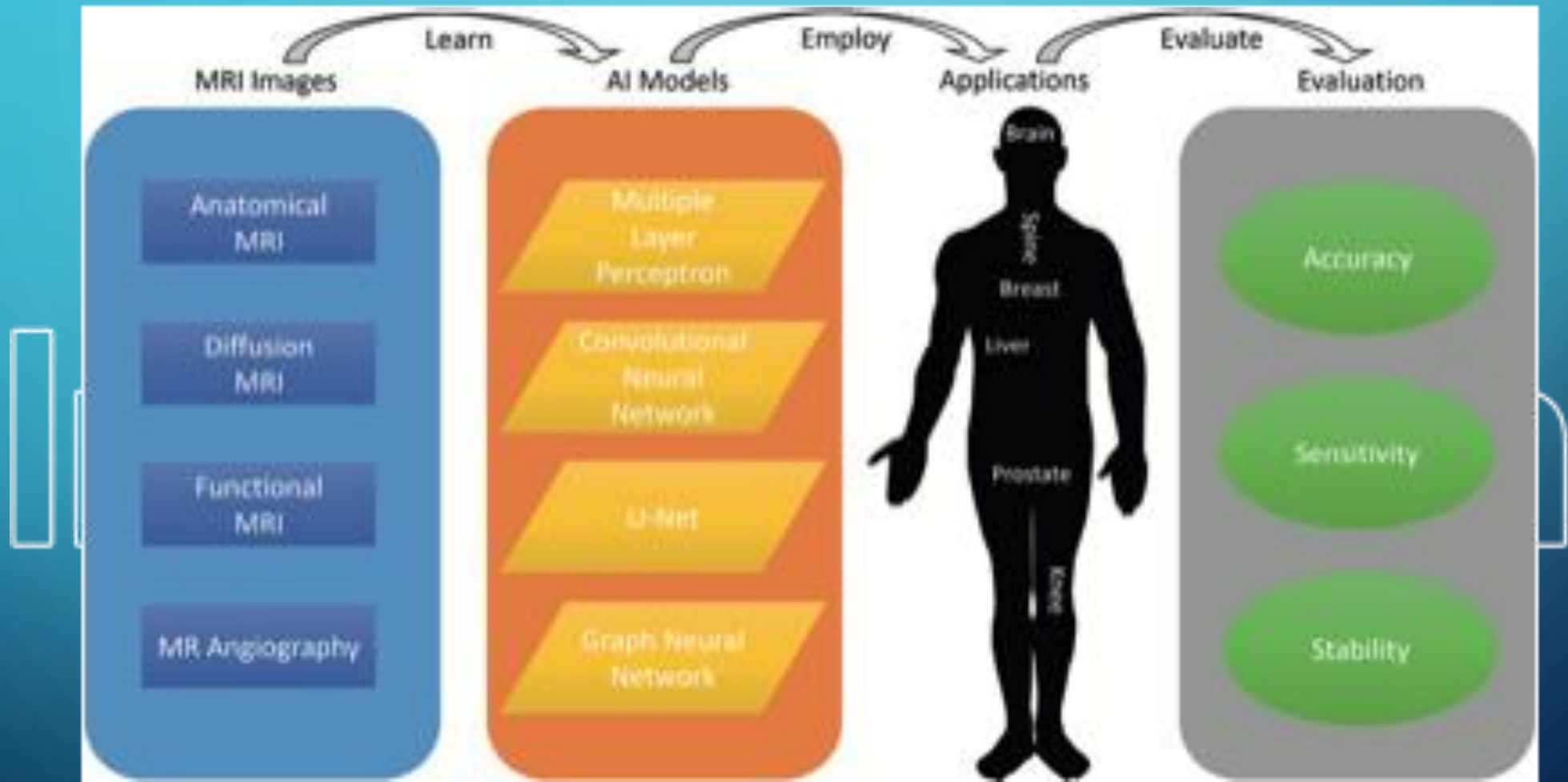
Presidente @ITIM

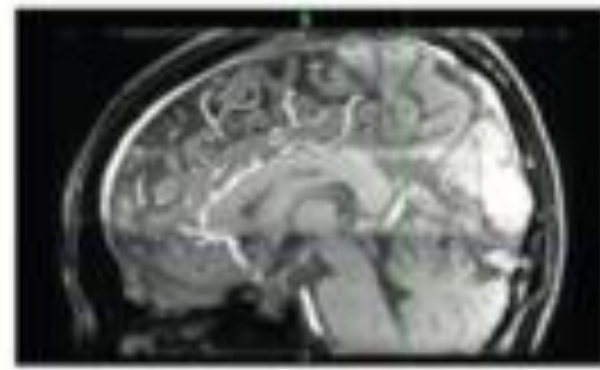
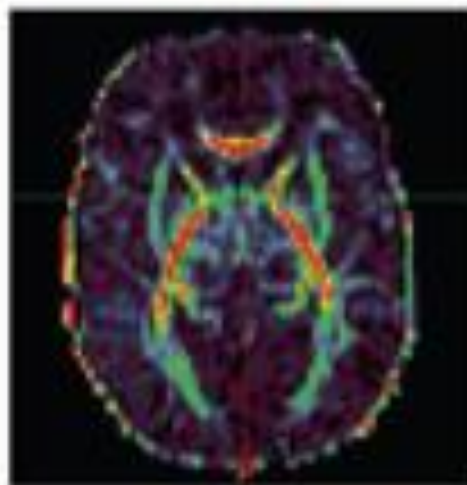
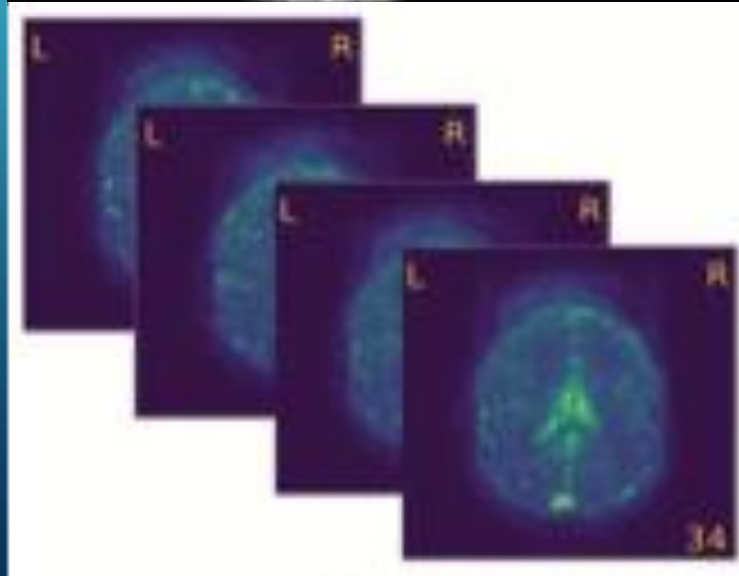
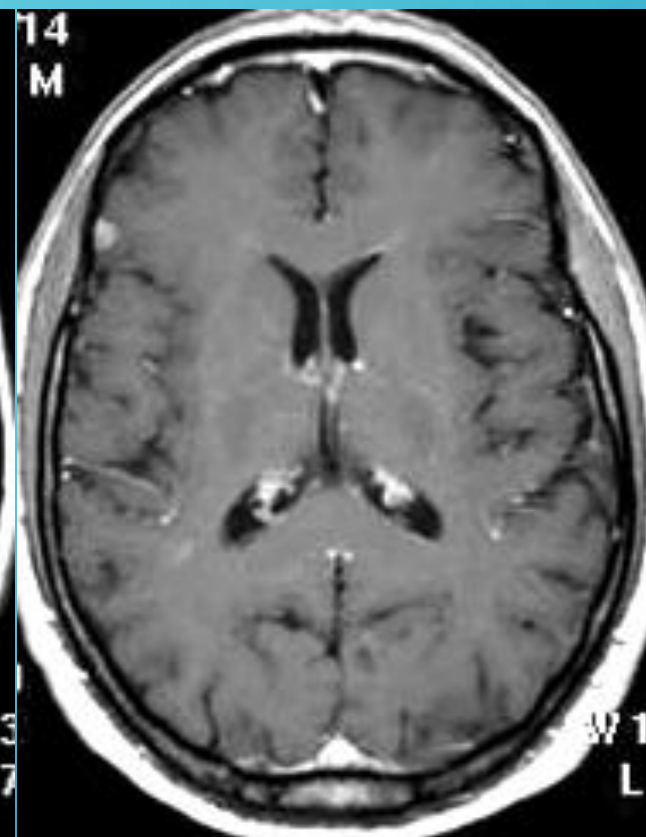
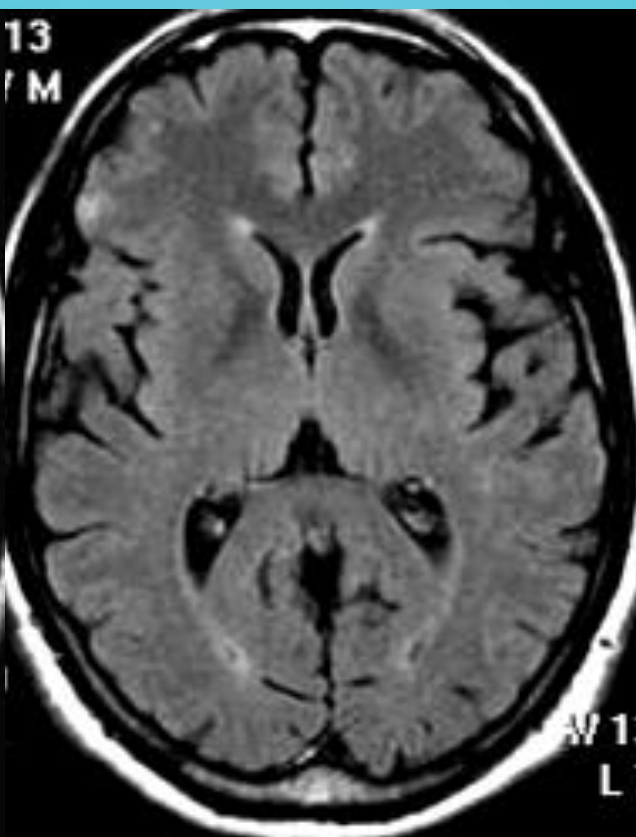
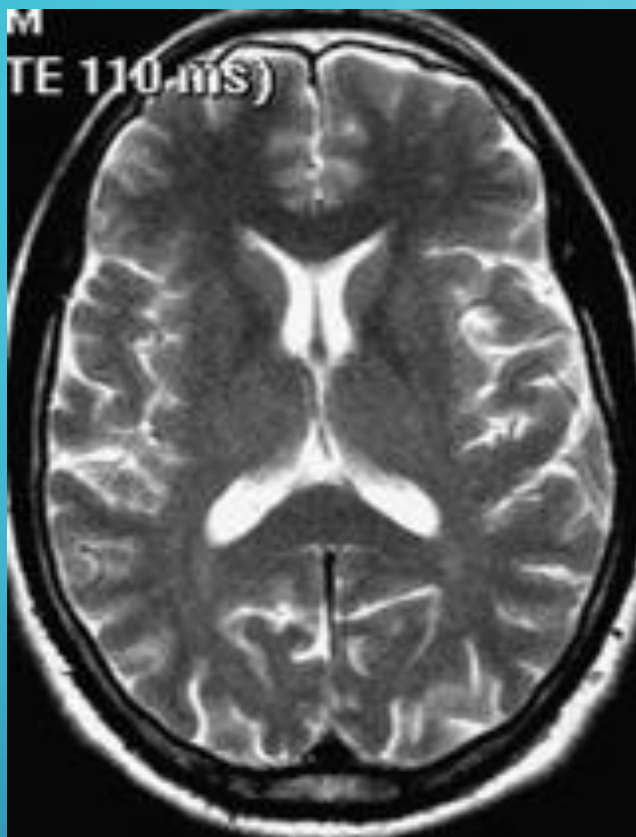
Firenze

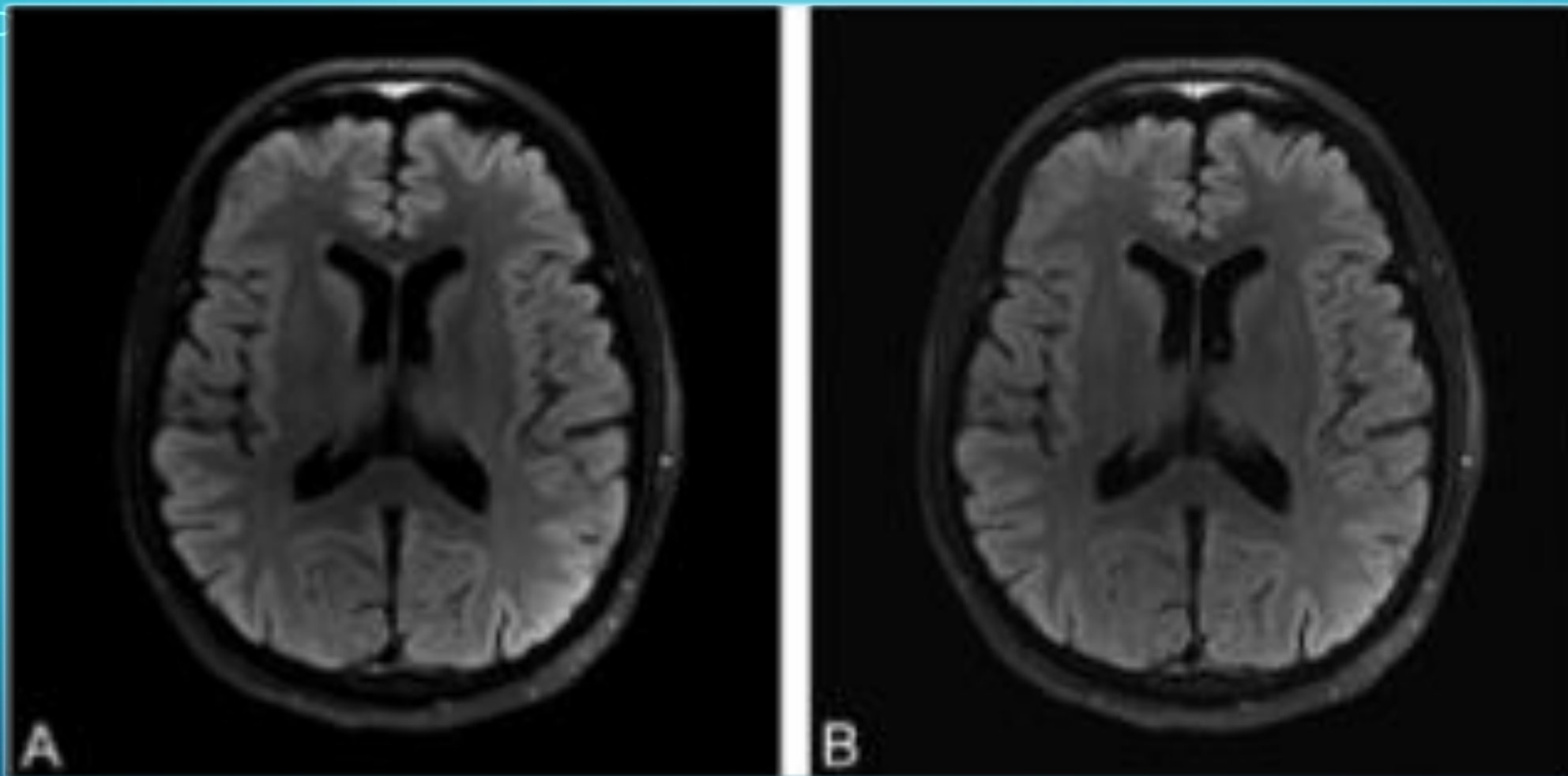
POSSIBILI APPLICAZIONI



Workflow operativo





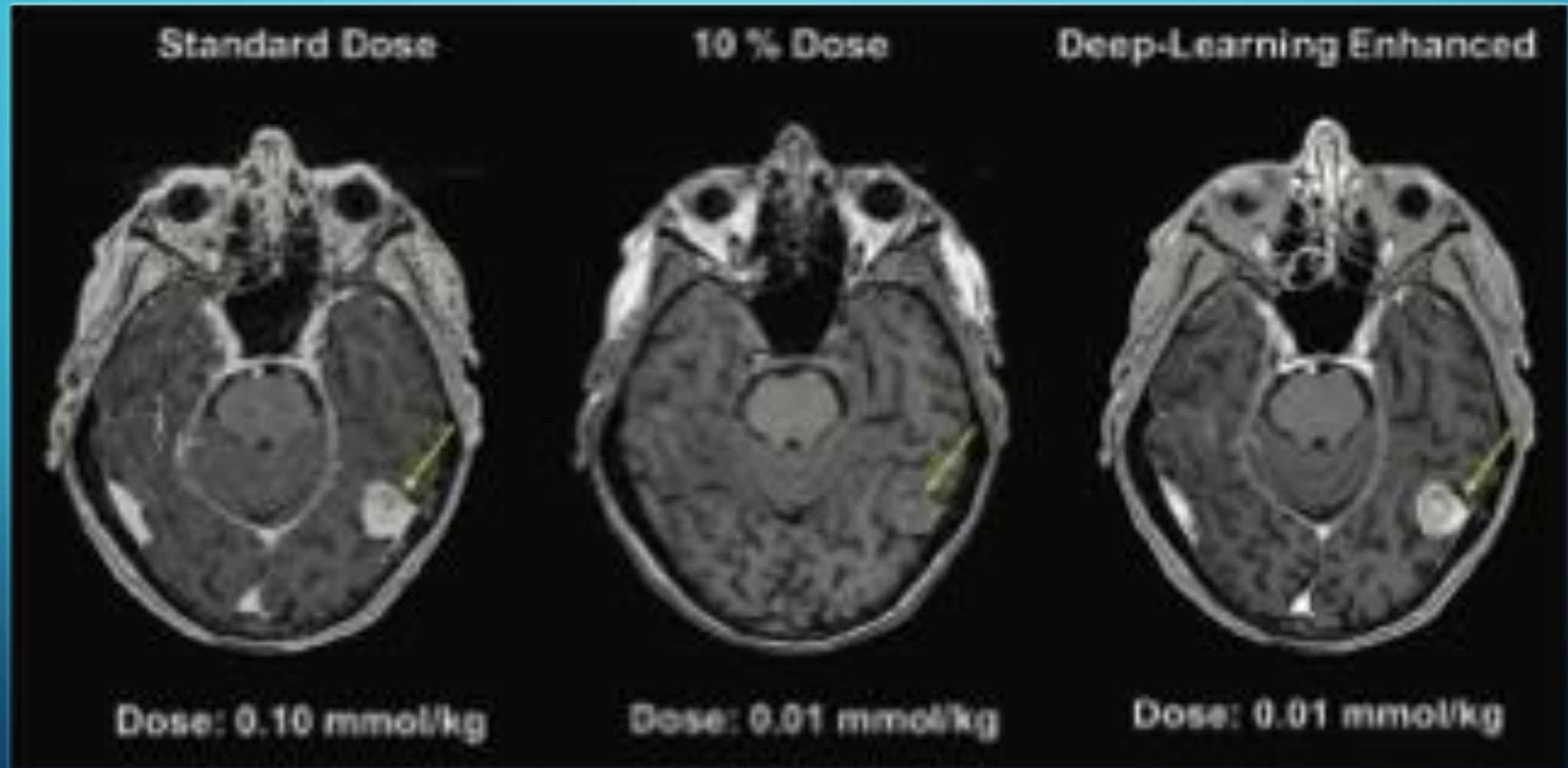


FLAIR CON IA 2.5'

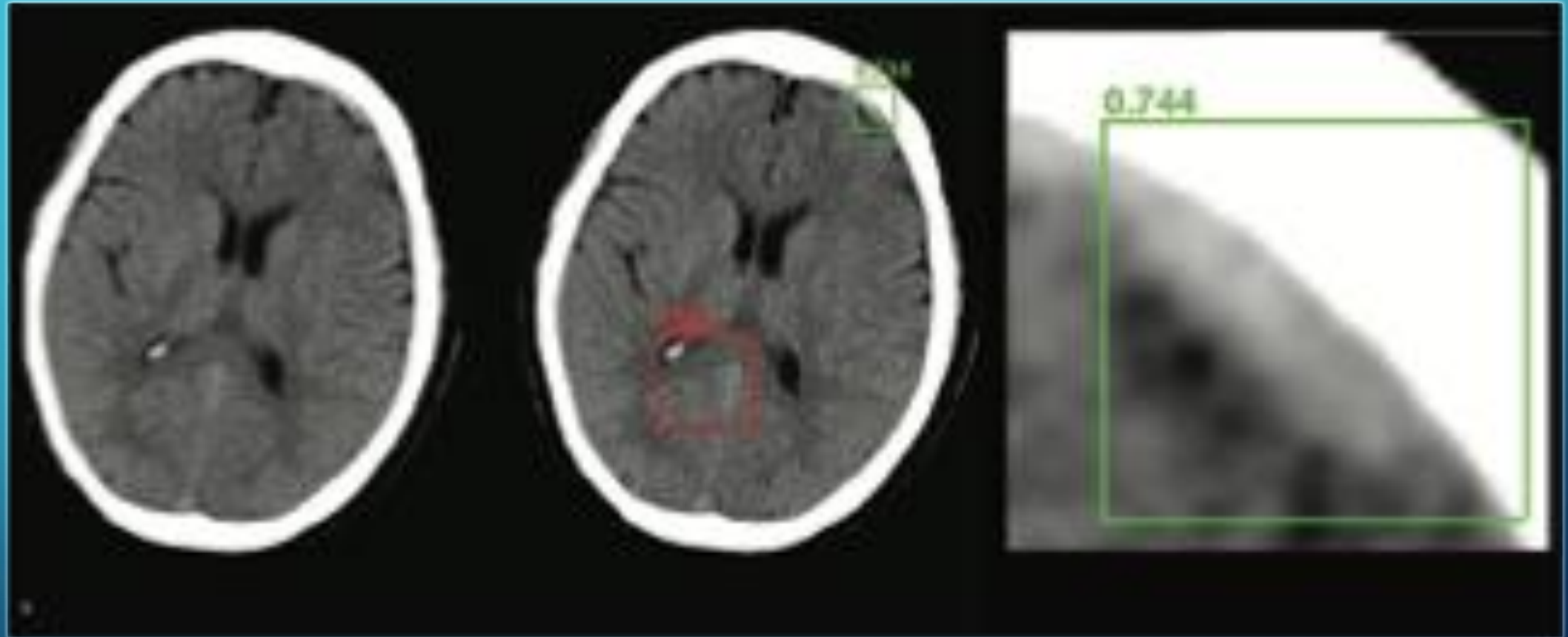
FLAIR CONVENZIONALE 5'

RIDUZIONE DEI TEMPI DI ESAME

Utilizzo del mezzo di contrasto



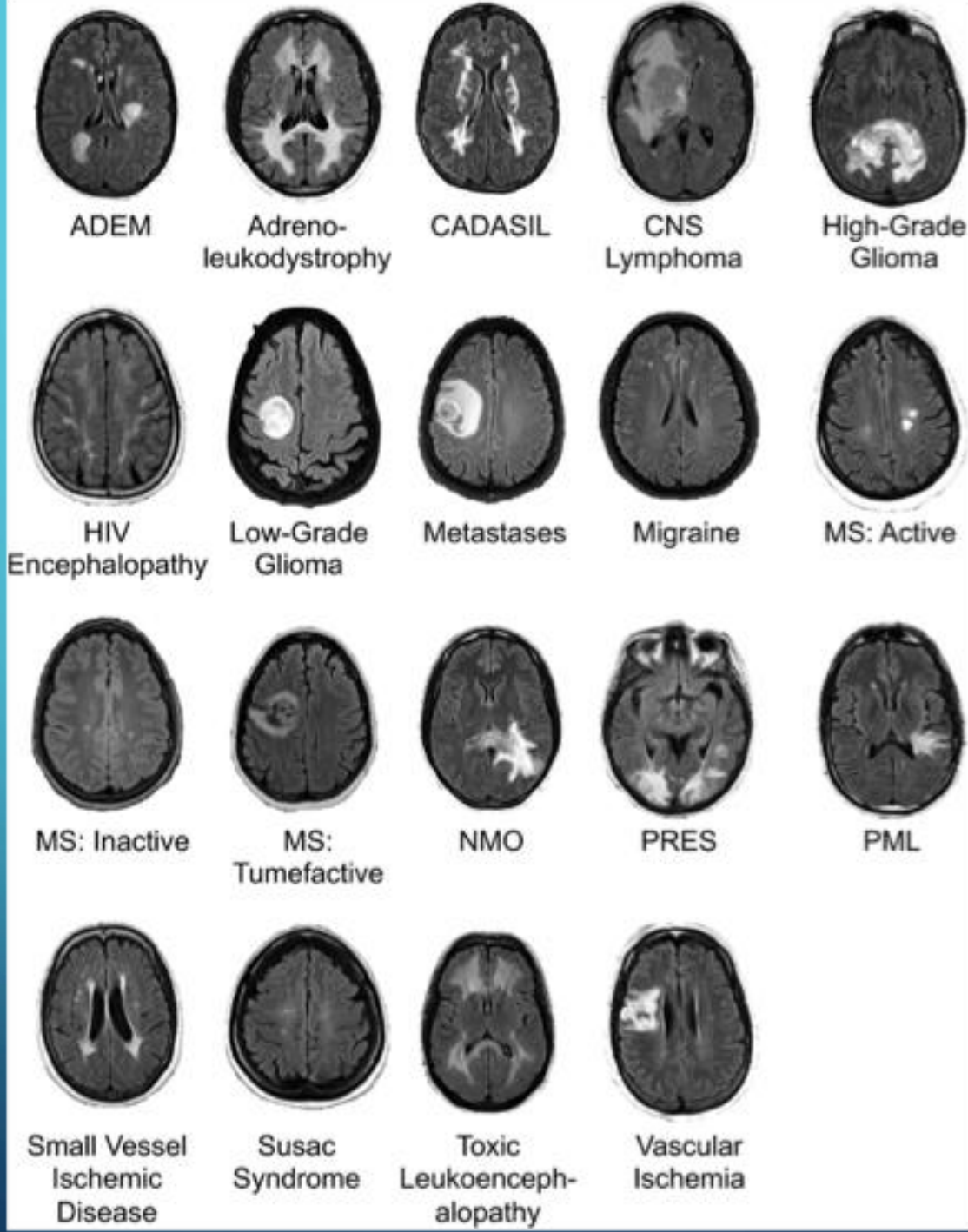
Sanguinamento vs. Calcificazioni

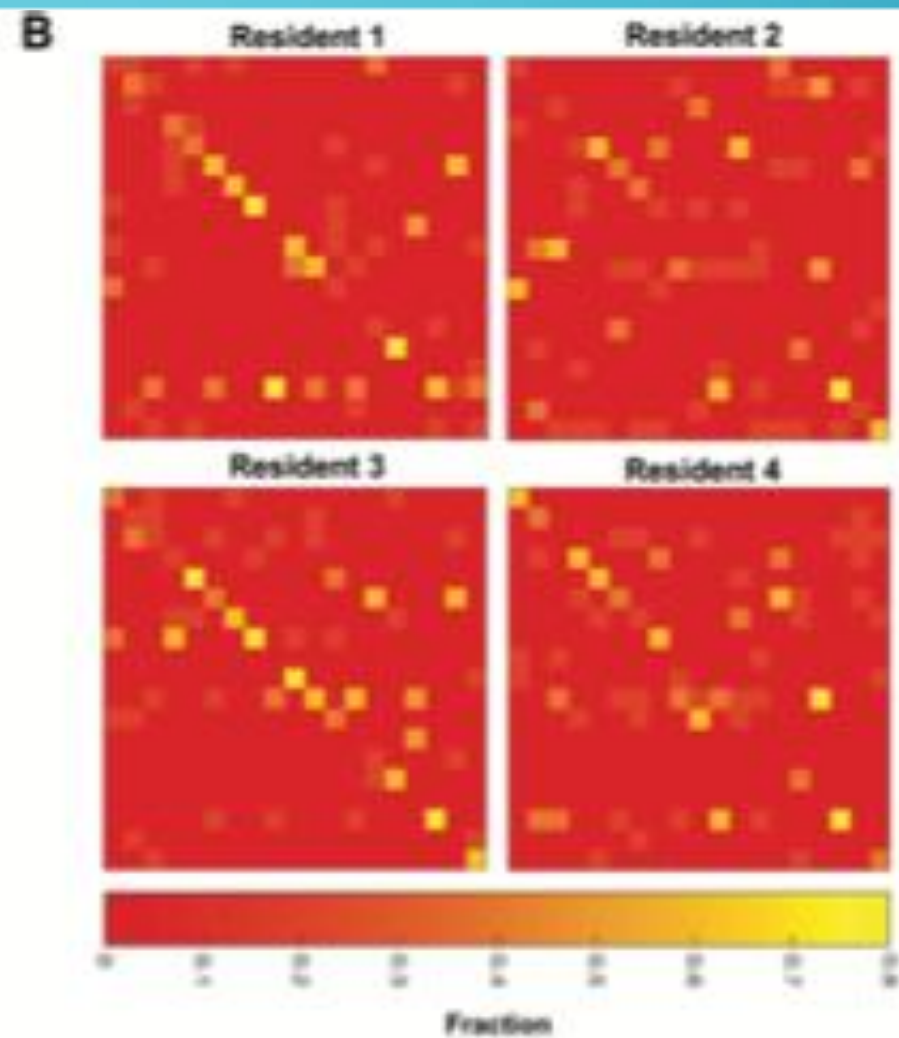
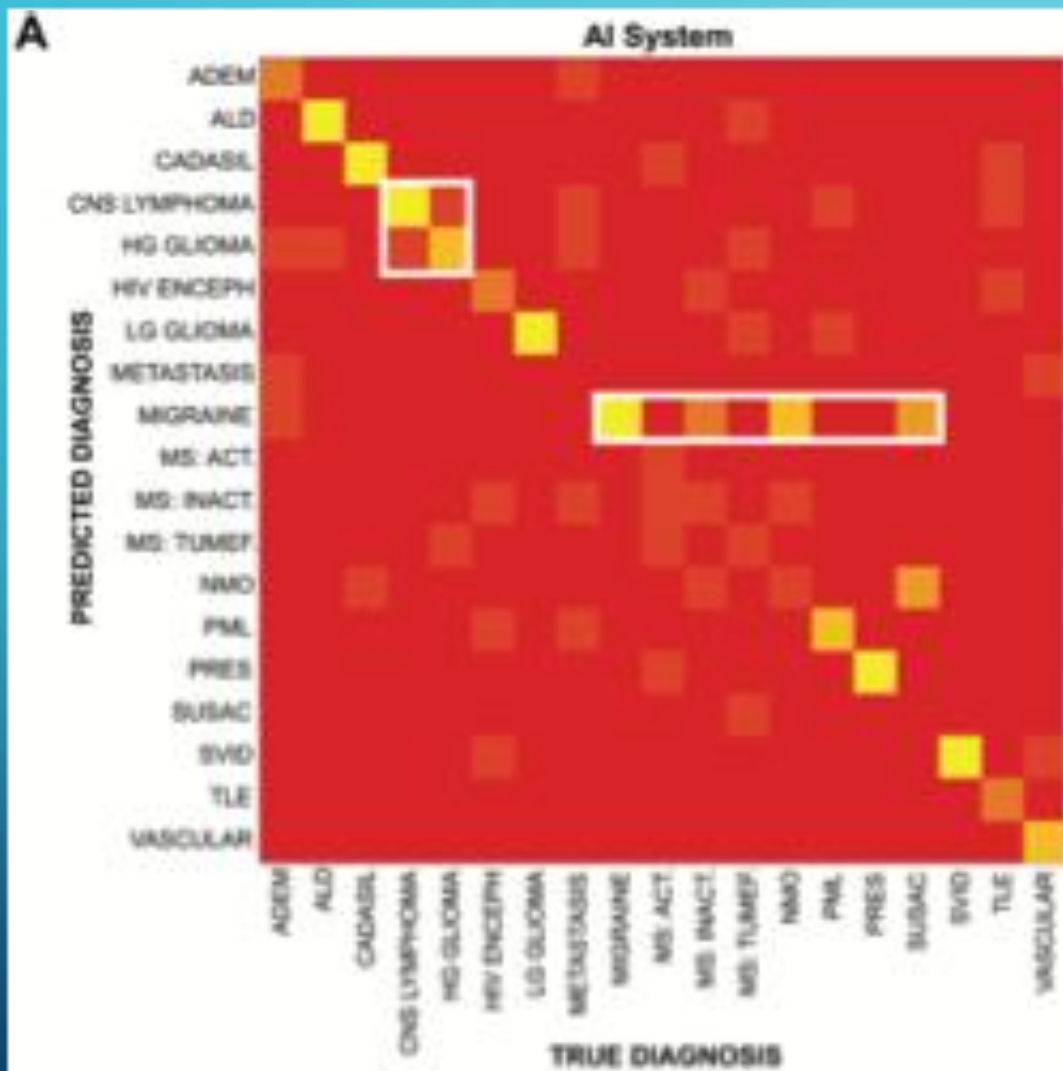


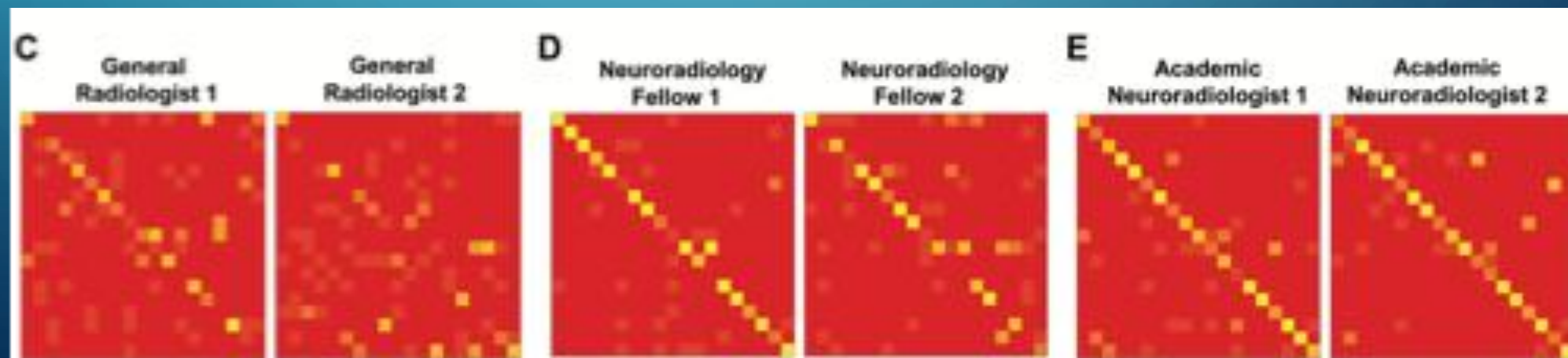
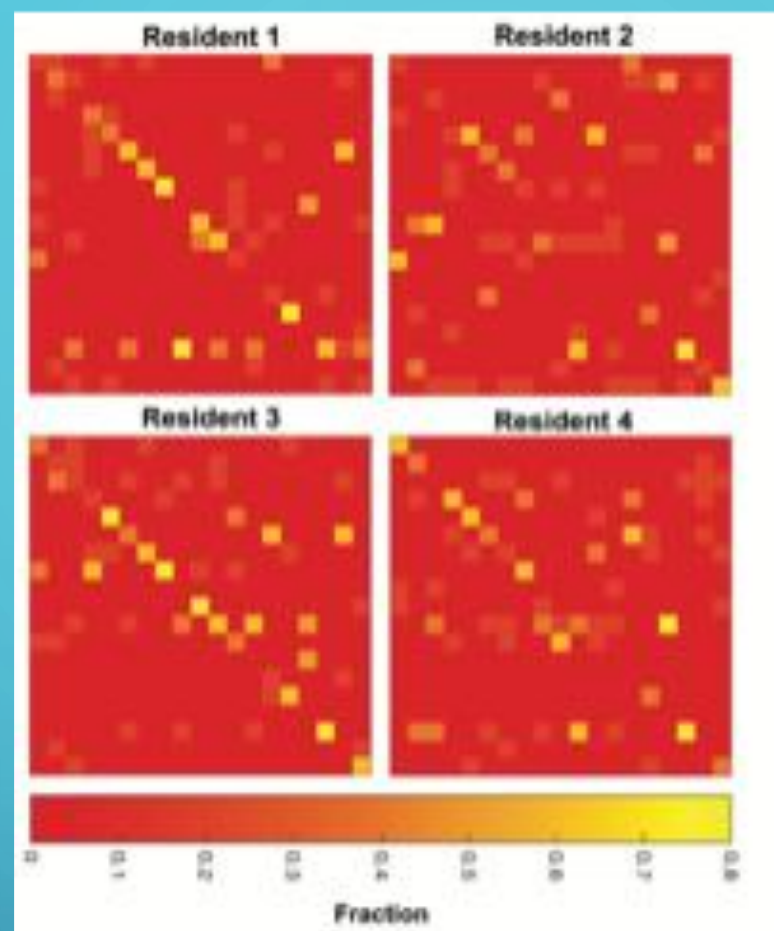
IDENTIFICAZIONE E TIPIZZAZIONE DI LESIONE

Application	Description
Image enhancement	Noise reduction: AI reduces noise and artifacts in MRI images. Super-Resolution: AI enhances image resolution for finer anatomical details.
Image reconstruction	Accelerated Imaging: AI-based reconstruction enables faster MRI scans. Sparse Sampling: AI reconstructs high-quality images from sparsely sampled data.
Disease detection and diagnosis	Tumor detection: AI identifies and characterizes tumors in MRI scans. Neurological Disorders: AI aids in diagnosing conditions like Alzheimer's using brain MRI. Cardiovascular diseases: AI assists in detecting heart diseases via cardiac MRI.
Lesion segmentation	AI accurately segments lesions (e.g., tumors) in MRI scans, aiding in treatment planning.
Functional MRI (fMRI) analysis	AI maps brain regions activated during tasks or conditions, facilitating cognitive research.
Diffusion MRI (dMRI) analysis	AI reconstructs white matter tracts in the brain, valuable for neurosurgical planning.

Quantitative imaging	AI quantifies tissue properties (T1, T2, diffusion) for disease characterization. AI analyzes tissue perfusion in MRI, important for diagnosing conditions like stroke.
Automated reporting	AI generates automated radiology reports by extracting findings from MRI scans.
Treatment planning	AI assists in radiotherapy planning by delineating target volumes on MRI.
Monitoring disease progression	AI tracks disease progression by analyzing changes in MRI scans over time.
Predictive modeling	AI predicts disease outcomes and treatment responses based on MRI data.
Quality control	AI performs quality checks on MRI scans, flagging artifacts and anomalies.
Population studies	AI analyzes large MRI datasets for trends, risk factors, and early disease indicators.
Customization and personalization	AI tailors MRI protocols to individual patients for optimized imaging.







RMN.ai - Data Submission

1376A1809A

Upload MR Data

In this section the User must upload the zipped DICOM archives of 4 key MR sequences needed to perform the tumor segmentations with **HO-GLO-RADT (1, 2, 3)** and which must have been acquired within the same exam session. The sequences are:

- T1-weighted sequence before contrast-agent administration (**T1**) acquired as 2D with axial orientation (e.g. T1E) or as 3D (e.g. MPRAGE)
- T1-weighted sequence after contrast-agent administration (**CT1**) acquired as 2D with axial orientation (e.g. T1E) or as 3D (e.g. MPRAGE)
- T2-weighted sequence (**T2**) acquired as 2D
- Fluid attenuated inversion recovery (**FLAIR**) sequence acquired as 2D with axial orientation (e.g. T1E). A 3D acquisition (e.g. 3D T1E/T1E) may work as well

These specifications are in line with the consensus recommendations for a standardized brain tumor imaging protocol in clinical trials - see Ebinger et al. *Neuro Oncol.* 2015 Sep;17(9):1188-98 - www.ncbi.nlm.nih.gov/pubmed/26200565

Note: the ".zip" archives containing the DICOM images, must only contain the images and no other files. Additionally, the images can be placed in a single folder before compressing to zip. Nesting folders will result in an error.

MR Sequence Name	Upload File	Filename	Upload State
T1	Drag and Drop or Select T1 DICOM zip	T1.zip	✓
CT1	Drag and Drop or Select CT1 DICOM zip	CT1.zip	✓
T2	Drag and Drop or Select T2 DICOM zip	T2.zip	✓
FLAIR	Drag and Drop or Select FLAIR DICOM zip	FLAIR.zip	✓

Subject Identification Tag (optional):

Patient#1

Additional Information (optional):

subject is part of a larger study (study ID, etc...)

RMN.ai - Status Viewer

1376A1809A

Please insert the token number and email address associated with the examination you would like to check the status of.

Email

prova@elettra.eu

✓

That looks like a valid address

Token

472743fe

✓

Alphanumeric sequence of 8 characters distributed by RMN.ai

Valid Token Length

VIEW STATUS

Status of 472743fe

Automated MRI Analysis:

Ready

Your data has been processed and is ready for download, together with the additional information provided at submission time.

Metadata input at submission:

Date and time of Request
Mon Feb 13 15:30:24 2023

Email of User
prova@elettra.eu

Subject Identification Tag
Patient#1

Additional Info
Any additional information added by the user

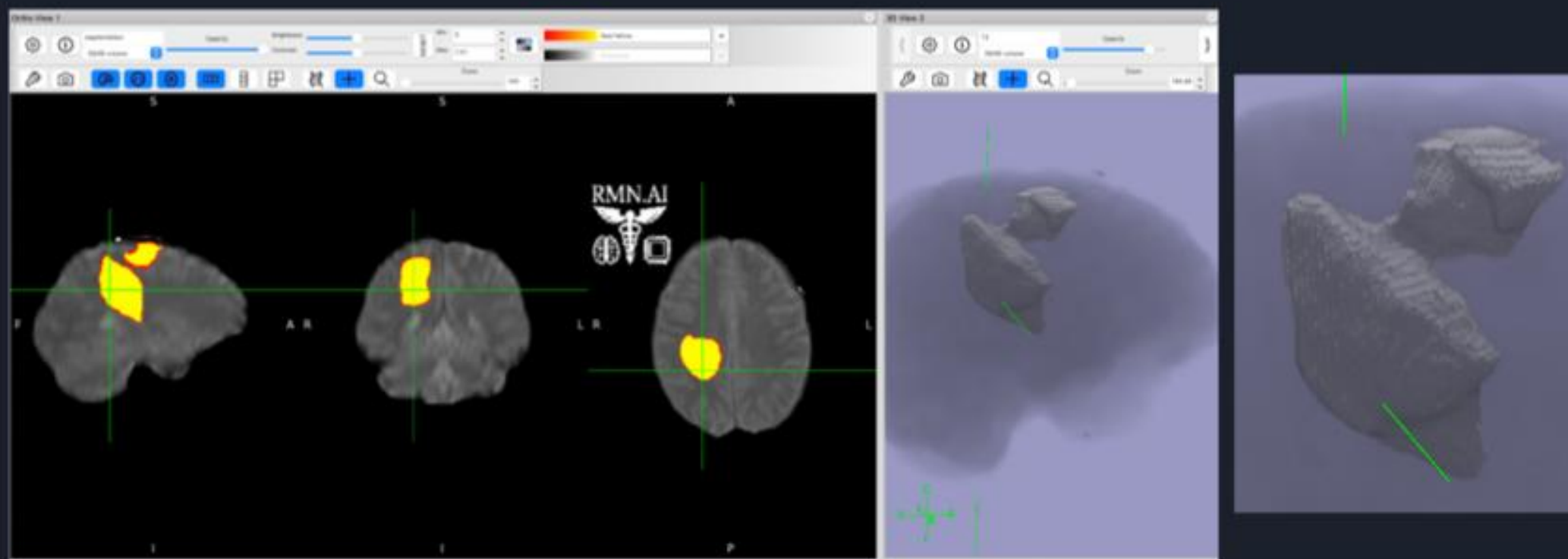
DOWNLOAD DATA

DOWNLOAD INFO

The RMN.ai system, services and the integration of algorithms are designed and implemented by the gubbiostomamultiforma #EDV volunteers: Matteo Spotti, Francesco Gatti, Roberto Pugliese, and George Kouroubas © 2023

RMN.ai

Example of **RMN.AI** Automated Segmentation

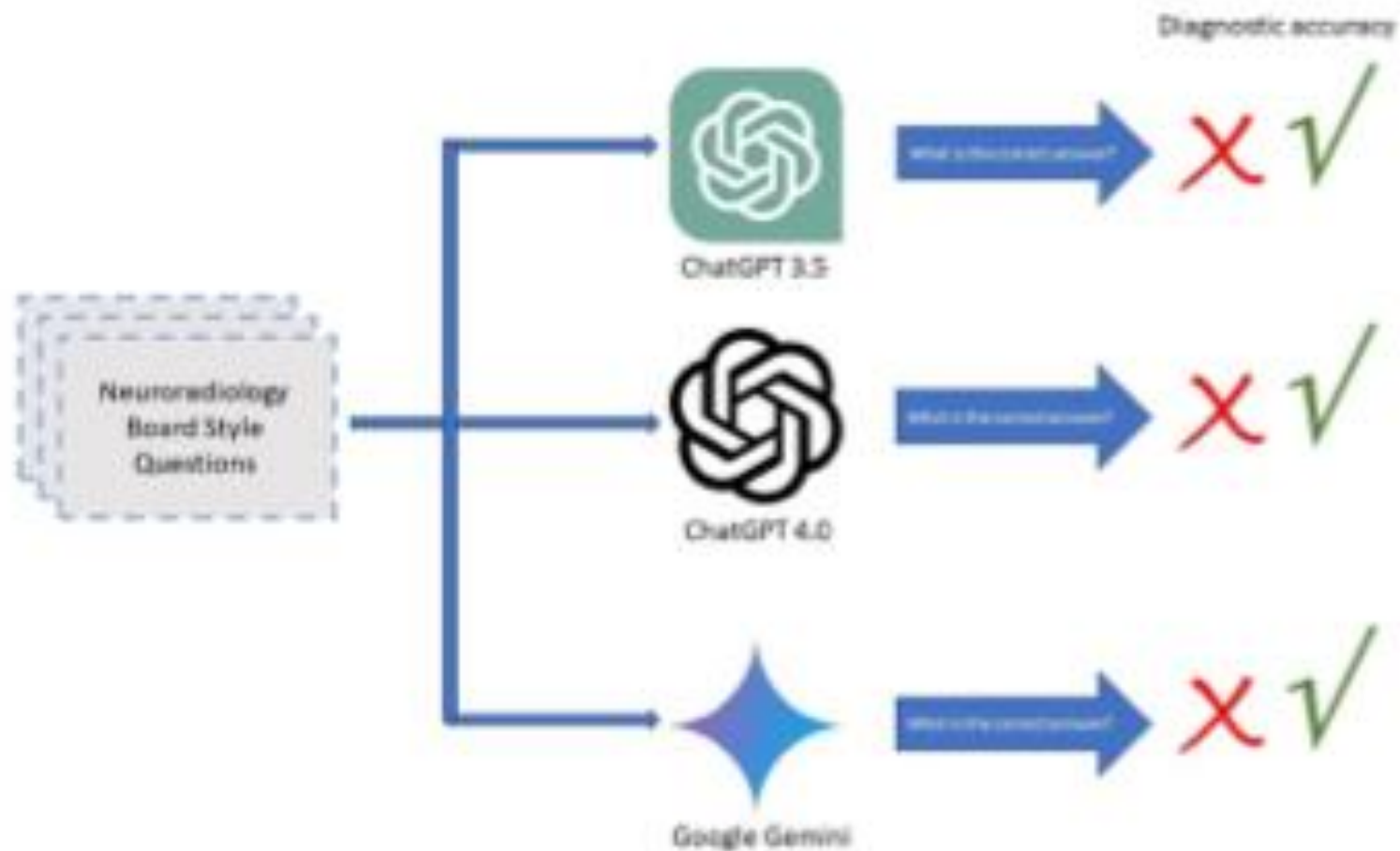


EP - 4/4/18 (At diagnosis):

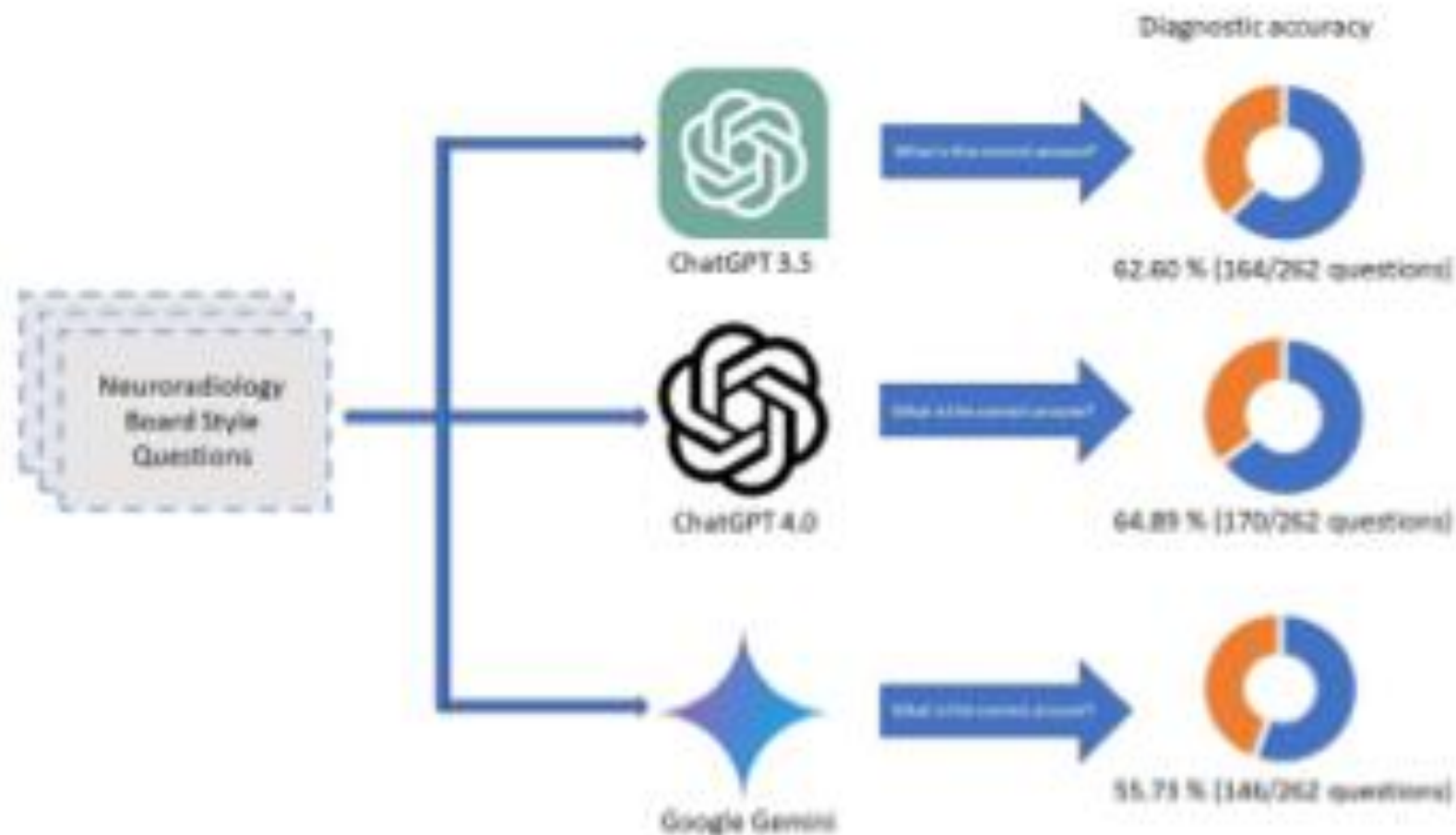
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volume_contrast_enhancing_tumor_mm³: 0.00

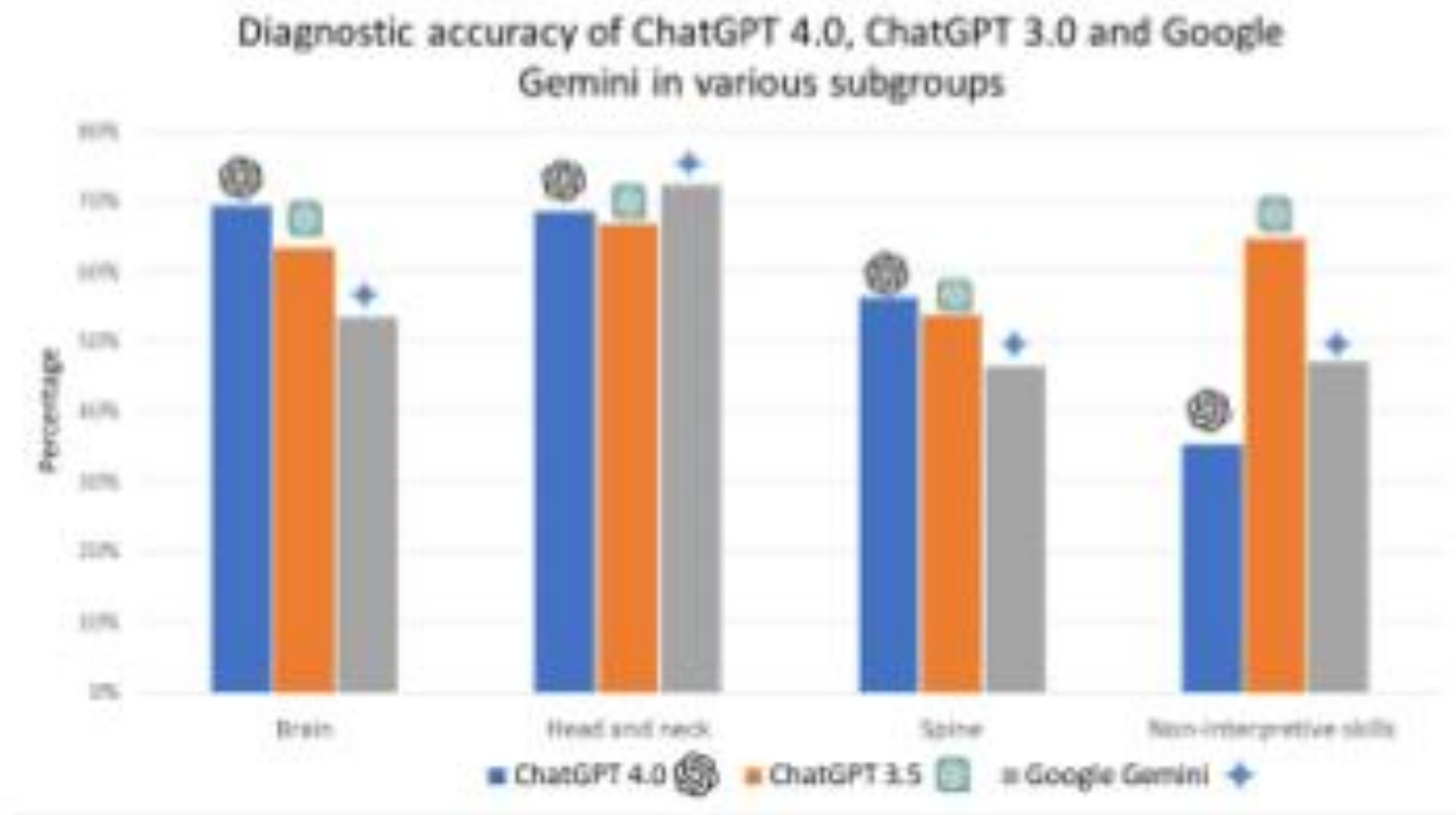
Confronto Chat-GPT 3,5, Chat-GPT 4, Google Gemini



Confronto Chat-GPT 3,5, Chat-GPT 4, Google Gemini

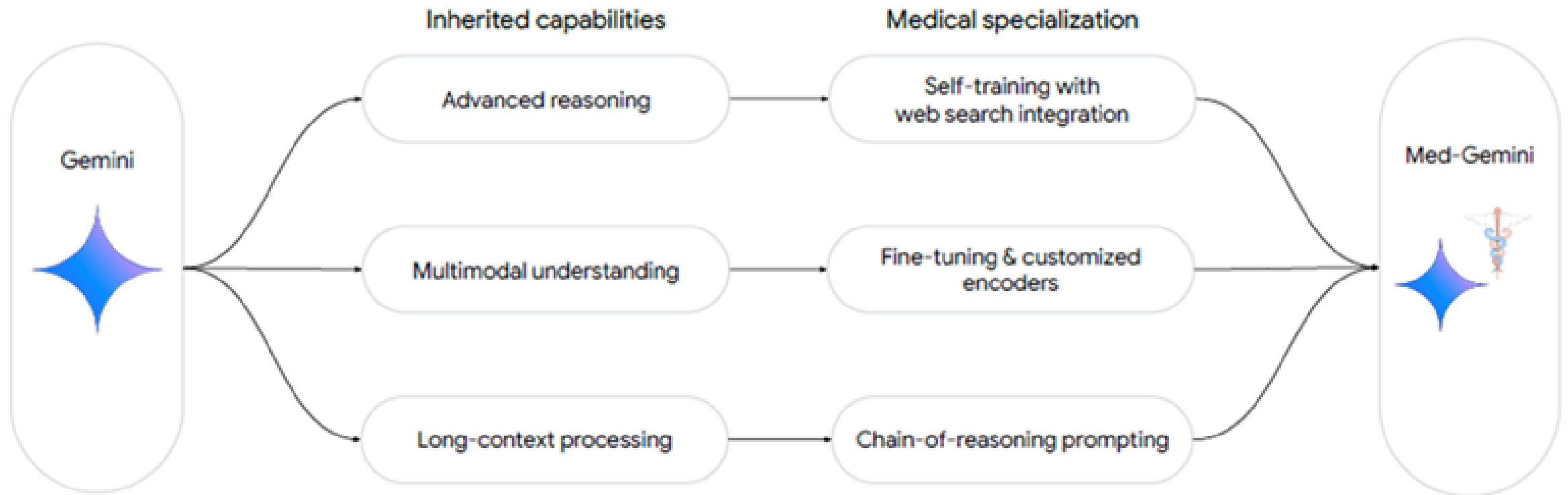


Confronto Chat-GPT 3,5, Chat-GPT 4, Google Gemini

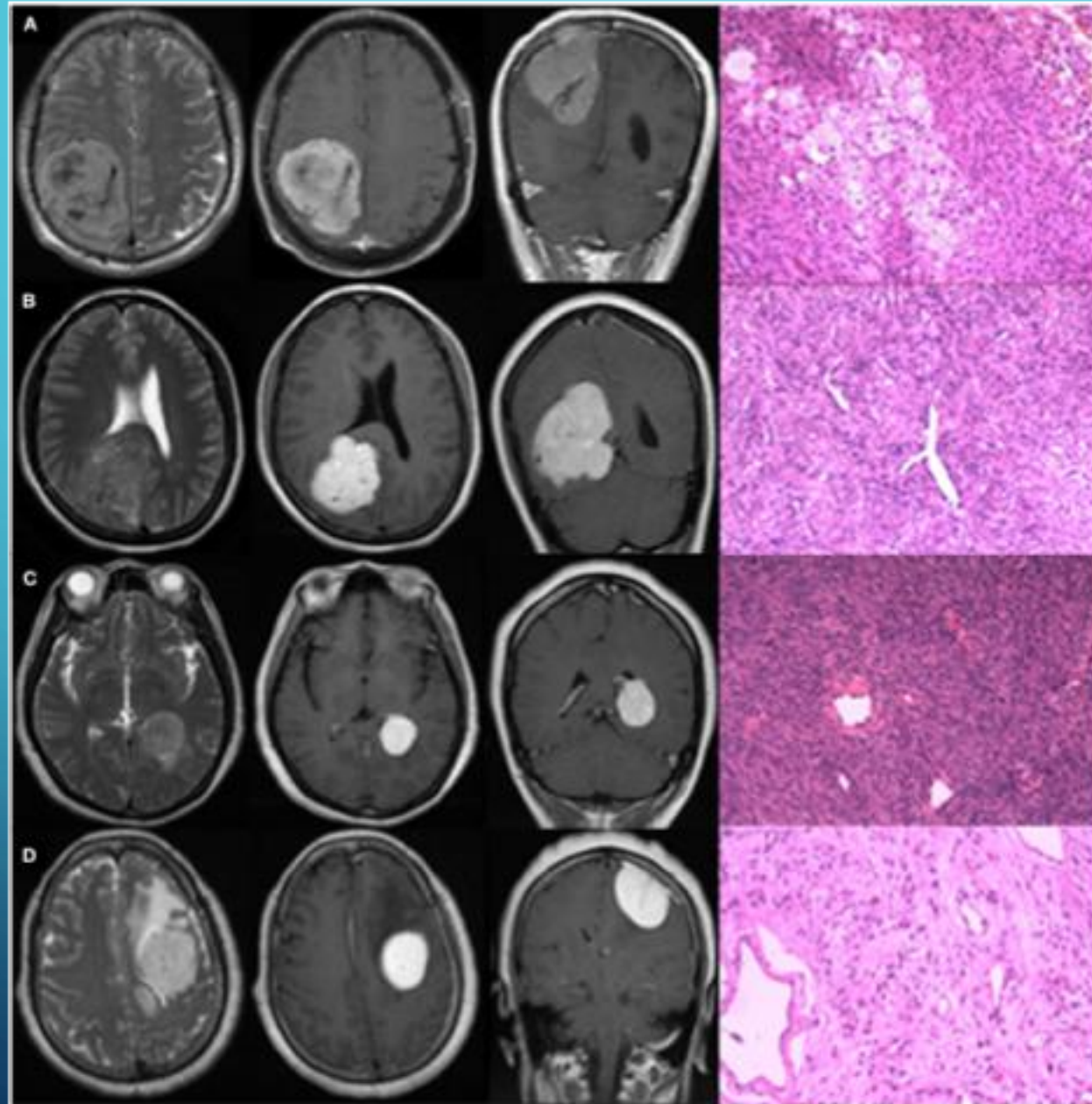


Sviluppo di Google Gemini

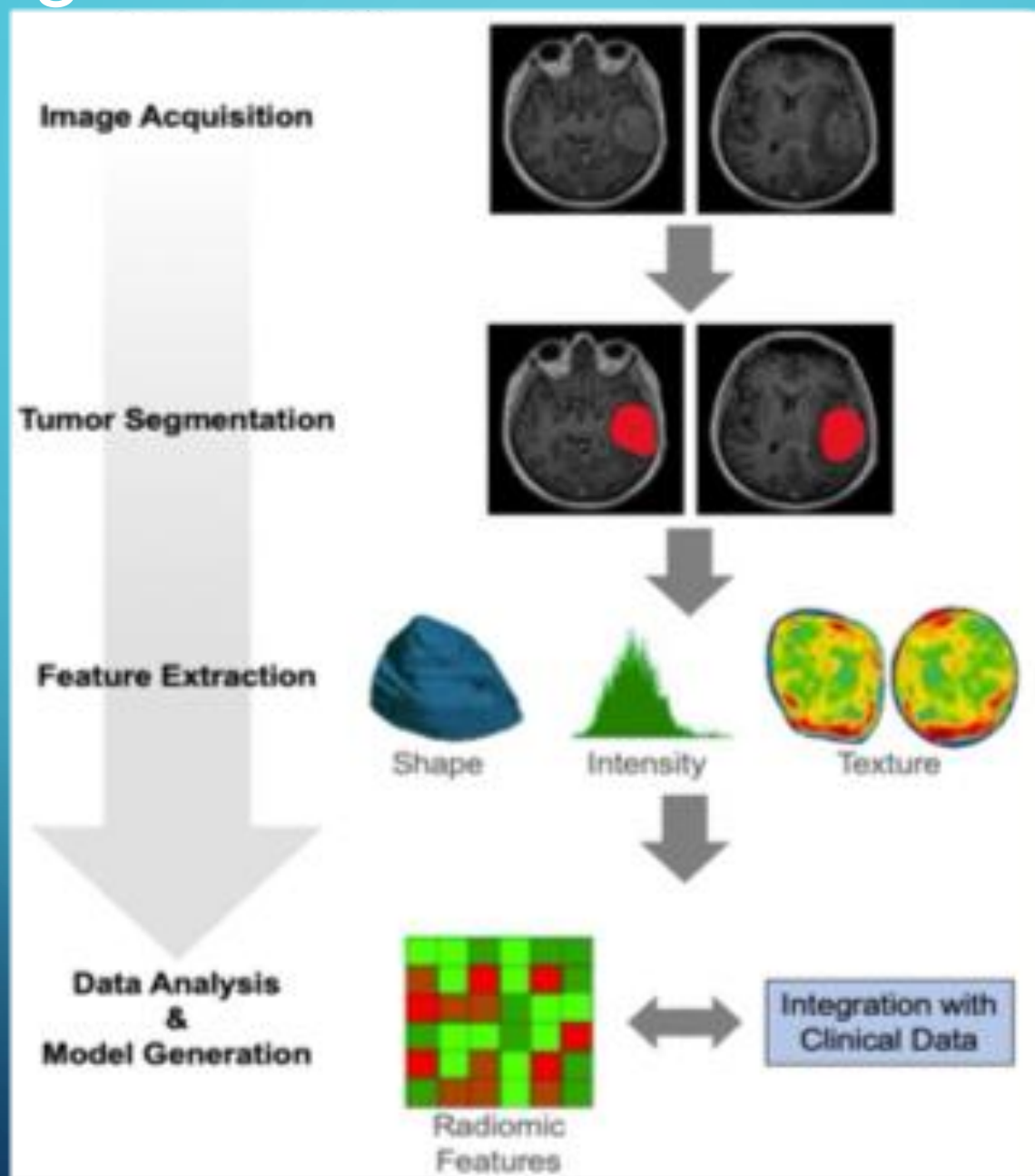
Med-Gemini Development



Meningioma vs Emangiopericitoma

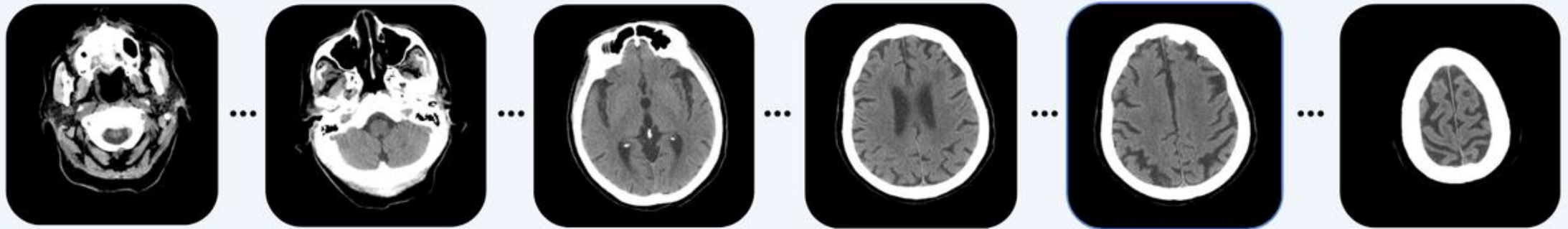


Segmentazione area lesionale



Prompt

Given the image, what are the radiology findings?



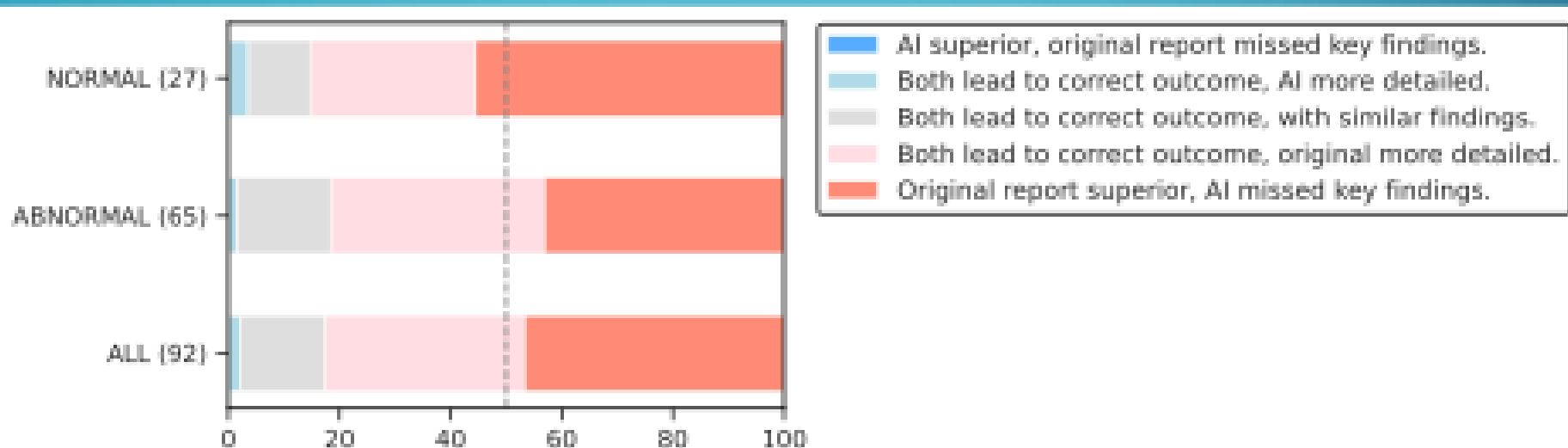
Response

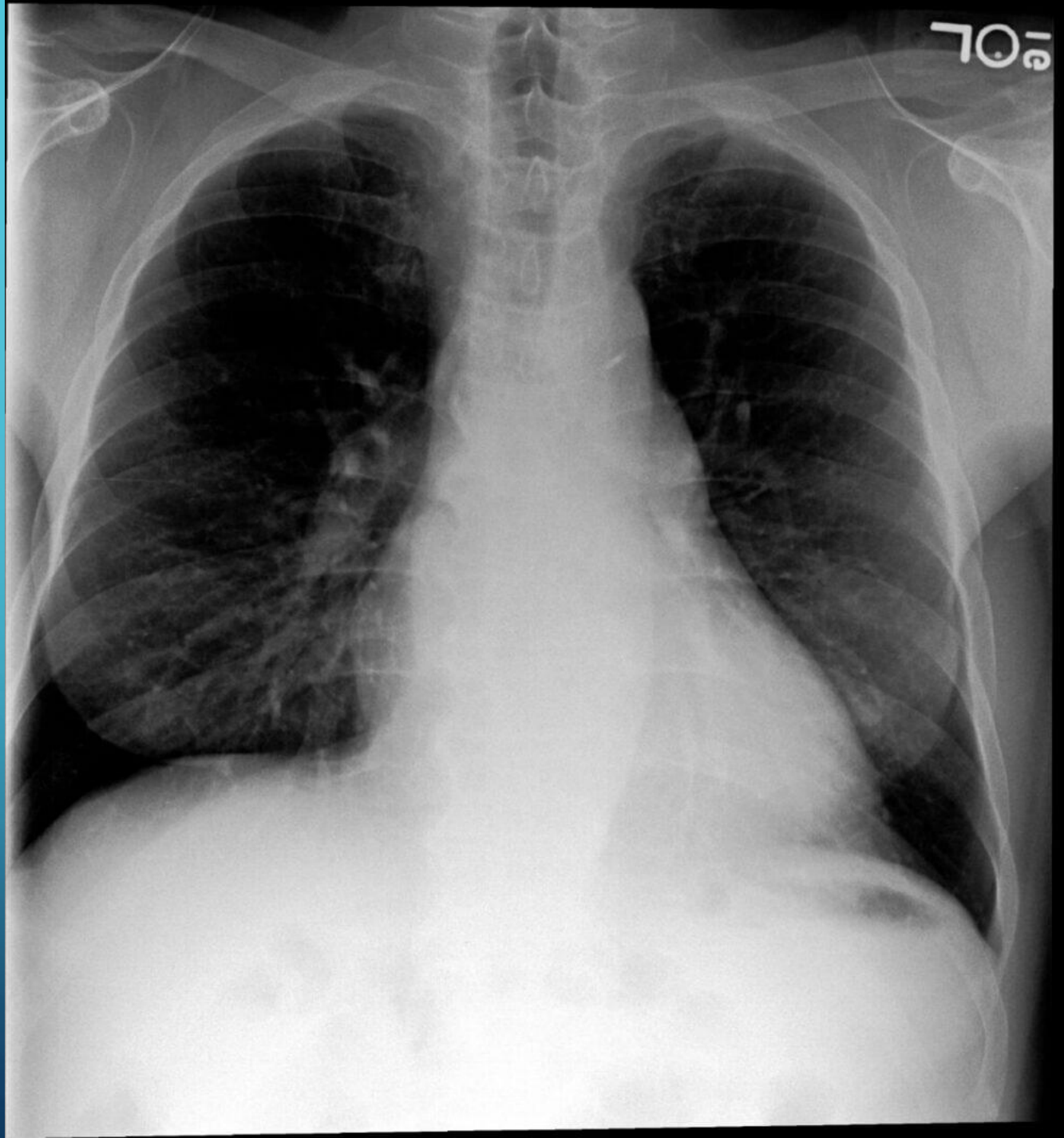
FINDINGS: mild cortical atrophy and periventricular white matter changes are noted compatible with microvasculopathy. there is proportionate ventriculomegaly. no bleed, mass effect, midline shift or abnormal intracranial fluid is seen. no evidence of acute intracranial hemorrhage, territorial infarct, abnormal fluid or mass effect. no abnormal extra-axial fluid collection is identified. no definitive evidence of intracranial hemorrhage or large territorial infarct within the limits of ct imaging. **old left basilar ganglia infarct**. no intracranial mass, swelling, hemorrhage, infarction or extra-axial collection is seen. visualized mastoid air cells: well pneumatized. visualized paranasal sinuses: well pneumatized. atherosclerotic calcification of vasculature at the skull base.

Radiologist Written Report

FINDINGS: the fourth ventricle is midline. the remaining ventricular system is within normal limits. there is mild chronic white matter microangiopathic disease and moderate generalized cortical atrophy. no bleed, mass effect, midline shift or abnormal intracranial fluid is seen. bone windows demonstrate an intact skull. the remaining visualized paranasal sinuses and mastoids are clear. chronic white matter microangiopathic disease, mild generalized cortical atrophy, not significantly changed since 2015. no evidence of acute intracranial hemorrhage, territorial infarct, abnormal fluid or mass effect.

Rubric Score	Rubric Definition
A2	Report A captures key clinically relevant findings that are not found in B. Report A would result in correct patient management and report B would not.
A1	Report A captures more relevant findings, but both would result in the same correct patient management.
C	Both reports capture similar findings in the image and would result in correct patient management.
B1	Report B captures more relevant findings, but both would result in the same correct patient management.
B2	Report B captures key clinically relevant findings that are not found in A. Report B would result in correct patient management and report A would not.
X	Neither report would result in correct patient management.





Medico: “Salve, sono un Medico di base e questa è una radiografia del torace di un mio paziente. Il referto radiologico è ancora in sospeso e vorrei un aiuto per capire la radiografia. Genera un referto radiologico di questa immagine.”

Med-Gemini: “Il cuore è ai limiti superiori delle dimensioni normali. I contorni mediastinici e ilari entro i limiti normali. I polmoni appaiono puliti. Non ci sono versamenti pleurici o pneumotorace. Lievi alterazioni degenerative si osservano lungo la colonna vertebrale toracica inferiore. Sintesi: Nessuna evidenza di patologia acuta in atto.”

Medico: “Quali sono i segni cambiamenti degenerativi?”

Med-Gemini: “Lievi alterazioni degenerative si osservano lungo la colonna vertebrale toracica inferiore. Ciò si evince dal lieve restringimento degli spazi dei dischi intervertebrali e dalla presenza di piccoli osteofiti (speroni ossei) lungo i margini anteriori dei corpi vertebrali.”

Medico: “Il mio paziente ha una storia di mal di schiena. Questo potrebbe spiegare il mal di schiena?”

Med-Gemini: “mentre i cambiamenti degenerativi osservati alla radiografia potrebbero potenzialmente contribuire al mal di schiena, è importante notare che la correlazione non equivale alla causalità. Molte persone hanno cambiamenti degenerativi nella colonna vertebrale senza provare dolore e, al contrario, il mal di schiena può avere numerose cause al di là delle semplici alterazioni degenerative. Pertanto, mentre i risultati delle radiografie sono degni di nota, non spiegano in modo definitivo il tuo mal di schiena del paziente. Una valutazione completa, comprendente un'anamnesi dettagliata, l'esame obiettivo, e potenzialmente ulteriori esami di imaging o test, per determinare l'esatta causa del suo dolore. Fammi sapere se hai altre domande.”

Medico: “Per aiutarmi a comunicare tutto questo al mio paziente, per favore riscrivi il referto senza usare termini troppo specialistici”.

Med-Gemini: “Risultati della radiografia del torace:

- Cuore: dimensioni normali.
- Polmoni: chiari, senza segni di infezione o accumulo di liquidi.
- Ossa: lieve usura nella parte inferiore della colonna vertebrale, comune con l'età.

Nel complesso nessun segno di gravi problemi al torace. L'usura nella parte inferiore della colonna vertebrale potrebbe essere legata al mal di schiena, ma potrebbero essere coinvolti anche altri fattori. Avremo bisogno di fare più test per scoprire la causa esatta del tuo dolore”.

Medico: grazie, **Med-Gemini:** prego! Sono contento di aver potuto aiutare. Se hai altre domande, non esitare a chiedere.

Conclusioni

- I grandi modelli linguistici multimodali stanno inaugurando una nuova era di possibilità per la salute e la medicina.
- Le capacità dimostrate dall'intelligenza artificiale evidenziano **un balzo in avanti delle opportunità per accelerare le scoperte biomediche** e assistere il settore sanitario.
- Tuttavia, è fondamentale che i progressi nelle capacità del modello siano accompagnate da una attenzione all'affidabilità e alla sicurezza di questi sistemi.
- Dando priorità ad entrambi gli aspetti, possiamo responsabilmente immaginare un futuro in cui le capacità dei sistemi di IA siano acceleratori sicuri sia del progresso scientifico che delle cure in medicina.

Conclusioni

- Dobbiamo preoccuparci , non tanto degli strumenti dell'IA ma, viste le possibilità, che si creino delle **sacche di esclusione**, di un digital divide sempre più importante,
- Dobbiamo impegnarci per superare la difficoltà di integrazione corretta di questi strumenti con i sistemi sanitari, nel pieno rispetto dell'uomo e del sapere come lo conosciamo fino ad oggi.