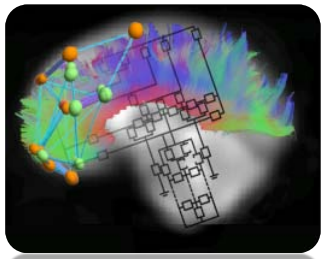
Fondazione Don Carlo Gnocchi Onlus

epr european platform for rehabilitation



Neuro Cognitive and Imaging-Assisted Treatments

Francesca Baglio, MD
Maria Marcella Laganà, PhD

Study Visit to Don Gnocchi Foundation

17-18 November 2016, Milan, Italy

for EPR members involved in medical rehabilitation

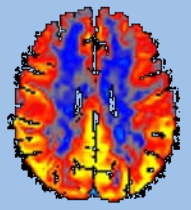
MR Laboratory and Translational Research

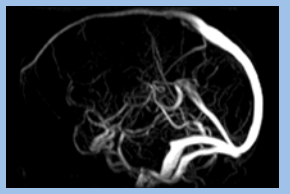
**Multidisciplinary team (MD, Eng, Psy, Tech)
for advanced rehabilitation purposes**

**State-of-the-art MRI techniques
and processing methods**

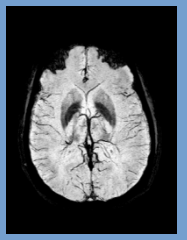
TRACTOGRAPHY, WM STRUCTURAL CONNECTIVITY

VASCULAR IMAGING

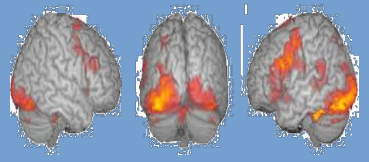




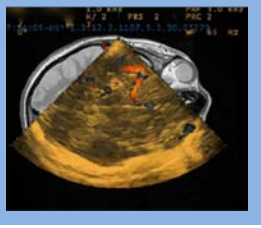
GM MEASURES: VOLUMETRY, IRON QUANTIFICATION



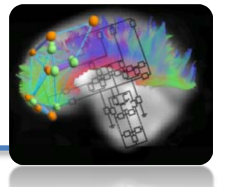
Functional MRI



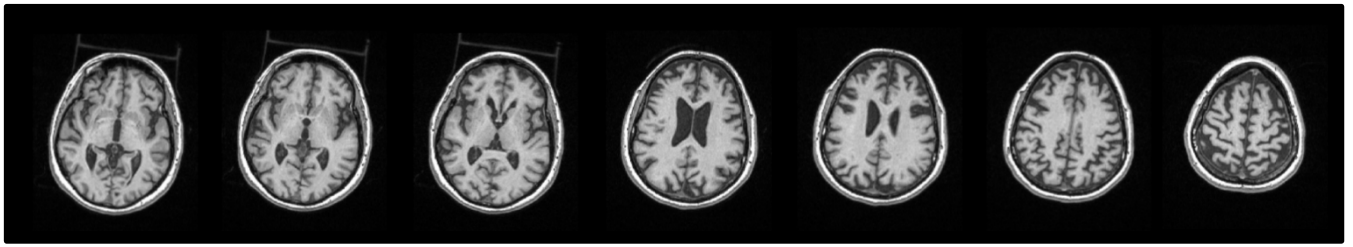
FUSION WITH OTHER IMAGING MODALITIES



Clinical Applications: Volumetric Analysis



Conventional 3D-T1 weighted MPRAGE



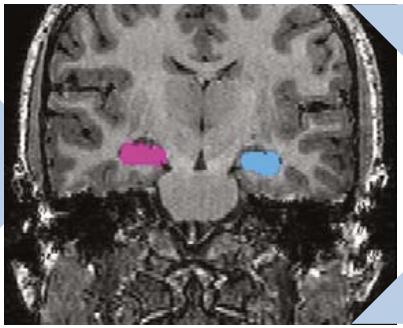
Lesions and atrophy

↓

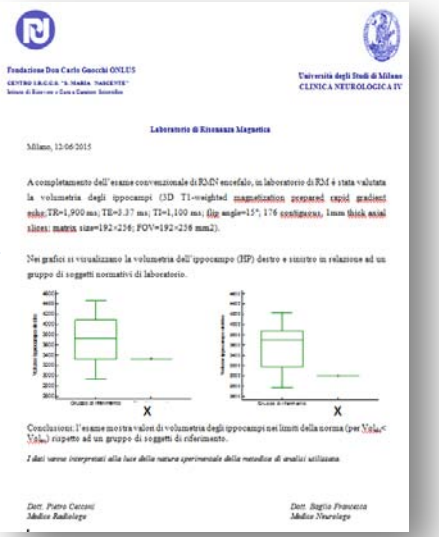
Quantitative measures?

QUANTITATIVE MEASURES FOR IMPROVING DIAGNOSIS

1) Automated hippocampal segmentation



Comparison with reference values from an age-matched group (report for clinicians)



Fondazione Don Carlo Gnocchi ONLUS

Università degli Studi di Milano
CLINICA NEUROLOGICA IV

Laboratorio di Risonanza Magnetica

Milano, 12/06/2015

A completamento dell'esame convenzionale di RMN encefalo, in laboratorio di RM è stata valutata la volumetria degli ippocampi (3D T1-weighted magnetization prepared rapid gradient echo; TR=1,900 ms; TE=3.37 ms; TI=1,100 ms; flip angle=15°; 176 contiguous, 1mm thick axial slices; matrix size=192×256; FOV=192×236 mm2).

Nei grafici si visualizzano la volumetria dell'ippocampo (HP) destro e sinistro in relazione ad un gruppo di soggetti normativi di laboratorio.

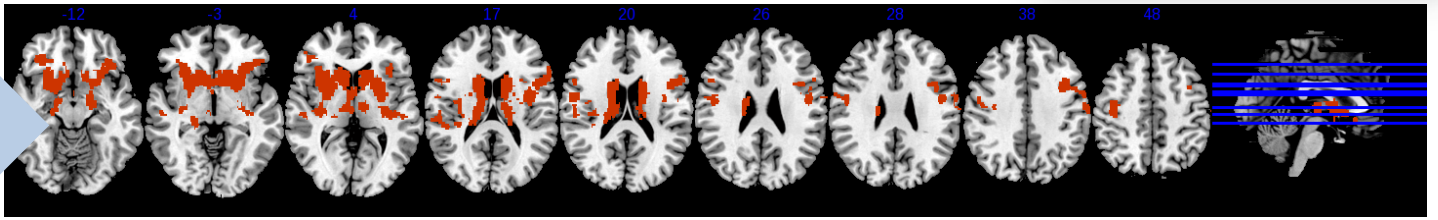
Conclusioni: l'esame mostra valori di volumetria degli ippocampi nei limiti della norma (per $Vol_{sx} < Vol_{dx}$) rispetto ad un gruppo di soggetti di riferimento.

I dati vanno interpretati alla luce della natura sperimentale della metodica di analisi utilizzata.

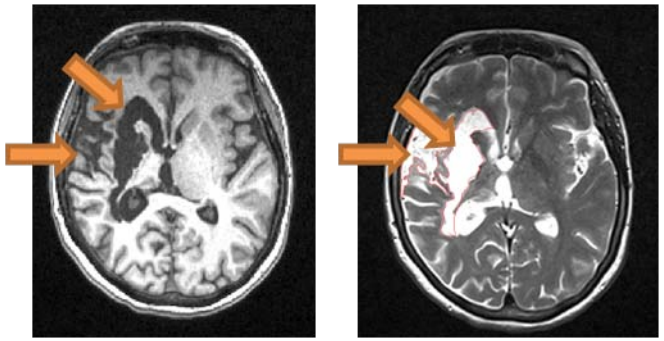
Dott. Pietro Cecconi
Medico Radiologo

Dott. Sigrid Francesca
Medico Neurologo

2) Voxel-based morphometry



Clinical Applications: Structural Connectivity

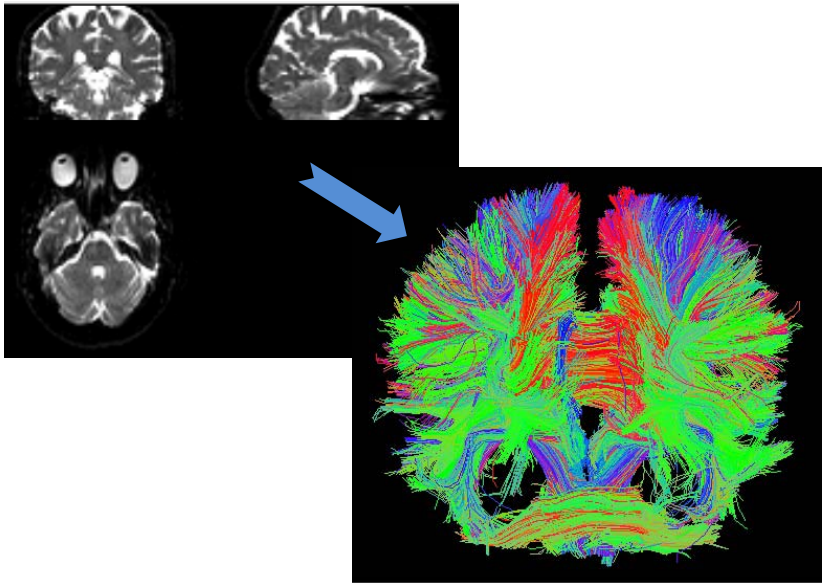


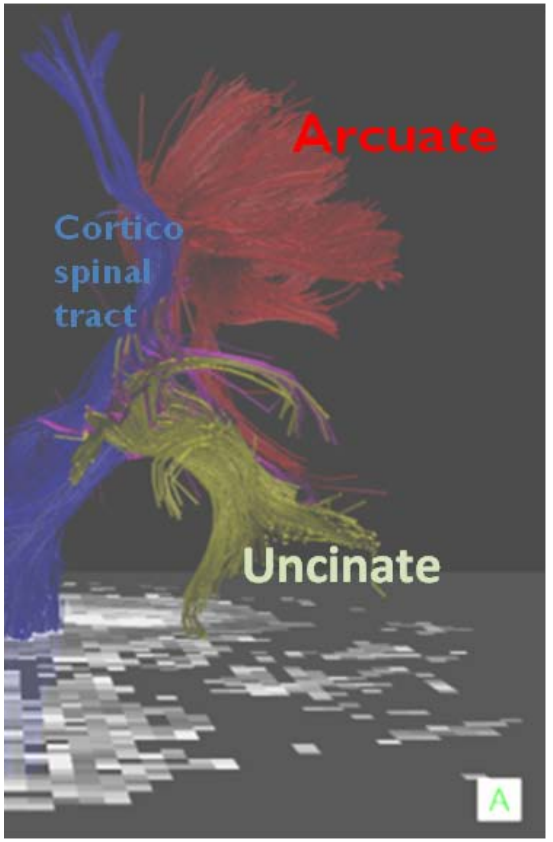
T1 and T2
Visible lesions

- **Is there a damage in the normal appearing White Matter?**
- **Which bundles are affected by the lesion?**
- **Structural connectivity changes after treatment**

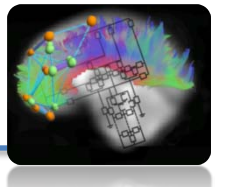
PROGNOSIS AND MONITORING THE REHABILITATION TREATMENT

Diffusion Weighted Imaging (DWI) and Tractographic reconstruction





Clinical Applications: Functional Connectivity

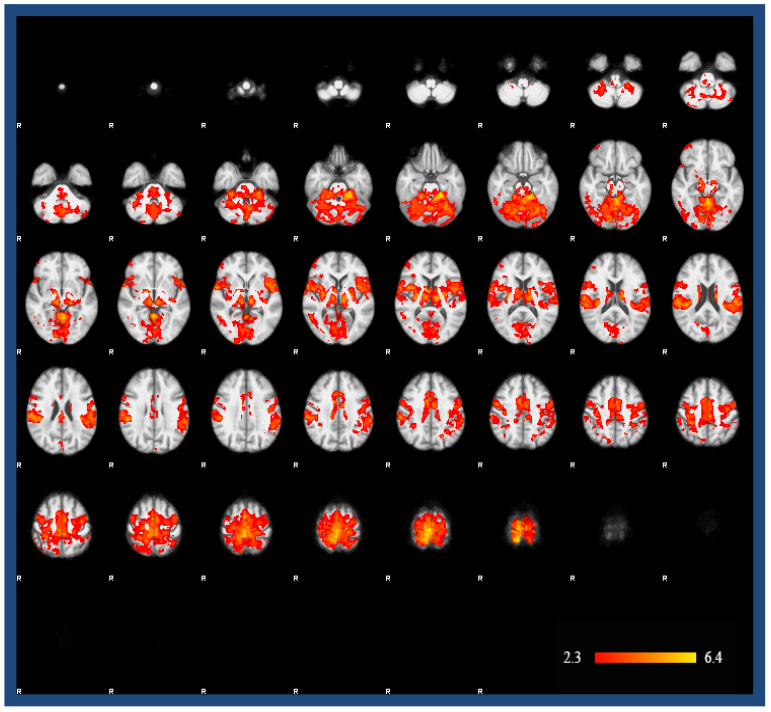


Neurorehabilitation →
- **How much does rehabilitation influence brain activity?**
- **Where are changes seen?**

Task fMRI assessment (cognitive and/or motor paradigm)

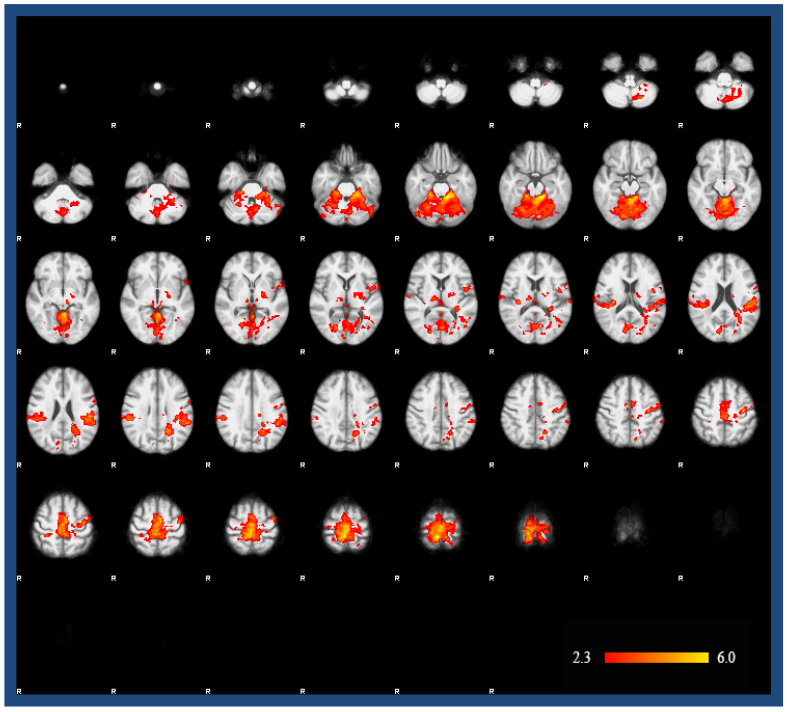
ACTIVATION PATTERN CHANGES WITH REHABILITATION

BEFORE



REHAB

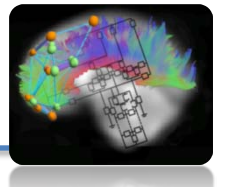
AFTER



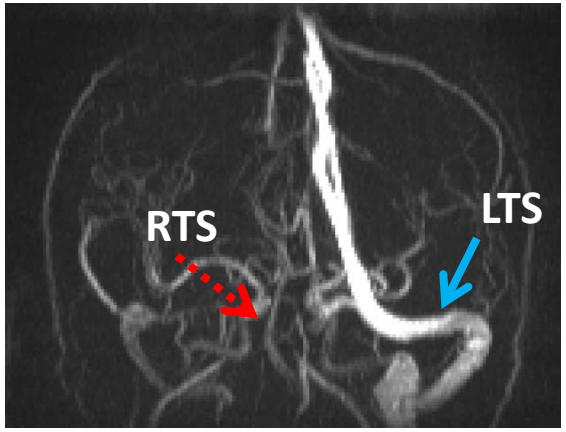
Bilateral activation for compensation

Significant reduction of activation in the motor cortex after rehabilitation

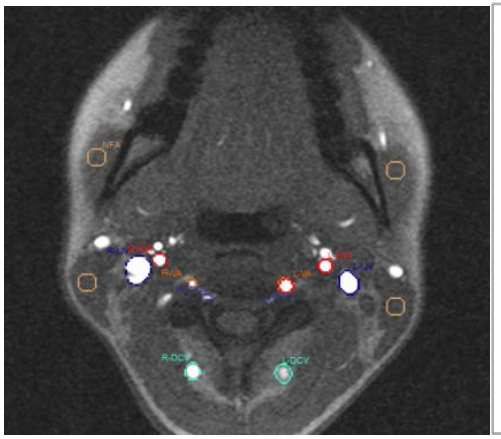
Clinical Applications: Vascular Imaging

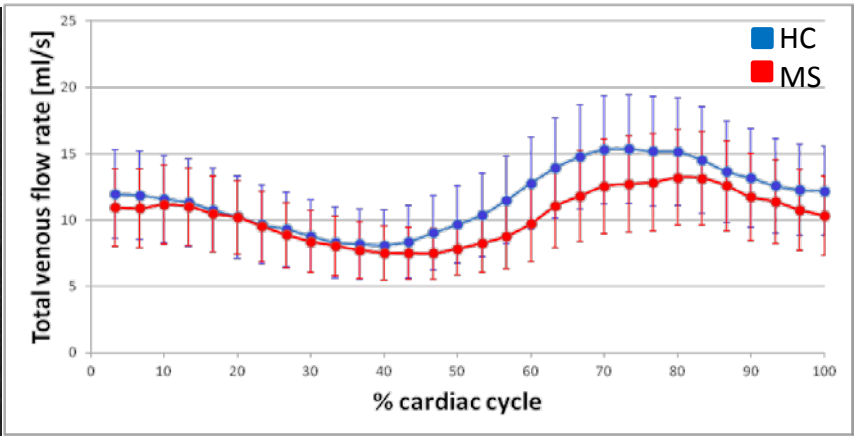


1) Brain Vascular Morphology

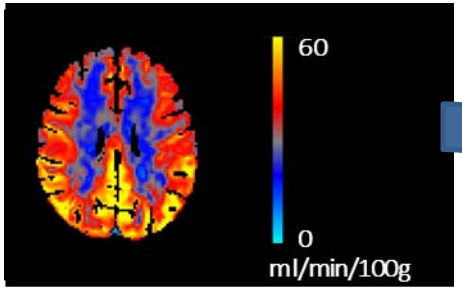


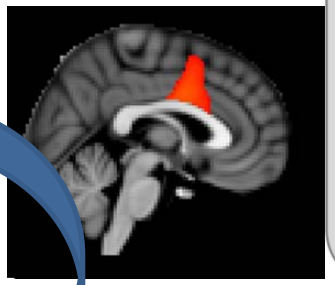
2) Hemodynamics (specific vessels)

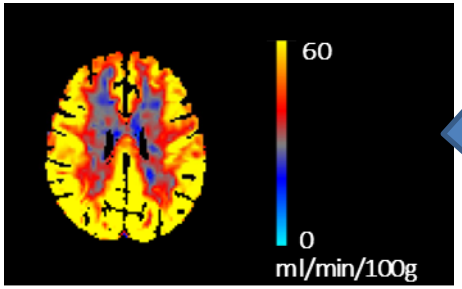


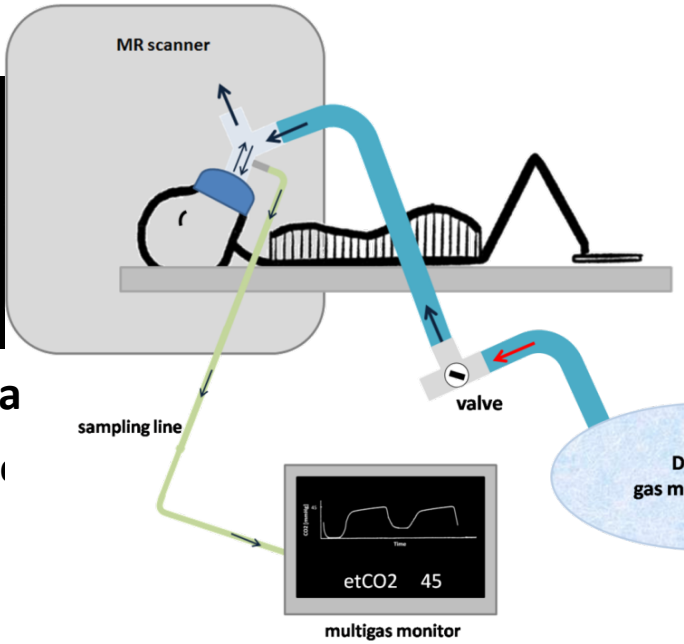


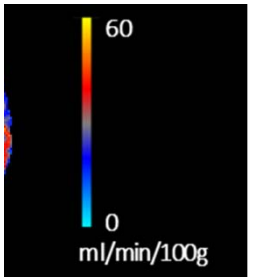
3) Brain Perfusion (CBF)











hypercapnia

Hypoperfusion in atients compare controls

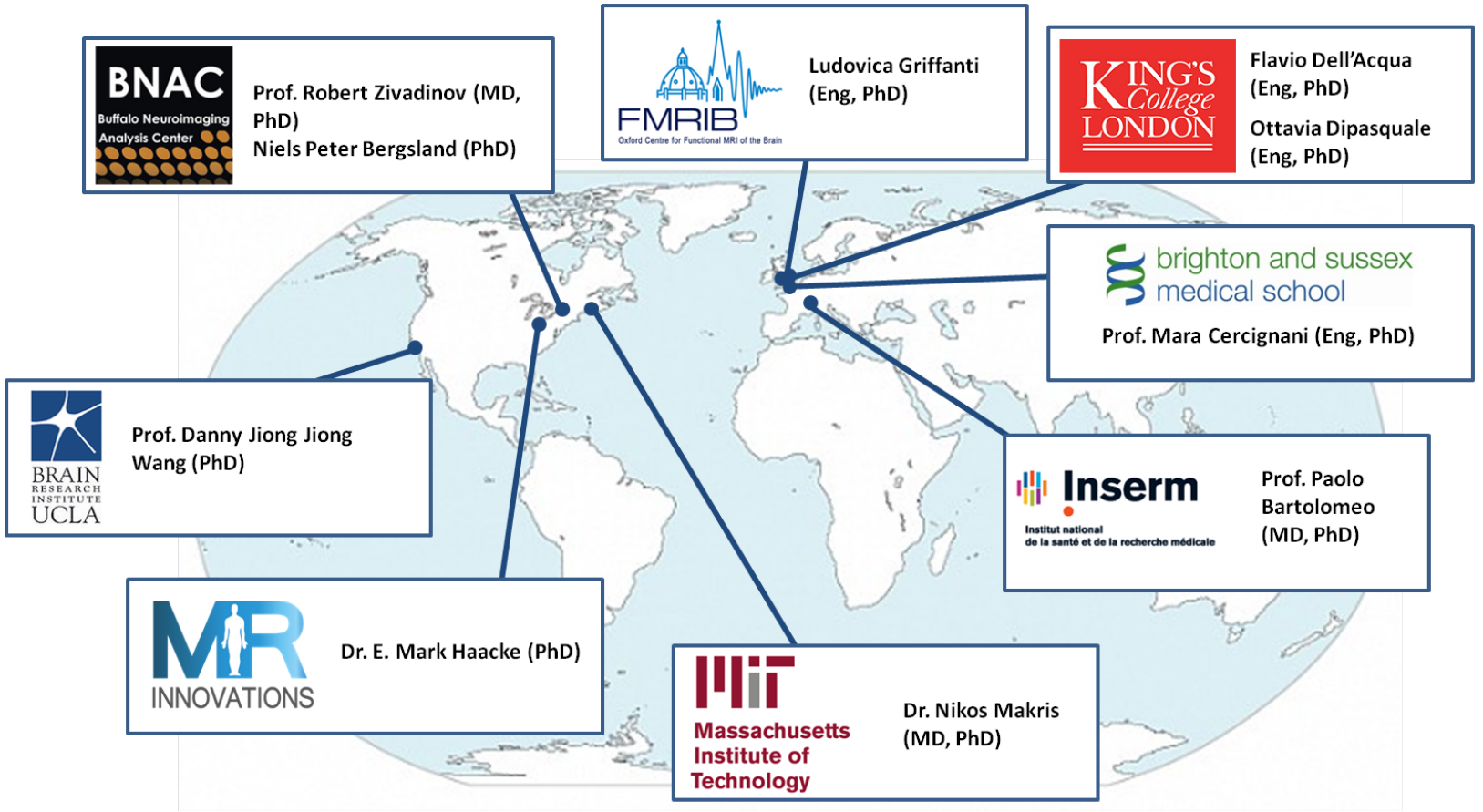
ison's Disease

4) Cerebrovascular reactivity (role in neurovascular coupling)

VASCULAR HEMODINAMIC CHANGES WITH REHABILITATION

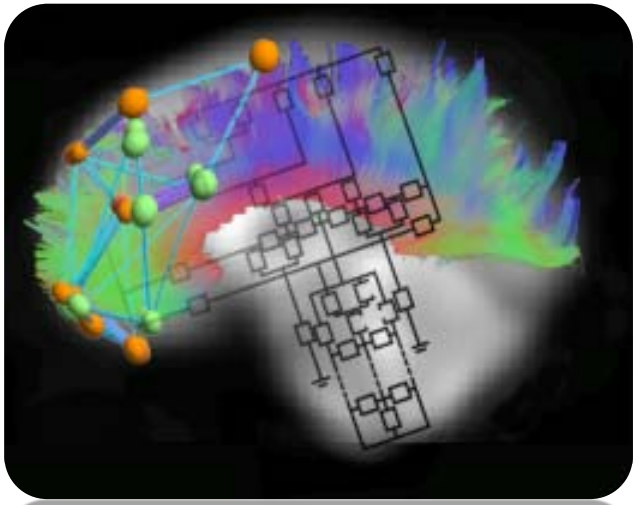
Collaborations

Collaborations with International Neuroimaging Laboratories



Collaborations with National institutions

- IRCCS Italian network for neuroimaging research with high technology
- Politecnico di Milano (Prof. Giuseppe Baselli, Eng)
- Università Cattolica (Prof. Antonella Marchetti, Psy)
- Università Satale di Milano (Prof. Carlo Lovati, MD)



THANK YOU FOR YOUR ATTENTION

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mlagana@dongnocchi.it