Introduction to new technology in sectional anatomy and neuroimaging

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کارگاه تصویربرداری پیشرفته مغز و اعصاب

آقای دکتر شهرام دارابی
(دبیر علمی کارگاه : دانشیار آناتومی
دانشگاه علوم پزشکی قزوین)

افتتاحیه کارگاه و مقدمه برتحولات علم اعصاب

آقای علی عبدل پور
کارشناس ارشد مهندسی پزشکی
کارشناس ارشد فیزیک پزشکی

جایگاه کشور در تکنولوژی های پیشرفته تصویربرداری
معرفی جدیدترین
روش های تشخیص بیماری MS در مدالیته MRI

دکتر آرش شعبانی
محقق تصویربرداری مغز و اعصاب
مدرس دانشگاه

فیزیک پایه و بالینی MRS

دکتر ایوب رستم زاده
استادیار آناتومی و محقق تصویربرداری عصبی
(دانشگاه علوم پزشکی قزوین)

نوروآناتومی و کانکتوم مغز، فیزیک پایه
DWI و DTI

دکتر رضا احدی
استادیار علوم تشریح دانشگاه علوم پزشکی ایران

تفسیر بالینی MRS و کاربرد آن در بیماری های
شناختی

دکتر حسین محمدی
(عضو هیات علمی دانشگاه علوم پزشکی اردبیل)

فیزیک fMRI، طراحی Task ها
و کاربردهای بالینی آن

آقای فرید محمد بیگی
(عضو هیات علمی دانشگاه علوم پزشکی
سمنان)

فیزیک و کاربرد تصویربرداری QSM
در تشخیص بیماری پارکینسون (PD)

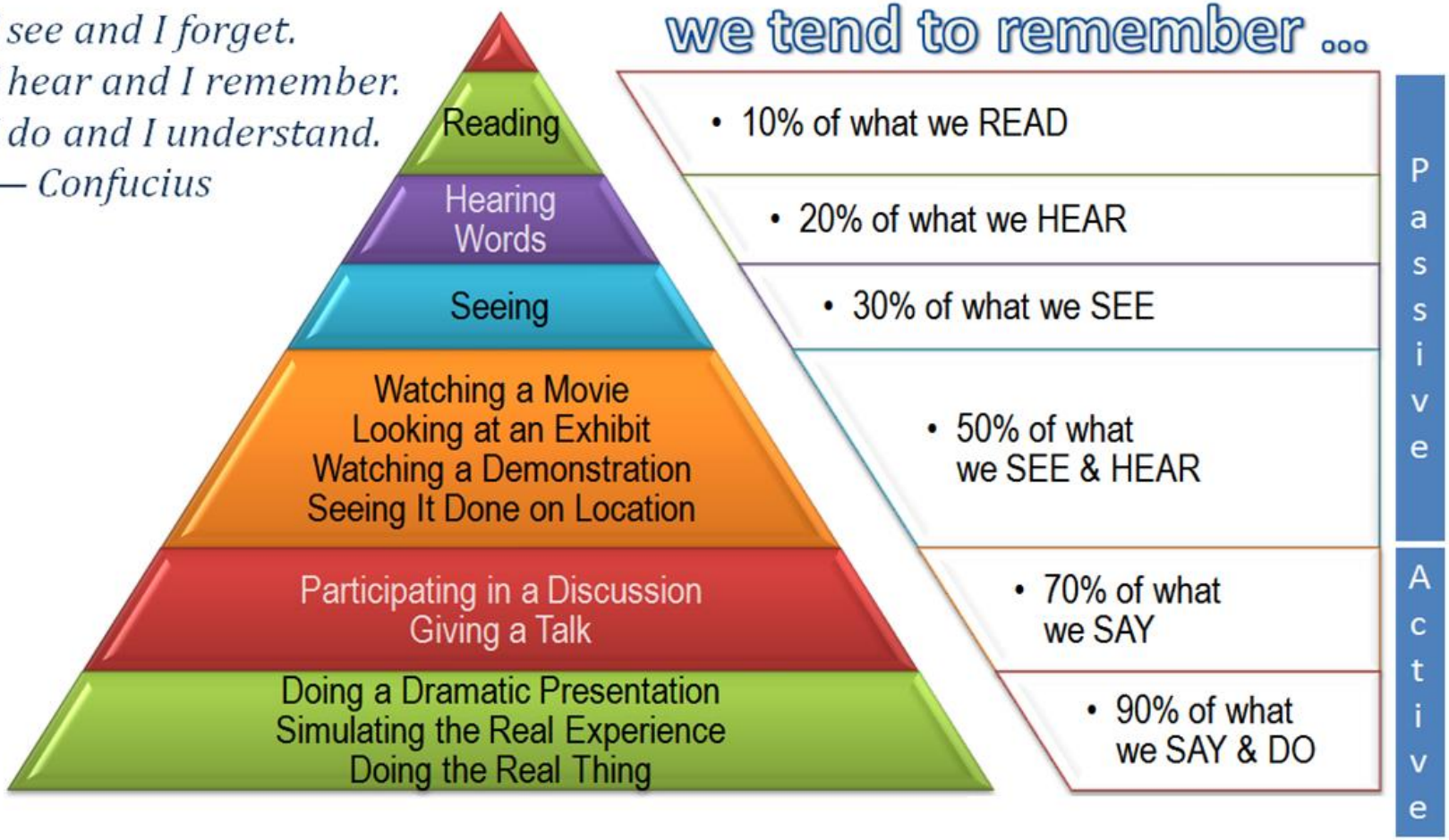
مخاطبان و گروه‌های هدف

۱. گروه جراحی مغز و اعصاب (متخصصین)
۲. گروه داخلی مغز و اعصاب (نورولوژی) (متخصصین)
۳. گروه علوم اعصاب (دکترا) و علوم تشریحی (ارشد و دکترا)

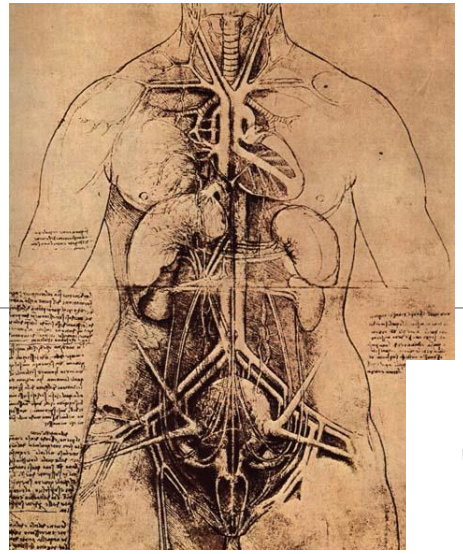
The Cone of Learning

هرم یادگیری ادگار دیل

I see and I forget.
I hear and I remember.
I do and I understand.
— Confucius

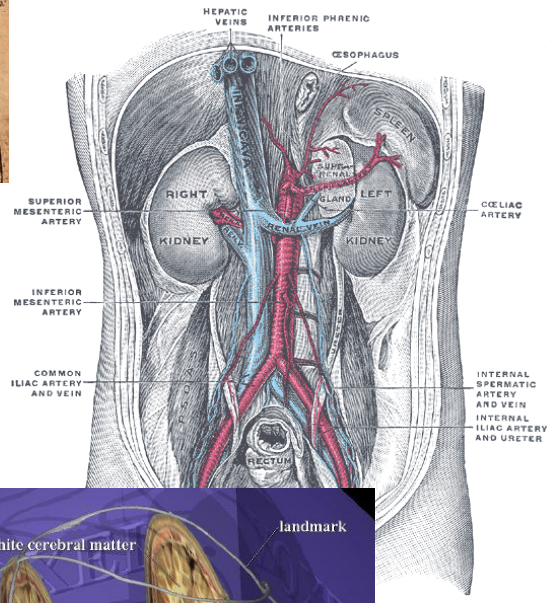


Exploring the human body



1) The "Ancients“

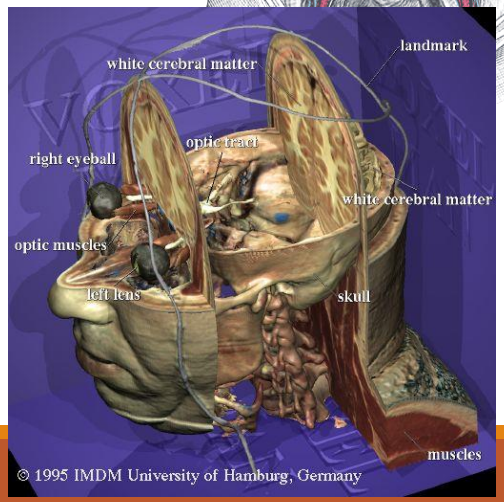
2) Gray's Anatomy



3) Human Visible Project (HVP)

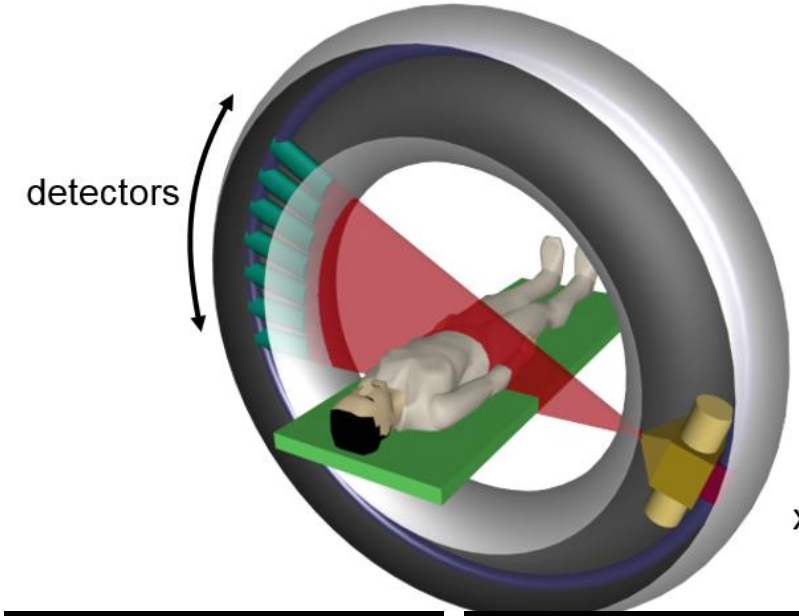
Or Korean Visible Human (KVH)

Or Chinese Visible Human (CVH)

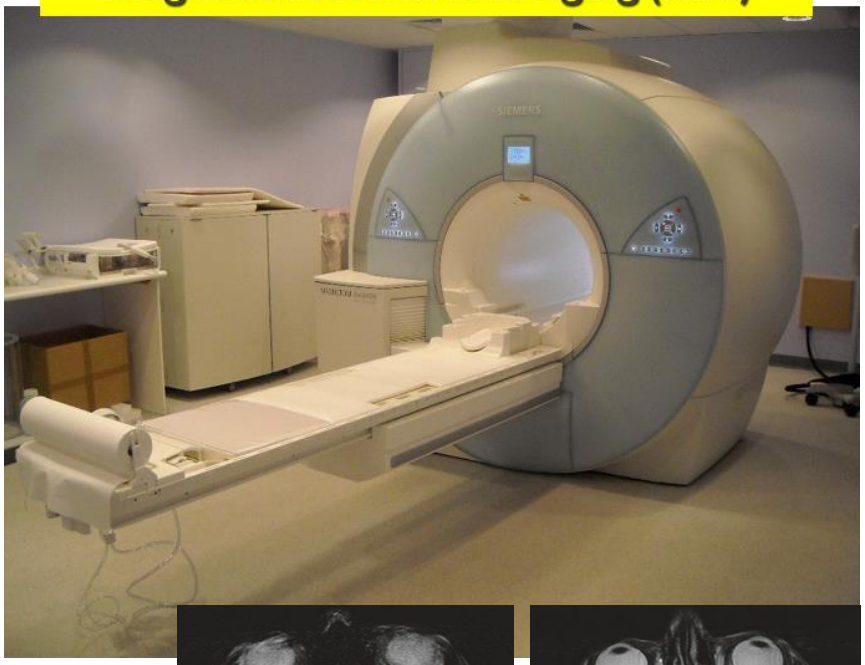


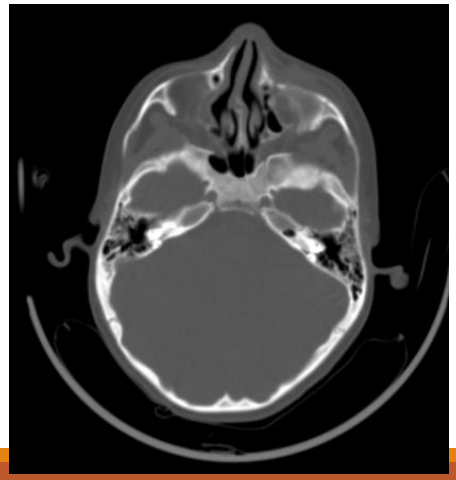
ظهور تکنیک های با قابلیت تصویربرداری مقطعی مانند CT و MRI

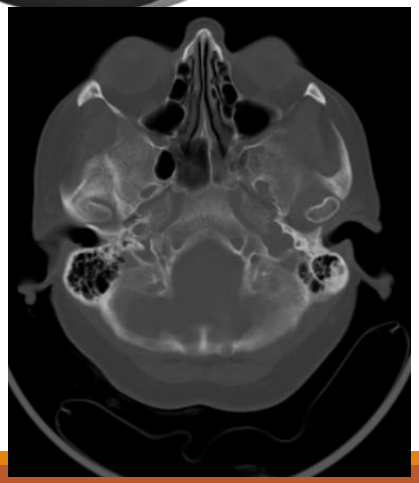
Computer tomography (CT)

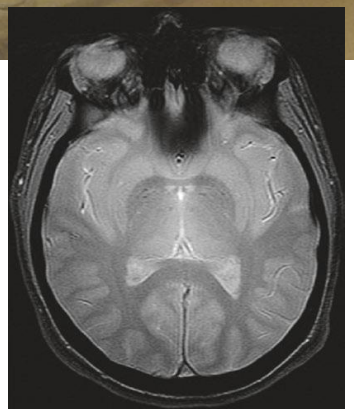


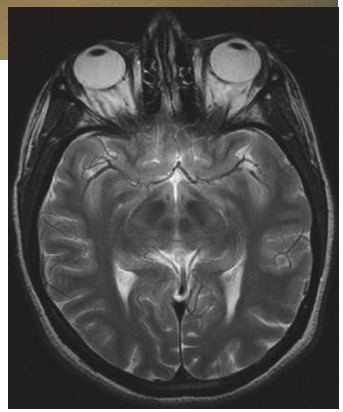
Magnetic resonance imaging (MRI)





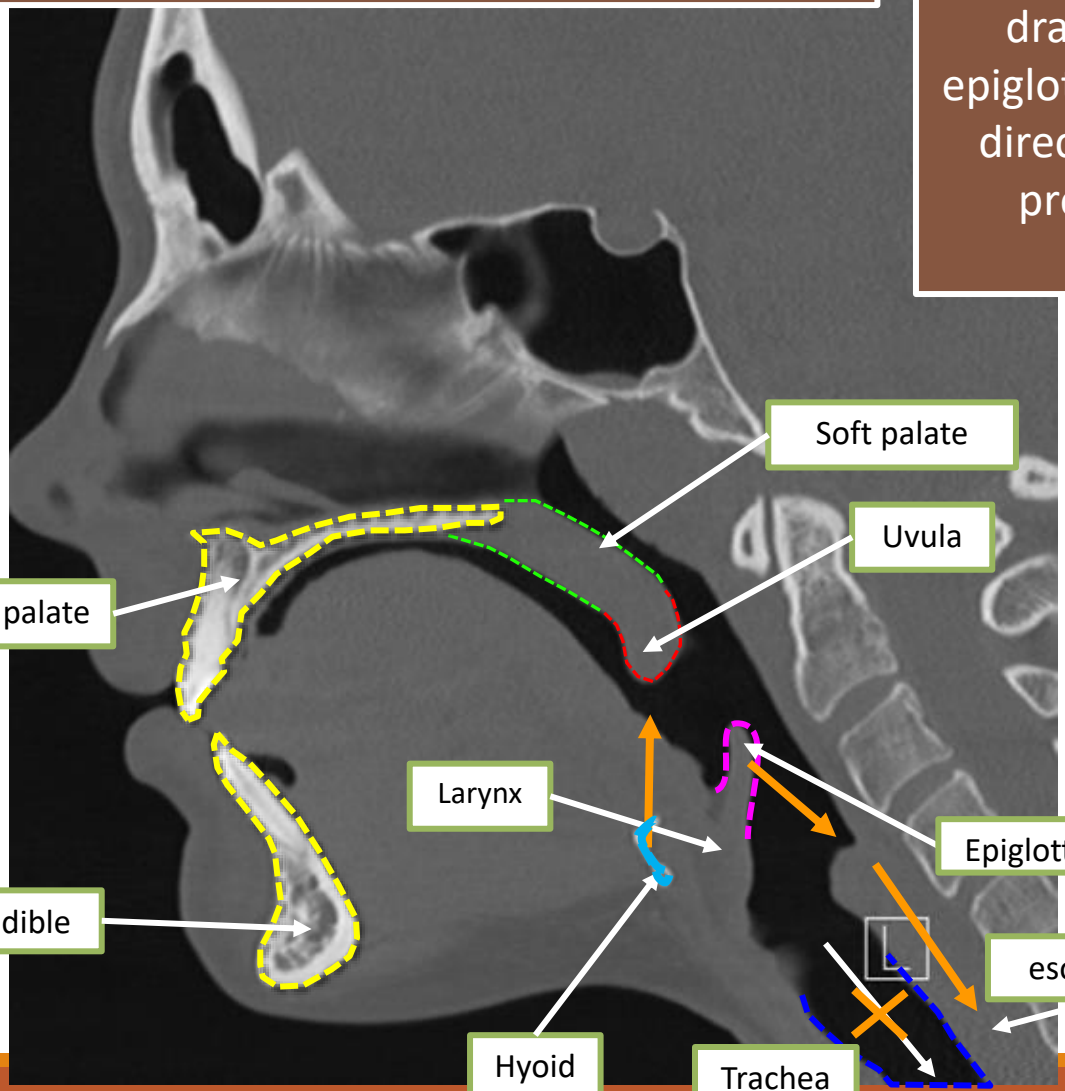






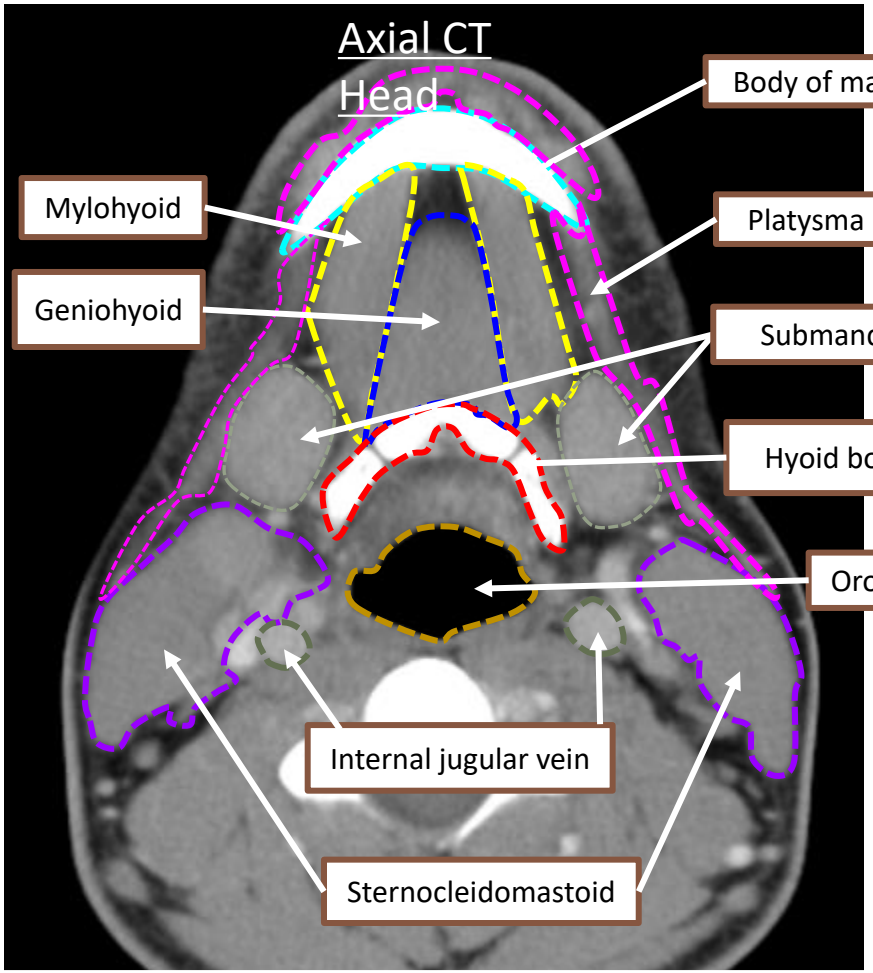
The palate is composed of bone anteriorly (hard palate) and soft tissue posteriorly (soft palate).

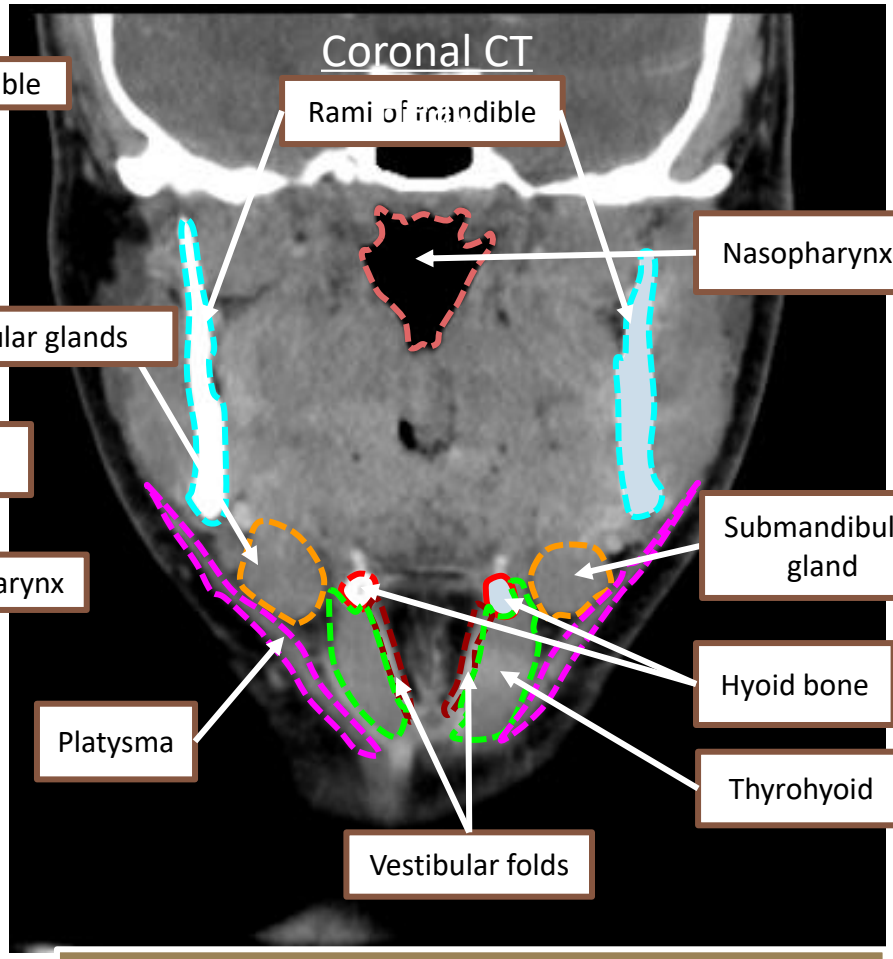
The epiglottis is a flap at the superior part of the larynx. It usually points upwards during breathing (as in CT). During swallowing, the hyoid bone draws the larynx upwards and the epiglottis flattens (see orange arrows) to direct food towards the oesophagus, preventing it from going into the trachea.



The epiglottis is essential in preventing aspiration; when food 'goes down the wrong way'. This usually means it goes towards the trachea, rather than the oesophagus.

Swallowing is innervated by 5 different cranial nerves which contributed to the sensory (V, IX, X) and motor (V, VII, IX, X, XII) aspects.



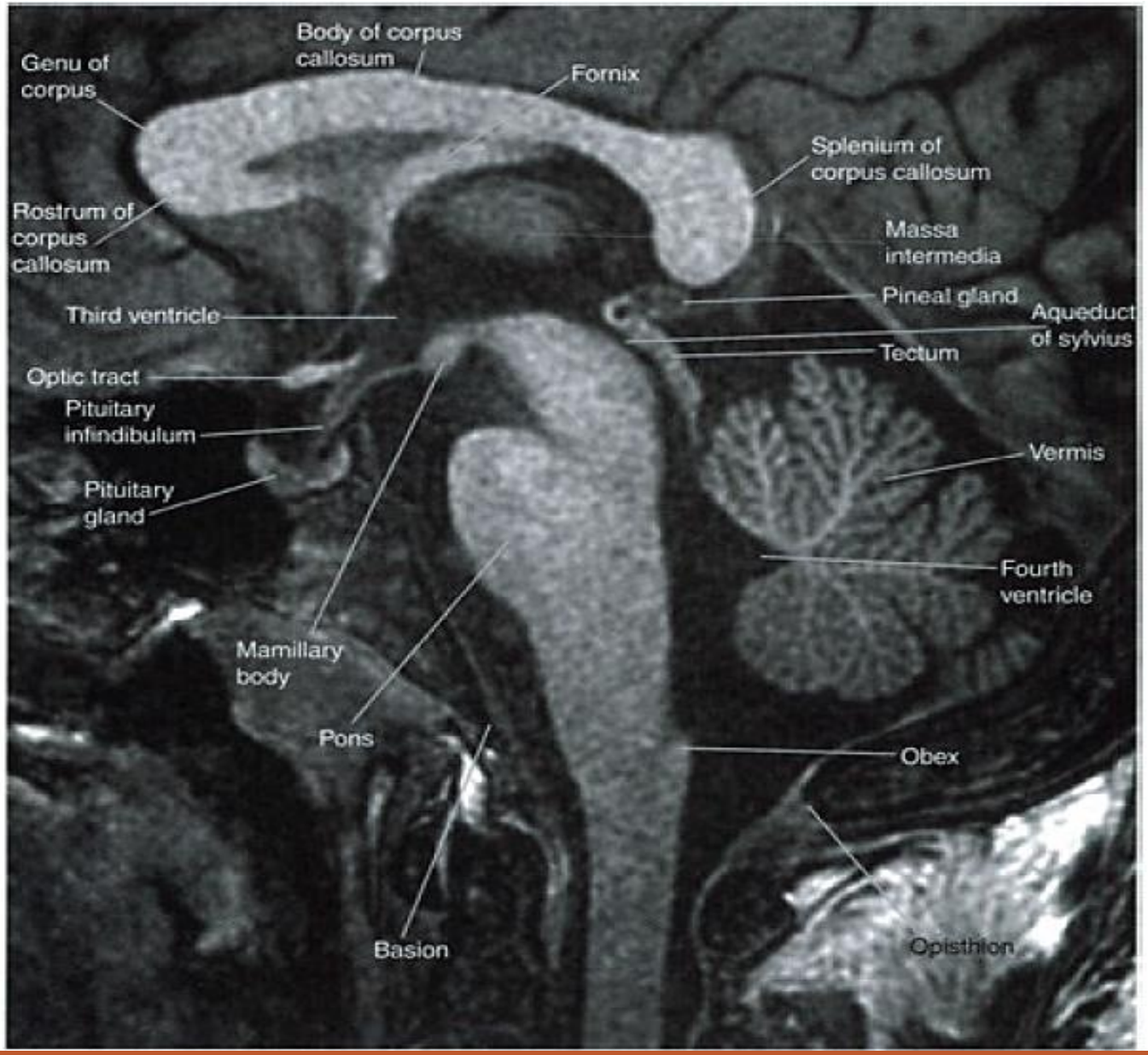


The submandibular glands are the second largest of the three salivary glands. They are supplied by parasympathetic secretomotor fibers from the facial nerve to the lingual nerve.

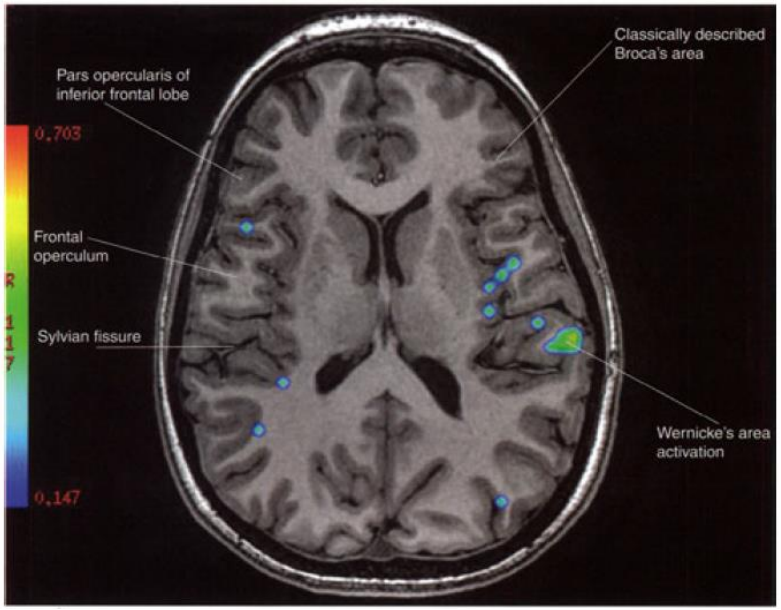
Where does submandibular gland saliva enter the oral cavity?

The sublingual papilla beside the base of the frenulum of the tongue.

MRI روتین

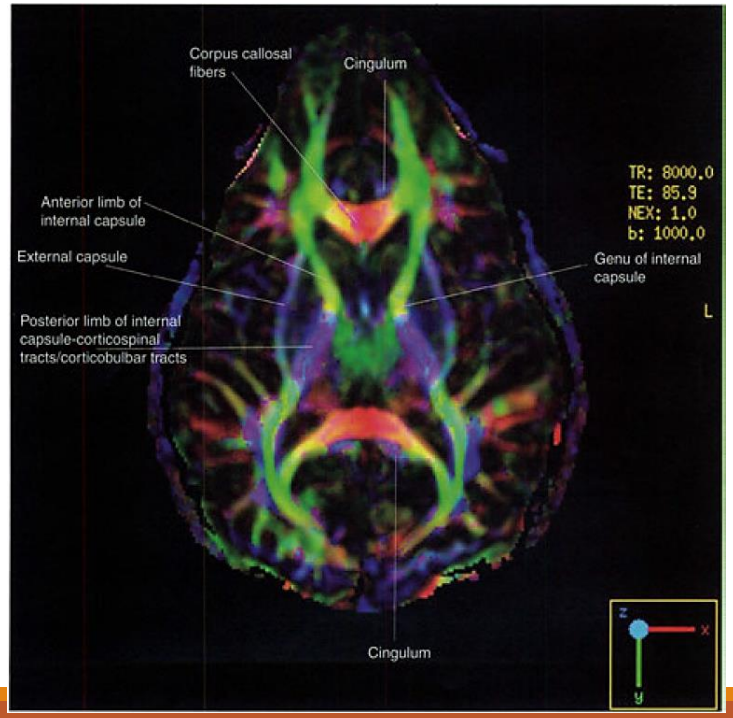

Body of corpus callosum
Genu of corpus
Fornix
Splenium of corpus callosum
Rostrum of corpus callosum
Massa intermedia
Pineal gland
Third ventricle
Aqueduct of sylvius
Tectum
Optic tract
Pituitary infindibulum
Vermis
Pituitary gland
Fourth ventricle
Mamillary body
Pons
Obex
Basion
Opisthion

تکنیک های پیشرفته MRI



fMRI

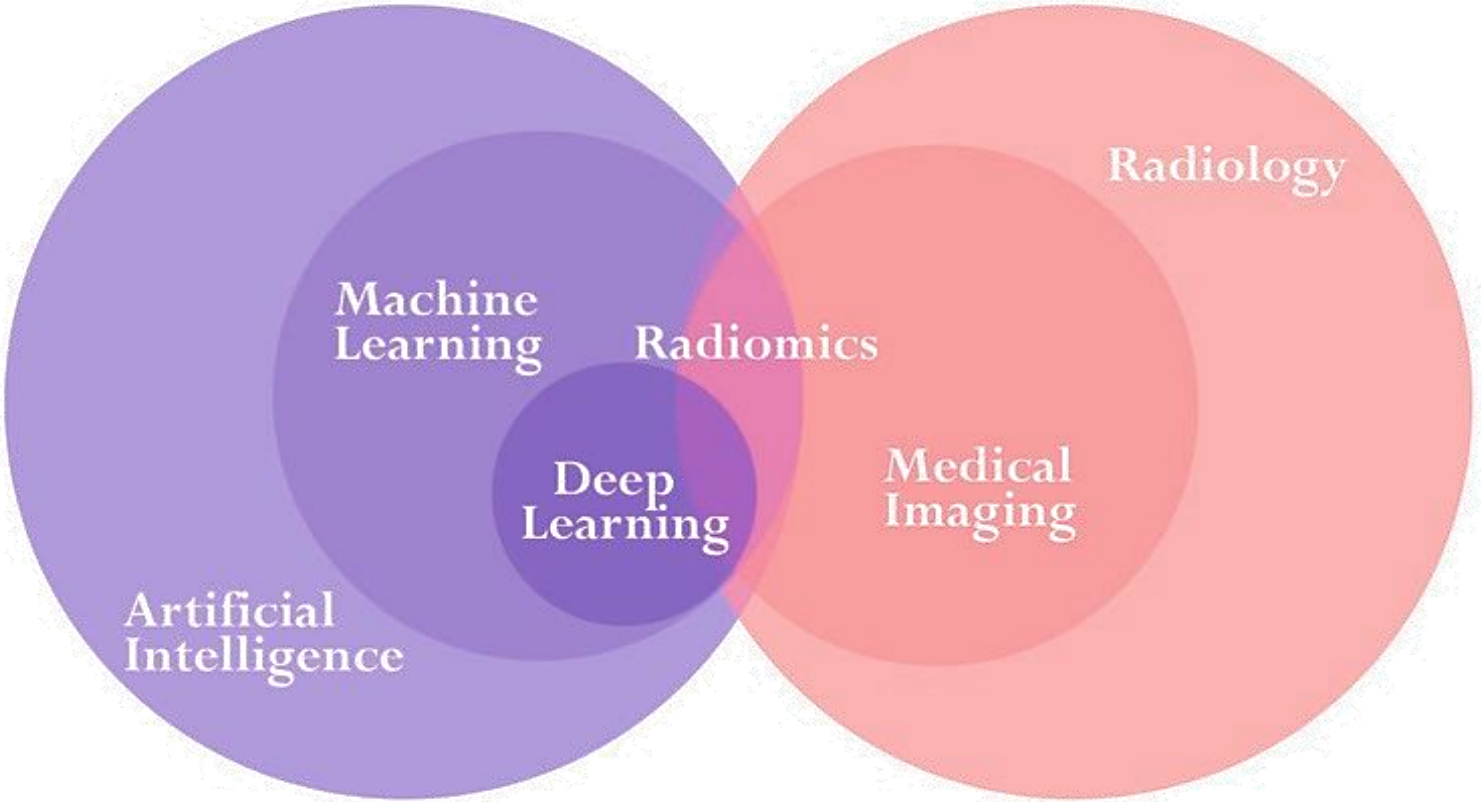
فعال سازی نورونی، افزایش جریان خون موضعی و مقدار اکسی هموگلوبین
تغییر در magnetic susceptibility



DTI (diffiusion tensor imaging)

درون زوائد عصبی، حرکت آزادانه آب بیش از آنکه به سمت حاشیه های اطراف باشد به سمت جلو است که انجام تراکتوگرافی را ممکن می سازد (جریان های antegrade **در آکسون ها) در بررسی راه های ماده سفید مغز کاربرد دارد.**

جایگاه هوش مصنوعی و فناوری های یادگیری ماشین در ارتقای نمایش تصاویر آناتومیک و تصویربرداری عصبی



What is Blue Brain ?

- The IBM is now developing a virtual brain known as the **BLUE BRAIN** . It would be the world's first virtual brain. Within 30 years, we will be able to scan ourselves into the Computers.

The **Blue Brain Project** is a Swiss brain research initiative that aims to create a digital reconstruction in May 2005 in Switzerland by Henry Markram.

- We can say it as Virtual Brain i.e. an **ARTIFICIAL BRAIN**, which is not actually a natural brain, but can act as a brain.

- **IBM** developing the "blue brain".
- IBM ,in partnership with scientists at ***Switzerland's Ecole Polytechnique Federal De Lausanne's(EPLF) Brain and Mind Institute*** will begin simulating the brain's biological systems.

HARDWARE AND SOFTWARE REQUIRMENT for BLUE BRAIN PROJECT

A super computer. (Blue Gene/L)
- 22.8 TFLOPS peak processing speed.

Processor with a very high processing power.
- 8,096 CPUs at 700 MHz (downgraded to handle massive parallel processing).
- 256MB to 512MB memory per processor with a very large storing capacity..

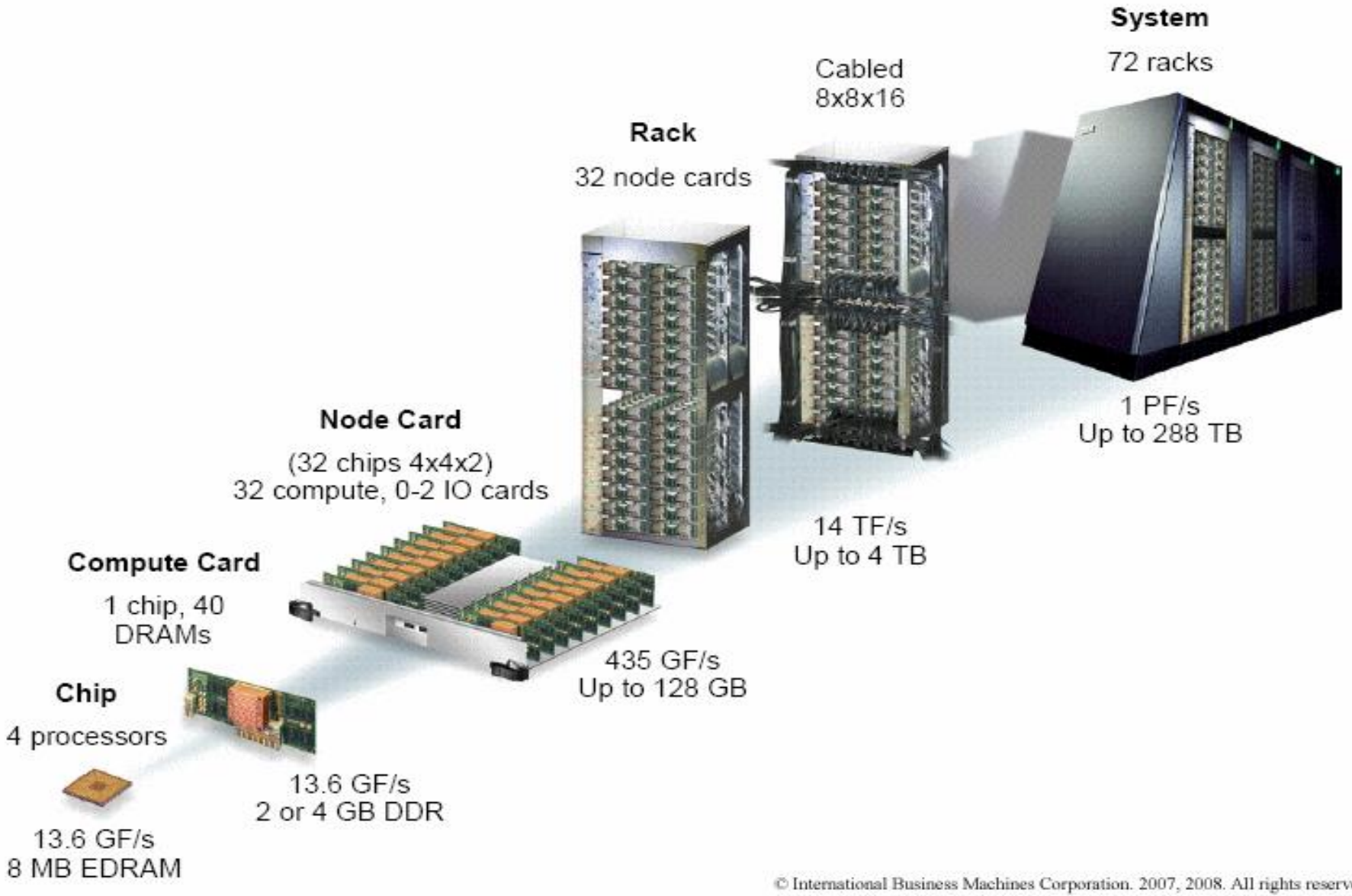
Linux and C++ software.

100 kilowatts power con

A very wide network.

Very powerful Nanobots to act as the interface between the natural brain and the computer

The Blue Gene/L supercomputer architecture



- The uploading is possible by the use of small robots known as the **NANOBOTS.**
- These robots are small enough to travel throughout our circulatory system.
- Will monitor activity of brain by traveling into the spine and brain
- They will provide an interface with computer .

Human Brain Project (HBP)

PRESS RELEASE

"Impressive research results" - external review panel evaluates final results of Human Brain Project

28 November 2023

NEWS

New HBP brochure: Spotlights on major achievements

11 September 2023

FEATURE

Learning from the brain to make AI more energy-efficient

04 September 2023

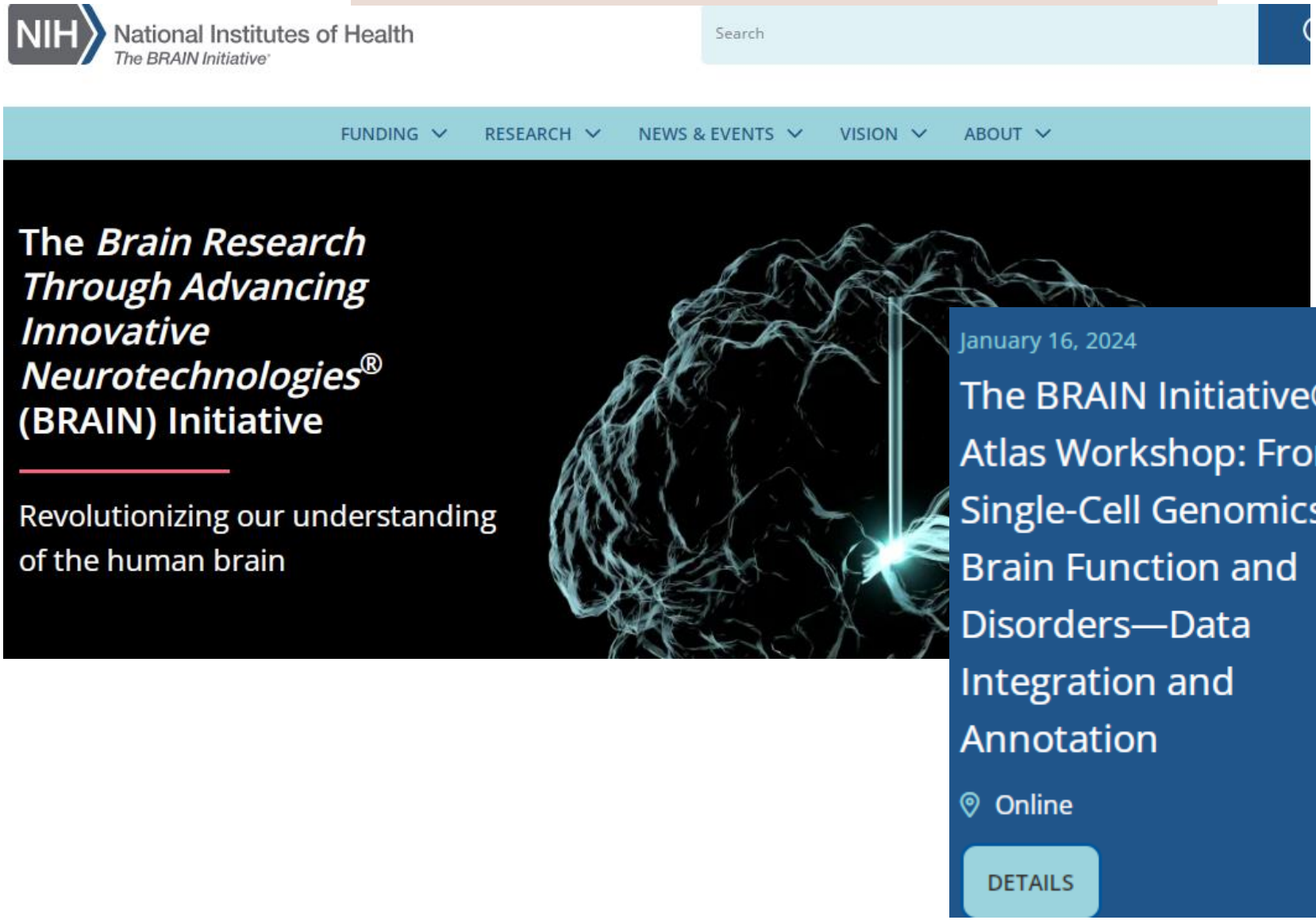
INTERVIEW

Neuromorphic Computing and the Human Brain Project: An Interview with Prof. Steve Furber on SpiNNaker and Cross-Disciplinary Brain Research

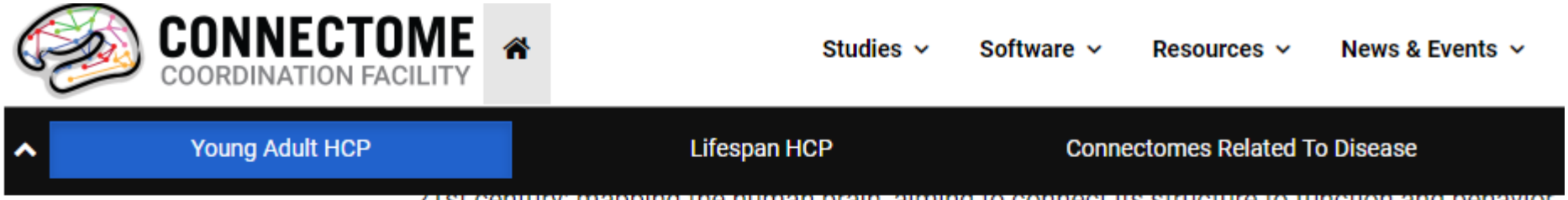
01 September 2023

HBP research has contributed to targeted spinal cord stimulation that has helped patients with paralysis walk again.
© EPFL/Jamani Caillet

https://braininitiative.nih.gov/



Human Connectome Project (HCP)

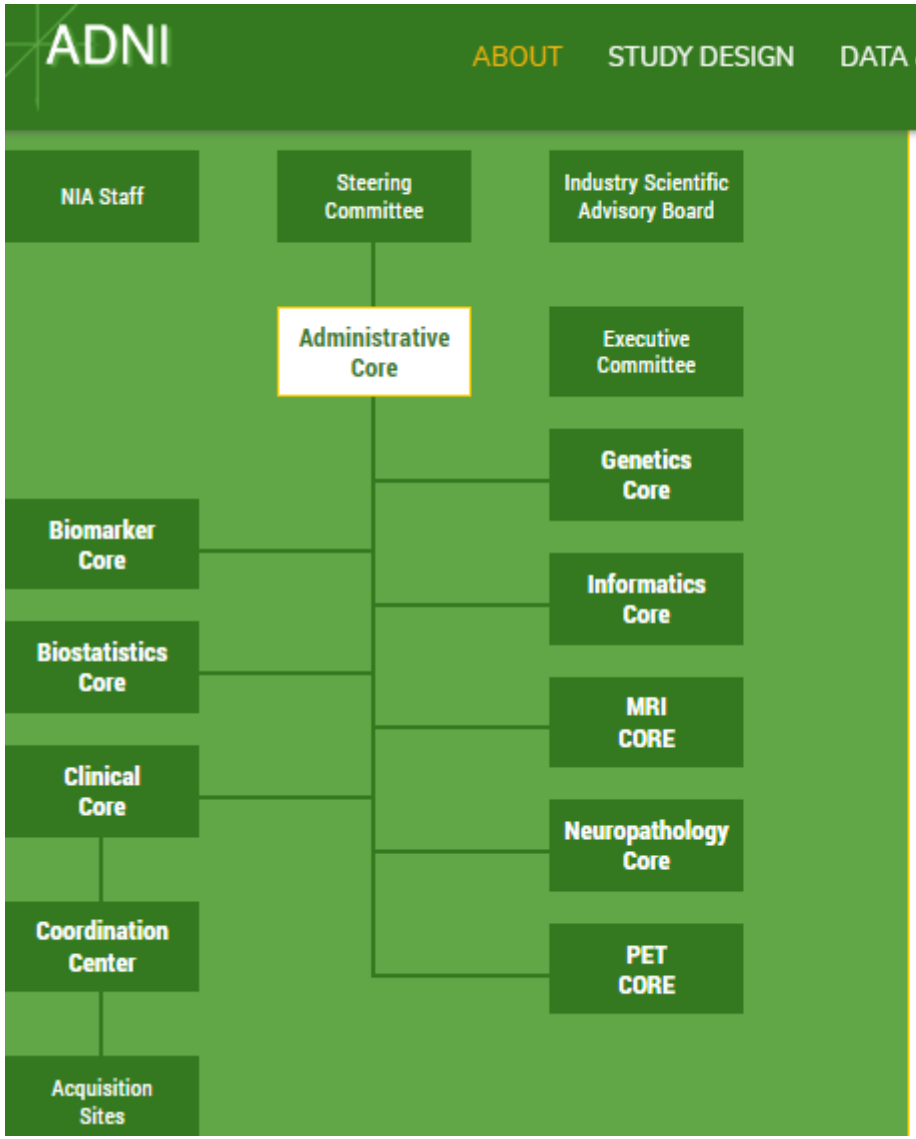


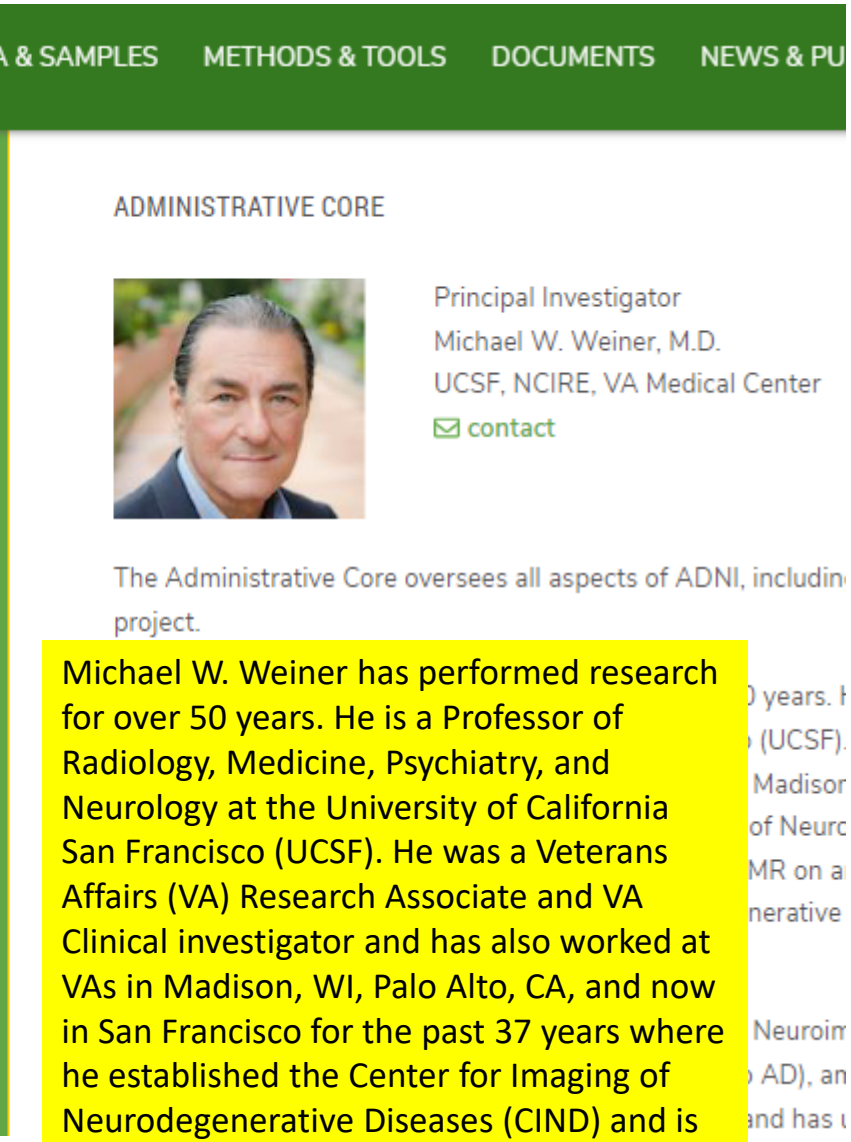
HCP Young Adult

PI: Kamil Ugurbil, David Van Essen

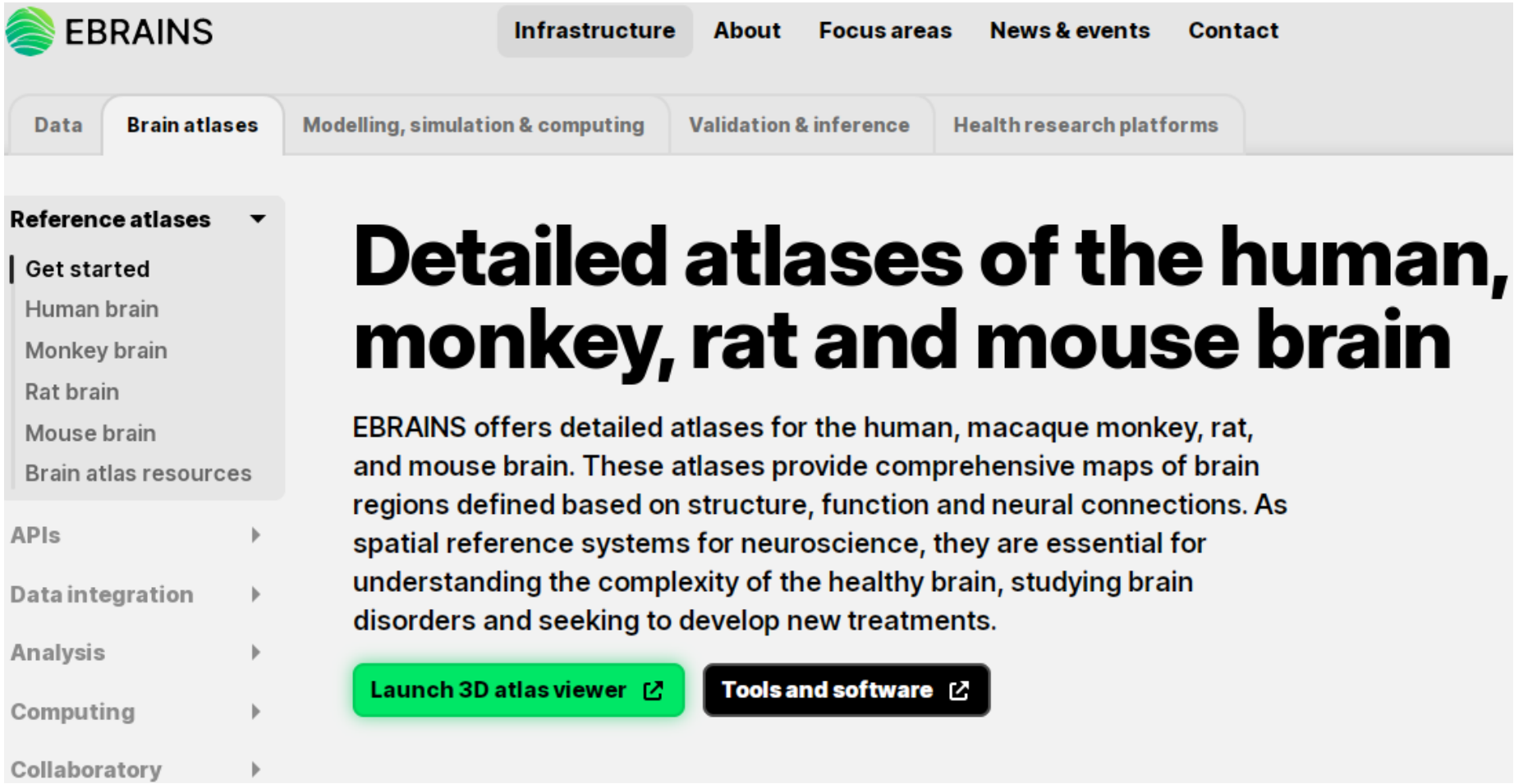
- 1200 Subjects, Age 22-35
- 3T MR, 7T MR, MEG
- Washington U. in Saint Louis, U. of Minnesota, U. of Oxford, Saint Louis U., Indiana U., U. d'Annunzio, Ernst Strungmann Institute, Warwick U., Radboud U. Nijmegen, U. of California at Berkeley

The Alzheimer's Disease Neuroimaging Initiative (ADNI)





Michael W. Weiner has performed research for over 50 years. He is a Professor of Radiology, Medicine, Psychiatry, and Neurology at the University of California San Francisco (UCSF). He was a Veterans Affairs (VA) Research Associate and VA Clinical investigator and has also worked at VAs in Madison, WI, Palo Alto, CA, and now in San Francisco for the past 37 years where he established the Center for Imaging of Neurodegenerative Diseases (CIND) and is the Director Emeritus.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Human brain
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Rat brain
Mouse brain
Brain atlas resources
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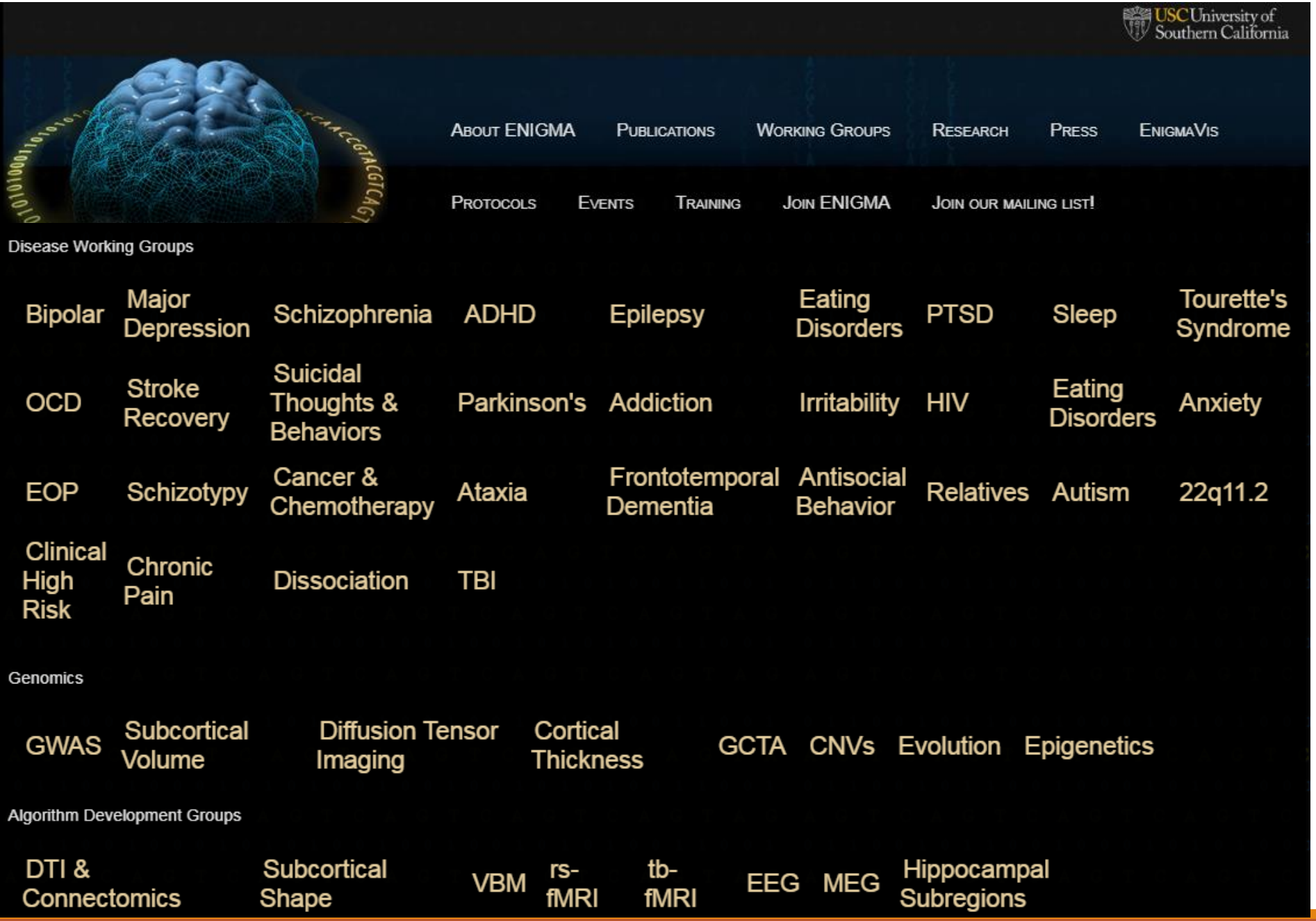
Data integration
Analysis
Computing
Collaboratory
Detailed atlases of the human, monkey, rat and mouse brain
EBRAINS offers detailed atlases for the human, macaque monkey, rat, and mouse brain. These atlases provide comprehensive maps of brain regions defined based on structure, function and neural connections. As spatial reference systems for neuroscience, they are essential for understanding the complexity of the healthy brain, studying brain disorders and seeking to develop new treatments.
Launch 3D atlas viewer
Tools and software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Epigenetics
Algorithm Development Groups
DTI & Connectomics
Subcortical Shape
VBM
rs-fMRI
tb-fMRI
EEG
MEG
Hippocampal Subregions

PREnatal CONnectome FInGerprint (PRECONFIG)

- "Endeavours towards a more profound understanding of the neural architecture enabling the staggering cognitive abilities of the human brain hold high promises regarding diagnosis and treatment of various diseases affecting the neural system.
- The novel paradigm of brain connectomics has opened a wealth of insights into the individual differences, emergence, development, plasticity, and disease specific re-organization of macro-scale brain networks composed of interconnected and synchronously operating neural units.

- Fetal neuroimaging, and in particular fetal magnetic resonance imaging (MRI) provides increasingly rich insights into the rapid prenatal neurodevelopment shaping the human connectome and establishing its capability to enable cognition or adapt and re-organize during disease. However, the exploration and study of this complex, highly multi-dimensional connectivity architecture, and its rapid change during gestation is still hampered by several limitations.

- PRECONFIG aims to overcome these limitations by developing novel techniques for the reliable and accurate capturing of structural and functional MRI brain connectivity in utero and integrating them into a quantitative model providing a complex feature set that characterizes the developing fetal connectome ("fetal connectome fingerprint").

Thank you for your attention