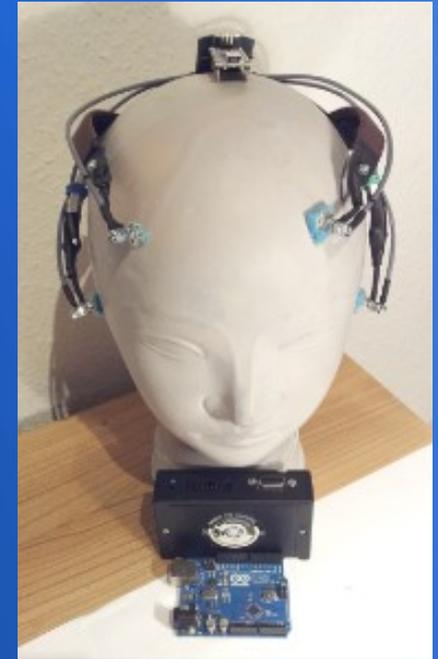


OpenBCI ~ MetaMind Evolution Brainwave Neurofeedback Mind-Hacking

for Mental Enhancement, Art, and Meditation - *Hack yOur bRain!*

solar powered wireless open source Biofeedback + EEG

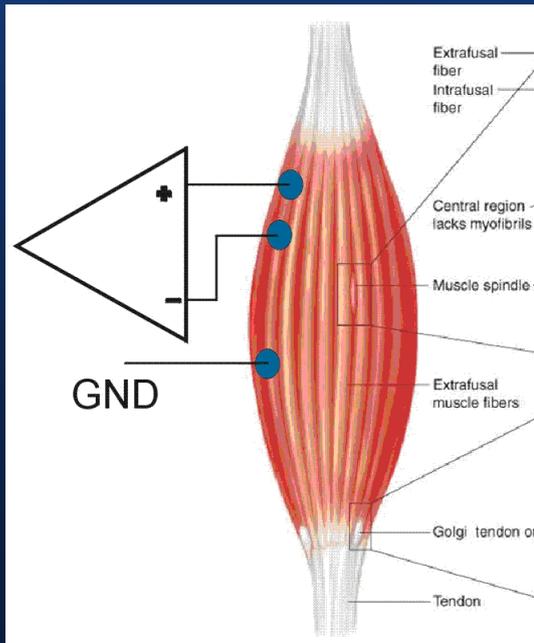


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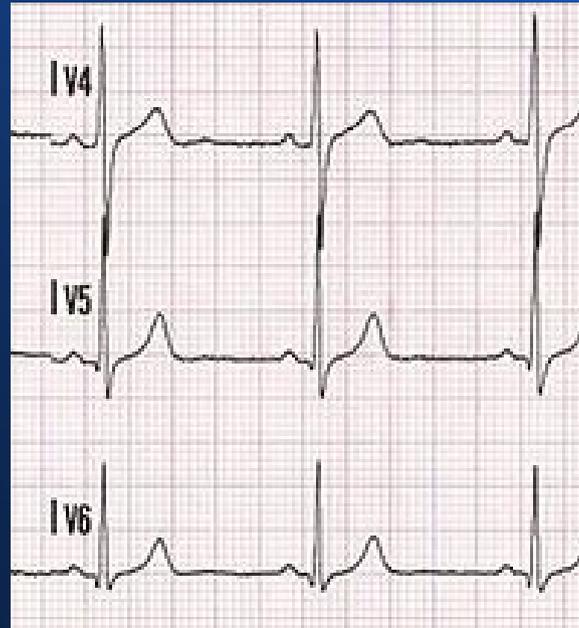
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SCIENCE : bio-electrical signals + brain-waves

EMG



ECG



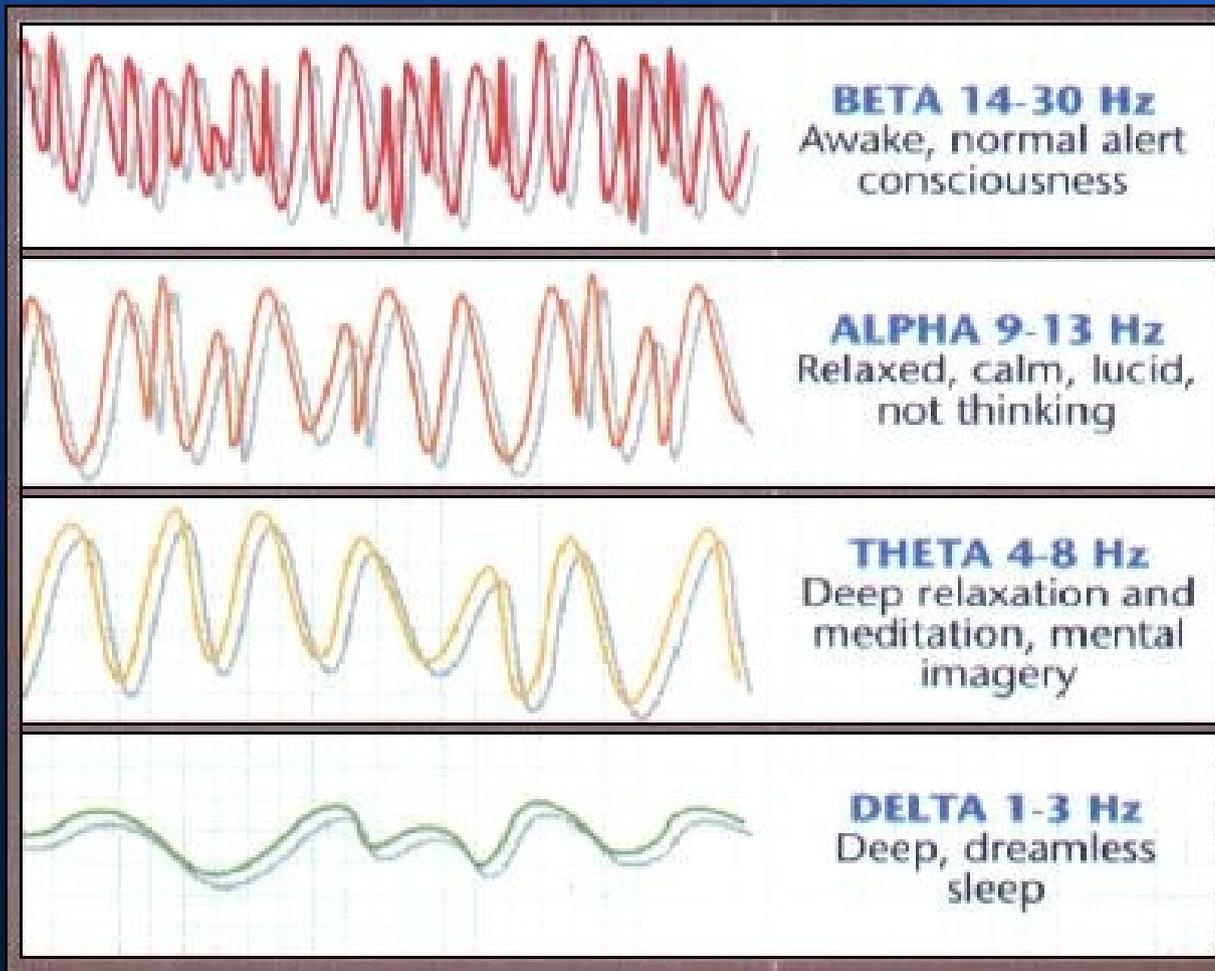
EEG



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SCIENCE : brainwave frequencies



external focus

relaxation

meditation + dream

deep trance / sleep



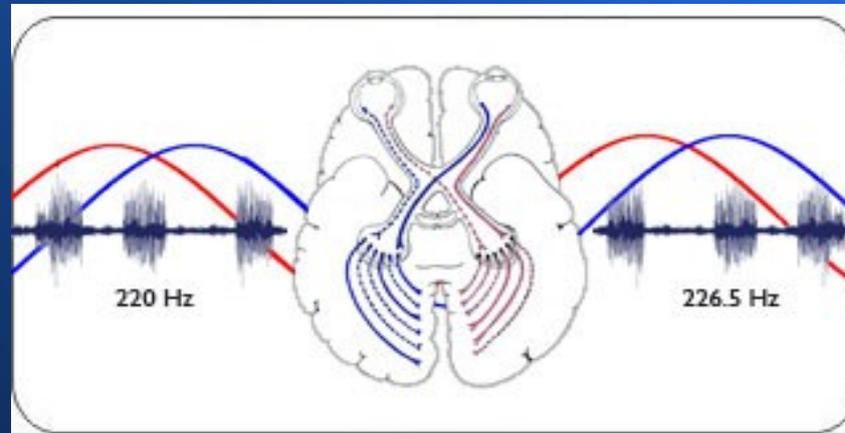
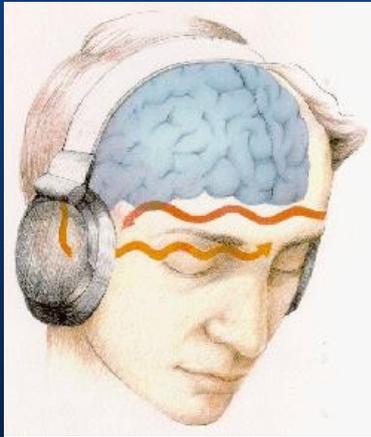
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TECHNOLOGY : binaural beats

white/pink/**brown** noise generator – variable stereo delay



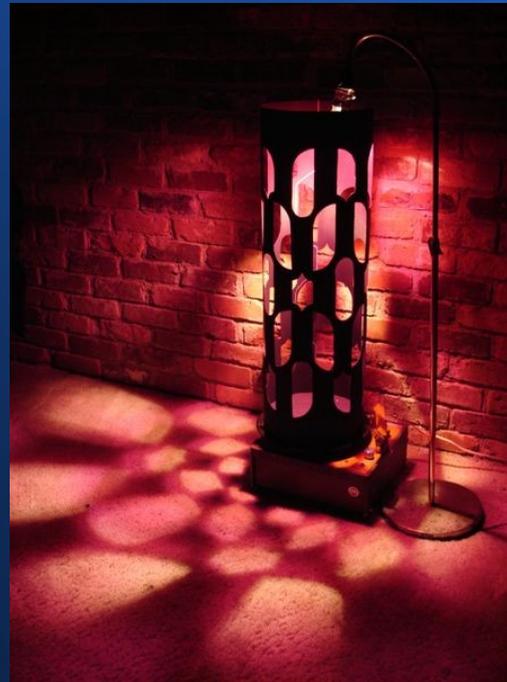
auditory sensory processing artifacts
Brain perceives frequency difference as oscillation



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TECHNOLOGY : blinking lights *classic*



frequency of light pulses stimulate brain resonance



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TECHNOLOGY : blinking lights *modern*



fullscreen monitor backbuffer flipping

programmable strobe flasher

DMX light control

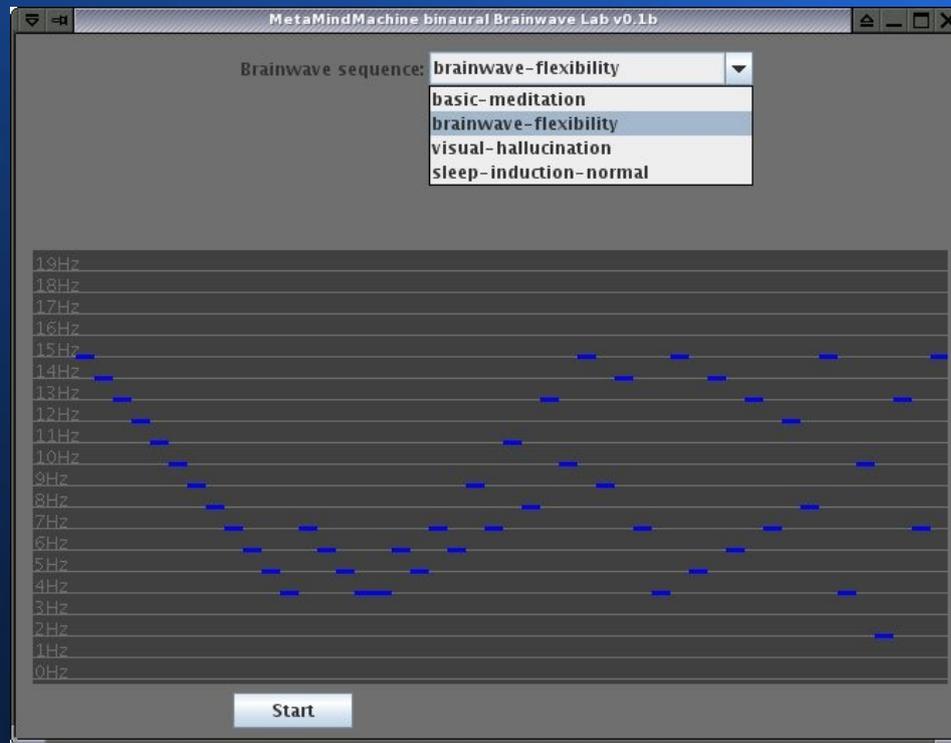
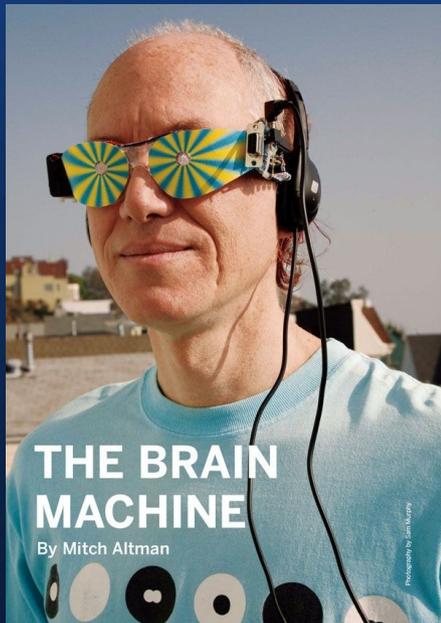


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APPLICATION : mind machines



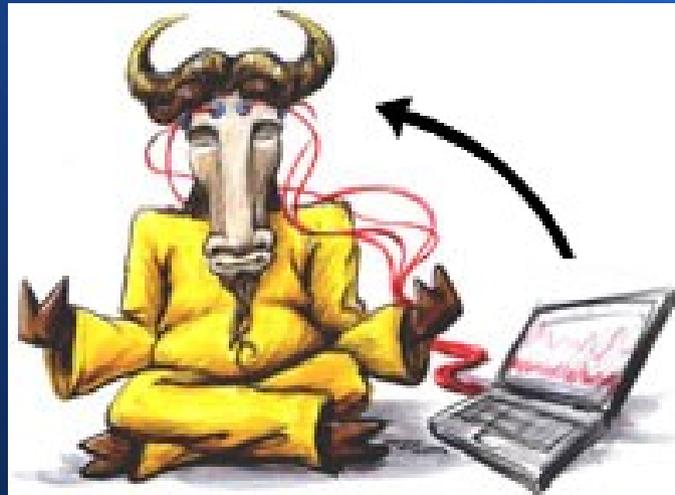
combine binaural beats and flashing lights to stimulate brain



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APPLICATION : Neurofeedback



direct feedback of brainwave distribution
visual, auditory, haptic feedback of mental state



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mental state change through positive feedback

brainwaves somewhat naturally oscillate

reward when closer to desired state (frequency distribution oscillation)

harmony vs. disharmony sounds

classic conditioning / pavlovian dogs



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OpenBCI hardware overview



silver electrodes

noise filter

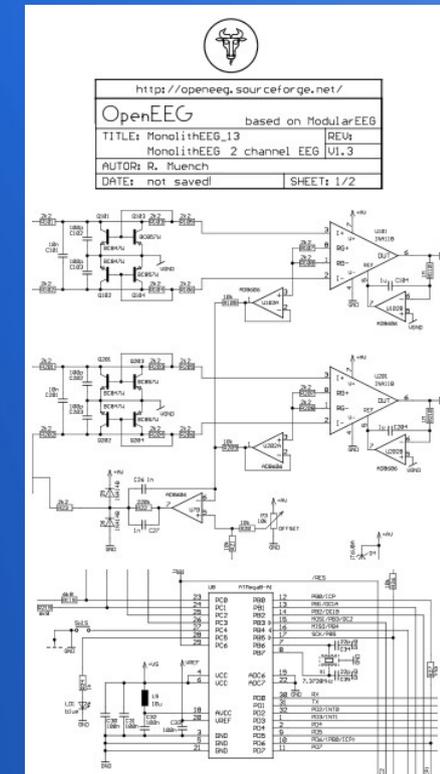
amplification

AD conversion

microcontroller

USB / bluetooth serial port

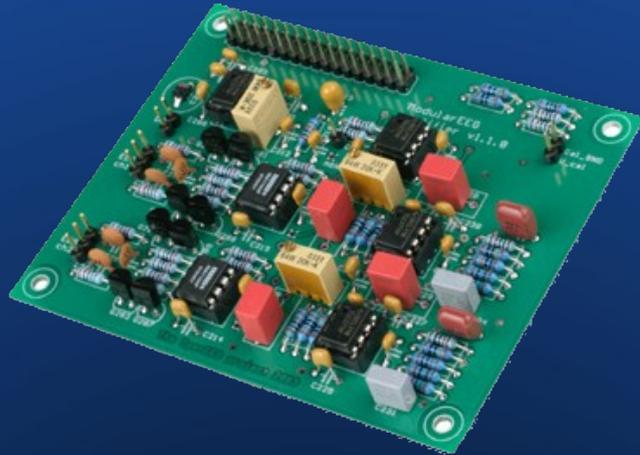
TCP network stream



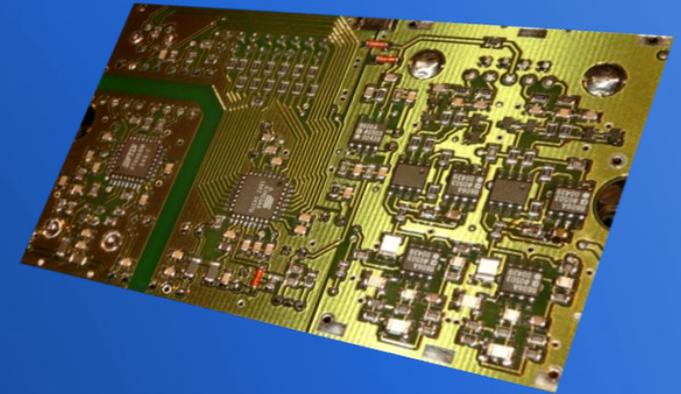
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EEG bio-signal amplifier hardware

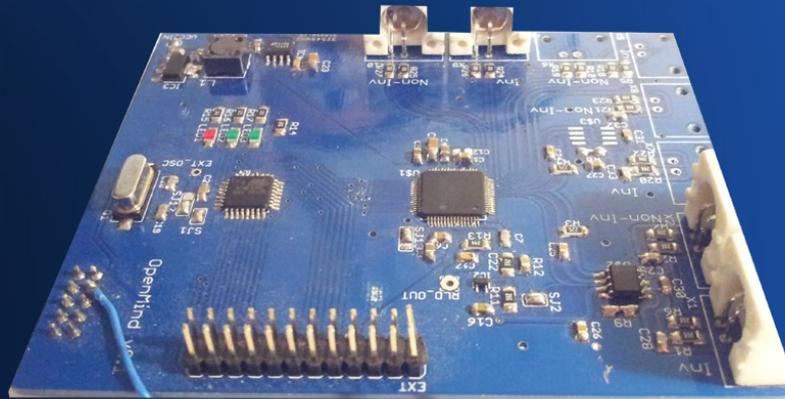


ModularEEG



MonolithEEG

OpenMind



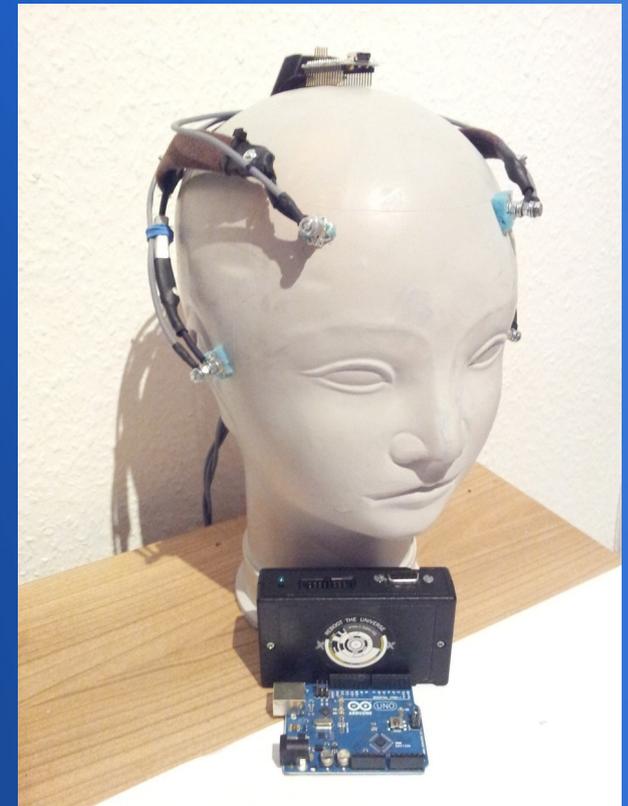
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Neuro-Headsets



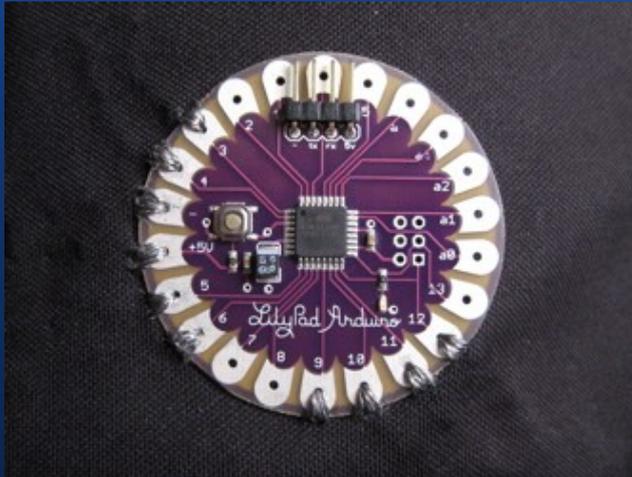
modular adjustable design
saline solution electrodes
replaceable active dry electrodes



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wearable technology



Lillypad Arduino

heart-lung-sensor belt/shirt

brainwave hats with silver fabric



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hackable commercial devices



COURTESY: EMOTIV

Emotiv NeuroSky IBVA

expensive to get raw data access
has mostly been reverse engineered
but not really hackable



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Brainwave Neurofeedback Mind-Hacking

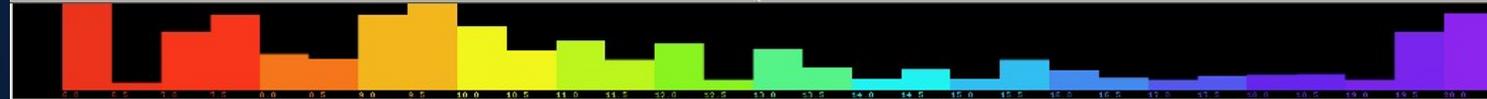
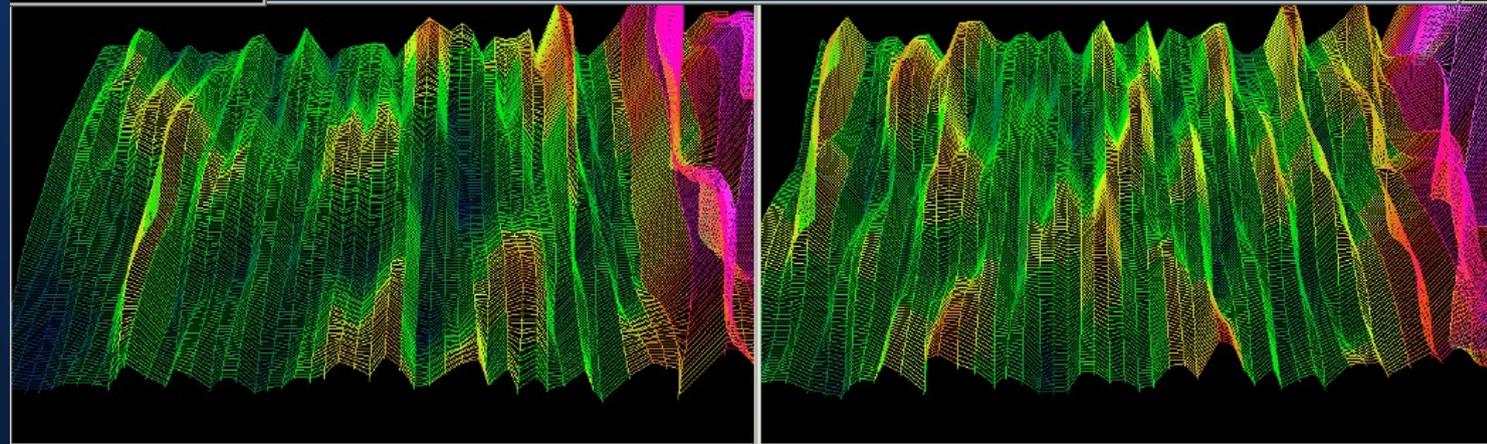
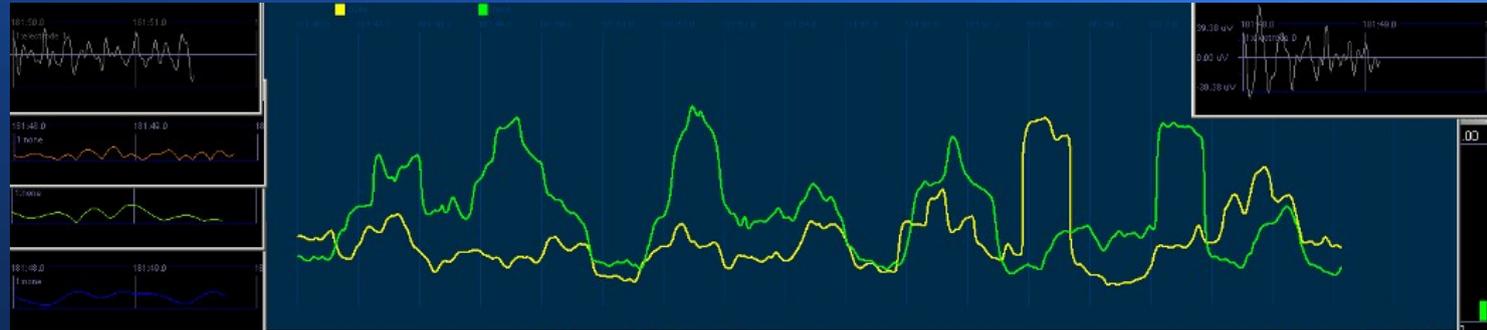
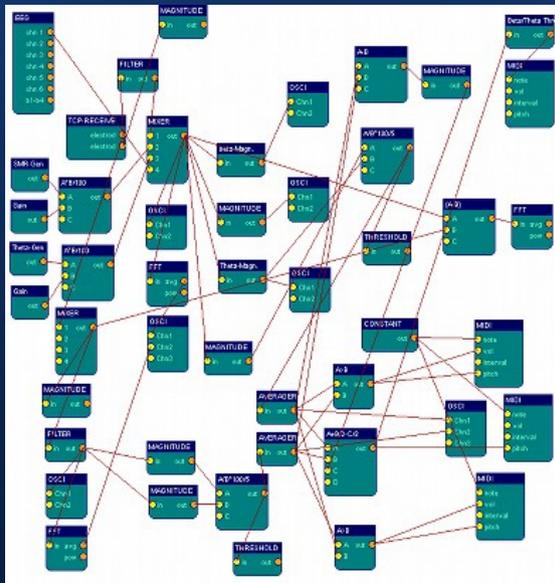
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MetaMind software overview

Neuroserver

TCP network stream

Brainbay Java, Python



Signal processing
filters averagers metrics

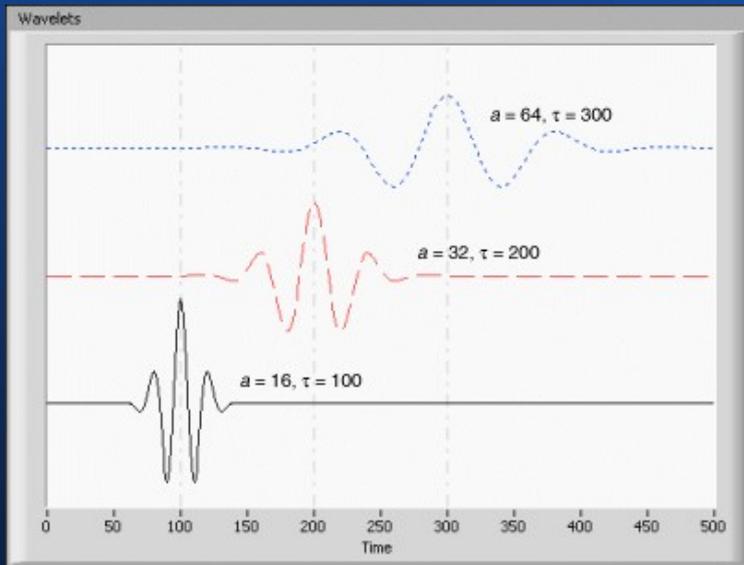


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Brainwave Neurofeedback Mind-Hacking

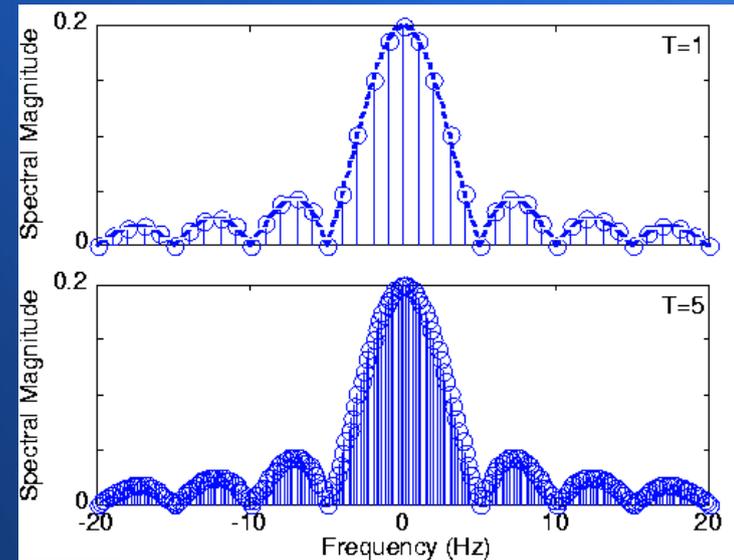
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ANALYZE : digital signal processing



Wavelet-Transform

event correlated potentials



Fourier-Transform

sliding window FFT

bandpass filter



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clustering + data-mining

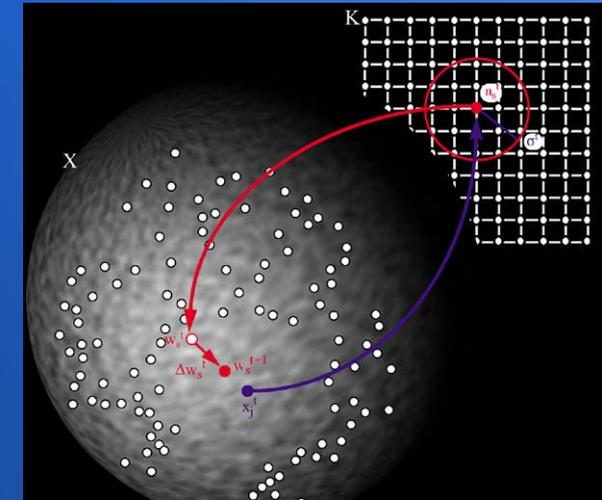
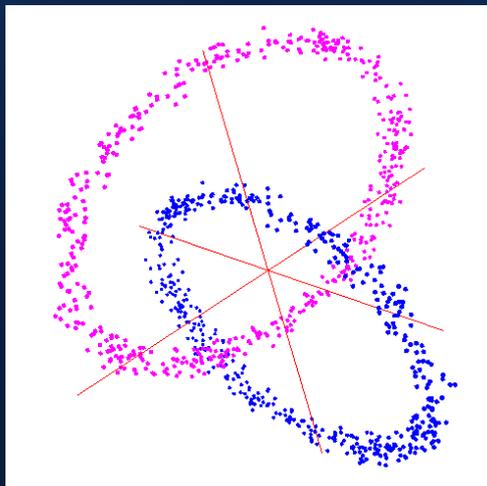
neural nets

databionics

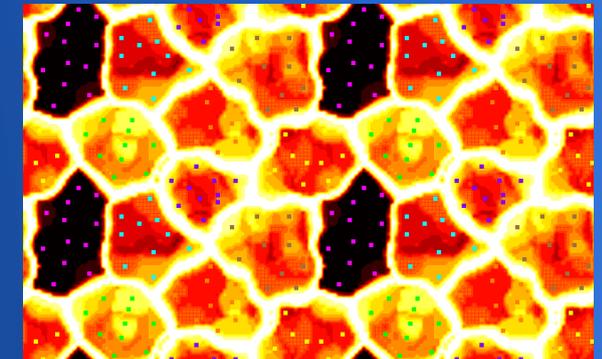
simulated annealing

clustering

PCA



ESOM



dynamic time warping

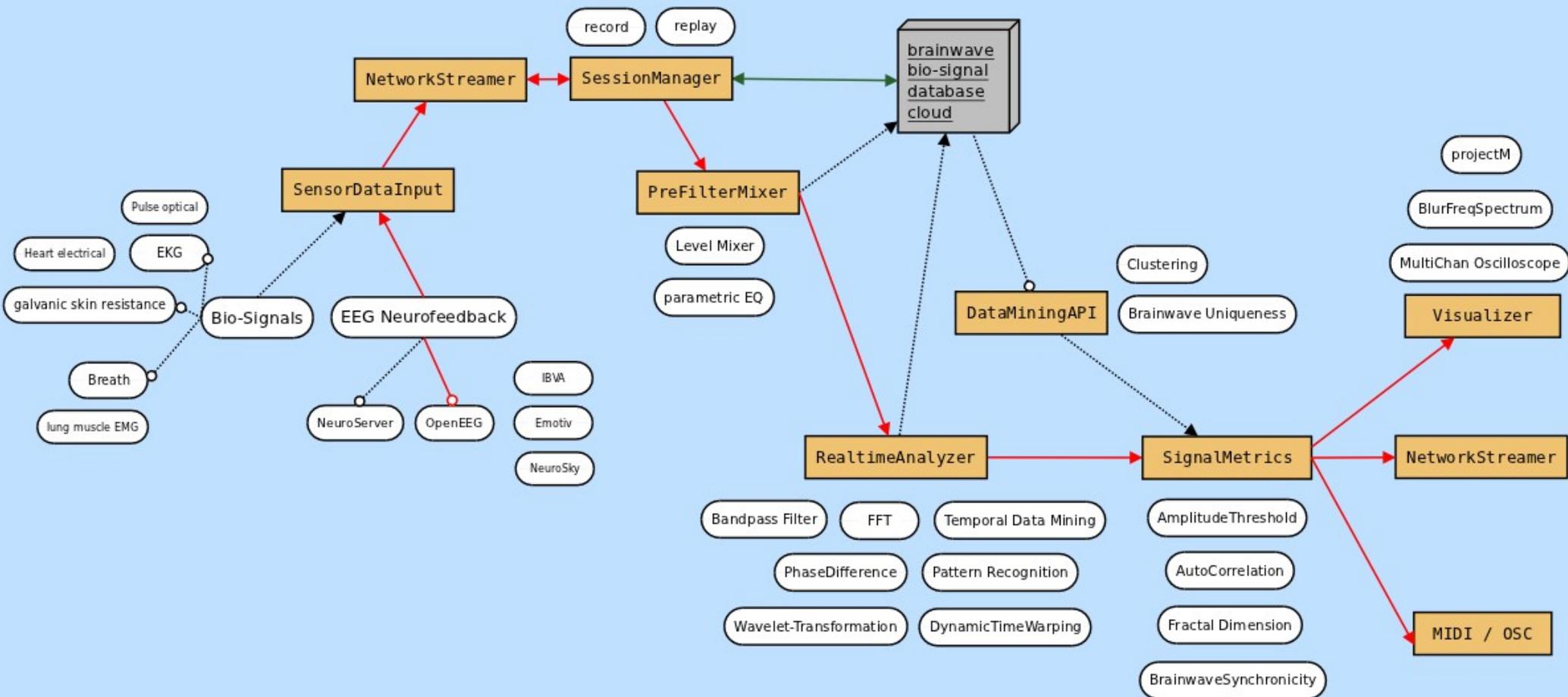


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data-flow bio-signal processing framework



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applications + use cases

control computer/electronics with mental states

generate MIDI sounds for music synthesizers

self-control mental state (relaxation / focus),
sleeping-induction, lucid-dreaming, fast-learning

increased mental capacity (brainwave synchronicity)

consciously control mental states

increased brain self-regulation ability

Neurofeedback Accelerated Learning

Neurofeedback Meditation

Personal-Development + Self-Hacking

synchronous activity, stimulating inter-neuron connectivity



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brain areas - electrode placement

frontal cortex left-right (conscious direction + reflection)

spacial motor cortex map (imaginative movement)

wernicke's areal (speech)

visual cortex



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tech evolution + trends + innovations

industrialized tech
moore's law effect

Internet Communication

- + precision
- + processing power
- + usability & comfort

open communities
social groupware
cloud computing
crowd sourcing

- physical size
- material cost
- energy need

contact-less measurement
wearable computing
immersive gaming

personal-coaching AI
exo-skeleton
self-transformation RPG



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participate + contribute

Open-BCI.org

international open-community

links news updates

free experimentation demos

hackerspace workshop tour

custom devices and software

- > check out the wiki website
- > Join the Facebook Group
- > be friends on social web



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open community projects

collaborative work - share projects – improve together

build a kit => have fun + learn
hack project => adapt + improve

upgrade **hardware design**
bio-signal **software framework**
[web] **application-building SDK**

secure chosen-anonymity distributed
“brainwave social network”



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impact on individual and society

individual empowerment



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Personal-Development + Self-Hacking

reprogram mental patterns

become aware

brainwave sniffer



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