



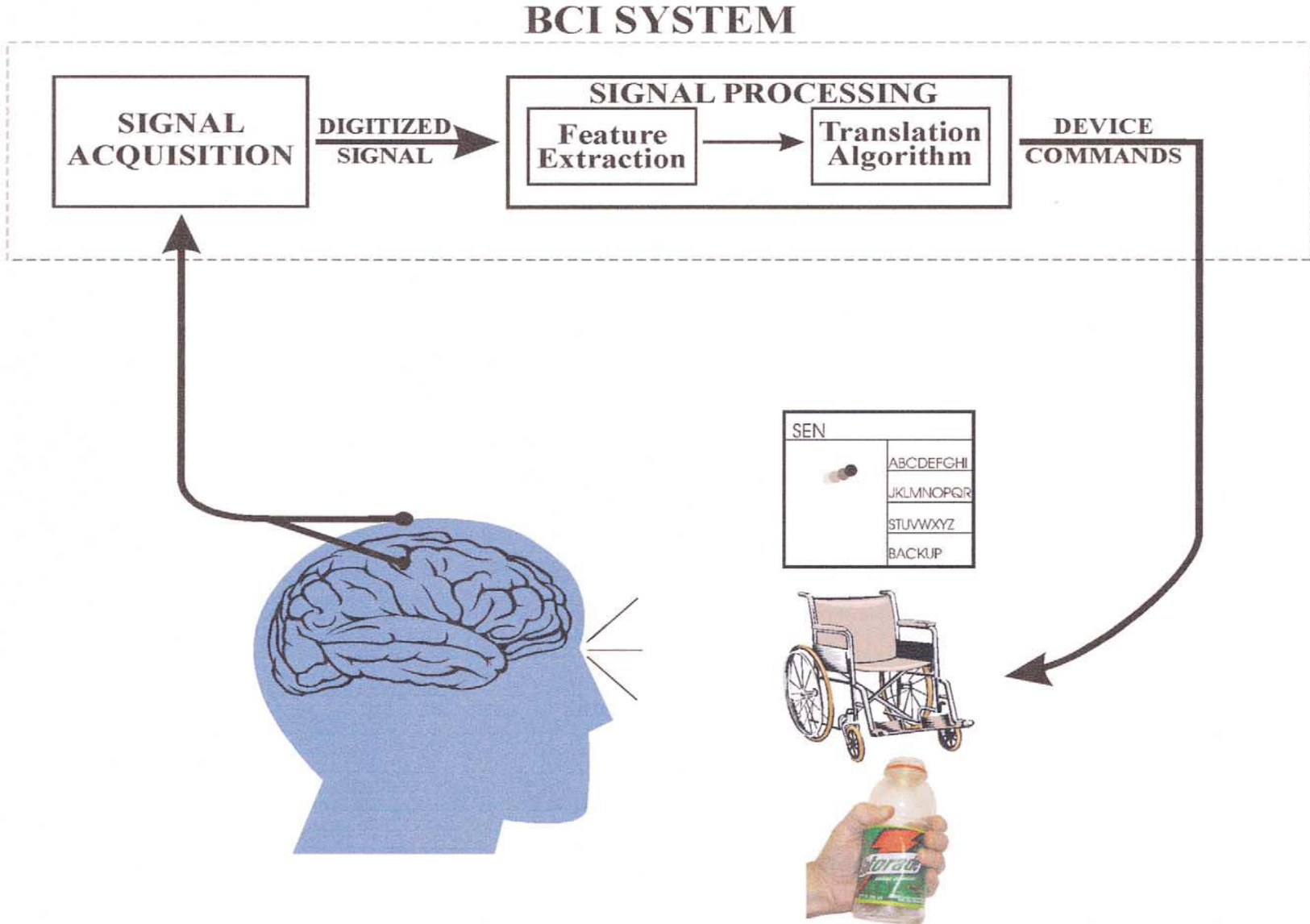
---

# Brain Computer Interface for Communication in Locked In State

Ujwal Chaudhary, Bin Xia, Aygul Rakhimkulova, Niels Birbaumer

Presenter : Dr. Ujwal Chaudhary, Ph.D.  
& Aygul Rakhimkulova

# Brain Computer Interface (BCI)



# Why do we need BCI?



# Amyotrophic Lateral Sclerosis (ALS)

- † A progressive motor disease.
- † No Treatment
- † Artificial Respiration
- † Locked in State (LIS)
- † Completely Locked in State (CLIS)
- † Only affecting sensory and cognitive functions to minor degree.
- † Communication



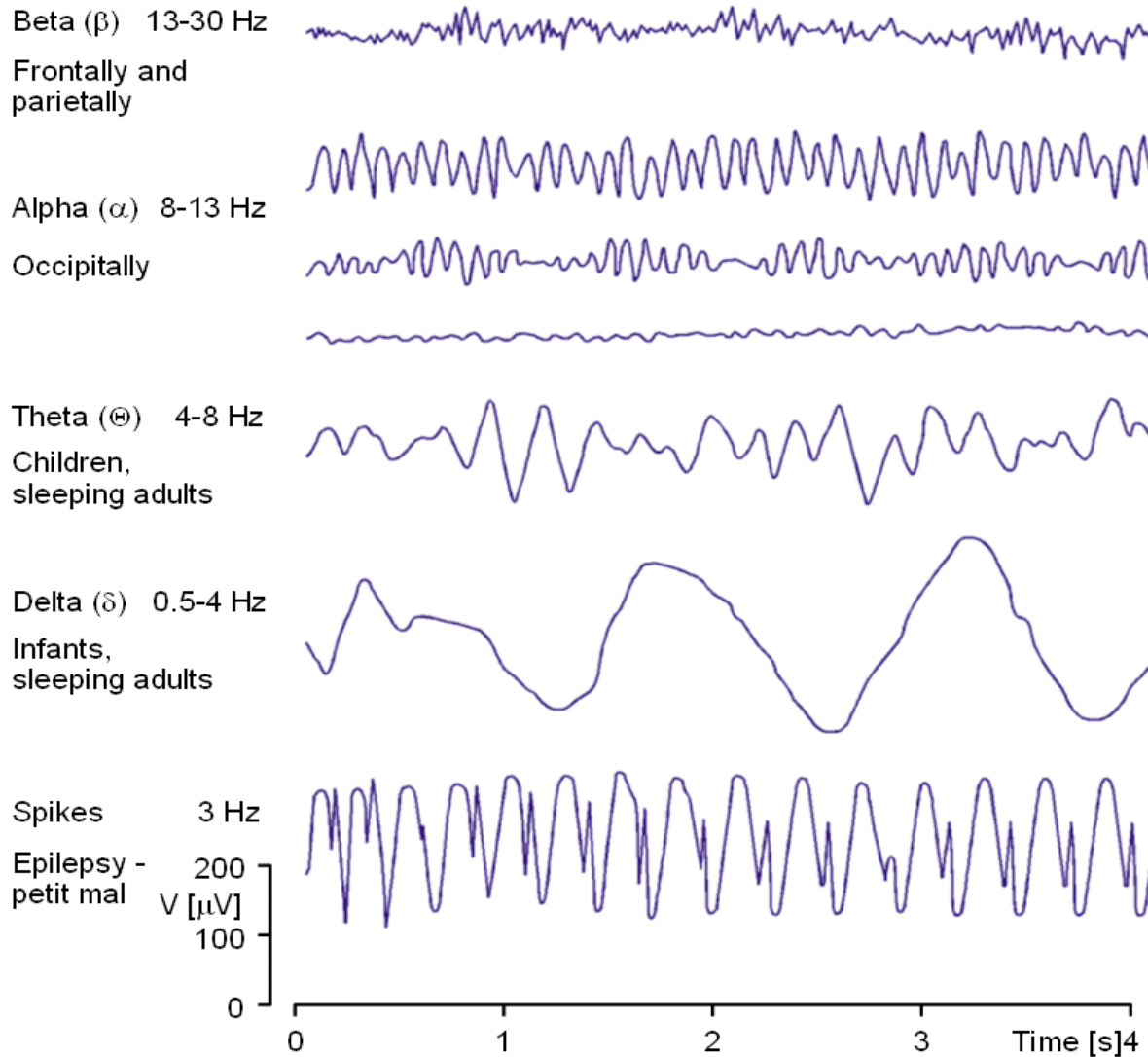
# Unlocking the Locked-In

Brain Computer Interface to aid patients in CLIS to communicate needs and feelings to their family member/ caregiver.

- † Electroencephalography (EEG)
- † Near Infrared Spectroscopy (NIRS)

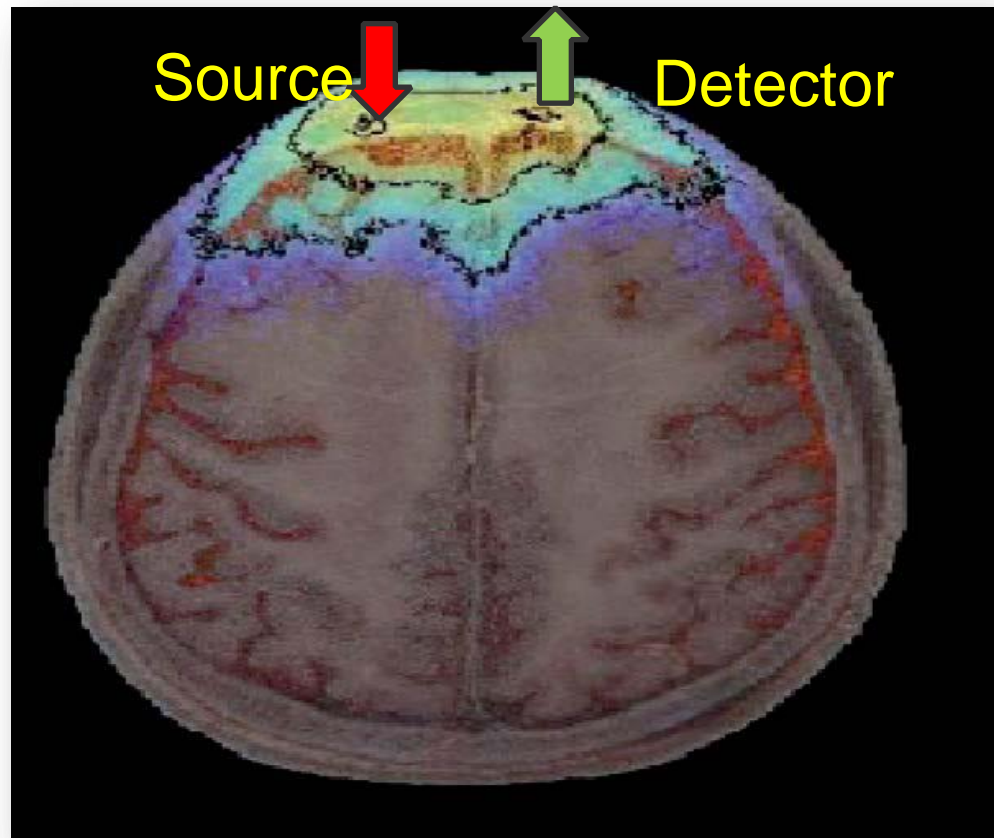


# Electroencephalography (EEG)





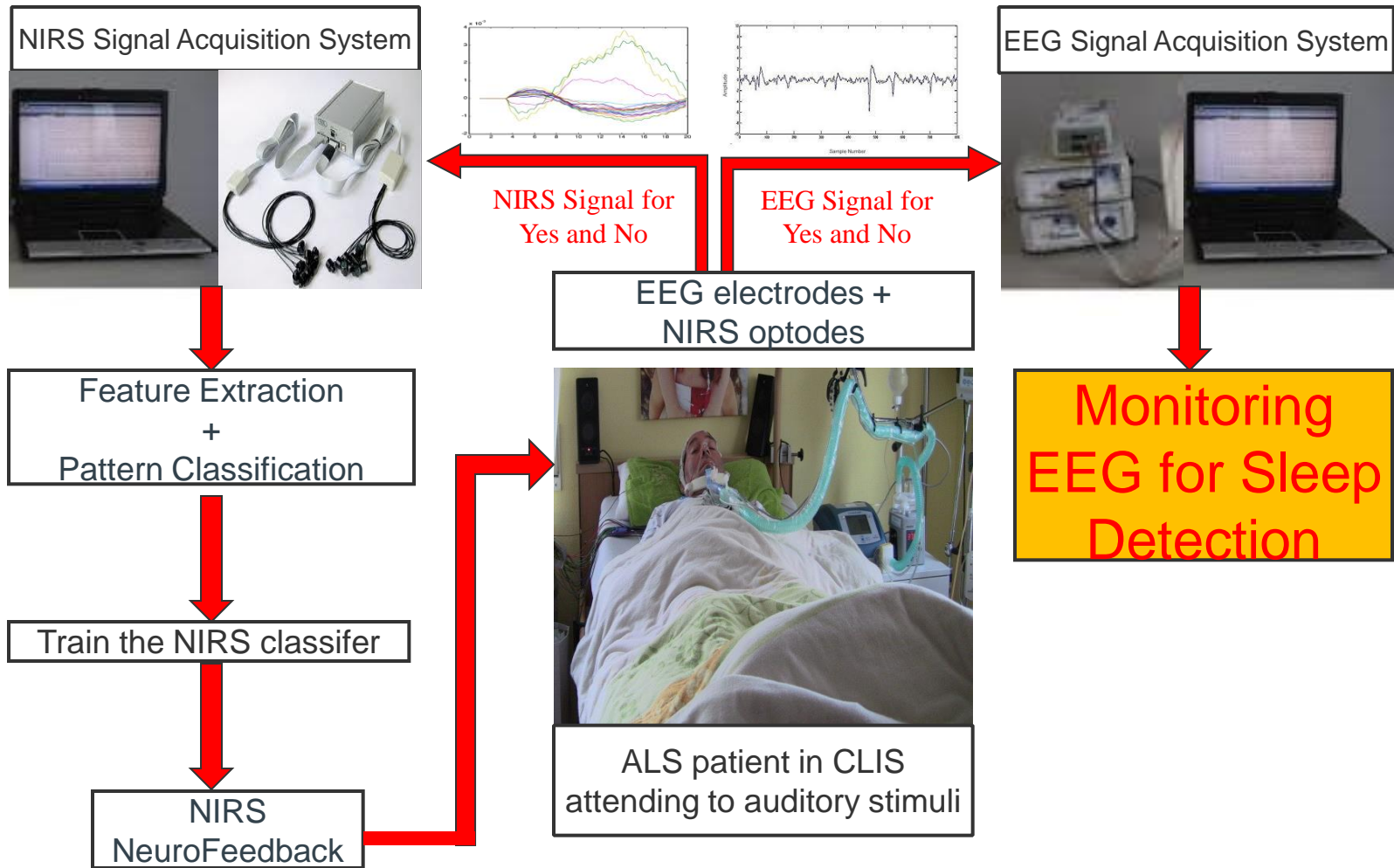
# Near Infrared Spectroscopy (NIRS)



Light Propagation in Brain

Ting Li et al *Journal of Biomedical Optics* 16(4), 045001(April 2011) Strangman et al. *Biol Psychiatry*. 52 (2002) 679-693.

# BCI Design





# BCI Setup in Progress



# ALS Patients





# BCI Training Sessions



# BCI Online Feedback

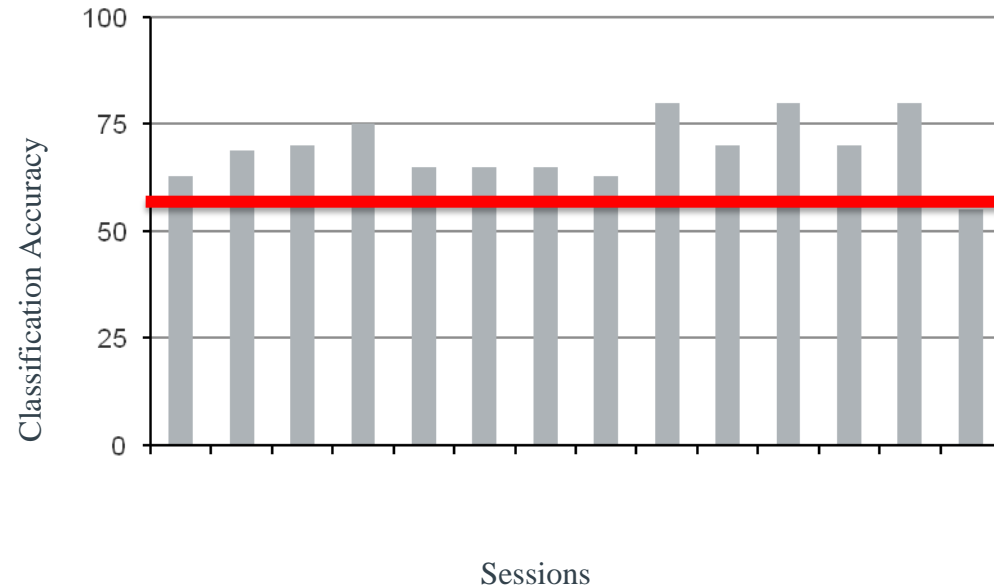


# Open Questions



# Result: Training and Feedback

Patient 1



Training Classification Accuracy greater than 65% for 90% of sessions.  
Online Feedback Accuracy = 75%



Mobile  
Kommunikation  
Infodivision  
127. Versammlung  
14. bis 18. September 2012  
Göttingen

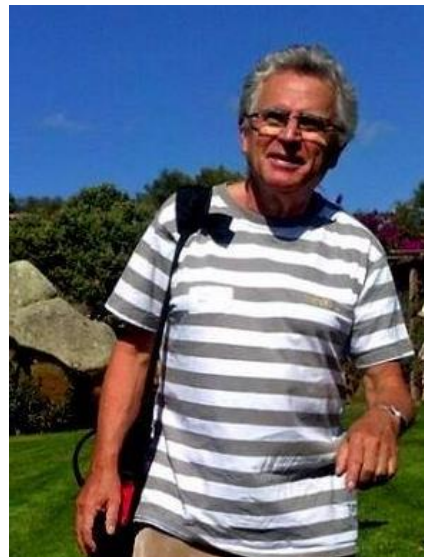


# Conclusion

- † Auditory based BCI
- † To unlock the Locked-In
- † Online Feedback
- † Successful communication in 4 ALS Patients
- † Locked in unlocked
- † Option based menu using “Yes” and “No” signal.



# Locked-In Unlocked



Thank You

