

Questions and Answers of Day 5 of the Virtual Meeting

Christoph Guger

Anonymous Attendee 11:14 AM

what is the difference between temporal and spatial resolution?

You 11:20 AM

Temporal resolution is how much time resolution the signal has. The EEG is e.g. reacting fast compared to fNIRS and therefore we say the temporal resolution is better. The ECoG has much more electrodes on the cortex than EEG and therefore it has a better spatial resolution.

ANDREA GIANNELLA LÓPEZ ANTÓN 11:22 AM

what if you put static and dynamic sound at the same time?

You 11:58 AM

Never at the same time.

Hamzeh 11:23 AM

Which band are suitable to evaluate mental workload in visual tasks?! And what is difference between mental workload and cognitive load?!

You 11:59 AM

Tomek used the P300, very low frequency.

kaya 11:25 AM

Comparing auditory functionality to other sensory functionalities, is it the best sensory pathway to develop a BCI for those Disorders of Consciousness population? Do they have the same auditory perception as normal subjects? Isn't there any loss of auditory skills?

You 11:59 AM

Auditory is good, vibro-tactile is also very good.

Nikki Leeuwis 11:36 AM

Good morning dr. Rutkowski, How many vibrations are needed for the tactile BCI speller to reach 100% accuracy?

You 12:00 PM

works even in single-trials

Anonymous Attendee 11:36 AM

How do the employed methods mean to address variability across subjects?

You 12:00 PM

there is variability

Jordi Jauset 11:38 AM

EEG has a good temporal resolution because offers information in very little time

You 12:00 PM

Correct.

Akshay Kumar 11:38 AM

What was the purpose of showing real-time brain-waves to the participant? Visuals distract people; what was its effect?

You 12:01 PM

monitoring reasons

Zoomme 11:38 AM

Did you cover the click sound during the tactile stimulation?

You 12:01 PM

the sound was not covered.

Zoomme 11:39 AM

Or are the sounds always the same and not distracting?

You 12:01 PM

they are not distracting.

Pragati Gupta 11:41 AM

What is the significance of P300 elicited in both auditory and tactile BCI?

Tomasz Rutkowski 12:04 PM

<https://www.frontiersin.org/articles/10.3389/fnbot.2016.00020/full>

You 01:17 PM

visual is best, then auditory and then vibro-tactile

Pragati Gupta 11:43 AM

How many electrodes are used when stimulating the head, are there any specific area we focus?

You 12:03 PM

for the P300 uses 8-16 electrodes.

Andrea 11:47 AM

I didn't really understand HOW the stimuli are used to control things. For example, if I wear the glove, how would I use it to give command to something?

You 12:04 PM

each finger is one command.

Anonymous Attendee 11:48 AM

Can you tell me P300 montage is shown in one wave although it is taken from multiple channel. so does this one wave is mean values of all channel of P300?

Tomasz Rutkowski 12:07 PM

Cz and Pz electrodes are usually the best but we often use more electrodes in case of noise, etc.

Anonymous Attendee 11:49 AM

did you offer any scholarship for training or internship?

Tomasz Rutkowski 12:08 PM

Yes, our institute has internship options for graduate students. I guess after COVID pandemic those offer will be available again. Please keep monitoring <https://aip.riken.jp/>

Anonymous Attendee 11:50 AM

I didn't get how the control of the robots work in the tactile and auditory cases.

Does the patient control where the vibration will happen or the control is based on the patient response to the vibration?

If it's based on the response, isn't the patient, and thus the control of the robot, passive to the input signal settled?

Tomasz Rutkowski 12:10 PM

Subject has to learn a mapping finger->command etc. So you focus on a part of the body representing a command and once the stimuli comes P300 is elicited.

Sidharth 11:57 AM

what is chance level?

Tomasz Rutkowski 12:10 PM

Chance level = random choice. For example, for a five commands BCI chance level = $1/5 = 20\%$

Karine R 11:58 AM

Very interesting and great indeed what's been done in the CBAT Lab. Does the biomarker for dementia using the oddball paradigm already going for clinical trial or even used in the clinical field?

Tomasz Rutkowski 12:11 PM

Not yet, but we are preparing for that. Fingers crossed!!! ...and collaborations welcome!

Steve M. Potter 11:59 AM

Fantastic stuff! I see the best discriminations at longer latencies, 400-600ms. What brain regions are generating those signals?

Tomasz Rutkowski 12:13 PM

In case of EEG we can only tell which head surface areas the best to P300 measurement. Temporal stimuli like sound or tactile stimulation caused those P300 delays.

Christian Penalosa 12:00 PM

Which type of BCI (auditory, visual or tactile) would you suggest has better effect for cognitive training?

Tomasz Rutkowski 12:14 PM

Personally I like tactile, but I guess visual or auditory could be best for reminiscence-based therapies.

Alexandros 12:00 PM

In your opinion, apart from early recognition and classification, could BCI offer a solution to slowing down the progression of dementia?

Tomasz Rutkowski 12:16 PM

Hmm, possible if we design nicely stimulating paradigms. Drop in vision and hearing often accelerate dementia.

Shriraj 12:00 PM

Hi Tomasz, can you tell us more about your research on using Deep Learning for EEG BCI? Which DL technique is most helpful and any suggestion to improve accuracy?

Tomasz Rutkowski 12:17 PM

Email me at tomek@bci-lab.info for more discussion.

Temmy 12:01 PM

Thank you for the inspiring presentation. Are there any further possible implications for the "imagery music" experiment? Thank you very much!

Tomasz Rutkowski 12:16 PM

Thank you and sure, we are very open to continue that project with collaborators.

Francesco Sheiban 12:01 PM

Do you think intelligence augmentation (IA) could eventually be achieved via non-invasive BCI, in the future? Or those will mostly be devoted to dementia assessment?

Tomasz Rutkowski 12:17 PM

Yes, I do believe IA is the way to prevent brain atrophy and dementia.

Martin Guy 12:01 PM

I guess it is the same as SSVEP, but did participants reported the sound-based approach to be particularly annoying to use?

Tomasz Rutkowski 12:18 PM

ASSR actually kind of difficult for not-musically trained users.

Anna Karchevskaya 12:03 PM

Is auditory BCI applicable for locked-in syndrome patients? Because sometimes these patients have difficulties with gaze concentration and BCI with eye-tracking is impossible to perform for them

Tomasz Rutkowski 12:19 PM

Yes, auditory and tactile BCIs are good solutions for patients with vision problems.

gayathri sankaran 12:04 PM

Is it possible to decode what a person is thinking about particular events?

Tomasz Rutkowski 12:19 PM

Not with EEG so far.

Brown xu 12:05 PM

Is the individual difference big or small for auditory BCI compared to p300 or tactile BCI?

Tomasz Rutkowski 12:20 PM

Yes, auditory BCI usually has smaller amplitude but longer latency. Tactile is kind of in the middle between visual and auditory.

AMMARA 12:08 PM

Can we participate in hackathon?

You 01:18 PM

Sure, just register on br41n.io to the BCI Hackathons.

Anonymous Attendee 12:08 PM

Given the COVID situation, will the hackathon in Brussels still take place?

You 01:19 PM

It will still take place, but the conference data was shifted from June 2020 away.

Bilal Orkan Olcay 12:10 PM

To Dr. Guger: Are you planning to design a BCI Competitions for new motor imagery decoding algorithms?

You 01:19 PM

This is part of the br41n.io BCI Hackathons.

Janani Arivudaiyanambi 12:12 PM

Can you please comment on which type of BCI say, visual or auditory or tactile would be more beneficial for a patient affected by ALS?

Tomasz Rutkowski 12:21 PM

Depends on a subject. Visual BCI is very robust but some subject cannot use it.

Sepideh 12:18 PM

Pragati Gupta 12:18 PM

What classification accuracy we get for "imagery music" experiment?

Tomasz Rutkowski 12:22 PM

It was around 70%

Carmen Kimball 12:21 PM

<https://www.popularmechanics.com/science/health/a26087847/scientists-translate-brain-waves-into-speech/> for gayathri sankaran

You 01:19 PM

thanks for the link for all spring school attendees.

M.Rezapour 12:24 PM

Thanks for your presentation. Could you please explain a little more about the "dream painting"? I didn't quite understand.

You 01:15 PM

During the dream you can check which brain regions are activated. If the leg region gets activated you can move e.g. a robot forward,....

Fatih Altindis 12:26 PM

Hi Christoph, are the applications to hackathons individual or do we need to form a group beforehand?

You 01:16 PM

You can pick an application beforehand and sign up with people you know or you can join another team

Anonymous Attendee 12:29 PM

can UNICORN be used for clinical purpose?

You 01:16 PM

The unicorn is an end-user product and not a medical device.

ahmed azab 12:30 PM

can unicorn be used for stroke rehabilitation research or not?

You 01:16 PM

The Unicorn can be used for stroke rehabilitation because it has electrodes over C3, C4 and Cz.

Subasree 12:32 PM

Does unicorn cover motor cortex? C3 C4 CZ

You 01:03 PM

Yes, the Unicorn covers the motor cortex with C3, C4 and Cz.

Martin Guy 12:32 PM

Hello, a question regarding the unicorn API (python for instance), it is used to do what kind of things ? Just the recording or also the pre-processing?

You 12:49 PM

The APIs give you the pure EEG data with 250Hz. No pre-processing is included.

Steve M. Potter 12:33 PM

Will the Unicorn have active electrodes?

You 12:39 PM

No, the electrodes are passive, but the amplifier is very close to the electrodes and sitting on the head.

M.Rezapour 12:34 PM

What are hybrid electrodes exactly?

You 12:38 PM

Hybrid electrodes are termed by g.tec like that. We mean that they can be used dry and wet.

iakovenko 12:34 PM

hybrid electrodes means they can be used both as dry and wet? are they active electrodes?

You 12:38 PM

Correct, the Unicorn hybrid electrodes can be used dry and wet. They are not active, but the amplifier is pretty close and sitting on the head.

Andrea 12:36 PM

Thanks. Is the name that appears on the certificate the one we're actually using on Zoom? Because in case I would like to add my surname too, to be clearer.

You 12:38 PM

You can enter the name that you want to have yourself.

Bryan 12:37 PM

There is a way to use this device as an 3D modelling input?

You 12:39 PM

You can connect e.g. the P300 speller with certain icons to the 3D modelling software.

Federico Zilio 12:38 PM

Regarding the Unicorn Speller for patients in CLIS, I suppose it only works as long as the patient's visual abilities are preserved. If they are not anymore, would the only alternative be MindBEAGLE? Would Unicorn be useless at that point? (for example, with patients who have lost the ability to lift their eyelids)

Thanks!

You 12:50 PM

The visual P300 speller only works if patients still have vision. DOC patients don't have vision anymore and then mindBEAGLE comes into the play.

ahmed azab 12:39 PM

so for unicorn not using active electrodes does this affect the EEG recording quality

You 12:50 PM

Of course the g.Nautilus with active electrodes is better but it is also much more expensive to make the active EEG electrodes. But the Unicorn still gives you great data.

Daniela Buchwald 12:39 PM

Which operation systems are supported by the unicorn suite?

You 12:51 PM

Windows. But you can read the data directly into e.g. Arduino with direct serial commands.

Zoomme 12:41 PM

do the python and other additional apis are wrappers or do they add functionality?

You 12:51 PM

the functionality is exactly the same, just for different languages.

Wisdom Iwueze 12:43 PM

Maybe I wasn't following closely and it was mentioned, but can you customize the number of channels and electrodes in the Unicorn Hybrid Black?

You 12:52 PM

No, the Unicorn Hybrid Black has exactly 8 channels.

Carolina 12:44 PM

Do you have available any unicorn application for detecting attention level? If yes, which are the features extracted?

You 12:52 PM

Attention can be extracted with the P300. You can use the P300 speller for that and you can modify the icons that are inserted at the moment.

Anonymous Attendee 12:47 PM

Dear Christoph,

I am new to BCI-related subjects. In fact, I have been graduated in biomedical engineering and instrumentation engineering and I have been working as an instrumentation engineer since 2012. I have gained a lot during this amazing spring school. Thank you, your colleagues and speakers very much indeed.

How can I contact with your team and the speakers?

You 12:53 PM

just send an email to the surname at gtec.at. e.g. guger@gtec.at

Aysa Jafarifarmand 12:50 PM

Can we access the price list of all the products?

You 12:53 PM

The Unicorn prices are online on www.unicorn-bi.com. The g.tec products will be online in 1 month.

Carmen Kimball 12:50 PM

is this the first iteration of the unicorn eeg cap; are new electrodes meant to be used with each recording? I thought I heard the speaker say the electrodes are "disposable"?

You 12:55 PM

The hybrid electrodes are used again and again. The reference and ground is done with disposable electrodes.

Carmen Kimball 12:52 PM

is there any impedance display?

You 12:56 PM

no, this is not necessary for this type of technology. impedance checking was done 20 years ago for passive electrodes to make sure the impedance is around 5 kOhm. With our setup we get nice EEG data with much higher impedances, even several 100 kOhm.

M.Rezapour 12:53 PM

Why the electrodes on the screen blink from yellow to green sometimes? What does it mean?

You 01:00 PM

The yellow colors shows that there is an artifact in the data. Green colour means that all is good.

Carmen Kimball 12:54 PM

ahhh now i see the answer to that question - i like how each site is illuminated to show quality of connection

You 01:00 PM

yes, that is very useful

Subasree 12:55 PM

May i know what are the 8 channels.

thanks

You 01:02 PM

The EEG electrodes are over central regions for P300 and motor imagery and visual regions for SSVEP

Hami Hekmati 12:58 PM

can I use this device for research purposes?

and also for detecting alpha or beta rhythm differences for example in artists & non-artists?

You 01:03 PM

You can use the Unicorn for neuroscience research and 250 Hz allow you to capture alpha and beta activity very nicely.

Christian 12:59 PM

From time to time I can see in channel 5 a burst of 2 consecutive spikes while another channel do not present it. What type of artefact is it?

You 01:17 PM

This was a movement artifact on this channel

Sidharth 12:59 PM

how artifact remove real-time like eye blink?

You 01:04 PM

You can do bipolar derivations or band-pass filtering.

rajshekar 01:01 PM

How to send the alpha peak frequencies to Unity?

You 01:05 PM

You can detect with the band power algorithm the alpha activity and use UDP to send it to unity. This is very easy to do.

iakovenko 01:02 PM

some companies manufacture electrodes that are wet with salt water. Is the quality of the signal of such salt solution electrodes comparable with such of gel electrodes?

You 01:11 PM

not really. Salt water electrodes are problematic in drying out and in getting bridging between the electrodes. The salt water is also running down the skin and distributes on positions where you don't want it. With gel systems the data is just much better.

ahmed azab 01:03 PM

Is unicorn can be used for stroke rehabilitation research topic

You 01:06 PM

Sure, the Unicorn has electrodes over the sensorimotor cortex and therefore you can use it for neurorehabilitation purposes.

Anonymous Attendee 01:04 PM

I saw you had designers make caps. Can we use the electrodes with other caps as I would need different electrode positions?

You 01:10 PM

You can insert the Unicorn electrodes basically into any material with a hole. It is easy to make additional holes into the Unicorn cap.

Andrea 01:04 PM

While recording alpha waves, with eyes closed, the electrodes were always yellow, yet he was not moving. What were the artifacts there?

You 01:09 PM

The artifact visualization considers the last 10 seconds. Therefore, it was yellow because there was a bite beforehand.

thilina Lalitharatne 01:06 PM

Hi Christoph, any plans to increase the number of electrodes in Unicorn?

You 01:07 PM

Hi Thilina, the current Unicorn Hybrid Black has exactly 8 channels. More channels are available with g.Nautilus.

Carmen Kimball 01:11 PM

jajaja especially the 3d printed unicorn eeg cap - its very apparent to me the care and artistry devoted to the hard/software design - thank you so much for hosting this I have learned so much this is an amazing opportunity you have given us all

You 01:20 PM

some of them are pretty funny. Best is to participate and see it in reality.

Carolina 01:12 PM

Thanks for answering! About attention level detection applications, was P300 applied in autism children application?

You 01:20 PM

of course. There is a whole special issue in Frontiers about BCIs for autism.

mark 01:12 PM

Do you know if the Unicorn works with the OpenVibe software application?

You 01:21 PM

You can use the Unicorn with LSL to stream into OpenVibe. During br41n.io we had several teams doing that.

Leila Saleh Moghaddam 01:12 PM

is there any free eeg dataset for downloading? if yes, could u write it's link in below, tnx a lot

You 01:41 PM

There are many free eeg data sets. if you are interested in BCIs just search for BCI competition. You can also find data on github from Unicorn. During the BCI Hackathons there are also many data-sets are available.

thilina Lalitharatne 01:13 PM

Hi again, do you have eeg cap sizes for neonatal and infants recordings ?

You 01:22 PM

Yes, the g.GAMMAcaps are also available in sizes mini, midi, maxi for neonates and infants.

shokoufeh 01:14 PM

how does work hybrid electrode? and what is it difference by another electrode?

You 01:22 PM

There is a hole in the middle that allows you to inject gel. without gel it is a dry electrodes. But the term is just used by g.tec for the Unicorn electrode.

Anna Karchevskaya 01:15 PM

If we use fNIRS and EEG simultaneously and stream data via LSL, could it lead to data interference and slow the data processing? Is it better to use EEG with USB-data stream and fNIRS via LSL?

You 01:23 PM

LSL is not made for fast data streaming. I would use a TCP/IP protocol to stream data.

Carolina Tabernig 01:16 PM

Dear Dr. Guger, for autism: what paradigms and EEG features do you use in the BCI?

You 01:24 PM

Many people are looking at P300 potentials in autism.

Sidharth 01:17 PM

real-time artifact removal algorithm like ICA?

You 01:25 PM

you can use ICA to remove artifacts. I think it is better to avoid them and in real-time to ignore them because they are very short. This assumes of course that the BCI equipment is of high-quality and gives you clean data.

Afroz Seyedebrahimi 01:19 PM

Could we use Unicorn to control Stroke patients' applications in the AR and the VR mode?

You 01:25 PM

Sure, the Unicorn has electrodes over the sensorimotor cortex for doing that.

Francisco Roque 01:19 PM

Hello Dr. Guger. How can we calibrate the Unicorn for a person in a bed hospital for example?

You 01:25 PM

You can put a pillow under the head so that there is no pressure on the head or put the Unicorn onto the pillow.

Anonymous Attendee 01:20 PM

I have created an attention bias experiment using E-Prime 2.0. I do have access to E-Prime 3.0. Do you know if PST have an extension for Unicorn? Or do I need to re-create on MATLAB to use Unicorn? I am using the Tobii TX300 and studio.

You 01:33 PM

e-prime does not have a Unicorn interface. But you can read triggers from e-prime into the Unicorn environment. Easier is to do the experimental paradigm just in the Unicorn environment.

Federico Zilio 01:20 PM

What are the advantages of the Unicorn Speller compared to a classic eye-tracking technology? It seems to me that while the eye-tracking one needs good oculomotor skills, Unicorn can be used with less preserved oculomotor skills. Is this right? Other advantages?

You 01:30 PM

The Unicorn Speller does not show to others what you are doing and has more privacy. It does not make a decision if you are not attending. The eye-tracker always follows your gaze. Some patients prefer to use or can just use the P300 speller and not the eye-tracker anymore. In general, it makes sense for a patient to have both to be on the same side for communication. The Unicorn speller is also much cheaper than an eye-tracker.

shokoufeh 01:24 PM

how would be sure that participants attend to the certain letter? i mean in 'BCI' for example focus on 'B' letter?

You 01:26 PM

We tell the person before what he should do.

Hami Hekmati 01:24 PM

can I have this video?

Is there any video for learning how to work with Unicorn?

You 01:26 PM

just got to www.unicorn-bi.com and follow the links to the videos and to github.

AMMARA 01:25 PM

In this procedure the user need to focus on the single alphabet appear?

You 01:27 PM

The task of the user is to attend to one of the characters to select it.

Carmen Kimball 01:27 PM

Can gtec caps be used with ANY amplifier or only gtec?

You 01:28 PM

Nowadays we just support g.tec anymore.

Sidharth 01:28 PM

how much time lag between EEG to EMG

You 01:31 PM

When you are acquiring the EEG and the EMG there is not time lag. If you mean the processing time of the brain until a finger is moving. Then this takes normally 1 second from the plan to move a finger until it is really moving.

vanessa 01:29 PM

I would like to ask if we can change the language in this keyboard.

You 01:31 PM

Yes, you can just load any language with custom icons.

Andrea 01:30 PM

Ok, didn't notice it. Another thing I was wondering is how does the system understand which is the right face/letter? Is it the cross between the row and the column that make P300 rise? Also, how can be sure that the letter we want to identify will appear within the flashes if they're not enough?

You 01:32 PM

The system is searching for the biggest P300 response for each icon. Then it knows which icon flashed 300 ms before to select it.

Mastaneh Torkamani 01:30 PM

Would be grateful if you elaborate on the differences between the unicorn set and other g.tec products besides the cap and type of electrodes.

You 12:36 PM

The Unicorn has 8 channels and the data is transmitted with 250 Hz. It is 990 EURO and therefore pretty cheap. The g.tec devices are much more flexible and have much more options and therefore are also more expensive.

Anonymous Attendee 01:32 PM

I don't understand how the system can identify the letter even though it's not only that letter that is sparkling but the entire row or column. Thank you

You 01:34 PM

You need the time point of the row and the time point of the column that flashes. The intersection is the target icon.

Anna Karchevskaya 01:34 PM

Because you are using fNIRS by Artinis, is it possible to use TCP/IP protocol for data streaming? Do I need some extension or other programmes for this purpose?

Thank you very much for your answers and spring school! I got so much information in such short time :) It is fascinating!

You 01:40 PM

We are reading the EEG and fNIRS directly into Simulink e.g. with 250 Hz. From Simulink we can then stream the data via TCP/IP to other applications.

Andrea 01:34 PM

But if it's an entire row flashing, how can the system discriminate?

You 01:35 PM

we check also the response of the column. the intersection is the target.

Francisco Roque 01:34 PM

But for the experiment how can we use the Unicorn with the person? For example, to the person react to the stimuli?

You 01:38 PM

I would use the Simulink API and would run the paradigm in Simulink while reading the data from the Unicorn. This is at the end only one Simulink model and the triggering and timing is just perfect.

vanessa 01:35 PM

Can I use Unicorn API with Nautilus?

You 01:37 PM

For g.Nautilus you need the g.NEEDaccess API. The Unicorn API is just for Unicorn.

vanessa 01:35 PM

I mean P300 API

You 01:39 PM

the unicorn speller is a kind of P300 API. You can use all visualization and signal processing tools and adapt it.

Andreas Winter 01:38 PM

How is the ball robot named, and where can you buy it?

You 01:39 PM

Sphero. just check on Amazon.

Martin Guy 01:45 PM

Hello Dr. Guger, I'm a PhD student working on BCIs and looking for a headset, and I am interested by the Unicorn BCI. However we do not have much findings available for a headset. Could a discount be considered? Many thanks, and thank you again for the talks.

You 01:50 PM

Hi Martin, the Unicorn is only 990 EUROS.

Subasree 01:47 PM

It will be interesting if you can kindly form a Google group of all participants in this spring school so that there is continued learning and discussion. Also, being a clinical neurologist, I wish to be in touch with this multidisciplinary group.

Thanks

You 01:55 PM

follow gtecmmedical engineering on Facebook, LinkedIn, twitter and Instagram -> there are many posts and discussions are going on these platforms. if you want to leave your contact just drop your name and email here and it goes into the QA daily report.

AMMARA 01:50 PM

LSL is used for communication?

You 01:51 PM

no, it is just used to send data from one app to another one.

Hami Hekmati 01:52 PM

sorry, does it connect to EEG LAB ?

You 01:53 PM

The Unicorn is a real-time device, but you can record data and read the data into eeglab.

Kiavash Fathi 01:55 PM

Why is the reference electrode used in this product different than the previously shown devices?

You 01:08 PM

We use the reference on the mastoid bone assembled with a disposable electrode. This is pretty easy to do and good looking. An ear clip is more visible.

parisa ghafourian 01:56 PM

if we use of high pass filter to remove motion artifact, do destroy signal eeg and we miss important information in the passive electrode??

You 01:57 PM

Movement artifacts are always problematic, better is to avoid them with proper equipment.

Marco Simões 01:58 PM

I've seen it before, but can you share the reference for the paper using the faces for boosting P300 accuracy?

You 02:45 PM

https://www.researchgate.net/publication/313586789_A_comparison_of_face_speller_approaches_for_P300_BCIs

aleksander valjamae 02:01 PM

Hi Christoph, fantastic you are doing this! Thanks!

Sorry, perhaps that has been mentioned before, can Unicorn be used in a hyperscanning settings and if yes, what maximal amount of devices can be running in synchrony at the same time?

You 02:05 PM

Hi Aleksander, nice to see you here. If you are using the API you can use up to 4. On different computers many more.

Francisco Roque 02:03 PM

I am sorry. My question was if it possible to use the speller app without the calibration to that person in particular

You 02:04 PM

it works also without calibration, but the accuracy is not so high.

Could stimulation be used with fNIRS?

You 02:27 PM

yes, stimulation can be done with fNIRS.

Kiavash Fathi 02:18 PM

Is there a criteria for selecting a word for calibration?

You 01:27 PM

Not really. Just select at least 5 characters.

Valeria de Seta 02:23 PM

Thank you for your presentations. Is the g.Hlamp compatible with BCI2000 and does it enable to do hardware filtering setting the cut off frequencies on BCI2000?

You 02:30 PM

The g.Hlamp is fully integrated into the core of BCI2000. You can access the hardware filtering from BCI 2000

Mastaneh Torkamani 02:26 PM

I was under the impression that combining alphanumeric characters with pictorial stimuli would increase the workload in the brain. But here the system is extremely fast in detecting the ERP. What would be the accuracy and speed if only one stimulus modality was used?

You 01:34 PM

By overlaying the black and white characters with faces, we are able to boost the accuracy to 100% for everybody.

shokoufeh 02:32 PM

why for evoked potential, we couldn't use active electrode?

You 02:33 PM

you can use active electrodes for evoked potentials.

Carmen Kimball 02:34 PM

can silver electrodes or infralow frequency electrodes be used with gtec amp for eeg neurofeedback?

You 02:42 PM

you can use them. Just use the g.SCARABEO electrodes or g.LADYbirds, they are active and made of Ag/AgCl

Sepideh 02:37 PM

does gtec has specific electrodes for sleep recording ?

You 02:40 PM

you can use the active electrodes also for the sleep recording.

Carmen Kimball 02:39 PM

Infra-low frequency - i believe this is the latest name used to be called infralow frequency - so used for detecting eeg signal 0 - 0.5 Hz

You 02:42 PM

Ag/AgCl is good for these applications.

Anonymous Attendee 02:40 PM

why do we need simultaneous TMS reading with EEG? We may be able to see differences in behavioural results and EEG recordings post TMS.

You 02:43 PM

either to inhibit or excite the brain with TMS before a treatment or to study the reaction of the brain because of TMS.

Hami Hekmati 02:52 PM

Does Unicorn support Persian keyboard?

You 02:53 PM

it allows to upload any images, so Persian also works.

Martin Rosenfelder 02:52 PM

Earplugs would be recommended in order to reduce auditory potential induction by the TMS pulse, is this correct?

You 02:54 PM

you can use earplugs with white or brown noise if you want to avoid the auditory influence.

Petros Kyres 02:53 PM

Thank you I did but still looks like 2 images .. I managed to add my name on it , but impossible to copy paste the 2 images one on another to make it look like 1

Shirya 02:56 PM

Thank you for your presentation Dr Slobodan! I enjoyed it. I still feel confused if we combine EEG and TMS to study the effects of TMS for research? But you mentioned that there are clinical applications. How do we see improvement of motor functions in patients via evoked potentials in this technique? Doesn't that require multiple sittings?

You 04:13 PM

TMS is often used for depression patients and in this case you can use the EEG to show the changes in the brain. Beside that you can enhance or inhibit the functional of cortical regions in stroke patients. This can force patients to use more the paretic side. TMS is done also before stroke rehabilitation experiments with BCIs to inhibit or enhance functions.

Shokoofeh Parvin 02:57 PM

What post processing approaches do you use to clean the TMS data and remove the two artifacts that you mentioned?

You 04:13 PM

We fit a linear regression model to the artifact to kill it.

Alfonso Magliacano 03:19 PM

Does the algorithm of mindBEAGLE look for the P300 specifically or for any difference between standard and target stimuli?

You 04:19 PM

mindBEAGLE looks for all the differences between target and non-target in a 800 ms window.

Janani Arivudaiyanambi 03:27 PM

Hello! Could you please comment on the wider P300 response for VT3 stimulation compared to VT2 for the healthy controls?

You 04:20 PM

The onset of the vibrators is not so accurate and longer than of a tone. Therefore, you get wider P300 responses for VT2 and VT3 than for AEP.

Jordy 03:27 PM

Hi Christoph, great results and very nice application of BCI. I was wondering whether this work is published already, or is it going to be?

You 04:20 PM

<https://loop.frontiersin.org/people/1735/publications>

Nikki Leeuwis 03:29 PM

Dear dr. Guger, this is not related to the current talk. But I was wondering if you maybe know what is the state-of-the-art of affective BCI? For example, using Frontal Alpha Asymmetry approach/avoidance measures? Thanks in advance.

You 04:29 PM

There is a lot of research going on in this domain and also in resting state analysis

Camellia Ibrahim 03:33 PM

So are there vibrations on both hands at the same time? Or do they vibrate on one hand first then the other? And if they are at the same time, are they vibrating alternatively?

You 04:21 PM

One vibrator is on the left hand, another one on the right and one on the chest.

Steve M. Potter 03:40 PM

It seems that if a patient were locked in or minimally conscious for some time, they may lose track of what is left and what is right. There are some "normal" who have a hard time distinguishing left from right. Therefore, wouldn't it be better to put the vibrators on one foot and one hand (say L hand and R foot) to make it easier for the patient to distinguish the two vibrations?

You 04:21 PM

not really. You can still touch the target hand to make sure they are understanding you.

Martin Rosenfelder 03:41 PM

Dear Christoph, how many percent of UWS patients in your projects had positive VT3 and MI response, respectively?

You 04:07 PM

About 10% have a positive VT3 response if you do the run only once. If you repeat it, then many more. We normally do not get a MI response in UWS.

Lucia 03:43 PM

What is the difference between VT2 and VT3?

You 04:06 PM

VT2 has vibrators on the left and right wrist. VT3 has one additional on the chest.

Anonymous Attendee 03:44 PM

I lost the very first part: do patients say "yes" or "no" through thinking of moving right or left hand?

You 04:07 PM

The patient has to count the vibrations on the left hand to say yes and has to count the vibrations on the right hand to say no

Lucia 03:46 PM

Is it really important for subject to count stimuli or is it enough to concentrate on that hand only?

You 04:06 PM

concentration is enough. we just ask them to count to make it easier for subjects to concentrate

Bryan Conklin 03:53 PM

Can you provide a link to that article about how bci works to enable locked-in patients to communicate?

You 04:04 PM

<https://www.frontiersin.org/articles/10.3389/fnins.2017.00251/full>

Bernarda Tellez Alaniz 03:55 PM

Great talk Dr. Guger, what is the team working in pre-frontal tDCS?

You 04:02 PM

the pre-frontal tDCS is done to improve the CRS-r in DOC patients.

LUFO 03:57 PM

would invasive methods provide more accuracy ?

You 04:01 PM

in general yes, but the EEG is just good enough to capture the P300 response that we need here.

Tomek 03:57 PM

Christoph, are all the procedures mentioned on the last slide available on the standard mindBEAGLE set?

You 04:02 PM

in the new one, yes,

Franklin 04:04 PM

Thanks Prof. Guger, besides that, as far as I know, EEG has a good temporal resolution, right?

You 04:04 PM

EEG has a very good temporal resolution, that is the reason why it is so good for BCIs.

Anonymous Attendee 04:06 PM

Some authors refer to EEG as something that we are to achieve its maximum potential soon, how would we be sure when this is actually reached in terms of how much useful information is being appropriately employed?

You 04:09 PM

Hi, not sure what you are asking.

Anonymous Attendee 04:09 PM

Does any of the platforms work through an online approach? (Not considering web, but considering BCI adjustments on real-time)

You 04:22 PM

The real-time adjustment does not work that well because it is adjusting too quick.

M.Rezapour 04:11 PM

I didn't get what are those blue electrodes attached to the wrists?

You 04:23 PM

these a little vibro-tactile stimulators given tactile stimuli to the hand.

Franklin 04:19 PM

Hi again Prof. Guger, as far as I know Pz position is the best to detect P300 response (highest amplitude), so why would be important to measure P300 in other positions (C3, CZ, FCZ, etc)?

You 04:25 PM

because we are fixing vibrators on right and left hands and therefore the P300 is topographically distributed.

Xun He 04:22 PM

sorry I missed the talk about TMS and EEG. I saw a question mentioning two types of artifacts from EEG. are these the electromagnetic artifact and the other auditory input artifact? Thanks!

Slobodan Tanackovic, g.tec 04:29 PM

No, they are both originated by TMS, the second one is basically discharge from a skin, hence that slow decay

Nedime Karakullukcu 04:30 PM

I understand that the vibrotactile paradigm is faster than the auditory paradigm. Would you explain what the reason is? How to decrease the response time of real-time classification? Which parameters are important for fast response time?

You 04:33 PM

The VT has a stronger P300 and therefore we need less repetitions.

Andrea 04:30 PM

I didn't really understand, what's the function of the distractor from a modelling point of view?

You 04:32 PM

we are running an oddball paradigm and therefore we have to embed the targets into frequent stimuli, otherwise you will not see a P300

Thanasis Koutras 04:39 PM

For the motor imaginary movements, how is the subject imagining moving his hand? up/down, finger movement?

You 04:40 PM

left and right dorsiflexion

Pragati Gupta 04:41 PM

Sir, this is regarding the presentation by Dr Slobodan. I am confused if there is an overlap in the signal with simultaneous collection of TMS and EEG? and How do we separate the artifacts between the two, which might interfere and interact between the two?

You 04:58 PM

The TMS artifact when the hardware setup is done correctly is only 1-2 ms and therefore not a problem for the EEG.

Martin Rosenfelder 04:43 PM

Do you have indications that imagined big movements increase classification performance compared to small imagined movements in the MI paradigm?

You 04:50 PM

Finger movements are very good because they have a big cortical representation area.

Federico Zilio 04:43 PM

How do you interpret the coloured boxes during the motor imagery task? The 4 on the screen

You 04:57 PM

These are the ERD maps showing activation in the alpha and beta regions.

Tapasaya Sharma 04:49 PM

Do you think you can modify this setup to get diagnosis assessment for Creutzfeldt-Jakob disease (CJD) . as till now it is challenge for neurologist to detect this disease. only diagnosis available is EEG which is not very useful?

You 04:55 PM

there will be a lot of new opportunities with these types of systems.

Brown xu 04:52 PM

For MI BCI what is the optimal time window? Longer time window is better or short time window? Should we use 500ms or 1S?

You 04:55 PM

normally 500 ms to 2s is best

Franklin 04:53 PM

If I want to measure P300 response on a P300 visual paradigm by using mindBEAGLE, could I design my own P300 visual stimulator, maybe by using MATLAB, would that work?

You 04:55 PM

easy would be to do it with g.HIsys.

Antony Peterson 04:54 PM

Why is MI faster than P300? Could fewer stimulations for P300 be used to improve response or would this significantly impact classification accuracy?

You 04:57 PM

because we can just integrate the time in MI and we get a response after every stimuli for P300 and the stimuli need some time in between.

Mastaneh Torkamani 04:55 PM

*oddball paradigm. May I ask which EEG electrodes were used in this training?

You 04:05 PM

Cz is the most important one. <https://www.frontiersin.org/articles/10.3389/fnins.2017.00251/full>
the publication shows it in detail

Danke uns Schöne Grüße

Mohammad Hamed Mirbagheri 04:59 PM

how long would it takes for BCI systems to complete a task? for bci keyboard it takes so much time so considering this would there be any future for it in gaming or other areas for healthy people ? and overally how far are from this tec to be well used in world ?

You 05:00 PM

sure, there was e.g. the very nice example of the computer game with the keyboard and the BCI system

Gunarajulu Renganathan

Dementia patients can't able to differentiate shapes. could able to investigate on that perspective? your suggestions on that?

You 12:34 PM

you can either develop an assessment battery for these patients or develop a rehabilitation system for them with BCI technology.

Swati Banerjee

Is there any way to understand crossmodal correspondence using the experiments done? (Sorry and please ignore the previous messages)

You 12:33 PM

sure, you can also do that.