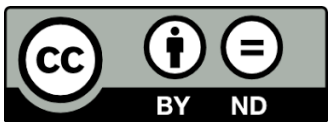
 DOI: 10.3217/978-3-85125-682-6-00

© 2019

Verlag der Technischen Universität Graz

http://ub.tugraz.at/Verlag



ISSN 2311-0422

ISBN 978-3-85125-682-6

DOI 10.3217/978-3-85125-682-6

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

Welcome Note

Bridging Science and Application

The reason for the choice of the title for our conference was to strengthen new ways and push for translation.
New insights naturally lead to open questions which we want to investigate and find solutions. However, we have to keep in mind the high goal of this research – to find solutions for people with disabilities, end users and not to forget their relatives. This year, the Conference has, besides workshops on specific topics one very special side event: The CYBATHLON BCI Series 2019. Pilots with physical impairments, who control computer avatars with their thoughts, will demonstrate how far brain-computer interface research has come. The BCI race will take place in front of a live audience and – challenging for all involved, pilot as well as developing team: far away from any lab conditions. As a special keynote, we present Prof. Robert Riener (ETH Zurich, Switzerland). He is full professor of sensory motor systems and the initiator of CYBATHLON. With his talk he will make a link between the BCI field, his research disciplines and CYBATHLON.

Furthermore, participating teams are invited to present their technologies, methods and algorithms in form of posters throughout the whole conference – hopefully provoking stimulating discussions. This 8th Graz Brain-Computer Interface Conference (GBCIC2019) offers the opportunity for extensive discussions and exchange of ideas among BCI experts from more than 20 countries. We received 76 scientific contributions from roughly 250 authors. The scientific contributions have been peer-reviewed by at least two reviewers (acceptance rate 87%) and collected in form of open access conference proceedings.
For the Conference itself, we have been able to setup a colorful and multifaceted program. We are very happy that the GBCIC2019 has been officially endorsed by the BCI Society. Further, we are lucky that outstanding experts in the field, Dr. Damien Coyle (Ulster University, Northern Ireland, UK), Prof. Moritz Grosse-Wentrup (University of Vienna, Austria), Dr. Robert Gaunt (University of Pittsburgh, PA, USA), Dr. Mariska Vansteensel (University Medical Center Utrecht, The Netherlands), and Prof. Pim Haselager (Radboud University Nijmegen, The Netherlands) accepted our invitation to present keynote addresses at the Conference.

We hope that this conference contributes towards a strong scientific cooperation among our field, and we wish all participants an exciting, stimulating and productive Graz BCI Conference 2019!

Gernot R. Müller-Putz
Conference Chair

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

Editorial Board

Prof. Dr. **Gernot Rudolf Müller-Putz** is head of the Institute of Neural Engineering and its associated Laboratory of Brain-Computer Interfaces. He received his MSc in electrical and biomedical engineering in 2000, his PhD in electrical engineering in 2004 and his habilitation and “venia docendi” in medical informatics from Graz University of Technoloy in 2008. Since 2014 he is full professor for semantic data analysis. He has gained extensive experience in the field of biosignal analysis, brain-computer interface research, EEG-based neuroprosthesis control, communication with BCI in patients with disorders of consciousness, hybrid BCI systems, the human somatosensory system, and BCIs in assistive technology over the past 18 years. He has also managed several national projects (State of Styria) and international projects (Wings for Life, EU Projects) and he recently coordinated the EU Horizon 2020 project MoreGrasp. Furthermore, he organized and hosted six international Brain-Computer Interface Conferences over the last 13 years in Graz and chairing the 8th Conference in Sept. 2019. He was also in the Programm Committees of the 7th International BCI Meeting 2018, 10th NeuroIS Restreat, ICCHP 2018. He is Review Editor of Frontiers in Neuroscience, special section Neuroprosthetics, Associate Editor of IEEE Transactions in Biomedical Engineering and Associate Editor of the Brain-Computer Interface Journal. Since August 2019 he is Speciality Chief Editor of Frontiers in Human Neuroscience: Brain-Computer Interfaces. He has authored more than 156 peer reviewed publications and more than 180 contributions to conferences which were cited more than 14300 times (h-index 60). Recently he was awarded with an ERC Consolidator Grant “Feel your Reach” from the European Research Council. In May 2017 he received the Ludwig-Guttman Award from the German Medical Spinal Cord Injury Association (DMGP). In May 2018 he was elected into the Board of Directors of the International Brain-Computer Interface Society. In May 2010 he received the Science Award from the State of Styria.

Jonas Christian Ditz is university assistant at the Institute of Neural Engineering (BCI-Lab), Graz University of Technology, Austria. He received his M.Sc. in Bioinformatics from the Eberhard Karls University Tübingen in 2018. From 2016 to 2018 he worked as a research assistant at the Max Planck Insitute for Biological Cybernetics in the Cognition & Control in Human-Machine Systems group. Currently he is working towards his PhD degree in computer science.

Selina Christin Wriessnegger is assistant professor at the Institute of Neural Engineering (BCI-Lab), Graz University of Technology, Austria. From 2001 to 2005 she was PhD student at the Max-Planck-Institute for Human Cognitive and Brain Sciences and received her PhD from the Ludwig-Maximilians University. During that time, she spent one year in Rome as research assistant at IRCCS (Fondazione Santa Lucia), Laboratory for Human Psychophysiology. From 2005 to 2008 she was university assistant at the Karl-Franzens-University Graz, section neuropsychology. From 2009 until May 2016 she was senior researcher at the Institute of Neural Engineering (BCI-Lab). In 2017 she was visiting professor at SISSA (Scuola Internazionale Superiore di Studi Avanzati), Trieste. Her research interests are subliminal visual information processing, neural correlates of motor imagery, novel applications of BCIs for healthy users, passive BCIs and embodiment of language acquisition.

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

Organizing Committee I

Conference Chair

Univ.-Prof. Dipl.-Ing. Dr.techn.
Gernot R. Müller-Putz
Institute of Neural Engineering
Graz University of Technology
Austria
(BCI Society Member)

Papers and Proceedings

MSc
Jonas C. Ditz
Institute of Neural Engineering
Graz University of Technology
Austria

Ass.Prof. Mag.rer.nat. Dr.phil.
Selina C. Wriessnegger
Institute of Neural Engineering
Graz University of Technology
Austria

Students Awards

ing. Dr. MSc
Andreea I. Sburlea
Institute of Neural Engineering
Graz University of Technology
Austria

Social Media & Graphics

MSc
Joana Pereira
Institute of Neural Engineering
Graz University of Technology
Austria
(BCI Society Member)

Industrial Sponsoring

Bsc
Aleksandra Krajnc
Institute of Neural Engineering
Graz University of Technology
Austria

Poster Sessions

ing. Dr. MSc
Andreea I. Sburlea
Institute of Neural Engineering
Graz University of Technology
Austria

MSc
Catarina Lopes Dias
Institute of Neural Engineering
Graz University of Technology
Austria

Administration

Petra Still
Institute of Neural Engineering
Graz University of Technology
Austria

Bsc
Aleksandra Krajnc
Institute of Neural Engineering
Graz University of Technology
Austria

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

Organizing Committee II

Exhibition & Infrastructure

Dipl.-Ing.
Reinmar Kobler
Institute of Neural Engineering
Graz University of Technology
Austria

BSc
Aleksandra Krajnc
Institute of Neural Engineering
Graz University of Technology
Austria

Program Book

MSc
Catarina Lopes Dias
Institute of Neural Engineering
Graz University of Technology
Austria

MSc
Joana Pereira
Institute of Neural Engineering
Graz University of Technology
Austria
(BCI Society Member)

Talks and Venue

Dipl.-Ing.
Reinmar Kobler
Institute of Neural Engineering
Graz University of Technology
Austria

Sience Slam

Ass.Prof. Mag.rer.nat. Dr.phil.
Selina C. Wriessnegger
Institute of Neural Engineering
Graz University of Technology
Austria

Volunteers

Dipl.-Ing.
Andreas Schwarz
Institute of Neural Engineering
Graz University of Technology
Austria

BSc
Aleksandra Krajnc
Institute of Neural Engineering
Graz University of Technology
Austria

Additional Local Staff

Dipl.-Ing.
Lea Hehenberger
Institute of Neural Engineering
Graz University of Technology
Austria

Bsc
Philipp Raggam
Institute of Neural Engineering
Graz University of Technology
Austria

Dr.
Valeria Mondini
Institute of Neural Engineering
Graz University of Technology
Austria

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

International Program Committee and Review Board I

We are very grateful to all reviewers for their help, to make this conference a success!

A

Aarnoutse Erik	University Medical Center Utrecht

B

Bauernfeind Günther	Medizinische Hochschule Hannover
Bianchi Luigi	University of Rome Tor Vergata

C

Chavarriaga Ricardo	Ecole Polytechnique Federale de Lausanne
Clerc Maureen	INRIA
Congedo Marco	CNRS
Cohen Ori	Bar Ilan University
Congedo Marco	University Grenoble Alpes
Coyle Damien	University of Ulster

D

Desain Peter	Radboud University
Ditz Jonas Christian	Graz University of Technology

F

Faller Josef	Columbia University
Farquhar Jason	Radboud University
Friedman Doron	IDC Herzliya

G

Grosse-Wentrup Moritz	Ludwig Maximilians University Munich
Guan Cuntai	Nanyang Technological University
Gutiérrez Dania	Center for Research and Advanced Studies (Cinvestav)

H

Halder Sebastian	Julius Maximilians University of Würzburg
Hehenberger Lea	Graz University of Technology

I

Ibanez Pereda Jaime	University College London

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

International Program Committee and Review Board II

J

Jeunet Camille	University Toulouse Jean Jaurès
Jin Jing	East China University of Science and Technology

K

Kanoh Shin'Ichiro	Shibaura Institute of Technology
Kobler Reinmar	Graz University of Technology
Krusienski Dean	Old Dominion University
Käthner Ivo	Julius Maximilians University of Würzburg
Kübler Andrea	Julius Maximilians University of Würzburg

L

Lopes Dias Catarina	Graz University of Technology
Lotte Fabien	INRIA Bordeaux Sud-Ouest
López-Larraz Eduardo	Eberhard Karls University of Tübingen

M

Mattia Donatella	Fondazione Santa Lucia, IRCCS
Mattout Jérémie	Université de Lyon
Melinscak Filip	University of Zürich
Modini Valeria	University of Bologna
Müller-Putz Gernot R.	Graz University of Technology

O

Ortner Rupert	g.tec medical engineering Spain S.L.

P

Pereira Joana	Graz University of Technology
Poel Mannes	University of Twente
Prasad Girijesh	Ulster University

R

Ricco Angela	Fondazione Santa Lucia
Ron-Angevin Ricardo	University of Malaga
Rutkowski Tomasz M.	University of Tokyo

S

Sburlea Andreea	Graz University of Technology
Schwarz Andreas	Graz University of Technology
Si-Mohammed Hakim	INRIA
Solis-Escalante Teodoro	Delft University of Technology

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

International Program Committee and Review Board III

Sorger Bettina	Maastricht University
Steyrl David	University of Vienna

T

Tangermann Michael	University of Freiburg
Tonin Luca	Ecole Polytechnique Fédérale de Lausanne

V

Volosyak Ivan	Rhine-Waal University of Applied Sciences

W

Wagner Johanna	University of California, San Diego
Wriessnegger Selina Christin	Graz University of Technology

Z

Zhang Yu	East China University of Science and Technology

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

List of Authors I

List of authors in alphabetical order with start pages of their respective contributions.

A

Aarnoutse, Erik....38, 50, 71, 157, 309
Adam, Perrine....139
Ahmadi, Sara....27
Angrisani, Leopoldo....44
Argelaguet, Ferran....317
Arnin, Jetsada....178
Arnold, Corey....344
Arpaia, Pasquale....44
Åsly, Sara Hegdahl....332
Avilov, Oleksii....139

B

Bassett, Danielle....16, 172
Benaroch, Camille....210
Bertrand-Lalo, Raphaëlle....88
Bevilacqua, Michele....65
Bianchi, Luigi....312
Bigirimana, Alain....355
Bigoni, Claudia....326
Bioulac, Stephanie....200
Borhanazad, Marzieh....27, 128
Bougrain, Laurent....139
Branco, Mariana....38, 50, 71, 157, 309
Burgard, Wolfram....228

C

Cappalonga, Federica....321
Carroll, Aine....355
Casiez, Géry....317
Castaño-Candamil, Sebastián....166
Cattai, Tiziana....172
Chandravadia, Nand....344
Chatel-Goldman, Jonas....88
Chavez, Mario....16
Chen, Duo....94

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

List of Authors II

Cho, Jeong-Hyun....216
Cieszyński, Łukasz....122
Cincotti, Febo....285, 321
Claffey, Máire....161
Clerc, Maureen....133
Clisson, Pierre....88
Colamarino, Emma....285
Colombo, Tommaso....285
Colonnese, Stefania....172
Congedo, Marco....6, 88, 111
Conway, Bernard....178
Cooney, Ciaran....338
Corsi, Marie-Constance....16, 172
Coyle, Damien....338, 355

D

Dayan, Natalie....355
De Vico Fallani, Fabrizio....16, 172
Delobel, Loïc....267
Desain, Peter....27, 82, 128
Dijkstra, Karen....82
Dinarès-Ferran, Josep....303
Ding, Yi....94
Dosen, Strahinja....350
Dowaki, Ryosuke....100
Dupont, Sophie....16

E

Eder, Andreas....234
Eidel, Matthias....106
Erdogmus, Deniz....22
Esposito, Antonio....44

F

Farquhar, Jason....27, 82, 128, 255
Fernández-Rodríguez, Álvaro....183
Folli, Rafaella....338
Fouillen, Mélodie....222

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

List of Authors III

Freudenburg, Zachary.....38, 50, 71, 157, 309
Fried-Oken, Melanie.....22

G

Gala, Riddhi.....11
Gambardella, Francesco.....312
García-Garaluz, Esther.....183
George, Nathalie.....16
Gilde, Monika.....332
Giraldi, Enrico.....321
Giraldo, Eduardo.....297
Grieshofer, Peter.....1
Grosse-Wentrup, Moritz.....32
Guan, Cuntai.....94
Guger, Christoph.....206, 303

H

Halder, Sebastian.....249
Haselager, Pim.....255
Hashimoto, Hiroaki.....100
Hehenberger, Lea.....244
Heilinger, Alexander.....161, 206
Herbillon, Vania.....222
Hirata, Masayuki.....100
Hugueville, Laurent.....16
Hummel, Friedhelm Christoph.....326

I

Isachenko, Andrey V.....291

J

Jadavji, Zeanna.....145
Jayaram, Vinay.....32
Jeong, Ji-Hoon.....216
Jeunet, Camille.....210
Jin, Jing.....206
Jutten, Christian.....6, 111

K

Kahani, Danial.....178

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

List of Authors IV

Kahn, Ari E. 16
Kaketsis, Daphne 145
Kanoh, Shin'Ichiro 239
Kelly, Dion
Kirton, Adam 145
Kleih, Sonja 234, 249
Klemm, Valeska 106
Kober, Silvia Erika 1
Kobler, Reinmar 100
Koizumi, Koji 117
Kojima, Simon 239
Kolkhorst, Henrich 228
Korik, Attila 338
Kozyrskiy, Bogdan L 291
Kübler, Andrea 106, 234, 249

L

La Bella, Vincenzo 206
Lakany, Heba 178
Latoschik, Marc Erich 249
Lecaignard, Françoise 59
Lécuyer, Anatole 317
Lee, Seong-Whan 216
Leinders, Sacha 38, 50, 71, 157, 309
Lennon, Olive 161
Liti, Chiara 312
Lopes Dias, Catarina 54, 65
Lotte, Fabien 194, 200, 210
Luppi, Janne J 38

M

Maby, Emmanuel 59, 222, 261, 267
Marttini, Andrew 344
Mattia, Donatella 285, 321
Mattout, Jérémie 59, 222, 261, 267
McCann, Alison 355
McElligott, Jacinta 355

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

List of Authors V

Medeiros de Freitas, Amanda....59
Medina-Juliá, María Teresa....183
Melnichuk, Eugeny V....291
Memmott, Tab....22
Miao, Yangyang....206
Micoulaud-Franchi, Jean-Arthur....200
Moccaldi, Nicola....44
Moctezuma, Luis Alfredo....332
Molinas, Marta....297, 332
Monseigne, Thibaut....200
Mrachacz-Kersting, Natalie....350
Müller-Putz, Gernot R....54, 65, 100, 188, 244, 279
Murovec, Nensi....206

N

Nakao, Masayuki....117
N'Kaoua, Bernard....194
Nuernberger, Andreas....11
Nuzhdin, Yury....77

O

Ofner, Patrick....188
Oken, Barry....22
Ortner, Rupert....206, 303
Ozdenizci, Ozan....22

P

Palagi, Laura....285
Partyka, Marta....222
Parvis, Marco....44
Pelagallu, Lisa....321
Pels. Elmar G. M....38, 50, 71, 157, 309
Pendekanti, Shrita....344
Pereira, Joana....188
Philip, Pierre....200
Piccialli, Veronica....312
Pichiorri, Floriana....285
Pillette, Léa....194

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

List of Authors VI

Pouratian, Nader....344

R

Ramsey, Nick F....38, 50, 71, 157, 309
Rejer, Izabela....122
Riccio, Angela....321
Rimbert, Sébastien....139
Roberts, Dustin....344
Roc, Aline....194
Rodrigues, Pedro Luiz Coelho....6, 111
Ron-Angevin, Ricardo....183
Roussel, Nicolas....317

S

Sancha-Ros, Salvador....183
Sanchez, Gaëtan....59
Sburlea, Andreea Ioana....54, 65, 100, 244, 279
Scarano, Gaetano....172
Schettini, Francesca....321
Schuster, Elisa
Schwartz, Denis....16
Schwarz, Andreas....188
Sebastián-Romagosa, Marc....303
Séguin, Perrine....261
Shim, Kyung-Hwan....216
Shishkin, Sergei L....291
Si-Mohammed, Hakim....317
So, Rosa....94
Soares, Alcimar Barbosa....59
Soler, Andres Felipe....297
Sosulski, Jan....273
Spataro, Rossella....206
Speier, William....344
Stow, Jacqueline....355
Stümpfig, Jana....249

T

Tangermann, Michael....166, 228, 273

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

 DOI: 10.3217/978-3-85125-682-6-00

List of Authors VII

Tateyama, Naoki....117
Thielen, Jordy....128
Tump, Danielle....27
Turi, Federica....133

U

Ueda, Kazutaka....117

V

Vaihinger, Mara....166
Van den Boom, Max....71, 157
Van der Vijgh, Ben....38, 50, 71, 157, 309
Van Zandvoort, Martine....50
Vansteensel, Mariska J....38, 50, 71, 157, 309
Vasilyev, Anatoly N....291
Veit, Joseline....228
Velasco-Alvarez, Francisco....183
Velichkovsky, Boris M....291
Verbaarschot, Ceci....255
Victor-Thomas, Guillaume....88

W

Weiss, Sarah....1
Wood, Guilherme....1
Wu, Zheng....11

X

Xu, Jiachen....32
Xu, Jiahua....11
Xu, Ren....206

Z

Zewdie, Ephrem....145
Zhao, Darisy G....291
Ziebell, Philipp....249

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

Table of Contents I

1. NIRS-BASED NEUROFEEDBACK TRAINING TO TREAT DYSPHAGIA.....1
Silvia Erika Kober, Sarah Weiss, Peter Grieshofer and Guilherme Wood
DOI: 10.3217/978-3-85125-682-6-01

2. THE RIEMANNIAN MINIMUM DISTANCE TO MEANS FIELD CLASSIFIER.....6
Marco Congedo, Pedro Lc Rodrigues and Christian Jutten
DOI: 10.3217/978-3-85125-682-6-02

3. DECODING SSVEP ON TIME AND FREQUENCY DOMAIN USING CONVOLUTIONAL NEURAL NETWORK.....11
Riddhi Gala, Jiahua Xu, Zheng Wu and Andreas Nuernberger
DOI: 10.3217/978-3-85125-682-6-03

4. LOOKING FOR CORTICAL PATTERNS OF SUCCESSFUL MOTOR IMAGERY-BASED BCI LEARNING.....16
Marie-Constance Corsi, Mario Chavez, Denis Schwartz, Nathalie George, Laurent Hugueville, Ari E. Kahn, Sophie Dupont, Danielle S. Bassett and Fabrizio De Vico Fallani
DOI: 10.3217/978-3-85125-682-6-04

5. ADVERSARIAL FEATURE LEARNING IN BRAIN INTERFACING: AN EXPERIMENTAL STUDY ON ELIMINATING DROWSINESS EFFECTS.....22
Ozan Ozdenizci, Barry Oken, Tab Memmott, Melanie Fried-Oken and Deniz Erdogmus
DOI: 10.3217/978-3-85125-682-6-05

6. SENSOR TYING, OPTIMAL MONTAGES FOR VEP-BASED BCI.....27
Sara Ahmadi, Marzieh Borhanazad, Danielle Tump, Jason Farquhar and Peter Desain
DOI: 10.3217/978-3-85125-682-6-06

7. INTERPRETABLE RIEMANNIAN CLASSIFICATION IN BRAIN-COMPUTER INTERFACING 32
Jiachen Xu, Moritz Grosse-Wentrup and Vinay Jayaram
DOI: 10.3217/978-3-85125-682-6-07

8. KEEP AN EYE ON IT: REPRESENTATION OF EYE MOVEMENTS IN THE SENSORIMOTOR CORTEX.....38
Mariana P Branco, Janne J Luppi, Sacha Leinders, Zachary V Freudenburg, Benny H van der Vijgh, Elmar G M Pels, Erik J Aarnoutse, Nick F Ramsey and Mariska J Vansteensel
DOI: 10.3217/978-3-85125-682-6-08

9. A WEARABLE SSVEP-BASED BRAIN-COMPUTER INTERFACE WITH OFF-THE-SHELF COMPONENTS.....44
Leopoldo Angrisani, Pasquale Arpaia, Antonio Esposito, Nicola Moccaldi and Marco Parvis
DOI: 10.3217/978-3-85125-682-6-09

10. COUNT ON IT: DORSOLATERAL PREFRONTAL CORTEX FOR BCI CONTROL IN LOCKED-IN SYNDROME.....50
Sacha Leinders, Erik Aarnoutse, Mariana Branco, Zachary Freudenburg, Elmar Pels, Ben Van der Vijgh, Martine Van Zandvoort, Mariska J Vansteensel and Nick Ramsey
DOI: 10.3217/978-3-85125-682-6-10

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

Table of Contents II

11. ASYNCHRONOUS DETECTION OF ERROR-RELATED POTENTIALS USING A GENERIC CLASSIFIER....54
Catarina Lopes Dias, Andreea Ioana Sburlea and Gernot R. Müller-Putz
DOI: 10.3217/978-3-85125-682-6-11

12. EVALUATING AUTOMATIC ARTIFACT CORRECTION FOR ONLINE HYPOTHESIS TESTING....59
Amanda Medeiros de Freitas, Gaëtan Sanchez, Françoise Lecaignard, Emmanuel Maby, Alcimar Barbosa Soares and Jérémie Mattout
DOI: 10.3217/978-3-85125-682-6-12

13. EXPECTATION MISMATCH DURING A TRACKING TASK: AN EEG ANALYSIS....65
Michele Bevilacqua, Catarina Lopes Dias, Andreea Ioana Sburlea and Gernot Müller-Putz
DOI: 10.3217/978-3-85125-682-6-13

14. CASE STUDY: TRADITIONAL MOTOR CORTEX CONTROL FEATURES IN ALS AND BRAINSTEM STROKE....71
Zachary Freudenburg, Mariska J Vansteensel, Benny Van der Vijgh, Mariana Branco, Sacha Leinders, Elmar Pels, Max van Den Boom, Erik Aarnoutse and Nick Ramsey
DOI: 10.3217/978-3-85125-682-6-14

15. RESONANCE - A BCI FRAMEWORK FOR WORKING WITH MULTIPLE DATA SOURCES. .77
Yury Nuzhdin
DOI: 10.3217/978-3-85125-682-6-15

16. PRESENTATION SPEEDS FOR A N400-BASED BCI....82
Karen Dijkstra, Jason Farquhar and Peter Desain
DOI: 10.3217/978-3-85125-682-6-16

17. TIMEFLUX: AN OPEN-SOURCE FRAMEWORK FOR THE ACQUISITION AND NEAR REAL-TIME PROCESSING OF SIGNAL STREAMS....88
Pierre Clisson, Raphaëlle Bertrand-Lalo, Marco Congedo, Guillaume Victor-Thomas and Jonas Chatel-Goldman
DOI: 10.3217/978-3-85125-682-6-17

18. INTRACORTICAL ACTIVITY DECODING OF MOTOR IMAGERY BASED ON DEEP CONVOLUTIONAL NEURAL NETWORK: A PILOT STUDY....94
Duo Chen, Rosa So, Yi Ding and Cuntai Guan
DOI: 10.3217/978-3-85125-682-6-18

19. SIMULTANEOUS DECODING OF VELOCITY AND SPEED DURING EXECUTED AND OBSERVED TRACKING MOVEMENTS: AN MEG STUDY....100
Reinmar Kobler, Masayuki Hirata, Hiroaki Hashimoto, Ryosuke Dowaki, Andreea Sburlea and Gernot Müller-Putz
DOI: 10.3217/978-3-85125-682-6-19

20. TRAINING EFFECTS OF A TACTILE BCI FOR WHEELCHAIR CONTROL....106
Matthias Eidel, Valeska Klemm and Andrea Kübler
DOI: 10.3217/978-3-85125-682-6-20

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

Table of Contents III

21. "WHEN DOES IT WORK?": AN EXPLORATORY ANALYSIS OF TRANSFER LEARNING FOR BCI.....111
Pedro Luiz Coelho Rodrigues, Marco Congedo and Christian Jutten
DOI: 10.3217/978-3-85125-682-6-21

22. EEG SOURCE ANALYSIS OF VISUAL MOTION IMAGERY FOR APPLICATION TO BRAIN-COMPUTER INTERFACE.....117
Koji Koizumi, Kazutaka Ueda, Naoki Tateyama and Masayuki Nakao
DOI: 10.3217/978-3-85125-682-6-22

23. AN ALGORITHM FOR DETECTION OF MULTIPLE BLINKS OF SINGLE AND BOTH EYES FROM EOG SIGNAL.....122
Izabela Rejer and Łukasz Cieszyński
DOI: 10.3217/978-3-85125-682-6-23

24. THE EFFECT OF HIGH AND LOW FREQUENCIES IN C-VEP BCI.....128
Marzieh Borhanazad, Jordy Thielen, Jason Farquhar and Peter Desain
DOI: 10.3217/978-3-85125-682-6-24

25. ADAPTIVE PARAMETER SETTING IN A CODE MODULATED VISUAL EVOKED POTENTIALS BCI.....133
Federica Turi and Maureen Clerc
DOI: 10.3217/978-3-85125-682-6-25

26. CAN SUGGESTIVE HYPNOSIS BE USED TO IMPROVE THE BCI PERFORMANCE?.....139
Sébastien Rimbert, Oleksii Avilov, Perrine Adam and Laurent Bougrain
DOI: 10.3217/978-3-85125-682-6-26

27. BRAIN-COMPUTER INTERFACE COMMUNICATION FOR A LOCKED IN CHILD WITH EPILEPTIC ENCEPHALOPATHY.....145
Ephrem Zewdie, Zeanna Jadavji, Daphne Kaketsis and Adam Kirton
DOI: 10.3217/978-3-85125-682-6-27

28. PEDIATRIC BRAIN-COMPUTER INTERFACE COMPETENCY: A PILOT STUDY.....151
Dion Kelly, Ephrem Zewdie and Adam Kirton
DOI: 10.3217/978-3-85125-682-6-28

29. UTRECHT NEUROPROSTHESIS SYSTEM: NEW FEATURES TO ACCOMMODATE USER NEEDS.....157
Benny van der Vijgh, Max van den Boom, Mariana Branco, Sacha Leinders, Zachary Freudenburg, Elmar Pels, Mariska van Steensel, Nick Ramsey and Erik Aarnoutse
DOI: 10.3217/978-3-85125-682-6-29

30. SYSTEMATIC REVIEW OF THE STATE-OF-THE-ART IN BRAIN COMPUTER INTERFACE ROBOTIC WALKING IN STROKE.....161
Alexander Heilinger, Máire Claffey and Olive Lennon
DOI: 10.3217/978-3-85125-682-6-30

31. A SIMULATED ENVIRONMENT FOR STUDYING PARTIAL OBSERVABILITY IN NOVEL ADAPTIVE DEEP BRAIN STIMULATION.....166

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

Table of Contents IV

Sebastián Castaño-Candamil, Mara Vaihinger and Michael Tangermann
DOI: 10.3217/978-3-85125-682-6-31

32. COMBINATION OF CONNECTIVITY AND SPECTRAL FEATURES FOR MOTOR-IMAGERY BCI....172
Tiziana Cattai, Stefania Colonnese, Marie-Constance Corsi, Danielle Bassett, Gaetano Scarano and Fabrizio De Vico Fallani
DOI: 10.3217/978-3-85125-682-6-32

33. HETEROGENEOUS REAL-TIME MULTI-CHANNEL TIME-DOMAIN FEATURE EXTRACTION USING PARALLEL SUM REDUCTION ON GPU....178
Jetsada Arnin, Danial Kahani, Heba Lakany and Bernard Conway
DOI: 10.3217/978-3-85125-682-6-33

34. UMA-BCI SPELLER, A P300-BASED SPELLING TOOL....183
Francisco Velasco-Alvarez, Salvador Sancha-Ros, Esther García-Garaluz, Álvaro Fernández-Rodríguez, María Teresa Medina-Juliá and Ricardo Ron-Angevin
DOI: 10.3217/978-3-85125-682-6-34

35. ONLINE DETECTION OF HAND OPEN VS PALMAR GRASP ATTEMPTS IN A PERSON WITH SPINAL CORD INJURY....188
Patrick Ofner, Joana Pereira, Andreas Schwarz and Gernot R. Müller-Putz
DOI: 10.3217/978-3-85125-682-6-35

36. WOULD MOTOR-IMAGERY BASED BCI USER TRAINING BENEFIT FROM MORE WOMEN EXPERIMENTERS?....194
Aline Roc, Léa Pillette, Bernard N'Kaoua and Fabien Lotte
DOI: 10.3217/978-3-85125-682-6-36

37. DESIGN AND PRELIMINARY STUDY OF A NEUROFEEDBACK PROTOCOL TO SELF-REGULATE AN EEG MARKER OF DROWSINESS....200
Thibaut Monseigne, Fabien Lotte, Stephanie Bioulac, Pierre Philip and Jean-Arthur Micoulaud-Franchi
DOI: 10.3217/978-3-85125-682-6-37

38. EFFECTS OF 10 VIBRO-TACTILE P300 BCI SESSIONS ON THE COMA RECOVERY SCALE-REVISED IN PATIENTS WITH MINIMALLY CONCSIOUS STATE....206
Alexander Heilinger, Nensi Murovec, Ren Xu, Yangyang Miao, Jing Jin, Rupert Ortner, Rossella Spataro, Vincenzo La Bella and Christoph Guger
DOI: 10.3217/978-3-85125-682-6-38

39. ARE USERS' TRAITS INFORMATIVE ENOUGH TO PREDICT/EXPLAIN THEIR MENTAL-IMAGERY BASED BCI PERFORMANCES?....210
Camille Benaroch, Fabien Lotte and Camille Jeunet
DOI: 10.3217/978-3-85125-682-6-39

40. CLASSIFICATION OF VARIOUS GRASPING TASKS BASED ON TEMPORAL SEGMENTATION METHOD USING EEG AND EMG SIGNALS....216
Jeong-Hyun Cho, Ji-Hoon Jeong, Kyung-Hwan Shim and Seong-Whan Lee

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

Table of Contents V

DOI: 10.3217/978-3-85125-682-6-40

41. PERFORMANCE, TRANSFER LEARNING AND UNDERLYING PHYSIOLOGY IN CHILDREN PLAYING P300 BCI GAMES.....222
Mélodie Fouillen, Emmanuel Maby, Marta Partyka, Vania Herbillon and Jérémie Mattout
DOI: 10.3217/978-3-85125-682-6-41

42. HETEROGENEITY OF EVENT-RELATED POTENTIALS IN A SCREEN-FREE BRAIN-COMPUTER INTERFACE.....228
Henrich Kolkhorst, Joseline Veit, Wolfram Burgard and Michael Tangermann
DOI: 10.3217/978-3-85125-682-6-42

43. THE EFFECT OF PERFORMANCE EXPECTANCY AND ACHIEVEMENT MOTIVE IN A P300 BASED BRAIN-COMPUTER INTERFACE.....234
Sonja Kleih, Andreas Eder and Andrea Kübler
DOI: 10.3217/978-3-85125-682-6-43

44. EVALUATION OF AUDITORY BCI SYSTEM BASED ON STREAM SEGREGATION.....239
Shin'Ichiro Kanoh and Simon Kojima
DOI: 10.3217/978-3-85125-682-6-44

45. TUNING OF PARAMETERS FOR A VIBROTACTILE KINAESTHETIC FEEDBACK SYSTEM UTILIZING TACTILE ILLUSIONS.....244
Lea Hehenberger, Andreea Ioana Sburlea and Gernot Rudolf Müller-Putz
DOI: 10.3217/978-3-85125-682-6-45

46. INTRODUCING A MOTIVATING TRAINING STUDY DESIGN TO COMPARE AUDITORY AND TACTILE STREAMING-BASED P300 BCIS.....249
Philipp Ziebell, Jana Stümpfig, Sonja Kleih, Marc Erich Latoschik, Andrea Kübler and Sebastian Halder
DOI: 10.3217/978-3-85125-682-6-46

47. FLIP-THAT-BUCKET: A FUN EEG-BCI GAME ON GOOEY MOVEMENT INTENTIONS.....255
Ceci Verbaarschot, Pim Haselager and Jason Farquhar
DOI: 10.3217/978-3-85125-682-6-47

48. WHY BCIS WORK POORLY WITH THE PATIENTS WHO NEED THEM THE MOST?.....261
Perrine Séguin, Emmanuel Maby and Jérémie Mattout
DOI: 10.3217/978-3-85125-682-6-48

49. SIMPLE DEEP NEURAL NETWORKS SHOW STATE-OF-THE-ART PERFORMANCE IN ERP-BASED BCI.....267
Loïc Delobel, Emmanuel Maby and Jérémie Mattout
DOI: 10.3217/978-3-85125-682-6-49

50. SPATIAL FILTERS FOR AUDITORY EVOKED POTENTIALS TRANSFER BETWEEN DIFFERENT EXPERIMENTAL CONDITIONS.....273
Jan Sosulski and Michael Tangermann
DOI: 10.3217/978-3-85125-682-6-50

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

Table of Contents VI

51. HOW SIMILAR ARE THE NEURAL PATTERNS WHEN OBSERVING GRASPING HAND POSTURES TO THE BEHAVIORAL PATTERNS WHEN EXECUTING THE GRASP?.....279
Andreea Ioana Sburlea and Gernot Müller-Putz
DOI: 10.3217/978-3-85125-682-6-51

52. SWLDA OFFERS A VALUABLE TRADE-OFF BETWEEN INTERPRETABILITY AND ACCURACY FOR REHABILITATIVE BCIS.....285
Emma Colamarino, Tommaso Colombo, Floriana Pichiorri, Donatella Mattia, Laura Palagi and Febo Cincotti
DOI: 10.3217/978-3-85125-682-6-52

53. AN EXPECTATION-BASED EEG MARKER FOR THE SELECTION OF MOVING OBJECTS WITH GAZE.....291
Darisy G. Zhao, Anatoly N. Vasilyev, Bogdan L. Kozyrskiy, Andrey V. Isachenko, Eugeny V. Melnichuk, Boris M. Velichkovsky and Sergei L. Shishkin
DOI: 10.3217/978-3-85125-682-6-53

54. PARTIAL BRAIN MODEL FOR REAL-TIME CLASSIFICATION OF RGB VISUAL STIMULI: A BRAIN MAPPING APPROACH TO BCI.....297
Andres Felipe Soler, Eduardo Giraldo and Marta Molinas
DOI: 10.3217/978-3-85125-682-6-54

55. CORRELATIONS BETWEEN THE LATERALITY COEFFICIENT AND FUNCTIONAL SCALES IN STROKE PATIENTS.....303
Marc Sebastián-Romagosa, Rupert Ortner, Josep Dinarès-Ferran and Christoph Guger
DOI: 10.3217/978-3-85125-682-6-55

56. LONG-TERM HOME USE OF A FULLY IMPLANTED BCI FOR COMMUNICATION: VISUAL AND AUDITORY SPELLING.....309
Erik Aarnoutse, Sacha Leinders, Zachary Freudenburg, Benny van der Vijgh, Elmar Pels, Mariana Branco, Nick Ramsey and Mariska J Vansteensel
DOI: 10.3217/978-3-85125-682-6-56

57. A SCORE BASED METHOD FOR P300 COLLABORATIVE BCI.....312
Chiara Liti, Luigi Bianchi, Veronica Piccialli and Francesco Gambardella
DOI: 10.3217/978-3-85125-682-6-57

58. DEFINING BRAIN-COMPUTER INTERFACES: A HUMAN-COMPUTER INTERACTION PERSPECTIVE.....317
Hakim Si-Mohammed, Géry Casiez, Ferran Argelaguet, Nicolas Roussel and Anatole Lécuyer
DOI: 10.3217/978-3-85125-682-6-58

59. INVESTIGATION OF NEEDS AND CHARACTERISTICS OF END-USERS, FOR A FUTURE INCLUSION OF BCIS IN AT-CENTERS.....321
Angela Riccio, Francesca Schettini, Enrico Giraldi, Federica Cappalonga, Lisa Pelagallu, Febo Cincotti and Donatella Mattia
DOI: 10.3217/978-3-85125-682-6-59

60. BCI THERAPIES TRIGGERING SENSORY FEEDBACK FOR MOTOR REHABILITATION AFTER STROKE: A SYSTEMATIC REVIEW.....326

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology

Table of Contents VII

Claudia Bigoni and Friedhelm Christoph Hummel
DOI: 10.3217/978-3-85125-682-6-60

61. TOWARDS EEG-BASED SIGNALS CLASSIFICATION OF RGB COLOR-BASED STIMULI 332
Sara Hegdahl Åsly, Luis Alfredo Moctezuma, Marta Molinas and Monika Gilde
DOI: 10.3217/978-3-85125-682-6-61

62. CLASSIFICATION OF IMAGINED SPOKEN WORD-PAIRS USING CONVOLUTIONAL NEURAL NETWORKS.....338
Ciaran Cooney, Attila Korik, Rafaella Folli and Damien Coyle
DOI: 10.3217/978-3-85125-682-6-62

63. A SELF-PACED P300 SPELLER WITH IMPROVED TYPING SPEED USING CONTINUOUS STIMULUS PRESENTATIONS.....344
William Speier, Corey Arnold, Nand Chandravadia, Dustin Roberts, Shrita Pendekanti, Andrew Marttini and Nader Pouratian
DOI: 10.3217/978-3-85125-682-6-63

64. MOVEMENT RELATED CORTICAL POTENTIALS DURING HAND OPENING AND CLOSING IN ALS PATIENTS.....350
Strahinja Dosen and Natalie Mrachacz-Kersting
DOI: 10.3217/978-3-85125-682-6-64

65. TOWARDS ANSWERING QUESTIONS IN DISORDERS OF CONSCIOUSNESS AND LOCKED-IN SYDROME WITH A SMR-BCI.....355
Natalie Dayan, Alain Bigirimana, Alison McCann, Jacqueline Stow, Jacinta McElligott, Aine Carroll and Damien Coyle
DOI: 10.3217/978-3-85125-682-6-65

CC BY-ND

Published by Verlag der TU Graz
Graz University of Technology