

A project proposal of the Greek Aerospace Medical Association and Space Research (AO-09-BR)"



LTBR {AO-2009-BR-1158}

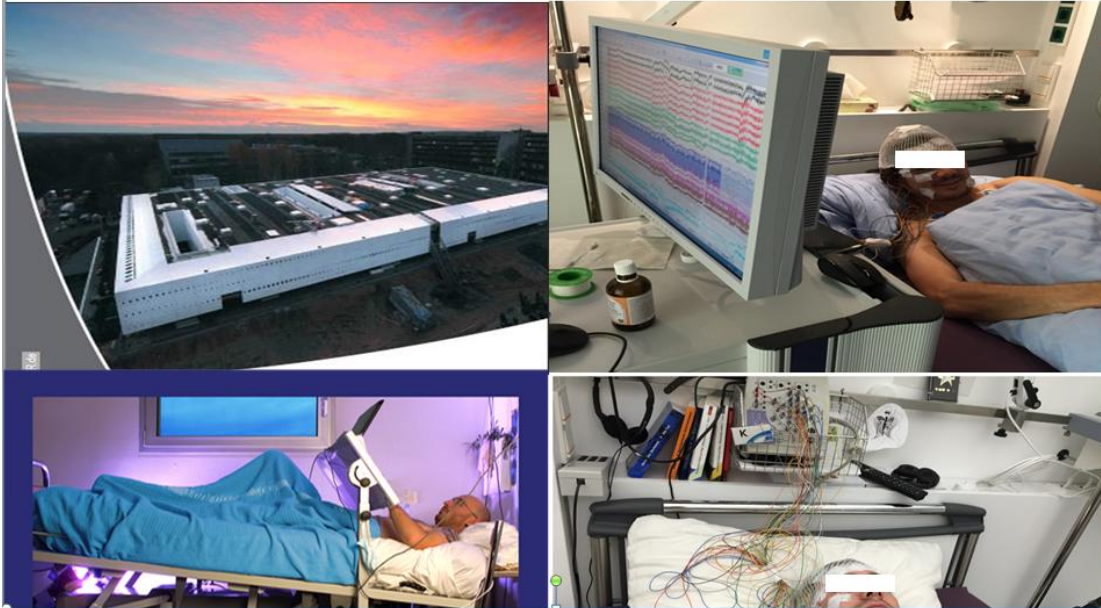
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Co-PI: Prof. Panagiotis D. Bamidis

European Space Agency (ESA) funded project, RSL study

Metabolic markers in Space flight analogue Bed rest, with sledge as a potential countermeasure to ameliorate the detrimental effects of microgravity

THE GERMAN CLINICAL TRIALS REGISTER (DRKS), THE IDENTIFICATION NUMBER : DRKS00012946

This study was performed in the ENVIHAB premises of the German Aerospace Center (DLR) in Cologne, Germany.



P.I. Dr. Chrysoula Kourtidou-Papadeli

Recordings by Dr. Christos A. Frantzidis and Polyxeni Guivogli supported financially by Prof. Panagiotis Bamidis

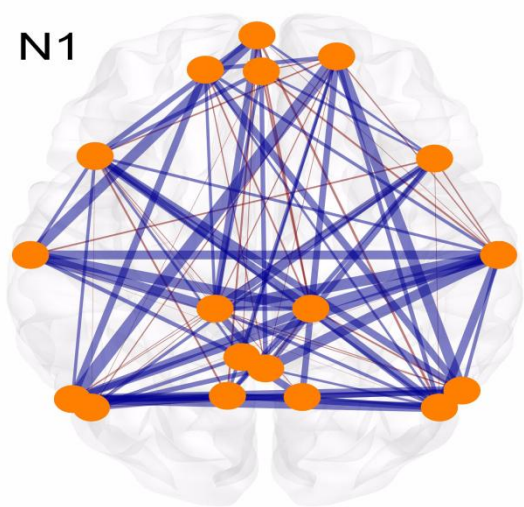
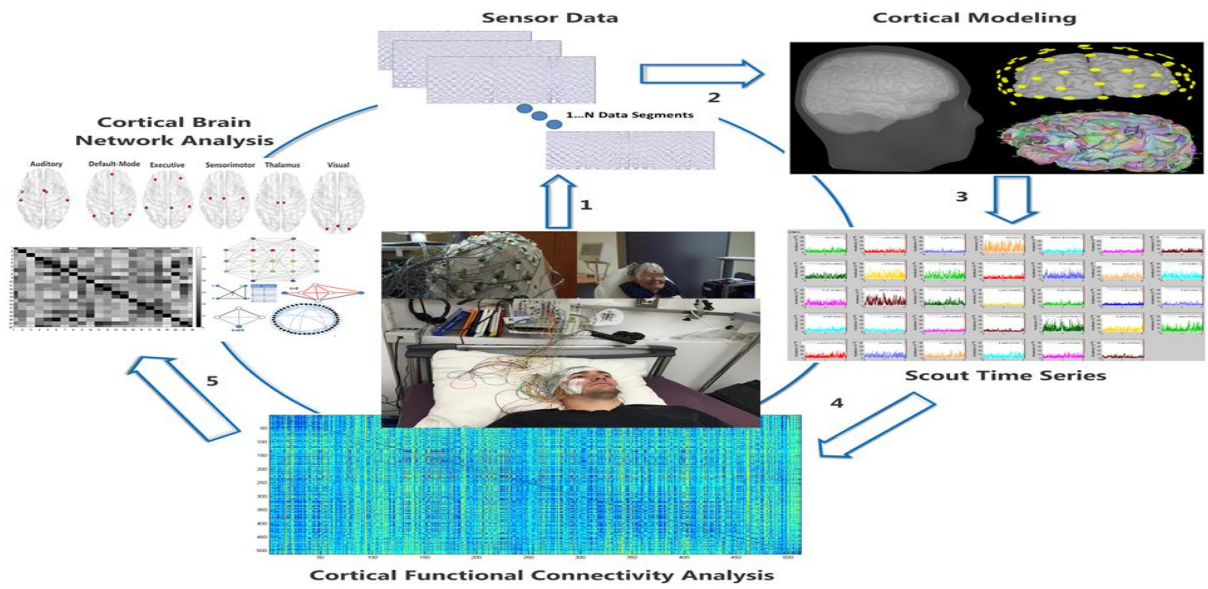


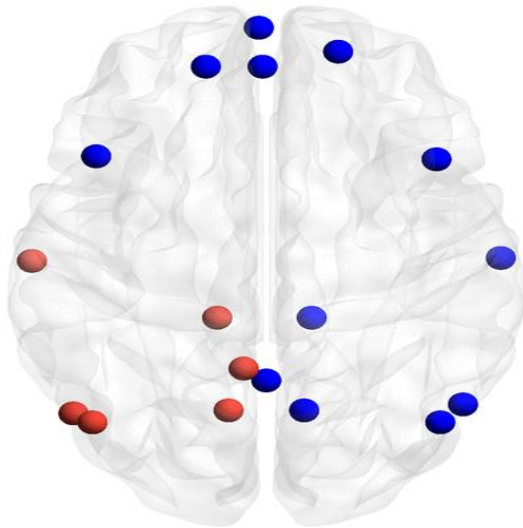
Study Aims to accomplish



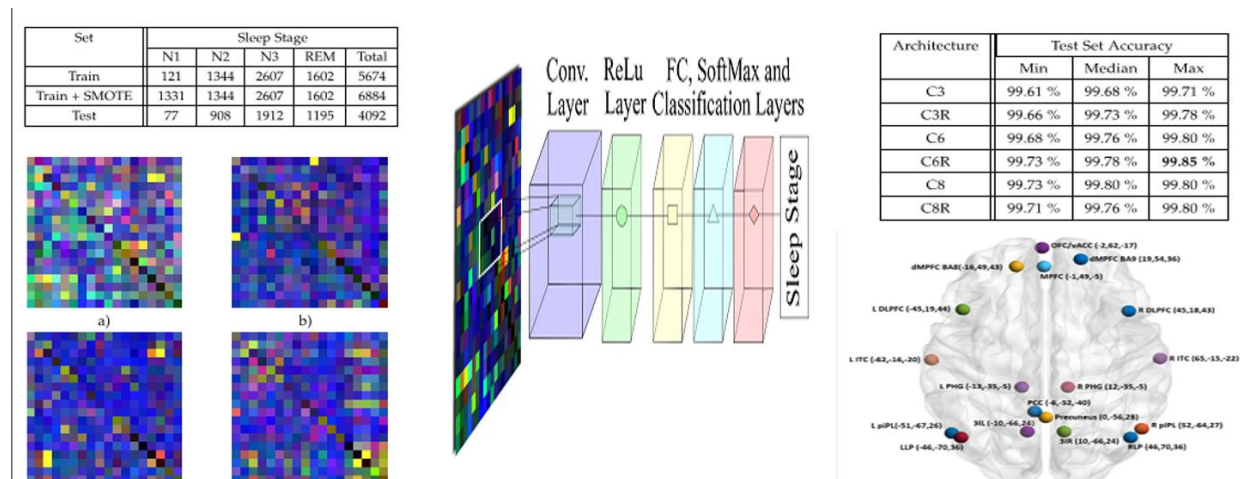
1. To investigate the impact of long-term spaceflights on sleep macro-architecture, brain function at the cortical level
2. To provide an integrative framework for assessing the countermeasure's robustness
3. To establish Artificial Intelligence (AI) techniques for assessing astronauts' mental & physical well-being through remote sensing, on-board equipment

We have implemented a neuroscientific methodology based on contemporary mathematic tools in order to estimate cortical activations during sleep. Then, we employ contemporary mathematical tools (e.g. functional connectivity and brain networks) for quantifying the dynamic interplay among brain regions during the various sleep stages.





By transforming the polysomnographic (PSG) recordings during sleep to RGB images quantifying the dynamic interplay among resting-state networks, we can employ artificial intelligence techniques to perform automatic sleep staging.



Publications

Automatic Sleep Staging Employing Convolutional Neural Networks and Cortical Connectivity Images.

Chriskos P, Frantzidis CA, Gkivogkli PT, Bamidis PD, **Kourtidou-Papadeli**

C.IEEE Trans Neural Netw Learn Syst. 2020 Jan;31(1):113-123. doi:

10.1109/TNNLS.2019.2899781. Epub 2019 Mar 15.

Human blood adenosine biomarkers and non-rapid eye movement sleep stage 3 (NREM3) cortical functional connectivity associations during a 30-day head-down-tilt bed rest analogue: Potential effectiveness of a reactive sledge jump as a countermeasure.

Nday CM, Frantzidis CA, Plomariti C, Gilou SC, Ntakakis G, Jackson G, Chatziioannidis L, Bamidis PD, **Kourtidou-Papadeli C.** *J Sleep Res.* 2021 Oct;30(5):e13323. doi: 10.1111/jsr.13323. Epub 2021 Apr 7. PMID: 33829595

Achieving Accurate Automatic Sleep Staging on Manually Pre-processed EEG Data Through Synchronization Feature Extraction and Graph Metrics.

Chriskos P, Frantzidis CA, Gkivogkli PT, Bamidis PD, **Kourtidou-Papadeli C.** *Front Hum Neurosci.* 2018 Mar 23;12:110. doi: 10.3389/fnhum.2018.00110. eCollection 2018. PMID: 29628883

Arterial Stiffness Alterations in Simulated Microgravity and Reactive Sledge as a Countermeasure.

Krachtis A, Karkala A, Frantzidis CA, Gkivogkli PT, Ladas AI, Strollo F, **Kourtidou-Papadeli C.** *High Blood Press Cardiovasc Prev.* 2022 Jan;29(1):65-74. doi: 10.1007/s40292-021-00486-2. Epub 2021 Nov 13.

SmartHypnos: Developing a Toolbox for Polysomnographic Data Visualization and Analysis.

Chriskos P, Frantzidis CA, Gkivogkli PT, Papanastasiou E, **Kourtidou-Papadeli C,** Bamidis PD. *Annu Int Conf IEEE Eng Med Biol Soc.* 2019 Jul;2019:1395-1398. doi: 10.1109/EMBC.2019.8857416. PMID: 31946153

Advanced network neuroscience approaches in sleep neurobiology on extreme environments.

Frantzidis CA, Nday CM, Chriskos P, Gkivogkli PT, Bamidis PD, **Kourtidou-Papadeli C.** *Annu Int Conf IEEE Eng Med Biol Soc.* 2019 Jul;2019:4046-4067. doi: 10.1109/EMBC.2019.8857053. PMID: 31946760

Current trends and future perspectives of space neuroscience towards preparation for interplanetary missions.

Frantzidis CA, Kontana E, Karkala A, Nigdelis V, Karagianni M, Nday CM, Ganapathy K, **Kourtidou-Papadeli C.** *Neurol India.* 2019 May-Jun;67(Supplement):S182-S187. doi: 10.4103/0028-3886.259124. PMID: 31134908

A review on current trends in automatic sleep staging through bio-signal recordings and future challenges.

Chriskos P, Frantzidis CA, Nday CM, Gkivogkli PT, Bamidis PD, **Kourtidou-Papadeli C**. Sleep Med Rev. 2021 Feb;55:101377. doi: 10.1016/j.smrv.2020.101377. Epub 2020 Sep 9. PMID: 33017770