Peyman Ghobadi-Azbari

- Ph.D candidate of Biomedical Engineering, Shahed University, Department of Biomedical Engineering, Tehran, Iran.
- Iranian National Center for Addiction Studies (INCAS), Neurocognitive Laboratory (NCL), Tehran, Iran.
Phone: +98 911 9371985
Date and Place of Birth: 1986, Tehran
Nationality: Iranian
Email: peymanbiom@gmail.com p.ghobadi@shahed.ac.ir
Languages: Persian, English

Personal Statement:

I was admitted to the Tehran University of Medical Sciences (TUMS) in 2011 as a biomedical engineering student after passing the MSc national university entrance exam with a rank of 8. I became interested in the neuronavigation systems in general and computational modelling and brain image processing in particular. I received my first grant as a biomedical engineering student in 2012 and published my first paper on the "Design a new hybrid system for patient dose reduction in image-guided surgery using a tracked mobile C-arm". I graduated from TUMS with honors in 2014. My dissertation was on the design a novel structure "Stereo-C-arm". Immediately, I started to work at the Research Center for Science and Technology in Medicine (RCSTIM). As the researcher of Intelligent Surgical System lab, I found great opportunities to explore the neuronavigation systems in order to improve clinical outcomes for neurosurgical procedures and therapies.

To extend my knowledge, I was admitted to the Shahed University in 2015 as a biomedical engineering student after passing the PhD national university entrance exam with a rank of 23 and do my thesis project on the development and integration of non-invasive transcranial brain stimulation techniques with neuroimaging approaches for use in the domain of obesity and addiction. In this project, we tried to bridge the gaps between neuroscience studies and urgent needs in the clinical practice in medicine for obesity.

With this proposal, we want to investigate the understanding of the neurocognitive mechanisms of obesity and addictive disorders, combining gyri-precise finite element head models and functional MRI for predicting behavioral and neural responses underlying tDCS, and machine learning methods to identify predictive biomarkers for the efficacy of tDCS among people with obesity and addictive disorders.

Description (research project):

Obesity is among the most important worldwide public health concerns. A majority of subjects with frequent food cravings attempting classical interventions, based on psychological and nutritional interventions, pharmacological treatments and bariatric surgery, relapse within 1 year of obesity treatment. Craving, especially cue-induced craving, is a trigger of overeating relapses. Novel therapies are needed to improve obesity treatment outcomes. Recently, some studies have shown that transcranial direct current stimulation (tDCS) can help reduce food-related behaviors, such as reported craving and food intake. Because of non-invasiveness, ease of use and low cost, tDCS may be a potential therapeutic alternative in future obesity reduce programs. However, the neural mechanisms of action of tDCS are still uncertain, although different theories have emerged.

In particular, top down regulation of prefrontal cortex (PFC), particularly dorsolateral PFC (DLPFC), over the reward-related regions of the brain (ventral striatum, amygdala, and ventral tegmental area), is commonly assumed to be the critical process underlying food cue-induced craving (Figure 1).

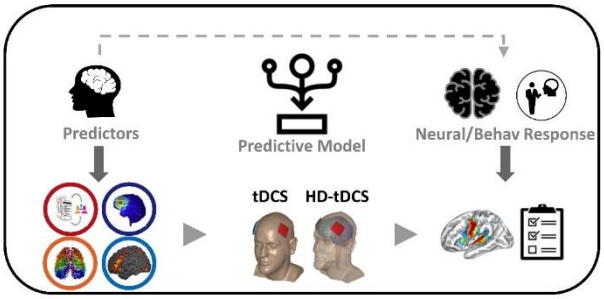

Figure 3: Estimating the prediction power of fMRI for explaining the variance in the behavioral/neural outcomes in response to tDCS.

Transcranial Direct Current Stimulation (tDCS) is a form of neuromodulation employed to change cortical excitability by using constant, low direct current delivered to specifically targeted areas of the brain via electrodes on the head (Figure 2).

There is emerging evidence that tDCS over DLPFC, a complex target site related to executive functions that supports cognitive control of food intake, can affect the reward–cognition balance towards facilitation of cognitive control and possibly suppression of reward-related mechanisms that drive food cue-induced craving and polyphagia4. However, the neural mechanisms behind the effects of tDCS remain largely unknown.

There are emerging evidences that tDCS over DLPFC can affect food cue-induced craving in different eating disorders and obesity.

The overall aim of the proposed research study is to investigate whether tDCS can amplify DLPFC's top-down modulatory role via its local and distance functional coupling to other cortical-subcortical areas.

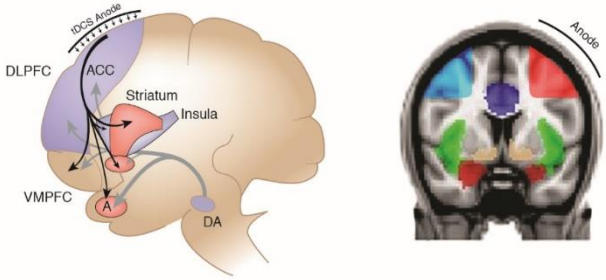

Figure1: Hypothesized role for tDCS over DLPFC to amplify its top-down modulation.

It is noteworthy that there is a high level of individual differences in response to tDCS and little is known about what symptomatic, behavioral or neural circuit function predicts response to tDCS in general and among obese subjects in particular.

In addition, we will conduct individual difference analyses to investigate whether pre-tDCS top-down connectivity measures of DLPFC along with other behavioral and clinical variables can predict response to tDCS in food cue induced craving (Figure 3).

We emphasize that this is the first study using integration of tDCS with fMRI in food craving; this study will offer the possibility of investigating neural mechanisms behind the effects of tDCS for different obesity disorders using both cue-reactivity task based and resting state functional neuroimaging methods.

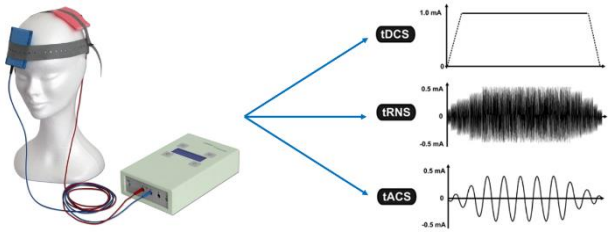

Figure 2: Transcranial Electrical Stimulation (TES) and Its Three Main Types. Here in this study, we will just use direct current (tDCS). But, alternating currents and random noise current could also be used.

Moreover, using the computational brain network modeling, we will be able to predict the efficacy of tDCS among obesity disorders, which will advance the field towards precision obesity medicine (Figure 4).

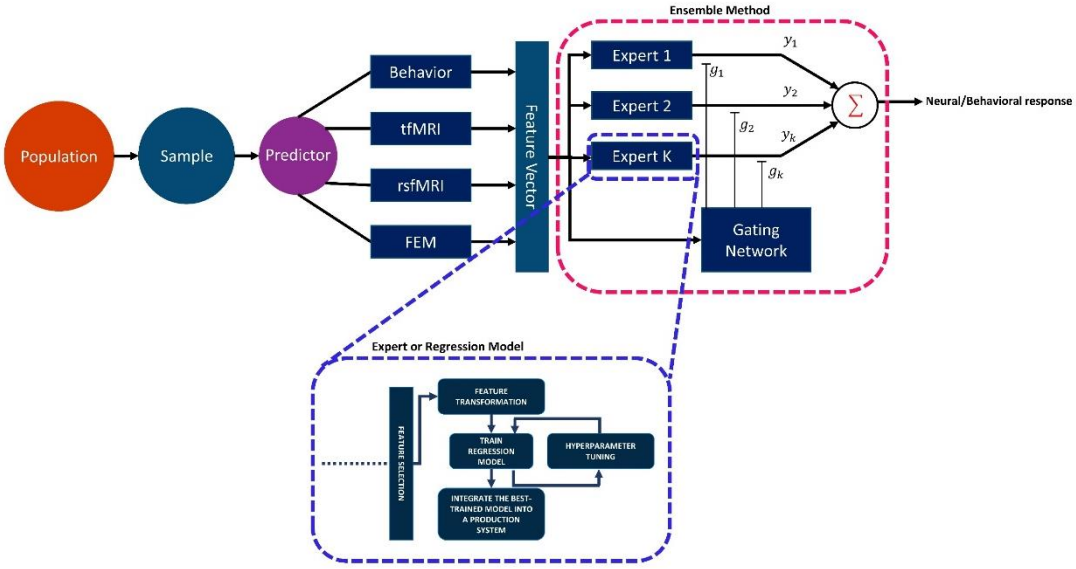

Figure 4: Details of the prediction model shown in Figures 3.

Academic Qualifications:

- **2007-2010** Qazvin University, Department of Engineering. Bachelor of Science **B.Sc:** Biomedical Engineering, Bioelectric
- **2011-2014** Tehran University of Medical Sciences, Department of Biomedical Systems & Medical Physics. **Master of Science MSc:** Biomedical Engineering, Bioelectric
- **2015-Continue** Shahed University, Department of Biomedical Engineering. **Doctor of Philosophy PhD:** Biomedical Engineering, Bioelectric

Academic Honors:

- Named as Top student among Biomedical Engineering B.Sc students, Qazvin University.
- 8th Ranks in admission exam entering M.S. degree program in IRAN.
- 23th Ranks in admission exam entering PhD degree program in IRAN.

IT Skills:

- **Programming:** Matlab, Visual Basic, C, R
- **Image Processing Software:** MeVisLab, Amira, AFNI, SimNIBS

Professional Activities:

- Researcher at Research Center of Biomedical Technology ad Robotics (RCBTR), Image Guided Intervention Group, Image Guided Surgery Lab, Tehran, Iran 2013- 2014.
- Researcher at Research Center for Science and Technology in Medicine (RCSTIM), Image Guided Intervention Group, Image Guided Surgery Lab, Tehran, Iran, 2011- 2013.
- Researcher at Parseh Intelligent Surgical System Company, 2012-2013.

Research Projects:

- Peyman Ghobadi Azbari, Alireza Ahmadian, Hooshang Saberi, Mohammadreza. Ay, "Design a new hybrid system for patient dose reduction in image-guided surgery using a tracked mobile C-arm", Tehran University of Medical Sciences – Tehran, IRAN.
- Peyman Ghobadi Azbari, Alireza Ahmadian, Hooshang Saberi, Mohammadreza Ay, "Design a novel structure "Stereo-C-arm" for dose reduction in image-guided surgery", Research Center for Science and Technology in Medicine (RCSTIM), Research Center of Biomedical Technology ad Robotics (RCBTR) – Tehran, IRAN.
- Peyman Ghobadi-Azbari, Amin Hassanvand, Mohammad Hossain Amini, "Feasibility study for Space Object Tracking from Phased Array Radar System", Aerospace University Complex of Malek Ashtar University of Technology– Tehran, IRAN.
- Peyman Ghobadi-Azbari, Amin Hassanvand, "Design, simulation and fabrication of Antenna for AGU system", Aerospace University Complex of Malek Ashtar University of Technology– Tehran, IRAN.
- Peyman Ghobadi-Azbari, Mohammad Bayanvandi, Ayoub Jafari, "Vehicle license plate recognition using image processing and neural network", QAZVIN University – Qazvin, IRAN.

Ongoing Projects

- Addiction Recovery Path (ARP)
- Small-and Large-Scale Network Modulation as Mechanistic and Predictive Biomarkers for tDCS; Randomized Clinical Trials among People with Obesity
- Resting-state MRI as a Predictive Measure for tDCS; Randomized Clinical Trials among Methamphetamine Users

University Lecturer:

- Logic Circuit, Circuit1, Electrical Physics, Physics2, Electrical Circuit, Digital Electronic Shahed University, Tehran, IRAN
- Medical Physics, Islamic Azad University of Eslamshahr, Tehran, IRAN

Publications:

Journal:

- Ghobadi Azbari P, Mohaqeqi S, Ghanbarzadeh Gashti N, Mikaili M. Introducing a combined approach of empirical mode decomposition and PCA methods for maternal and fetal ECG signal processing. The Journal of Maternal-Fetal & Neonatal Medicine. 2016 Oct 1;29(19):3104-9.
- AZBARI PG, Ahmadian A, Saberi H, Ay M, Abdolghaffar M, KHOIY KA. A hybrid tracking system for image-guided spine surgery using a tracked mobile C-arm: a phantom study. Turkish Journal of Electrical Engineering & Computer Sciences. 2017 Jan 24;25(1):434-48.
- Azbari PG, Abdolghaffar M, Mohaqeqi S, Pooyan M, Ahmadian A, Gashti NG. A novel approach to the extraction of fetal electrocardiogram based on empirical mode decomposition and correlation analysis. Australasian physical & engineering sciences in medicine. 2017 Sep 1;40(3):565-74.
- Esmaeilpour Z, Shereen AD, Ghobadi-Azari P, Datta A, Woods AJ, Ironside M, O'Shea J, Kirk U, Bikson M, Ekhtiari H. Methodology for tDCS integration with fMRI. medRxiv. 2019 Jan 1:19006288.

Conference:

- M. Bayanvandi, P. Ghobadi Azbari, M. A. Shahi Ashtiani, M. Shahravi, "Design of hybrid PID-fuzzy controller for controlling the position of a satellite", 11th Iranian Conference on Intelligent Systems February 27th & 28th, 2013.
- R. Khayati, P.Ghobadi Azbari, F. Khalili, Saeed Mohagheghi, M. Sigaroudy, "A real-time segmentation in CT images using Otsu optimized method by PSO", 3rd National Conference New Idea On Electrical Engineering December 28th & 29th, 2014.

Book:

- Set of questions and answers for entrance exam of pharmacy courses and basic Sciences