Conference Booklet

2nd IBRO-APRC

Fundamental of Neuroscience, Neural Disorders, and Neural Engineering 2019

2nd IBRO-APRC Bangladesh Associate School of Neuroscience

4-8 December, 2019
Dhaka, Bangladesh

Organized by:
AIMS Lab, United International University
Dhaka, Bangladesh
2nd IBRO-APRC

Bangladesh Associate School of Neuroscience

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# Program Schedule

## Day 1: Wednesday
4th December at United International University

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 am – 11:30 am</td>
<td>Inauguration Ceremony</td>
</tr>
<tr>
<td>11:30 am – 12:00 pm</td>
<td>Refreshment Break (Program Venue)</td>
</tr>
<tr>
<td>12:00 pm – 1:00 pm</td>
<td>Quantitative Modeling and Analysis of Multiscale Brain Structure and Dynamics</td>
</tr>
<tr>
<td>1:00 pm – 2:00 pm</td>
<td>Lunch (Program Venue) and Prayer Break</td>
</tr>
<tr>
<td>2:00 pm – 3:15 pm</td>
<td>Fundamental Neuroscience</td>
</tr>
<tr>
<td>3:15 pm – 4:30 pm</td>
<td>Neuromodulation: Opportunities and Challenges</td>
</tr>
<tr>
<td>4:30 pm – 5:35 pm</td>
<td>Prayer and Refreshment (Program Venue)</td>
</tr>
<tr>
<td>5:35 pm – 6:50 pm</td>
<td>Thoughts on Selection, Execution and Funding of Research Projects</td>
</tr>
<tr>
<td>7:00 pm</td>
<td>Dinner (Program Venue)</td>
</tr>
</tbody>
</table>
### Day 2: Thursday  
5th December at United International University

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Description</th>
<th>Speaker and Affiliation</th>
</tr>
</thead>
</table>
| 10:00 am – 11:00 am | The Effect of Feedback in Activity-Dependent Brain Spectrum                         | Dr. Nipa Roy  
Assistant Professor, INS, UIU |
| 11:00 am – 11:15 am | Refreshment Break (Program Venue)                                                  |                                                            |
| 11:15 am – 1:00 pm  | Brain-Machine Interface – A Transitional Neural Engineering Technology for Treatment and Rehabilitation | Prof. Khondaker Abdullah Al Mamun  
Professor, CSE, UIU |
| 1:00 pm – 2:00 pm     | Lunch (Program Venue) and Prayer Break                                             |                                                            |
| 2:00 pm – 3:45 pm    | State-of-the-art EEG Signal Processing Techniques in the Diagnosis and Treatment of Neurological Diseases | Dr. Md. Kafiul Islam  
Assistant Professor, EEE, IUB |
| 3:45 pm – 4:15 pm    | Refreshment (Program Venue) and Prayer Break                                       |                                                            |
| 4:15 pm – 5:15 pm    | Dementia a Growing Burden in Bangladesh                                            | Dr. Mithila Faruque  
Assistant Professor and Head, Noncommunicable Diseases, BUHS |
| 5:15 pm – 5:35 pm    | Prayer and Tea Break (Program Venue)                                               |                                                            |
| 5:35 pm – 6:50 pm    | Introduction to the Development of the Nervous System                              | Dr. Aurnab Ghose  
Indian Institute of Science Education and Research (IISER) Pune, India |
| 7:00 pm             | Dinner (Program Venue)                                                             |                                                            |
### Day 3: Friday
6th December at United International University

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker</th>
</tr>
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<tbody>
<tr>
<td>10:00 am – 11:30 am</td>
<td>Health Research In Bangladesh: A session with Prof. Syed Modasser Ali Ex. Advisor, Health and Family Welfare and Social Welfare, Honorable Prime Minister</td>
<td>Prof. Syed Modasser Ali</td>
</tr>
<tr>
<td></td>
<td>Health Research and Development Initiative @ AIMS Lab</td>
<td>Prof. Khondaker Abdullah Al Mamun, Professor, CSE, UIU</td>
</tr>
<tr>
<td>11:30 am – 11:45 am</td>
<td>Refreshment Break (Program Venue)</td>
<td></td>
</tr>
<tr>
<td>11:45 am – 1:00 pm</td>
<td>Cytoskeletal Remodeling in Neuroscience: Formation and Plasticity of Neural Circuits</td>
<td>Dr. Aurnab Ghose, Indian Institute of Science Education and Research (IISER) Pune, India</td>
</tr>
<tr>
<td>1:00 pm – 2:30 pm</td>
<td>Lunch (Program Venue) and Prayer Break</td>
<td></td>
</tr>
<tr>
<td>2:30 pm – 3:00 pm</td>
<td>Ethics for researchers: Successful research modeling within ethical boundaries</td>
<td>Prof. Khondaker Abdullah Al Mamun, Professor, CSE, UIU</td>
</tr>
<tr>
<td>3:00 pm – 3:45 pm</td>
<td>Neuro-Cognitive Disorder</td>
<td>Dr. Chiranjeeb Biswas, Assistant Professor and Head, Dept. of Psychiatry, UWMCH</td>
</tr>
<tr>
<td>3:45 pm – 4:15 pm</td>
<td>Refreshment (Program Venue) and Prayer Break</td>
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<tr>
<td>4:15 pm – 5:15 pm</td>
<td>Depression-The Hidden Killer of Modern Life</td>
<td>Dr. Tanjir Rashid Soron, Consultant, NDD Trust, Ministry of Social Welfare</td>
</tr>
<tr>
<td>5:15 pm – 5:35 pm</td>
<td>Prayer and Tea Break (Program Venue)</td>
<td></td>
</tr>
</tbody>
</table>
**5:35 pm – 6:50 pm**
Detection of Neuronal Impairment in Parkinson’s Disease
Dr. Sudip Paul
Assistant Professor, Dept. of Biomedical Engineering, North-Eastern Hill University, Shillong, India

**7:00 pm**
Dinner (Program Venue)

### Day 4: Saturday
7th December at United International University

**10:00 am – 11:00 am**
Genetic test: An important modality of Investigation in Pediatric Neurodevelopmental disorder in Bangladesh.
Dr. Kanij Fatema
Associate Professor, IPNA

**11:00 am – 11:15 am**
Refreshment Break (Program Venue)

**11:15 am – 12:15 pm**
Clinical Neurophysiology in Bangladesh: Transfer of Technology and Appropriate use in Regular Medical Practice
Dr. Selina Husna Banu
Associate Professor, Neurosciences Unit, ICH and SSF Hospital, Dhaka

**12:30 pm – 1:30 pm**
Lunch (Program Venue) and Prayer Break

**1:30 pm - 1:40 pm**
Report to Transport Vehicle & Take Seat

**1:45 pm – 6:30 pm**
Visiting National Institute of Neuroscience

**4:00 pm – 4.30 pm**
(Approx)
Refreshment Break

**7:00 pm**
Dinner (Program Venue)
## Day 5: Sunday
8th December at United International University

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 am – 11:00 am</td>
<td>Neuronal Oscillations: An Early Signature of Parkinson’s Disease</td>
<td>Dr. Sudip Paul</td>
<td>Assistant Professor, Dept. of Biomedical Eng., North-Eastern Hill University, Shillong, India</td>
</tr>
<tr>
<td>11:00 am – 11:15 am</td>
<td>Refreshment Break (Program Venue)</td>
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<td></td>
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<tr>
<td>11:15 am – 12:00 pm</td>
<td>Neuromodulation: neuropeptides in Neural Encoding of Physiological States</td>
<td>Dr. Aurnab Ghose</td>
<td>Indian Institute of Science Education and Research (IISER) Pune, India</td>
</tr>
<tr>
<td>12:00 pm – 1:00 pm</td>
<td>Digital health in Neuropsychiatric Disorders</td>
<td>Dr. Tanjir Rashid Soron</td>
<td>Consultant, NDD Trust, Ministry of Social Welfare</td>
</tr>
<tr>
<td>1:00 pm – 2:00 pm</td>
<td>Lunch (Program Venue) and Prayer Break</td>
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<tr>
<td>2:00 pm – 2:30 pm</td>
<td>A new mechanism controlling conduction in myelinated nerves</td>
<td>Dr. K Siddique-e Rabbani</td>
<td>Honorary Professor Biomedical Physics &amp; Technology, DU, Bangladesh</td>
</tr>
<tr>
<td>2:30 pm – 3:30 pm</td>
<td>A Study of Multi-Channel EMG in Writer’s Cramp (Technical Advancement)</td>
<td>Dr. Venkateshwarla Rama Raju</td>
<td>Professor CSE and Biomedical Engineering, Neurology, (NIMS), India</td>
</tr>
<tr>
<td>3:15 pm – 4:30 pm</td>
<td>Abstract Presentation</td>
<td>Participants</td>
<td></td>
</tr>
<tr>
<td>4:30 pm – 5:30 pm</td>
<td>Refreshment (Program Venue) and Prayer Break</td>
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<tr>
<td>5:30 pm – 6:15 pm</td>
<td>Closing</td>
<td></td>
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</tr>
<tr>
<td>6:30 pm</td>
<td>Gala Dinner (Program Venue)</td>
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</tbody>
</table>
Brief Biography of the Speakers and Abstract of the Sessions

Professor Peter A Robinson
Professor, School of Physics
*University of Sydney*

**Biography:**

Professor Peter Robinson is the Deputy Director of the Brain Dynamics Center at the Westmead Millennium Institute and Research Director of the University of Sydney's Center for Waves and Complex Systems.

Professor Robinson has wide ranging interests in the areas of complex systems, brain dynamics, sleep modeling, computational neuroscience, biological physics, plasma and space physics, and other areas of theoretical and computational physics. In the area of the CCRE he is developing and verifying quantitative physiologically based models of sleep-wake dynamics and new methods of analysis of sleep data.

Professor Robinson has developed and tested quantitative models of brain dynamics underlying observed brain activity in normal sleep and wake states, epilepsy, and Parkinson’s disease. His model of sleep-wake dynamics reproduces numerous experimental results on normal and abnormal physiological conditions, fatigue, shift work, jet lag, drug effects, and the sleep of other species. His work on modeling brain activity more generally is being used commercially by the listed spinoff company Brain Resource Ltd. In other areas, he is recognized for his contributions to nonlinear and stochastic processes in plasmas and is a CI on the STEREO spacecraft mission.

**Talk 1: Quantitative Modeling and Analysis of Multiscale Brain Structure and Dynamics**

**Talk 2: Thoughts on Selection, Execution and Funding of Research Projects**
Biography:

Dr. Jalal Uddin Mohammad Rumi is a consultant and specialist in Neurosurgery Department (Brain, Spinal Cord & Nerve). His specialization areas are functional neurosurgery and epilepsy, Parkinson’s disease, spasticity, trigeminal neuralgia and all other general neuro spinal surgical conditions. Moreover, Dr. Jalal Uddin Mohammad Rumi got his training in epilepsy and functional neurosurgery from SCTIMST (India), John Radcliffe Hospital, Oxford, UK and AANS (USA).

Talk: Neuromodulation: opportunities and challenges

The field of neuromodulation encompasses a wide spectrum of interventional technologies that modify pathological activity within the nervous system to achieve a therapeutic effect. Therapies including deep brain stimulation (DBS), intracranial cortical stimulation (ICS), transcranial direct current stimulation (tDCS), and transcranial magnetic stimulation (TMS) have all shown promising results across a range of neurological and neuropsychiatric disorders. While the mechanisms of therapeutic action are invariably different amongst these approaches, there are several fundamental neuro engineering challenges that are commonly applicable to improving neuromodulation efficacy. This article reviews the state-of-the-art of neuromodulation for brain disorders and discusses the challenges and opportunities available for clinicians and researchers interested in advancing neuromodulation therapies.
Dr. Aurnab Ghose  
Associate Professor  
*Indian Institute of Science Education and Research (IISER) Pune, India*

**Biography:**

Aurnab Ghose studied at Presidency College, Calcutta, India for his undergraduate degree which was followed by a Masters from the University of Leicester, UK. His PhD research was conducted at The Beatson Institute for Cancer Research, UK. Following postdoctoral research at the Dept. of Cell Biology, Harvard Medical School, Harvard University, USA, he joined the faculty of Indian Institute of Science Education and Research (IISER), Pune, India.

**Talk 1: Introduction to the Development of Nervous Systems**

The lecture will provide an overview of the major developmental events, starting from the embryo and resulting in mature, functional nervous systems. Neural induction, patterning, his to genesis, neuronal polarization, neurite outgrowth & pathfinding, and synaptogenesis will be covered. The approach will be to establish the conserved general principles underlying these processes.

**Talk 2: Cytoskeletal remodeling in neuroscience: formation and plasticity of neural circuits**

Instructive remodelling of the cytoskeleton underlies all forms of developmental and adult neuronal morphogenesis, including neurite formation and specification, establishment of synaptic connectivity, structural remodelling in plasticity and regenerative capabilities. Using thematic examples from our group’s research, I will showcase some of the cytoskeleton-driven functions in neurodevelopment and plasticity. I will attempt to highlight contemporary experimental approaches driving research in this area.

**Talk 3: Neuromodulation: neuropeptides in neural encoding of physiological states**

Behavioural outputs are exquisitely tuned to homeostatic and affective internal states. Neuropeptide activity is a key mode of representing physiological states, like hungry or fed conditions, to the brain. I will showcase work from our group to demonstrate how physiology tunes behavioural output and approaches to identify the underlying mechanisms.
Dr. Khondaker Abdullah Al Mamun

Chair
*IBRO-ARPC 2019*
Director, *AIMS Lab*

Professor, Dept. of CSE
*United International University*

**Biography:**

Khondaker A. Mamun received his Ph.D. in Computer and Biomedical Engineering from the University of Southampton, UK. After that, he worked as a Postdoctoral Research Fellow in the PRISM Lab with a joint appointment from the Institute of Biomaterials and Biomedical Engineering (IBBME), University of Toronto, Toronto, Canada, and Bloorview Research Institute, Holland Bloorview Kids Rehabilitation Hospital, Toronto, Canada. He also worked as a lecturer and then assistant professor in the Department of CSE, Ahsanullah University of Science and Technology from 2002 to 2007, and as a researcher in the College of Computer and Information Science, King Saud University, Saudi Arabia from 2007 to 2008. Since October 2014, he is working as an Associate Professor and then Professor at the Department of CSE, United International University (UIU), Bangladesh. He is the founder and Director of Advanced Intelligent Multidisciplinary Systems Lab (AIMS Lab) at UIU, where he actively performs research in areas of machine learning, intelligent System, healthcare, disabilities, and education as well as human-machine interface (HMI), brain-computer interface (BCI), rehabilitation engineering, and mobile technology for health care and rehabilitation applications. He has published more than 100 peer-reviewed international journal and conference papers. He has invented a number of digital healthcare and rehabilitation service delivery architecture and mobile-based solutions for developing countries. His research and innovation have also been featured in a number of local and international news outlets including New Scientist and BBC.

His contribution to the innovation and development is recognized internationally and by the government of Bangladesh. He is the founder of CMED Health, a startup that focuses on preventive and primary healthcare through ICT. CMED Health is the Winner of DBS-NUS Social Innovation 2018 (Singapore), SeedStarWorld Global Innovation 2018 (Switzerland), Bangladesh Innovation 2018, BASIS National ICT 2017, Startup Challenge 2017 and GP Accelerator 2016 Award. He also received National ICT and APICTA Awards for Autism Barta (Smart Phone App for Autism Screening) and Bolte Chai (Smart Phone App for enhancing communications for nonverbal children).

He is the organizer and general chair of the first medical engineering conference, MediTec 2016 (International Conference of Medical Engineering, Health Informatics, and Technology) in Bangladesh supported by IEEE EMBS. He is also the organizer and chair of the first International Neuroscience School (IBRO APRC 2017) to develop future neuroscience researchers in...
Bangladesh, sponsored by International Brain Research Organization (IBRO). With the IBRO support, Prof. Mamun has introduced first Deep Brain Stimulation surgery for Parkinson’s patients in Bangladesh through the National Institute of Neuroscience and Hospital with active support from Prof. Tipu Z. Aziz, University of Oxford, UK.

He is a member of the Institute of Engineers Bangladesh (IEB), IEEE; Founder Chair, EMBS Bangladesh section; Fellow, Bangladesh Computer Society (BCS).

**Talk 1: Brain Machine Interface - A Translational Neural Engineering Technology for Treatment and Rehabilitation**

Continuing research on cognitive neuroscience, medical engineering and intelligent systems has made substantial progress to understand the neurophysiological process of the human brain and its applications to the clinical interventions as well as development of neural engineering technology such as Brain Machine Interface (BMI). The idea of BMI is the detection of patterns of neurophysiological activities of the brain, i.e. neural signals and then transforms it into commands to operate assistive devices, such as computer, wheelchair or artificial limbs. BMI system not only identifies the pattern of neural signals but also it can able to feed signals into the brain through neuro stimulators for neural modulation towards treatment and rehabilitation of neural disorders. It can also be able to establish bidirectional communication (both reading and writing of neural signatures) for enabling Brain Machine Brain Interface (BMBI). In addition to that, it will help us to understand the neural circuit mechanisms and open up the possibilities to develop intelligent therapeutic interventions.

Significant effort has made on developing BMIs to support motor control through external devices (read-out BMI) and direct neural stimulation through implanted electrodes in the brain (write-in BMI). One good example of read-out BMI is neural prosthetics, which are artificial extensions to the body that restore or supplement function of the nervous system lost due to disease or injury. It created the possibilities to improve quality of life for people with severe disabilities. On the other hand, an example of write-in BMI is deep-brain stimulation (DBS), which is a surgical implantation of a medical device called a brain pacemaker that sends electrical impulses to specific parts of the brain to suppress abnormal neural activity. The usual target of the DBS implantation for movement disorders is in the subcortical structure of the brain, basal ganglia, which is a part of the brain circuit involved in motor control. DBS made remarkable therapeutic benefits for patients with neurological diseases, such as chronic pain, Parkinson's disease, tremor and dystonia. This technique is not only clinically useful, but also it can provide new insights into fundamental brain functions through direct manipulation of both local and distributed brain networks. This talk will focus on recent advancement of different alternative modalities and methods of BMI technologies and its ranges of real life applications in medical interventions and rehabilitations.

**Talk 2: Ethics for researchers: Successful research modeling within ethical boundaries**
Dr. Tanjir Rashid Soron
Founder & Managing Director,
Telepsychiatry Research and Innovation Network,
Bangladesh.
Consultant (Research and Innovation),
Neuro-Developmental Disability Protection Trust, Ministry of Social Welfare

Biography:

Dr. Tanjir Rashid Soron is a pioneer of Telepsychiatry in Bangladesh. He received his MBBS from University of Dhaka and Post graduation in Psychiatry, MD (Psychiatry) from Bangabandhu Sheikh Mujib Medical University (BSMMU), Dr. Soron has also completed MPH and other relevant research courses. He founded Telepsychiatry Research and Innovation Network that aims to provide a common platform for the mental health professionals, policy makers and IT professionals to share their experience and collaborate to promote technology based mental health services globally. He is leading the first nationwide mobile based Mental Health Service “MIND TALE”. Previously, he worked as Head of department of Psychiatry in Z H Shikder Women’s Medical College. Dr. Soron is working as editor for various international journals including Interactive Journal of Medical Research. His area of research interest focused on behavioral addiction, telepsychiatry, autism, and depression.

Talk 1: Depression-The Hidden Killer of Modern Life

Depression is the leading cause of disability in the modern world affecting more than 350 million people and the burden is accelerating. It costs a global total of over 50 million Years Lived with Disability (YLD) and more than 80% of this non-fatal disease burden occurred in low- and middle-income countries. More and more people are being affected by it due to the rapid change of social dynamics, lifestyle, interpersonal relationships, professional and academic stress, and social media influence in addition to the biological factors. The socio-cultural factors in many developing countries including Bangladesh restrain people from expressing depression and seeking professional help. Although we are living in a world of constant connectivity and communication, people are feeling lonely more than ever before. Trust and values are declining. People are getting more and more isolated and alienated. Polarization and extremism seems to create extensive psychological distress. Moreover, depression is one of the major causes of suicide; depression contributes to more than 80% of suicide cases. Suicide is the leading cause of death among 15-19 years old globally and 15-29 years old in many countries. The economic cost of depression is also mounting. It cost more than $200 billion per year in the USA alone. Additional to economic impact and death causes, we should also consider the social impact of depression and the devastating consequences of untreated depression. Though the burden of depression is rising our knowledge is also expanding and the rate of successful management has increased tremendously. What we need most at this crisis moment is to break the social stigma and seek help as soon as we become depressed, so that it doesn’t bring upon more fatal consequences.
Talk 2: Digital health in Neuropsychiatric Disorders
The uses and application of digital technologies; like the computer, internet, mobile phone, virtual augmented reality, games and artificial intelligence into health care is known as digital health. Digital health is one of the most buzzing words in the modern health care service designing that drew huge attention from researchers of various disciplines. The use of digital health modalities is expanding from the early stage of the computerized cognitive behavioral therapy (cCBT) and online and mobile psychotherapy to recent day’s virtual augmented reality exposure therapy and sensor-based serious games approach. Advances in the technological world are giving us new hope and tools to deal with different neuropsychiatric disorders. Various researches are going on to find out digital biomarkers; that is to find out early behavioral symptoms in the using patterns of consumer-grade and wearable technologies. The concept of serious games, the use of artificial intelligence, crowd sourcing and crowd solving, the use of ecology momentary assessment has changed the concept of the traditional health care service designing and delivery in the Neuropsychiatric Disorders. Devices like Google Assistant, Amazon Alexa and Siri might be used to monitor language uses, thus could lead to early diagnosis. However, the changing dynamics of digital health sectors and coping up with its ethical issues is challenging. There is always the threat of data security and privacy issues. More over due to the cost of some of this high-tech devices middle- and low-income county like Bangladesh might find it difficult to apply these on mass people.
Biography:

Dr. Md Kafiul Islam has received his B.Sc. in EEE from IUT, Gazipur in 2008 and completed his PhD from Dept. of ECE, NUS, Singapore in the area of Neural Signal Processing back in 2015. Currently he is serving as an Assistant Professor in the Dept. of Electrical and Electronic Engineering of Independent University, Bangladesh. His research interests include biomedical instrumentation and signal processing, neural signal processing, brain-computer interface (BCI), etc. He is actively involved as a TPC member of several international conferences and he reviews Journal articles frequently. Recently he has been elevated as a Senior Member of IEEE in 2019. He has published more than 30 peer reviewed journal articles and conference papers with Google Scholar Citations of 450+ and impact factor contribution of around 16+.

Talk: State-of-the-art EEG signal processing techniques in the diagnosis and treatment of neurological diseases

Electroencephalography (EEG) is a non-invasive recording technique that measures the electrical activity of the brain by placing electrodes on the scalp. Due to its non-invasiveness and cost-benefit ratio, EEG has been the most preferred method of brain recording in clinical studies, lab experiments, patient health monitoring, diagnosis, and many other applications. Unfortunately, EEG recordings are often contaminated by different forms of artifacts, such as artifacts due to electrode displacement, motion artifacts, ocular artifacts and EMG artifacts from muscle activity. These offending artifacts not only misinterpret the underlying neural information processing but may also themselves be difficult to identify. For example, during patient monitoring in a critical care unit or during epilepsy seizure detection, artifacts may increase the chance of false alarms. The same problem may occur during sleep study and diagnosis of other neurological disorders such as Alzheimer’s disease (AD), Parkinson’s diseases, schizophrenia, etc. Therefore, artifact detection and removal is one of the most important preprocessing steps for EEG-based applications. In addition, applying appropriate machine learning algorithms for classification of any mental/cognitive task, for detecting/diagnosing any neural diseases/disorders as well as classification in BCI applications also play important role. In conclusion, proper processing and analysis of EEG signals are very critical for consequent outcome in terms of disease detection accuracy or BCI performance.
Biography:

Dr. Sudip Paul is currently an Assistant Professor in Department of Biomedical Engineering, School of Technology, North-Eastern Hill University (NEHU), Shillong, India. He completed his Post-doctoral research at School of Computer Science and Software Engineering, The University of Western Australia, Perth. He was one of the most precious fellowship awardee (Biotechnology Overseas Associateship for the Scientists working in North Eastern States of India: 2017-18 supported by Department of Department of Biotechnology, Government of India). He received his Ph.D. degree from Indian Institute of Technology (Banaras Hindu University), Varanasi with specialization in Electrophysiology and brain signal analysis. He has many credentials in his credit out of which his First Prize in Sushruta Innovation Award 2011 sponsored by Department of Science and Technology, Govt. of India and also he also organized many workshops and conferences out of which most significant are the 29th Annual meeting of the Society for Neurochemistry, India and IRBO/APRC Associate School 2017. Dr. Sudip published more than 90 International journal and conference papers and also filled four patents. Recently he completed three book projects and five are ongoing as editor. Dr. Sudip is a member of different Societies and professional bodies, including APSN, ISN, IBRO, SNCI, SiN and IEEE. He received many awards specially World federation of Neurology (WFN) travelling fellowship, Young Investigator Award, IBRO Travel Awardee and ISN Travel Awardee. Dr. Sudip also contributed his knowledge in different international journals as editorial board members. He has presented his research accomplishments in USA, Greece, France, South Africa and Australia. He is presently associated as Joint Secretary for the Biomedical Engineering Society of India.

Talk 1: Neuronal Oscillations: An early signature of Parkinson`s Disease

The neurodegenerative disorder (Parkinson`s disease) is thought to be genetic in a very small percentage of cases. Symptoms of Parkinson's disease are caused by the progressive degeneration of nerve cells in the middle area of the brain. This causes a lack of dopamine, a chemical messenger (neurotransmitter) necessary for smooth, controlled movements. EEG is one of the oldest and commonest methods for studying brain function; even though cost effective also. It has been proposed as a promising tool for the detection of cognitive decline in neurodegenerative disorders including PD. The EEG can be utilized in resting state situations as an indicator of spontaneous neural background activity as well in relation to specific cognitive tasks as an indicator of specific brain behavior relationships. The correlation between adjacent neurons is measured via the auto correlation dimension. Further, the attractors represent the states of the collection of neurons. The very fact that the auto correlation changes from the control to the Parkinson`s disease condition implies that the neuronal equilibrium has been disturbed and the system of neurons must find a
new equilibrium. Significant changes were observed between the dimensionalities of brain attractors in normal state, and neurodegenerative conditions.

**Talk 2: Detection of neuronal impairment in Parkinson’s disease**

Parkinson’s disease (PD) is a neurodegenerative disorder which occurs when there is less production of dopamine in the substantia nigra of the human brain. Electroencephalography (EEG) can predict the early signature of the Parkinson’s disease. Neural oscillations, or brainwaves, are rhythmic or repetitive patterns of neural activity in the central nervous system. Neural tissue can generate oscillatory activity in many ways, driven either by mechanisms within individual neurons or by interactions between neurons. This change in oscillations can be analyzed through autocorrelation function. In this work, we reported a study of the neuronal oscillations for the frontal and temporal region of Parkinson’s disease patients using EEG. It was observed that there are many negative peaks present and the correlations also disturbed for the PD compared with the control subjects in the frontal brain while the peak amplitude changes rapidly; which signifies that the brain potential especially the action potential changes rapidly compared with the control one in temporal brain. The negative peaks indicate that the neuronal oscillations are completely 180-degree reverse and synchronization breaks. So, one can say that the neuronal insult occurs in the frontal region for the PD cases.
Dr. Kanij Fatema

Associate Professor
Bangabandhu Sheikh Mujib Medical University,
Bangladesh

Biography:

Dr. Kanij Fatema has been working as an Associate Professor in IPNA for the last 3 years. She is experienced in Child Neurology and Development and has been working in this particular field for 7 years. She is a graduate of Dhaka Medical College with excellent academic results. Dr. Kanij has completed her first fellowship in Pediatrics in 2009. Then she also achieved her 2nd fellowship in Pediatric Neurology and Development in 2017. She has been trained in All India Institute of Medical Services (AIIMS), Delhi for 3 months in Pediatric Neurology and EEG.

In her professional life, Dr. Kanij first joined Bangladesh Civil Service and served in different districts in Bangladesh. She joined as an Assistant Professor in BSMMU in 2011. She has taken part in a number of academic research and many of her research got financial grants. She has publications in national and international peer-reviewed journals.

Dr. Kanij is a dynamic, energetic professional having keen interest to serve the children with neurodevelopmental disorders. She has particular interest in CNS infection, epilepsy, movement disorders and behavioral problems like ASD and ADHD.

Talk: Genetic test: An important modality of Investigation in Pediatric Neurodevelopmental disorder in Bangladesh.

Neurodevelopmental disorders (NDDs) are a group of early onset neurological disorders which include epilepsy, autism spectrum disorder (ASD), language disorder, intellectual disorder (ID) etc. NDDs affect more than 3% of children worldwide. The management of NDDs is challenging as detection of etiology is difficult and many of them have heritable origin. Till date about 1000 genetic mutation have been identified in relation with NDDs.

Identifying genetic basis is very important for understanding the precise mechanism of disease, relating phenotype with genotype, identifying the unaffected/carrier family members, preventing the future pregnancies from having similar kind of disorder. Most importantly genetic diagnosis plays a pivotal role for taking decision regarding the individualized therapeutic approach- the precision medicine.

In this presentation, the preliminaries of genetic basis of NDDs will be discussed. Along with that, some interesting cases will be discussed with genetic diagnosis. For instance, some cases of ASD,
ID, epilepsy, neuromuscular disorder will be discussed with treatment strategy. It is here to mention that, genetic testing of NDDs is comparatively new in Bangladesh and expensive. This presentation has been aimed to highlight the importance of genetic testing in NDDs and explore this modality in the management of NDDs.
Biography:

Nipa Roy has a background in Physics, and she likes to explore various problems in Complex Systems as a researcher. She received her Ph.D. in Brain Dynamics from The University of Sydney, Camperdown, Australia. She also got B.Sc. (Honors) and M.S. in Physics from Jahangirnagar University with some research works on Plasma Physics. Currently she is working as Assistant Professor at United International University, Dhaka, Bangladesh, and also conducting research at Advance Intelligent Multidisciplinary Systems (AIMS) Lab as a principal investigator. In addition, she also has experience in mentoring M.S. students of Plasma Physics Research Group at Jahangirnagar University, as a Peer Reviewer in some international journals such as Physical Science International Journal, Physica Scripta, Journal of Modern Physics, and some other Neuroscience journals. She is also moderator of UIU Science Forum and one of the organizer of the 2nd IBRO Associate School of Neuroscience in Bangladesh. She has published more than 20 peer-reviewed international journal and conference papers.

Talk: Spectral signatures of activity-dependent neural feedback in the corticothalamic system

The modulation of neural quantities by presynaptic and postsynaptic activities via local feedback processes is investigated by incorporating nonlinear phenomena such as relative refractory period, synaptic enhancement, synaptic depression, and habituation. This is done by introducing susceptibilities, which quantify the response in either firing threshold or synaptic strength to unit change in either presynaptic or postsynaptic activity. Effects on the power spectra are then analyzed for a realistic corticothalamic model to determine the spectral signatures of various nonlinear processes and to what extent these are distinct. Depending on the feedback processes, there can be enhancements or reductions in low-frequency and/or alpha power, splitting of the alpha resonance, and/or appearance of new resonances at high frequencies. These features in the power spectra allow processes to be fully distinguished where they are unique, or partly distinguished if they are common to only a subset of feedbacks, and can potentially be used to constrain the types, strengths, and dynamics of feedbacks present.
Dr. Mithila Faruque
Assistant Professor and Head of the Department, Noncommunicable Diseases
Bangladesh University of Health Sciences

Biography:

Dr. Mithila Faruque is an Assistant Professor and Head of the Department, Noncommunicable Diseases at BUHS. Also, she is the Program Coordinator of the MPH Program in NCD and Chairman of the Academic Committee. She has extensive experience on noncommunicable disease prevention and management. She is a leading medical services team of CMED Health.

Talk: Dementia: A Growing Burden in Bangladesh
Dr. Selina Husna Banu

Associate Professor, Neuroscience Unit,
ICH and SSF Hospital, Dhaka

Biography:

Dr. Selina Husna Banu, MBBS, DCH, Ph.D. (University College London). Associate professor, Neurosciences Unit, ICH and SSF Hospital, Mirpur, Dhaka, Bangladesh. Graduated from Chittagong Medical College, Faculty of Medicine, University of Chittagong, Bangladesh in 1985. Worked at different thana health complexes under the Ministry of Health from 1986 till 1989. Got training on pediatric medicine at the Bangabandhu Sheikh Mujib Medical University (BSMMU) and in Bangladesh Institute of Child Health (BICH). Dr. Banu started a career in the field of pediatric neurology and developmental disorders in 1991. Fellowship training and experience in Neurosciences and clinical neurophysiology at Great Ormond Hospital, ICH, London, 1995-1998, a Ph.D. student at the University College London in 1999. She was awarded a Ph.D. in childhood epilepsy in 2003, UCL, ICH London. Selina has long time working experience in Child Neurology and developmental disorders including child and adolescence Behavioral disorders. She has experience in establishing comprehensive services for children with neurological disorders and developmental disabilities in multiple governments and private hospitals in Bangladesh. Trained many technologists and neurophysiologists and established clinical neurophysiology laboratories in and out of the country (Bangladesh, Tanzania, and Ghana). Dr. Selina has a special interest in Clinical Neurophysiology, genetics, childhood epilepsy, and paroxysmal disorders.

Talk: Clinical Neurophysiology in Bangladesh: Transfer of Technology and Appropriate Use in Regular Medical Practice
Dr. Chiranjeeb Biswas
Assistant Professor and Head of Psychiatry
Medical College for Women & Hospital, Uttara

Biography:

Dr. Chiranjeeb Biswas works as a specialist in Psychiatry Department (Depression, dementia, schizophrenia, anxiety disorders). Previously he worked in Square Square Hospital Limited, Sylhet Jalalabad Ragib Rabeya Medical College. He participated in many workshops related to mental health.

Talk: Neuro-Cognitive Disorder

Dr. Forhad Hossain Chowdhury
Assistant Professor, Neurosurgery
National Institute of Neuroscience, Bangladesh

Biography:

Dr. Forhad Hossain Chowdhury is a Skull base, Neurovascular (Stroke) & Endoscopic Neurosurgeon. He is pioneering in Brain vascular bypass surgery (EC-IC Bypass) in Bangladesh. Dr. Forhad Hossain Chowdhury has more than 70 peer reviewed publications. He is also a life member of Society of Surgeons and Bangladesh Society of Neurosurgeons.

Talk: Fundamental Neuroscience
Dr. K Siddique-e Rabbani

Honorary Professor
Department of Biomedical Physics & Technology
University of Dhaka, Dhaka, Bangladesh

Founder Director
Relevant Science & Technology Institute (RSTI)

Biography:

Rabbani completed his bachelor's from University of Dhaka and master's from Islamabad University in 1970 and 1972 respectively. He then earned his Ph.D. from the University of Southampton in Microelectronics as a Commonwealth Scholar in 1978. He then joined as a faculty member of the Department of Physics at the University of Dhaka. In 2008, he became the first Chairperson of the post-graduate Department of Biomedical Physics and Technology at the University of Dhaka. His current research area includes: Biomedical Physics & Engineering (Neurophysiological measurements, Electrical Impedance Measurement, Appropriate Biomedical equipment for the Third World), solar Energy (Drinking water sterilization, water heating), and instrumentation (medical, educational, industrial).

Talk: A new mechanism controlling conduction in myelinated nerves

Biochemistry:

Venkateshwarla R. Rama Raju is a full Professor of Computer Science & Engineering and Biomedical Engineering Hyderabad and Biomedical Scientist in Neurology at Nizam's Institute of Medical Sciences (NIMS) Hospital Hyderabad. Dr Raju is the Principal Investigator of DST funded project of Cognitive science research initiative (CSRI) entitled 'A study of neuro medical diagnostics of cognitive impairment in case of Parkinson disease using real-time multi-channel microelectrode recording system'.

Talk: A Study of Multi-Channel EMG in Writer’s Cramp (Technical Advancement)
Abstracts and Short Summaries of Research Presentation from Participants

Neural Engineering for Emotion Analysis

Dr. Shovan Barma
E-mail: shovan.barma@gmail.com

Abstract: My area of research encompasses to understand the human emotional process in connection with brain at neural level. In this purpose, I use advanced analyzing methods of signal processing, non-invasive brain simulation techniques and brain computer interface (BCI) to explore human emotions with great details in different environmental/social perspective. I work with biomedical signal processing to study underlying neural mechanisms involved in emotional processes by mathematical modeling and state-of-the-art neuroimaging techniques emphasized to better understand the brain basis of emotions. Other areas of works are affective computing, human emotion analysis and recognition based on physiological signal, facial expression, gesture and speech. In addition, I also work towards investigation of brain activation and its pattern to treat medical disorders such as altered emotional behavior after brain damage, depression, anxiety, and addiction. Further, handling and resolving technical challenges in fundamental signal processing related to time complexity issues of time-frequency analysis (TFA) methods, big data processing with a focus on sparsity analysis, etc. are also my research areas. Further, I focus on product design (prototype development) for various commercial/non-commercial tools and IoT based tools and for this machine learning, deep learning, image processing etc. at software, hardware or both level are often implemented, along with other open source tools and computer languages (like Matlab, Python etc.).

Analysis of brain signal for early detection of neurodegenerative diseases like epilepsy, alcoholism and Alzheimer’s

Dr. Sunil Kumar Prabhakar
Email: sunilprabhakar22@gmail.com

Abstract: Different pathological and physiological activities of the brain can be analyzed by means of utilizing Electro encephalography (EEG) signals. One such important activity which can be assessed and understood with the help of electrical representation of the brain signals is alcoholism. Alcoholism is a serious concern to many in the world as it affects the vital organs of the human body like liver, brain, lungs, heart, blood, immunity levels etc. In the arena of biomedical research,
classification of alcoholic subjects from EEG signals is quite a challenging task. In this paper, the alcoholic EEG signals are analyzed comprehensively for a single alcoholic patient and it is classified with many post classifiers. Initially Correlation Dimension features are extracted from the EEG signals and then it is classified with the help of Detrend Fluctuation Analysis (DFA). In order to improve the classification accuracy further, it is again classified with 6 other post classifiers such as Linear Discriminant Analysis (LDA), Kernel LDA, Fire fly algorithm, Gaussian Mixture Model (GMM), Logistic Regression (LR) and Soft max Discriminant Classifier (SDC). Results report a high classification accuracy of 97.91% when GMM is employed followed by a classification accuracy of 97.33% when Logistic Regression is employed. A comparatively low classification accuracy of 89.6% is obtained when LDA was employed.

**Investigating the effect of α-ketoglutarate dehydrogenase complex Inhibition on the Granular Cell Activity in the Hippocampal CA1 in the animal model of Alzheimer's disease**

Fatemeh Sayehmiri  
Email: fsayehmiri@yahoo.com

**Abstract:** I worked on animal model of Alzheimer disease. AD is induced by Ab(1-42) injection. And inhibitor CESP will be used. Inhibition will be induced dose- dependent and time dependent. My behavioral testing will be MWM. In Molecular section GABA/GAD/GDH/ will be measured. And then I will do patch clamp in vitro from DG area hippocampus.

**Amla Fruit Extract Improves Ischemic Brain Injury by Modulating Mitochondrial Function and Autophagy after Focal Cerebral Ischemia in Rats**

Dr. Dinesh Tripathi  
Email: dineshbt2009@gmail.com

**Abstract:** My primary research objective is to understand the biology of survival/death mechanism/s of brain injury model (Stroke). My present project involves autophagy activation in ischemic stroke, and its inhibition through antioxidant and anti-inflammatory herb. I am trying to elucidate the role of Autophagy proteins in cell survival and death in ischemic stroke and explore the mechanisms of autophagy activation implicated in inflammatory diseases e.g. -stroke (in vivo and in vitro). My initial studies suggest that Autophagy plays a crucial role in cell survival and death. Further I am interested in exploring the cross talk involved between these proteins. So understanding of the role played by AMBRA1 and Beclin-1 in Stroke may give newer targets for protection against cerebral stroke. This study hopes to develop a new drug target for stroke therapy and it is very beneficial for human health.
Therapeutic effects of oleuropein in improving seizure, oxidative stress and cognitive disorder in pentylene tetrazole kindling model of epilepsy in mice

Dr. Samira Asgharzade
Email: asgharzade2336@gmail.com

Abstract: Prolonged epileptic seizures are the cause of neuronal death and brain damage. Lesions in different regions of the brain can lead to memory loss and cognitive disorders. It is therefore essential to seek out new neuroprotective drugs. Our aim was to investigate the therapeutic effects of oleuropein in improving seizure, oxidative stress and cognitive disorder in pentylene tetrazole (PTZ) kindling model of epilepsy in mice. Mice were randomized to four groups: negative control group (1) intraperitoneally receiving PTZ for 10 days, oleuropein group (2) receiving oleuropein (20mg/kg) 30 minutes before PTZ administration, positive control group (3) receiving diazepam 30 minutes before PTZ administration and flumazenil group (4) receiving flumazenil and then oleuropein 30 minutes before PTZ administration. Epilepsy severity was investigated after final administration of PTZ. Then hippocampal tissues were removed and stored at -70°C until measurements of the interleukin-1 (IL-1) and glutamate transporter 1 (GLT-1) gene expression were conducted. Oleuropein treatment caused a significant increase in seizure latency and a significant decrease in total frequencies of head ticks, head and upper limbs seizures, the whole body seizures, frequent spinning and jumping and tonic seizures in PTZ receiving mice. IL-1 expression decreased in oleuropein group and GLT-1 levels did not change significantly in this group. Oleuropein treatment caused significant improvement of passive avoidance memory in PTZ receiving mice in shuttle box. Oleuropein can decrease PTZ induced seizure and memory disorders due to its antioxidant and anti-inflammatory properties and is thus recommended to be used for production of anti-epileptic drugs.

Perceptual eldvariables in visual perception

Dr. Zahra Kashani
Email: rezvanizahra@gmail.com

Abstract: My Ph.D. thesis is about how perceptual field variables can affect our visual perception. We are using eye-tracking data as inputs of the brain and trying to explore and model how these variables can affect how we perceive our environment. Are we stuck in details or paying attention to similarities between objects?
Preventive Role of Gabapentin in Transmission of Inflammatory Nociception in Acute and Sub-Chronic Inflammatory Models of Rat.

Dr. Huma Jawed
Mail: humajawed@yahoo.com

Abstract: The central nervous system has integrated innate immune system among them the neuroglia is the major neuronal cell which act as resident macrophages in the central nervous system and involve in the defense system regulating neuroinflammation. Neuroinflammation is the cellular and biochemical reaction series in response to brain injury or trauma in which glia and other neuronal cells become activated. It is one of the important characteristic hallmarks in the pathogenesis and progression of neurodegenerative diseases including such as Alzheimer’s disease (AD), Parkinson’s disease (PD), dementia and amyotrophic lateral sclerosis. Microglia originally synthesized in bone marrow and then differentiated within brain during neuronal development. These microglial cell occupy approximately 12% of the central nervous system cellular mass. As discussed above, microglia act as one of the major immune mediator which regulate immune system within CNS while maintaining the neurovascular integrity. Studies suggest microglia role as phagocytic, as they ingest cellular debris of apoptotic neurons, thus microglia are involved in the pathogenesis of many neuro inflammatory disease like multiple sclerosis, Alzheimer's disease, Parkinson's disease, HIV dementia, retinal degenerative diseases and many other conditions. The complex inflammatory response generated after exposure to neurotoxic stimuli, traumatic or oxidative brain injury, or age related homeostatic perturbations results in their lease of certain trigger factors such as cytokines (TNF,ILs), interferons, lipoxins (e.g.,lipoxygenase), resolvins (e.g., eicosatetraenoic acid, docosahexaenoic acid) reactive oxygen species (superoxide, hydrogen per oxide etc.) and reactive nitrogen species(NO). The acute inflammatory response if lead to uncontrolled aggressive reactions it becomes chronic and injurious neuro inflammation causing the development of certain neurodegenerative diseases. Cytokines such as IL-1β, IL-6, and TNF-α and interferon’s are involving in inflammatory reactions and in pathological pain. Similar to peripheral inflammation, neuroinflammation also Result in increased prostaglandins (PGs) levels including pro-inflammatory prostaglandins like prostaglandin E2. PGE2 signaling is mediated by interactions with four distinct G protein–coupled receptors, EP1, EP2, EP3, and EP4, which are differentially expressed on neuronal and glial cells throughout the central nervous system. It has been observed that during aging process of the brain increased level of PGE2 and another inflammatory mediator or become significantly increased. Any type of neuroinflammation, infection, toxicants oxidative stress injuries exerts worse effects on the brain which is under already.

The Therapeutic use of Repeated Transcranial Magnetic Stimulation in Neurology

Ehsan Ansari
Email: ehsanans45@gmail.com

Abstract: Transcranial magnetic stimulation (TMS) is an on-invasive, safe, effective, and food and drug administration approved treatment for major depressive disorder. Fibromyalgia is the result
of abnormal changes in the central sensory processing of pain signals, which are thought to arise from a combination of interactions between neurotransmitters, external stressors, behavioral constructs, hormones, and the sympathetic nervous system. Recent research studies indicate that central sensitization is responsible for fibromyalgia. TMS relies on time-varying magnetic fields to induce an electric field in the brain, resulting in depolarization or hyper polarization of the neurons. The aim of the study was to assess the central sensitization objectively in female fibromyalgia patients non-invasively by the use of transcranial magnetic stimulation and to compare with normal healthy female controls. Female fibromyalgia patients were recruited from rheumatology clinic and healthy female controls were recruited from staff and relatives of the patients. Their age, height and weight were noted. Resting motor threshold of healthy controls (n=49) and fibromyalgia patients (n=75) were calculated by applying transcranial magnetic stimulation at their right motor and compared. Results: There was no significant difference between age, height and weight off fibromyalgia and healthy controls. Resting motor threshold was significantly lower in fibromyalgia patients as compared to healthy controls indicating hyper-excitability of motor cortex. Conclusion: The resting motor threshold was significantly lower in fibromyalgia patients as compared to healthy controls indicating hyper-excitability of motor cortex. This study provides objective proof as the central sensitization is the main aetiology of fibromyalgia.

Neurocysticercosis: Clinico-radiological profile and outcome at BPKM Cancer Hospital

Quamrul Haque Ansari
Email: kamruhak@yahoo.com

Abstract: Neurocysticercosis (NCC) is one of the most common cause of seizures and epilepsy in the developing world. There is insufficient information about NCC in Nepal. This study was, therefore, conducted to evaluate the clinical, neuro-radiographic and therapeutic aspects of NCC at BPKM Cancer Hospital. Material and Methods: 100 patients with this Neurocysticercosis were studied prospectively in 12 months in the BPKM Cancer Hospital (BPKMCH), a secondary-level-referral hospital in the central Nepal. The diagnosis of NCC was based primarily on the neuro-imaging (CT scan) findings. Results: The patients were predominantly females (nearly 60%) with age ranging from 5 to 70 years. school-age children constituted 35% of the patients. The three common manifestations were seizures (95%), headache and or vomiting (40%). CT scan demonstrated a single parenchymal ringor nodular enhancing lesion (REL) in 84% of cases with peri lesional edema in nearly 85% of cases. A large majority of patients were treated only with the anticonvulsant drugs (ACDs) for 9 months. Follow-up with repeat CT after1-5 years showed a complete resolution of NCC in most of the cases without the need for cysticidal treatment. Conclusion: NCC should be considered first in the differential diagnosis of new-onset seizure among the patients of developing countries, where taeniasis is endemic. Most of the patients with Neurocysticercosis do not need anticysticercal therapy.
Chronic intraperitoneal injections of L-theanine potentiates dopamine and serotonin release in the striatum of Parkinsonian mice without causing any behavioral alterations

Satarupa Deb
Email: deb.satarupa1993@gmail.com

Abstract:

Background: Tea, derived from Camellia sinensis, holds immense popularity in different regions of the world and is currently ranked as one of the most frequently consumed beverages. Statistical studies revealed an association between tea consumption and reduced risk of Parkinson’s disease (PD), which has thrown light in the pathway of exploring beneficial properties of tea components. L-theanine (chemically known as γ-glutamyl ethyl amide) is a non-proteinogenic amino acid of tea that takes part in the biosynthesis of its polyphenols. It is efficiently absorbed from the intestinal tract and conveyed to the brain across the blood brain barrier and its psychoactive properties are documented by a number of successful experimental outcomes. Hypothesis: Recently discovered neuroprotective effects of L-theanine can be attributed to its structural analogy with glutamate, the principal excitatory neurotransmitter in brain. Because of this, it is often termed as a unique amino acid, which might be effective in managing neurodegeneration owing to its natural glutamate receptor antagonistic property. Research Gap: Recent studies have demonstrated the neuroprotective efficacy of L-theanine against β-amyloid-induced cognitive dysfunction and neuronal cell death in ischemic brain damage. The compound was also shown to down-regulate the neurotoxicity induced by PD-related environmental toxins, such as rotenone and dieldrin in cultured neuronal SH-SY5Y cells. However, no significant work relating to the effect of L-theanine in animal models of PD has been reported and this window stands in the urgent need of being explored.

Methodology: Swiss albino mice were divided into four groups depending on the treatment received: Group 1–Control (0.9% saline i.p.), Group 2–MPTP (2 x 30mg/kg; 16 hours apart), Group 3– L-theanine (5mg in 0.9% saline i.p.), L-theanine + MPTP. L-theanine was administered for 20 days following which MPTP was injected on the 19th and 20th day. The groups of animals were tested for psychomotor behavior such as Akinesia, Catalepsy, Rearing behavior test, Light Dark Box test for anxiety and depression, Object Recognition Test for memory and cognition on a day before MPTP administration and these psychomotor tests validated the effects of MPP+ during wash-out period after MPTP treatment. Animals were sacrificed and brains were removed and dissected out on 6th day post MPTP injection, for the analysis of biogenic amines neurotransmitters dopamine, serotonin and their metabolites with HPLC techniques. Experimental outcomes: 20 days’ pre-treatment of 5mg/kg L-theanine alongin PD-induced mice effectively improves dopamine and serotonin level in the striatum. However, no significant changes in psychomotor behavior could be observed due to L-theanine administration in PD mice.
Effectiveness of Lead Position with Microelectrode Recording in Determining Sub thalamic Nuclei-Based Deep Brain Stimulation (STN-DBS)

Dr. Venkateshwarla Rama Raju
Email: drvenkateshwararr@gmail.com

Abstract: Effectiveness of Lead Position with Microelectrode Recording in Determining Sub thalamic Nuclei-Based Deep Brain Stimulation (STN-DBS). V.R. Rama Raju Nizam’s Institute of Medical Sciences, Hyderabad. In Parkinson’s disease, there is a decreased dopaminergic cell output from the substantianigra (SN) that changes firing patterns of many neurons of nuclei (thenucleus). One of the consequences is an increased firing from the neurons of sub thalamic nucleus (STN) which, by stimulating to the neurons of globus pallidus interna (GPi), causes inhibition of thalamus and cortex, producing the slowing of voluntary movements. The simplistic view was, supported by the fact that high frequency current delivered to STN or GPi neurons or other neurons of basal ganglia (BG), that caused their inhibition, improved the symptoms. It is now known that there is a significant change in the firing pattern and a reorganization of the entire basal ganglia with DBS. Microelectrode recording of STN neurons has identified a specific high-frequency irregular and larger amplitude firing patterns seen only in disease states, and hence this is used to detect the neurons of STN during functional surgery. The DBS is a computer aided stereotactic based functional surgery and as such STN neurons cannot be clearly visible (9×7×4mm) on MRI and targeting of BG neurons is based on Lozano’s method which his indirect (3mm lateral to the lateral and superior margin of the red nucleus). Micro electrode recording (MER) gives proof of the correct positioning of electrode and ensures accurate detection of STN precincts and determines its exact coordinates in a more objective-way. MER enhances safety, accuracy and efficacy of DBS electrode implementation. Thus, microelectrode recording confirms the presence of abnormal STN neurons.

Brain targeted drug delivery of doxycycline hydrochloride loaded Tween 80 coated chitosan nanoparticles for the management of experimental model of psychosis: behavioral, biochemical, neurochemical and histological alterations in mice

Dr. Monu Yadav
Email: monuyadav.pharmacology@gmail.com

Abstract: To develop optimized brain targeted Tween 80 coated chitosan nano particulate formulation for oral delivery of doxycycline hydrochloride for the treatment of psychosis and to evaluate its effect on ketamine induced behavioral, biochemical, neurochemical and histological changes in mice. 32full factorial design was used to optimize the nano particulate formulation to minimize particle size and maximize entrapment efficiency, while independent variables chosen were concentration of chitosan and Tween 80. The optimized formulation was characterized by
particle size, drug entrapment efficiency, Fourier transform infrared, Transmission electron microscopy analysis and drug release behavior. Pure doxy cycline hydrochloride (25 and 50 mg/kg, p.o.) and optimized doxycycline hydrochloride encapsulated Tween 80 coated chitosan nanoparticles (DCN Popt) (equivalent to 25mg/kg doxycycline hydrochloride, p.o.) were explored against ketamine induced psychosis in mice. The experimental studies for DCN Popt, with mean particle size 237nm and entrapment efficiency 78.16%, elucidated that the formulation successfully passed through blood brain barrier and exhibited significant antipsychotic activity. The underlying mechanism of action was further confirmed by behavioral, biochemical, neurochemical estimations and histo pathological study. Significantly enhanced GABA and GSH level and diminished MDA,TNF-a and dopamine levels were observed after administration of DCN Popt at just half the dose of pure doxycycline hydrochloride, showing better penetration of doxycycline hydrochloride in the form of Tween 80 coated nanoparticles through blood brain barrier. This study demonstrates the hydrophilic drug doxycycline hydrochloride, loaded in Tween 80 coated chitosan nanoparticles, can be effectively brain targeted through oral delivery and therefore represents a suitable approach for the treatment of psychotic symptoms.

Antidepressant activity of Morin in stressed induced mice

Deepak Lamba
Email: deepaklamba786@gmail.com

Abstract: Currently I am doing evaluation of some plants/bioactive compounds on stress-induced depression in mice. First we induce stress in mice by different methods. After 21 days we go for Behavioral model of depression Tail suspension test. On 22nd day we sacrifice the animal to study the mechanism of action of drug. For this we do the biochemical estimation.

Emerging cellular and molecular signaling pathways involved in the pathophysiology of Alzheimer’s disease

Monika Kadian
Email: monikakadian29@gmail.com

Abstract: The key defects within the Cell signaling pathways discovered by several researchers potentially contribute to the distortion in the cross-talk between neurons, energy failure, accumulation of intracellular waste and production of a higher amount of toxic protein within the brain parts which are the causative potential culprit in the pathogenesis of Alzheimer’s disease (AD). As we have studied about two well know disease condition such as AD and cancer, which carries opposite cellular growth activity like increased amount of cellular death occur in AD while higher cell proliferation rate in cancer, that is the reason which motivates us to figure out about unknown or un-mapped mechanism behind the common genes and the cell signaling pathways involved in AD or other neurological disease conditions. Presently, in our study we have figure out about the possible as well as expected role of several cell signaling pathways linked to AD, including mechanistic (mammalian) target of rapamycin(mTOR), 5’adenosinemonophosphate-activated
protein kinase (AMPK), protein kinase B (PKB or AKT) signaling, phosphoinositide 3-kinases-protein kinase B (PI3K-Akt) signaling and mitogen-activated protein kinase/extracellular-signal-regulated kinase (MAPK/ERK) signaling, silent mating-type information regulator 2 homolog 1 (Sirtuin 1) signaling, Wnt signaling, and peroxisome proliferator-activated receptor-gamma co-activator 1-alpha (PGC-1α) signaling etc. In this review, we have also presented a defined knowledge or concrete outcomes about the dysfunction of several pathological biomarkers pathways, which are responsible for AD-like dementia, like inflammatory biomarkers pathway (Nrf2, NFkB, iNOS) mitochondrial dysfunction (regulation of ETC dynamic), neuronal damage by oxidative stress, etc. These key defects in signaling pathways and dysfunction in pathological biomarkers pathways are providing the basis of the development of Alzheimer's disease, but our key-findings intimate that it is beneficial and could be established possible targeted remedy for prevention and treatment of AD in advance stages.

The Neuroprotective Effect of Filgrastim Against Haloperidol Induced Orofacial Dyskinesia in Rats

Narhari G. Yedke
Email: yedkeng16a@gmail.com

Abstract: Tardive dyskinesia (TD) is an iatrogenic, inevitable, hyperkinetic movement disorder characterized by chorei form ataxic and repetitive involuntary movements involving the mouth, face and trunk. Orofacial movements like vacuous chewing movements (VCM's), facial jerking, tongue protrusion and lip-smacking are among the primary features of TD. The oxidative stress hypothesis one of the possible mechanisms involved in the TD. The study was designed to investigate the neuroprotective effect of filgrastim against haloperidol induced orofacial dyskinesia possibly by modulating the behavioral and oxidative stress parameters in rats. Rats were treated with haloperidol (1 mg/kg, i.p. for 21 days) to induce orofacial dyskinesia. Filgrastim (20, 40 and 60 μg/kg, s.c.) was administered daily 4 hours before the haloperidol treatment for 21 days. Behavioral parameters (VCM's, facial jerking, tongue protrusion, bodyweight, locomotor activity and rotarod activity) were assessed on 1st, 7th, 14th, 21st day after haloperidol treatment. On day 22nd animals were sacrificed, striatum and cortex were separated out for the estimation of biochemical parameters (malondialdehyde (MDH), reduced glutathione (GSH), superoxide dismutase (SOD), catalase and nitrite). Administration of haloperidol for 21 days results in decreased rotarod and locomotor activity and increasing the orofacial dyskinetic movements. Further, haloperidol treatment results in increased levels of MDA, nitrite and decreasing levels of antioxidant enzymes (GSH, SOD and catalase). The administration of filgrastim (40 and 60 μg/kg, s.c.) along with haloperidol significantly attenuate the impairment in behavior and biochemical parameters. However, the lower dose of filgrastim (20 μg/kg, s.c.) shows no significant effect. Results of the present study indicated the therapeutic benefits of filgrastim in the prevention or delaying of antipsychotic-induced orofacial dyskinesia.
Erythropoietin alleviates cognitive impairment and neuro inflammation in high fat diet fed sleep restricted mice

Sunanda Tuladhar
Email: tuladharsunanda4@gmail.com

Abstract: Present study is designed to investigate the pleiotropic effects of erythropoietin on cognitive performance and neuro inflammation in sleep restricted (SR) mice fed with high fat diet (HFD). Animals were fed with HFD for a period of 9 weeks and SR was induced for 10 h (06.00 am to 4.00 pm) using modified platform method. Exposure to HFD aggravated SR induced cognitive impairment, up-regulates brain Iba-1, pro inflammatory cytokines (IL-1β, TNF) expression when compared to vehicle treated non-sleep restricted mice. Simultaneously administration of Erythropoietin (EPO) was administered at 100 and 500 IU/kg, i.p, produced a dose dependent improvement in cognitive function assessed in Morris water maze and step down latency. EPO down-regulates Iba-1, IL1β and TNF α In the hippocampal region of HFD/SR animals. Further, EPO improved glutathione and superoxide dismutase levels in HFD/SR animals. Interestingly, EPO improved histological structure in the dentate gyrus of hippocampus. In summary, EPO suppresses neuroinflammation and improves anti-oxidant defense in HFD/SR animals. Our lab is working further to understand the role of EPO on neurogenesis in such co-morbid state of hyper lipidemia associated in sleep restricted state.

Learning more about Neural Disorders

Ahsan Ahmed
Email: ahsan1037@gmail.com

Abstract: Neurodevelopmental disorders include intellectual disabilities (ID), autism spectrum disorders (ASD) like diseases. Recent experiments show that long non-coding RNA plays an important role in the formation of these kinds of diseases. For the long term of a period, this section was ignored respect to the human genome. As most of the mammalian genome is transcribed, it is hard to understand it's the mechanisms. In recent experiments, it is identified that IncRNA is involved in neuro behavioral and neurodevelopmental disorders. However, the activities and importance of IncRNA in these diseases formation are mostly unknown.
Mobile phone radiation and the developing brain: behavioral and morphological effects in juvenile mice

Imam Hasan
Email: hasanimam38514@gmail.com

Abstract: The effects of mobile phone radiation (electromagnetic radiation; EMR) are a subject of recent interest and study, because of the enormous increase in its usage throughout the world. The aim of this study was to investigate the effects of 4G mobile phone radiations in mice. Twenty-one 4-week aged juvenile male mice were divided into three groups; group A (control), group B (exposed 40 minutes daily for 60 days), group C (exposed 60 minutes daily for 60 days). Exposure of radiation was given from 4G handsets connected mobile phones in an interactive call the 2100 MHz frequency. The control group did not receive any radiation. After exposure of radiation, the behavioral study was performed in every week by using elevated plus maze in both control and exposed groups. At the end of the exposure of radiation hematological, biochemical and histological tests were performed. The results of the elevated plus maze test showed that the frequency of time spent and entries into the open arms significantly decreased while time spent in closed arms was significantly increased in both exposed group compared to the control group. The mean body weight of the exposed group was decreased significantly. The TLC and Hb% were increased significantly in 40 and 60 minutes exposure groups while the values of TEC was decreased significantly 60 minutes exposure group. The ALT, AST, and Serum creatinine were increased significantly in 40 and 60 minutes of exposed groups of mice. The weight of the liver and kidney were decreased in exposed groups of mice than the control group. The pyramidal neuronal cells in the CA1 and CA3 area of hippocampus showed variable degrees of degeneration in 60 minutes exposed group compared to the 40 minutes and control groups of mice. Marked lymphocytic infiltration was found surrounding the bile duct and hepatic artery in the liver of exposed group. The kidney of 60 minutes exposed group of mice showed lymphocytic infiltration with severe vascular congestion. Irregular shapes seminiferous tubules, and fewer spermatogenic cells with larger lumen were found in some of the seminiferous tubules of both exposed groups of mice. The findings of this study indicated that excessive use of mobile phone radiation leads to damage the structural integrity of the hippocampus, which lead to anxiety like behaviors as well as the deleterious effects on hemato biochemical parameters, and impairment of liver, kidney, and test is function in mice. So, excess use of mobile phone should be prohibited to avoid these hazardous effects. More research work will be needed to reveal whether these pathological changes are reversible or permanent to have a definite conclusion in this aspect.
Bioinformatics

Nafees Sadique
Email: nafees.sadique@gmail.com

Abstract: Research in this area explores the use of computational methods to better categorize, visualize, and model biological data and systems. These problems often involve massive, high-dimensional datasets and their solutions draw from many disciplines of computer science including database management, data mining, machine learning, and algorithmic optimization. Research in this group includes algorithms for sequence and structure analysis, protein structure prediction, virtual screening and lead discovery, data modeling of scientific applications and building predictive models for effective disease diagnoses.

Anticancer peptide prediction using Deep Learning

Samia Tasnim Sara
Email: samia.sarah007@gmail.com

Abstract: Nowadays cancer is the most common disease and trigger of millions of lives globally. Chemotherapy, which is very costly and has a catastrophic impact on normal cells, is the most accessible technology for cancer treatment. We understand that peptide plays a significant role in the therapy of cancer. Which is much more cost-effective and precise than biological experiments. Here we are attempting to construct a web-based instrument that uses computer teaching to define protein sequence anticancer peptides. Hope that it will help a lot in the therapy of cancer.

Learning of Neuroscience

Usma Aktar
Email: usma.cse101@gmail.com

Abstract: Sigma promoter sequences in bacterial genomes are important due to their role in transcription initiation. Sigma 70 is one of the most important and crucial sigma factors. In this paper, we address the problem of identification of σ 70 promoter sequences in bacterial genome. We propose I Promoter-FSEn, a novel predictor for identification of σ 70 promoter sequences. Our proposed method is based on a feature subspace based ensemble classifier. A large set of of feature sextracted from the sequence of nucleotides are divided into subsets and each subset is given to individual single classifiers to learn. Based on the decisions of the ensemble an aggregate decision is made by the ensemble voting classifier. We tested our method on a standard bench mark data set extracted from experimentally validated results.
Experimental results show that I Promoter-FSEn significantly improves over the state-of-the art σ 70 promoter sequence predictors. The accuracy and area under receiver operating characteristic curve of I Promoter-FSEn are 86.32% and 0.9319 respectively.

**An Integrated Brain-computer Interface and Neurofeedback Based Education System for University Students**

Tahnia Nazneen  
Email: tahnian.k08@gmail.com

*Abstract:* Information Technology education divisions require an increased amount of dedicated and skilled students in developing countries like ours. However, apart from monetary and social issues, many students in the tertiary level drop out mid-study or show poor performance due to course content, depression, stress and sleep deprivation. Unlike children, where signs of attention deficiency are prominent and easily detectable, most of the under-graduate level students never disclose their difficulties with even their nearest ones for they are routinely mislabeled. More often than not, these problems go unnoticed by the students themselves and thereby result in poor grades and a shortage of skilled graduates, affecting the nation’s prosperity on a larger scale. Fortunately, as all these phenomena originate in the brain, an extensive study utilizing the brain waves from electroencephalography (EEG) signals can help develop a neurofeedback system to connect both the students and teachers by tracking their attention level in real-time. Using the FocusEDU headset from Harvard Innovation Lab’s BrainCo Inc., we propose FocusMind which will be a cloud-based neurofeedback system that will connect the students to their teachers in real-time attention tracking, focus training, self-regulation, and relaxation platform using the built-in features of FocusEDU. Additionally, utilizing the raw EEG data from the students and FOCUS SDK, our machine learning algorithms will detect depression, sleep deprivation, and stress level of the students. The students will then have access to individualized games and training to overcome their obstacles and seek medical assistance if necessary through the FocusMind Mobile Application. It will thereby not only assist students in focusing on their education but life as a whole as well.

**Design and development of a Brain Computer Interface (BCI) based Neuromarketing System and evaluation of its feasibility for marketing research in Bangladesh**

Ferdousi Sabera Rawnaque  
Email: rawnaque.fs@gmail.com

*Abstract:* Neuromarketing is a Brain Computer Interface (BCI) based marketing research approach, which uses brain signal recordings to analyze and predict consumer response to the marketing stimuli. Without effective marketing, a good product fails to inform, engage and sustain its targeted audiences. Consumer preference is continuously evolving with the ever-expanding
economy and new businesses. It is hard for the businesses to grow and sustain without having quantitative or qualitative assessment from their consumers. Traditional survey methods i.e. self-reported surveys, focus group discussions (FGD) and interviews provide unreliable consumer information due to the indiscriminate self-reporting and time constraints. To build the bridge between consumer preference and the product/service, Neuromarketing comes as a solution which combines neuroscience, psychology and marketing research. Neuronal recording techniques i.e. functional Magnetic Resonance (fMRI), Electroencephalography (EEG), Magnetoencephalography (MEG) etc. are used to directly measure the response of a customer’s brain to the marketing stimuli, which supersedes the traditional survey methods. Obtaining neuronal activity from the brain, one can explore the cognitive and emotional responses of a customer brain. However, conducting market research with fMRI or MEG machines are less efficient due to their immobility and high expenses. On the other hand, EEG offers us reliable data with cost effective and moveable EEG devices. Our project is focused to build the very first Neuromarketing system for advanced marketing research in Bangladesh. This project utilizes EEG, eye tracking and Photoplethysmograph (PPG) signals to gain the insight from audience’s neurophysiological responses while they experience marketing stimuli. This project is aims to develop a prediction algorithm which will be able to identify consumer engagement with the advertisements (video/static image) based on consumer cognitive and emotional responses measured from neurophysiological signals.

**Development of Brain Computer Interface (BCI) Enabled Game for Enhancing Concentration Level and Create Database for Further Research**

Rana MD Shahriare Parvez
Email : ranadepto@gmail.com

**Abstract:** Brain-Computer Interface (BCI) also known as Brain Machine Interface (BMI) has become one of the most popular and demanding fields of research interest in recent years. This is a rapidly growing fields and day by day the publicity of this technology is increasing dramatically. It is hardware and software based systems which provide support to interact with the machine using bio signals generated either by physiological or neurophysiological activity. Although the primary aim of BCI research is to help the disabled people to communicate and observe neural activity of patients, some researchers are also working on developing games and communicative application using BCI. As most of the researchers have been working on the medical field of BCI, it’s getting mature day by day. On the contrary, non-medical field like gaming and other application using BCI is still in an immature state. Brain-computer interface (BCI) offers humans an alternative mechanism for computer interaction and it has advanced significantly in recent years, mainly due to the advancement in signal processing methods and more qualitative and quantitative application focused investigations and technology trials. A BCI which can be adapted quickly and easily to each individual with the capacity to provide accurate, stable and low latency feedback has been developed. The online performance of the new game suggests that the game can be used as a new training paradigm and encourage subjects to maximize effort and help to
enhance performance. BCI enabled systems has a lot of promises in both medical and non-medical fields. BCI enabled games can bring entertainment and also a promising system to improve concentration level. However, we need to conduct a study to make it possible. As a matter of study or conducting research, real data plays a vital role. Researchers can’t verify their theory or conduct further research without implementation and analysis. On the field of BCI research, devices for data acquisition is not only expensive but also it requires expertise and some special requirements (like a noiseless lab) to acquire data. Moreover, the data donator needs to be trained properly to pursue quality data. Therefore, besides developing a game for enhancing concentration level, database development will be beneficial for future research.

Relative refractory period and its impact on activity-dependent power spectra of human brain

Nasrina Parvin
Email: nasrina@ins.uiu.ac.bd

Abstract: Relative refractory period has a significant role in the activity dependent brain spectra, which can be related to other physiological activities. Neural Field Theory gives an opportunity to parameterize relative refractory period via local feedbacks. The postsynaptic modulation of the firing threshold by the postsynaptic firing rate leaves traces in the power spectra that might give rise to the longer relative refractory period such as the decrease in power in low frequencies, split of some spectral peaks, and new resonances in high frequencies. These can be related to longer response time for individuals, and thus indicates a number of physiological activities except habituation, which gives a wide range of future research areas.

AD Care: Smart tools for screening, resource mapping, and increasing awareness of Alzheimer’s Disease among population in Bangladesh

Md. Habibur Rahman
habibrajib2018@gmail.com

Abstract: Alzheimer’s disease is the most common cause of dementia and usually occurs in old age.[2,3] Alzheimer’s disease is currently ranked as the third leading cause of death in the United States, just behind heart disease and cancer as a cause of death for older people. Research shows that the expenditure due to Alzheimer’s disease will be 7 billion USD in 2030 only in the United States.[1] Being an overpopulated country and most people living in rural areas, there is a very little concern about Alzheimer’s disease in Bangladesh among general people.[14] In this project
we proposed a detailed survey on prevalence of Alzheimer’s disease, specially, age, sex, area and how people treat Alzheimer’s disease. The Next step would be observing healthcare facilities (both Government and Non-government organizations) to find the exact number of people with basic training or expertise to treat Alzheimer’s disease. However, Mini-Mental State Examination (MMSE), Geriatric Depression Scale (GDS) and ABC Dementia Scale (ABC-DS) [14] are available for Alzheimer’s disease screening, which we can use as motivation to develop a standard set of questionnaires appropriate in Bangladesh. We intend to use those to build a virtual platform through ICT to develop awareness of Alzheimer’s disease among mass population in Bangladesh.

An analytics-based intelligent system to guide H.S.C passed students determine education pathway based on their personality and ability

Nabila Kamal Nova
Email: nabilanova0@gmail.com

Abstract: In Bangladesh, an overwhelming number of college students often face dilemma in deciding an education pathway after HSC examination. Choosing a university is the primary footstep for most individuals’ preparation for working life. Traditionally, while preparing for a specific admission test student often take university ranking, suggestion from family and peers into account without exploring his/her interest, aptitude and personality-traits. Sometimes, students become dissatisfied with academic subjects after enrollment and it often leads to career indecision and future uncertainty. Students’ satisfaction with their academic studies correlate with their academic and career success and undergraduate admission decision is far more complex than admission test scores and meeting admission requirement. Therefore, it is crucial for an individual to match with a specific form of undergraduate subject and to choose the best possible institution after H.S.C relevant to his/her persona, skills, interests and aptitude. So that students will be able to make the best out of their potential which will foster development in the country and their own lives.

UPDRS Level Assignment for Parkinson’s Patient from Hand Tremor Analysis

Md. Sakibur Rahman Sajal
Email: sakibur@cse.uiu.ac.bd

The study of the characteristics of hand tremor of the patients suffering form Parkinson’s disease (PD) offers a great scope to detect and assess the stage of progression of the disease. Based on the tremor analysis, neurologists label the PD patients with any of the (0-4) Unified Parkinson’s
Diseases Rating Scale (UPDRS) value. With the availability of latest smart-phones with built-in accelerometer sensor, it is possible to acquire the tremor data very easily and a trained algorithm can provide the suspected patient with proper recommendation based on data analysis. The objective of this study was to find the accuracy in detection of PD and assess the stage of it if detected. We obtained 98% above detection accuracy and 95% above labeling accuracy for 23 subjects of whom 17 were PD patients at different stages.

Nonlinear modelling of voltage fluctuations in brain imaging modalities

Mahtab Uddin
Email: mahtab@ins.uiu.ac.bd

Abstract: Brain imaging modalities, for example, includes magnetic resonance imaging (MRI), ultrasound, medical radiation, angiography, and computed tomography (CT) scanners. In addition, to several scanning techniques to visualize the human body for diagnostic and treatment purposes. Various patterns of Brain activity are observed in dynamic cortical imaging data. Such patterns may reflect how neurons communicate using the underlying circuitry to perform appropriate functions; thus it is crucial to investigate the spatiotemporal characteristics of the observed brain activity patterns. In general, however, brain activities are highly nonlinear and complex, so it is a demanding job to analyze them quantitatively or to classify the patterns of observed activities in various types of imaging data. Brain cells function using rapid electrical impulses, a process that underlies our thoughts, behavior, and perception of the world. Using a voltage-sensing molecule that fluorescently lights up when brain cells are electrically active, researchers at Boston University and the Massachusetts Institute of Technology have shown that they can see the activity of many more individual neurons than before as they fire inside the brains of mice. With the new voltage sensor, it is also possible to measure very small fluctuations in activity that occur even when a neuron is not firing a big spike in electrical activity. Electroencephalography (EEG) is an electrophysiological monitoring method to record electrical activity of the brain. EEG measures voltage fluctuations resulting from ionic current within the neurons of the brain. Clinically, EEG refers to the recording of the brain's spontaneous electrical activity over a period of time, as recorded from multiple electrodes placed on the scalp. Diagnostic applications generally focus either on event-related potentials or on the spectral content of EEG.

PVDoctor : Cloud based Virtual Doctor for Parkinson's Disease Screening and Monitoring

Md. Tanvir Ehsan
Email: mehsan172026@mscse.uiu.ac.bd

Abstract: Parkinson's Disease (PD) is the second most severe neurodegenerative disease. Among the number of techniques, 'voice disorder' and tremor are very common symptom for efficient PD
detection. According to the severity of the disease, PD diagnosis and intervention are almost non-existent in developing countries, where resources are lacking. Therefore, in this paper, we are proposing a cloud based tool using mobile application, PVDoter (Parkinson's Virtual Doctor) to identify PD patients automatically by analyzing recorded voice and hand tremor using smartphone and create awareness for PD in developing countries.

**Generic Bi-directional Sign Language System and Bangla Sign Language Numbers Detection using Leap Motion**

Ashek Shanto  
Email: asekshanto@gmail.com