

Diagnostics, Therapeutics and Assistive Devices Laboratory

Introduction:

Autism is a neurodevelopmental condition characterized by impairments in social communication, stereotyped behaviors, and repetitive activities. Center for Disease Control and Prevention (CDC) estimates that approximately 1% (1 out of 160) of the world's population is affected with autism spectrum disorder (ASD)(CDC,2020). According to the most recent statistics from the Global Burden of Disease Study (GBD), 4.57 million children worldwide under five have autism. In Asia, Shuang Qiu et al. conducted a systematic review. According to the review, an updated and overall estimate of ASD prevalence in East Asia, South Asia, and West Asia was 0.51%, 0.31%, and 0.35%, respectively. Moreover, 24% of the world's population resides in the South Asia region. Overall, the prevalence of ASD in South Asia, emphasizes the importance of thorough research and interventions for therapy that can help children with ASD in this region.

About:

The Diagnostics, Therapeutics and Assistive Devices Laboratory (DTADL) is multidisciplinary, translational research involving engineering and medical streams. This lab mainly focuses on the development of devices for diagnosing and treating neurological developmental disorder patients.

In this lab we aim to

- Design and development of customized IoT-based reconfigurable therapeutic devices for visual, auditory, speech, and tactile sensory stimuli.
- Development of a sensor-based system to track and analyse the frequency of stereotypical movements in disabled children.
- Development of protocols for conducting various child development activities using therapeutic display devices.
- Development of supervised machine learning algorithms to analyse the behavioural pattern of disabled children.

Not limited to this, the DTADL also focuses on the detection and quantification of ultra-low concentrations of target biomarkers such as proteins, nucleic acids, bacteria, and viruses in clinical and environmental samples is essential for the diagnosis of chronic diseases such as early-stage of Cancer, Tuberculosis, Myocardial Infraction and also the acute diseases such as Dengue, Chikungunia, and COVID-19. According to World Health Organization (WHO) guidelines, An Ideal diagnostic device not only utilizes simple technology but also follow ASSURED criterion. In this line of research, it is essential to develop a state-of-the-art Point-of-care (PoC) device which can detect ultra-low concentrations of analyte from inadequate sample volumes, and a semi-professional can perform a test without additional laboratory support. This lab will allow researchers to explore various PoC diagnostic technologies for medical applications and help explore plasmonic nanoparticles for various analytical applications. This lab will provide training to undergraduate and postgraduate students in simulations and experimental research.

Funded Projects:

Ongoing:

1. **Dr. K. V. Phani Kumar (PI)**, Dr. Bandaru Ramakrishna (Co-PI), Prof. Ganapathy Sankar (Co-PI), “Design, Development, and Validation of User-Adaptive Sensory Integration Room for Children with Autism Spectrum Disorder using IoT and Machine learning Approach”, ***DST SERB Core Research Grant 2021, Amount: Rs. 18.95 Lakhs***

Submitted:

1. **Dr. K. V. Phani Kumar (PI)**, Dr. Suresh Subramanian (Co-PI, Ahlia University, Bahrain), Dr. Bandaru Ramakrishna (Co-PI), Prof. Ganapathy Sankar (Co-PI), “Development of Reconfigurable Therapeutic Devices: An Internet of Things(IoT) and Machine Learning Approach for Sensory Stimulation and Behavior Analysis in Autistic Children”, ***AUAP Research Fund 2021, Amount: 5000 \$, Status: In Review (Top 12)***
2. **Dr. Bandaru Ramakrishna (PI)**, Dr. N Ashwin Kumar (Co-PI), Dr. C Likith Kumar (Co-PI), “Design and Development of Plasmonic Immunosensor test kit: A plasmonic fiberoptic absorbance sensor platform for selective detection of biomolecules and pathogens”, ***DST SERB CRG 2022, Amount: INR 50,20,490.00, Project Duration: 36 months Status: In Review***

Expected Outcomes:

- An indigenous user-adaptive sensory integration therapeutic center for people with multiple disabilities will be established as a facility at the College of Occupational Therapy to benefit ASD children.
- Establishment of a Startup
 - Design and development of customized diagnostics and therapeutic modules
- Development of Human Resources:
 - UG, PG Project Guidance
 - Ph.D., and Post-Doc. Recruitment and Training
- Publications in terms of patents, journals, and conferences.