Dr. A.P.J. Abdul Kalam Technical University

Sec-11, Jankipuram Vistar Yojna, Lucknow, Uttar Pradesh-226031

Research Opportunity and Facilities in AKTU for UG and PG Students.

Dated: 11 Jan 2020.

Centre for advanced Studies (In-campus Institution of Dr. A. P. J. Abdul Kalam Technical University) is a Research driven institution whose objective is to promote state-of-art research and innovation. The center has state of art laboratories and is committed for high end research. Currently the center is offering M. Tech programs, Ph.D. Programs and has ongoing Ministry of Science and Technology – Department of Science and Technology (DST) funded projects in cutting edge technologies. Also there is good research collaboration with National and International Organizations for collaborative research.
Research data can be generated with the research instruments which can be implemented in different Deep learning and machine learning based models to develop intelligent AI devices and expert systems. Work in such research projects may result into good publications, patents, international collaborations, and will lead good foundation for a R&D career and higher education prospects in India and Abroad.

Research minded B.Tech /M.Tech students who intends for higher education/career in R&D and has a strong liking for research activities can be part of some research groups in Centre for advanced studies in following areas: Machine learning, Deep learning, Computer Vision, Image processing, Bio-medical engineering, Signal Processing, Audio Signal Processing etc. Students having knowledge in Python and experience in the above areas will be preferred. **Final Year B.Tech Students can also do their final year Projects using these research facilities.** The mode of association will not have any stringent rules and will be flexible in timings as per mutual convenience and will be outcome oriented. The student can work beyond college hours and weekends/holidays/vacations in research projects.

The research facility is assisted by the High-Speed Data Servers, Computing Devices, 24*7 internet and electricity facility. List of equipment / Research facilities are attached.
Interested candidates can fill this Google form Sheet by 16 Jan 2020**. Link Given Below.**

https://forms.gle/WfwgU7XX1wZqUi9v9

Shortlisted candidates will be called for an interaction at Center for Advanced Studies, AKTU and if found suitable will be involved in research projects.

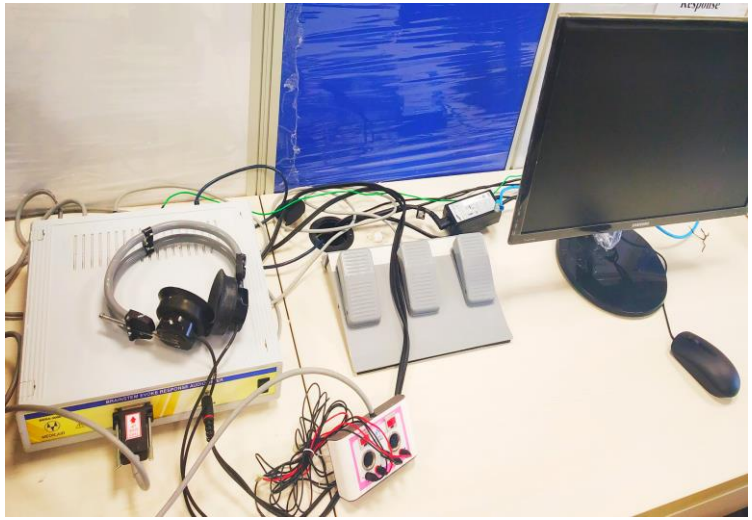
Enclosure: List of equipment / Research facilities are attached.

Best Wishes.

M.K.Dutta, PhD
Professor, **Centre for Advanced Studies**
(An Autonomous Uttar Pradesh State Government Research Driven Institution)
Dean, Post Graduate Studies and Research.
Dean, Research & Development and Industrial Consultancy
Dr. A.P.J. Abdul Kalam Technical University.
(*Formerly Known as Uttar Pradesh Technical University*).
Sec-11, Jankipuram Vistar Yojna, Lucknow, Uttar Pradesh-226031

Equipment / Facility List in ICT Lab.

S. No.	Equipment Name	Applications	Images
1.	**Markerless Motion capture system (2-D Gait Analysis System) with Force plate** It contains 16 * 2 feet stable three-layered platform. The software provides parameters like velocity, cadence, step length, step width, stance and swing percentage, toe-in/out angle, instantaneous Centre of Pressure (COP), Centre of Mass, Foot angle, direction of progression, Left to Right Ratios path efficiency, total pressure, footfall COP, and [COP-COMe] etc. Provide facility for multiple protocols like walking, standing, running and jumping and can develop own protocols. Video synchronization of 2 or more cameras with replay capabilities and a push-button switch for marking events is also available.	It is used in research and study of Cerebral Palsy, Stroke, Parkinson's Disease, Multiple Sclerosis, Alzheimer's Disease, Ataxia, Muscular Dystrophy, Neuropathy Concussion, Fall Risk, Osteoarthritis, Motor Impairments, Sensory Impairments, Knee and Hip Replacement, Injury Rehabilitation, Amputation, Brace fitting and tuning, Prosthetic limb optimization, Equines Gait (Toe-Walking), Spine Bifida It can also be used for comparing variables between the left and right footfalls to evaluate symmetry, track changes over time to quantify patient progress and provide metrics and complete reports.	
2.	**FLIR E5 Thermal Imaging Camera** This is a real-time working 10,800 (120 × 90) pixel infrared resolution, focus-free camera. By providing thermal images along with accurate temperature measurements using different colour.	The FLIR E5 is a powerful thermal imaging tool for troubleshooting electrical, mechanical, and building problems. Find hidden issues quickly, easily, and safely– without the need for direct contact with equipment	
3.	**Human Non-invasive Blood Pressure (NIBP) Monitor** Reliably record and monitor trends in response to interventions on finger arterial pressure, systolic, diastolic, mean arterial, heart rate and inter-beat interval. Have Volume Clamp Technology that providing accurate finger pressure measurement. Have a facility for the Height Correction unit. This system automatically corrects for movement of the finger cuff relative to the heart with the height correction unit (HCU).	Heart Rate Variability HRV (psychophysiology) Biopotentials & GSR (psychophysiology) Record and measure various physiological responses such as biopotential recordings (EOG, ECG, EMG, EEG, GSR), which measures the electrical conductance of the skin in response to stimuli. Cardiovascular studies: ECG signals are recorded to examine heart rate, heart rate variability, analysis of the waveform morphology, arrhythmia and other similar functions, Sleep studies.	

4.	**Equi-vital Physiological Monitoring System** Comfortable belts for recording physiological data via a compact and unobtrusive sensor belt, leaving the subject free to move naturally. Module can record ECG signal, Acceleration (3 axes), Respiration, Skin Temperature, SPO2, and GSR. The system should provide Real-time data recording with online and offline analysis. Provide Noise and movement artefact ciliary pack.	It is used to record and measure various physiological responses such as EOG, ECG, EMG, EEG and Galvanic Skin Response (GSR).	
5.	**Auditory brainstem response (ABR) audiometry system** Auditory brainstem response (ABR) audiometry is a neurologic test of auditory brainstem function in response to auditory (click) stimuli, which is the most common application of auditory evoked responses. It features high-performance amplifiers specifically designed to obtain high quality evoked potentials signals. With 14 bit averages, the BERAGRAPH can measure an objective auditory threshold a degree of accuracy greater than 5 dB and so distinguish end cochlear deafness from retro-cochlear deafness. The auditory stimulator gives burst, login and clicks stimulation presented either in condensation, refraction or alternating from 0 dB to 120 dB. The masking intensity can be controlled automatically with the stimulating intensity while maintaining the same programmed difference.	Research in the field of new-born hearing screening, auditory threshold estimation, intraoperative monitoring, determining hearing loss type and degree, auditory nerve and brainstem lesion detection, cochlear implant	

6.	**Electronic Stethoscope for PCG signal** The Electronic Stethoscope II is a second generation, patented, electronic stethoscope that allows the user to amplify or record heart and lung sounds. A sound selector switch is used to select the proper frequency for listening to either heart sounds or breath sounds. Volume and filter controls on the stethoscope head allow convenience and ease-of-use. Automatic ~1.5 minutes shut down timer that will turn the instrument off to conserve battery life. Exceptional sound quality with 64 gain positions	The devices or prototype which require a unit to listen heart, lungs, bowel sounds and blood flow noises in arteries and veins while simultaneously recording representative signal traces with a suitable Bio Amp and shielded lead cables .	
7.	**EMOTIV EPOC+ 14 Channel Mobile EEG** EMOTIV EPOC+ 14 channel EEG provides access to professional grade brain data. Access high-quality raw EEG data conduct research leveraging the detections for mental commands performance metrics or facial expressions. The EPOC+ measures both EEG and 9-axis motion data. Data is transmitted wirelessly through Bluetooth. It is a 5-channel wireless EEG device covering frontal, temporal and parietal and occipital locations around the brain. It is designed for everyday use by individuals looking to understand and improve their own brains. It utilizes proprietary polymer sensors that are hydrophilic they pull moisture from the air and skin.	EMOTIV EPOC+ 14 channel mobile EEG is designed for scalable and contextual human brain research and advanced brain-computer interface applications. Performance Metrics analysis like Excitement, Commitment, Relaxation, Interest, Stress, Focus. Facial expressions analysis like blinking, wink L / R, surprise, frowning, smiling, clenching, laughing, grinning.	

8.	**EMOTIV 32 Channel EEG cap** EPOC Flex combines the wireless technology with the flexibility and high density afforded by more traditional EEG head cap systems. The saline sensors leverage easy-to-use saline-soaked felt pads, for minimizing setup and maintenance time. It Contains 32 channels with 2 references. Its EEG signals Resolution 14 bits with 1 LSB and Band width is 0.16 – 43Hz with digital notch filters at 50Hz and 60Hz	Wireless recording of high-resolution brain data from any of the standard 10-20 EEG positions for up to 32 channels with transmission data rate of 128 Hz without being tethered to a computer	
9.	**Delsys Wireless EMG System** Freely record and measure electrical activity produced by muscles, using wireless EMG sensors. Wireless EMG is useful for a wide range of applications within exercise physiology.	Track & field and gymnastics, studying motor control for patient rehabilitation or muscle performance, activity, and fatigue in elite athletes, measure electrical muscle activity simply.	
10.	**SENSEnuts – IOT platform for Research** SENSEnuts uniquely offers full technology stack with application layer, wireless network & cloud connectivity protocols for rapid IoT prototyping and end to end vertical applications. It is Microcontroller with an integrated 802.15.4 transceiver and a variety of sensors like Environment, Meteorological, Air & water quality, etc. It also has features like modular design having Gateways, Radios & sensors devices Self-healing multi-hop network, easy to install and faster deployment It gives an affordable solution for WSN concept testing and learning. It is easy to use because of C based programming, exhaustive set of “easy to use” APIs, flexible MAC protocol implementation, live data Interface with MATLAB, etc.	An ideal platform for research projects. It has many advanced features to offer like energy-efficient individual Streetlight Controllers which enable remote On/Off switching, dimming control, user-configurable time scheduling & grouping schemes, Current/power consumption tracking of luminaire, Alerts for outage & malfunction, connectivity to Local or Cloud Server for data access and management and finally interfaces for Sensors like Motion detection, Pollution, light etc.