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IT INDUSTRY DEVELOPMENT AGENCY

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ICT R&D Newsletter in Egypt

VCOACH Virtual Coaching for Indoors and Outdoors Sporting

Egypt-Japan University of Science and Technology and XIOT LLC company

Researchers from Egypt-Japan University of Science and Technology and XIOT LLC company created a multi-modal workout dataset from different sensors, including RGB videos, inertial motion data, depth, and thermal data, all synchronized with regard to the activities/exercises performed. The exercises are performed by 50 participants indoors at a fitness center. Human Activity Recognition (HAR) has sparked a lot of attention because of its wide range of applications in sports, animation, simulation, and entertainment. There are many applications based on HAR, like healthcare monitoring, entertainment applications, and athletes' performance analysis. During the Corona pandemic, people took remote training as a safe and easy solution to do sports activities during the closure period, so there was a need to use smart systems to help people to train alone. "We built a smart Gym coaching model using classical machine learning and deep learning methods for various tasks including exercise recognition, biometrics analysis of the subject performing the exercises and a feedback assessment system for the performance and mistakes done by the subject' says Dr. Walid Gomaa, Professor at Egypt-Japan University of Science and Technology and the principal investigator of the project.

A User-friendly 3D Printer Solution Unleashes Children and Youths' Creativity

Fab-Minds

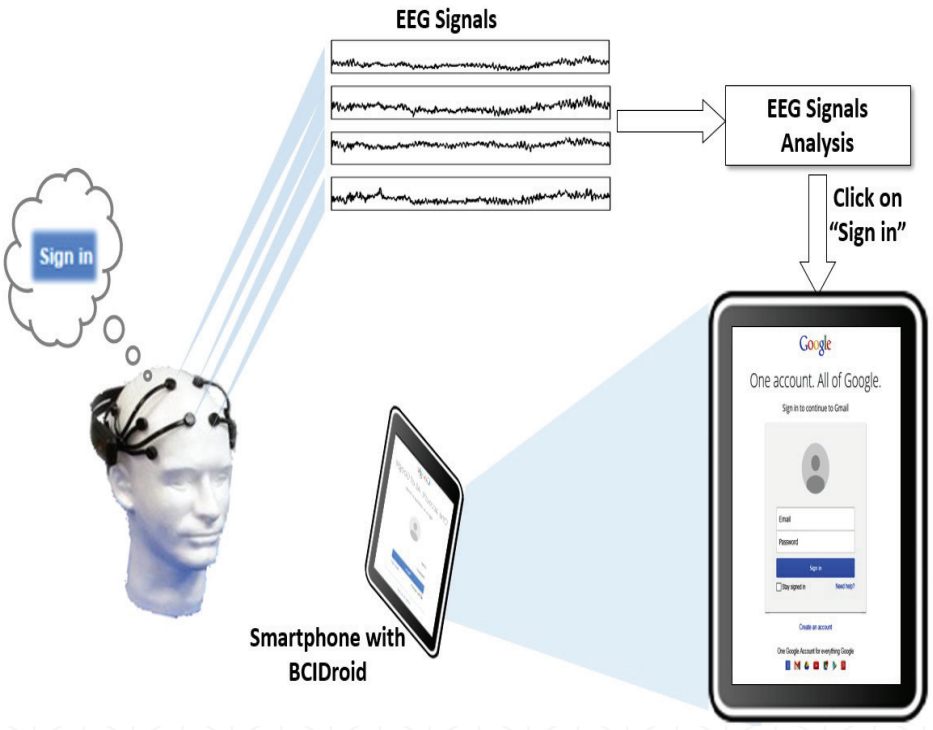
Researchers from Fab-Minds came to offer a solution by bridging the gap between A.I. vs. 3D printing and Technology vs. Creativity, through its product; "The FabMaker'. Children, Youth and their access to screen time has always been a subject of controversy and debate over the years. Studies have shown that easy access to smart phones, smart TVs, PlayStations, Nintendos and Game boys, etc. at a young age with no strict time constraints has clearly and specifically contained Children and Youths' creative play abilities among other behavioral issues of concern. It's inevitable that the new generations of Children and Youth will be exposed to an ever-growing Techworld with more access to screens with user friendly interfaces; however, it is important to ensure that they
are at least constructive and not limiting to their abilities. The core technology offers using A.I. to help users utilize their own creative imaginations into tangible innovations, through a one stop shop; the "Fab-Connect' app. The Fab-Connect offers many features like; sketching 2D sketches on the application, processing them to high quality 3D printed models, scanning real life objects, and 3D printing them in just a few minutes.

"The FabMaker aims to impact Children and Youths' thought processes, understand their wants and unleash their creative talents. Children and Youth can design and expand their toy collections through high quality printed 3D models that perform as toys to teach them about Science, Technology, Engineering, Art and many more' Dr. Hisham Haddara, the principal investigator of the project.

BCIDroid: A Universal Brain-controlled Interface for Smartphones

German University in Cairo

Researchers from German University in Cairo introduced BCIDroid as a BCI system that allows people with hand disabilities to interact with Android-based touchscreen devices using their brain activity. They developed a proof-of-concept that demonstrates the feasibility of allowing complete control of smartphones using limited EEG data. Advances in Brain-Computer Interface (BCI) technology have opened the door to assisting millions of disabled people worldwide. One main essential component of our daily life is using smartphones and tablet devices in a multitude of functions. However, people with hand disability have significant challenges in using touchscreen-based devices as these devices require physical touch. Signal processing and machine learning algorithms were developed to analyze the recorded brain activity with the goal of recognizing the P300 pattern that appears in EEG signals as a result of visual stimulation. Additionally, Generative Adversarial Networks (GANs) have been developed and examined in augmenting the recorded data to reduce the need for extended recordings. The results showed the ability of the developed algorithms to recognize the P300 pattern. “We were able to show a statistically significant increase in the performance of the P300 classification task using our proposed method by picking from an ensemble of GANs. Finally, we developed the mobile interface of BCIDroid, which allows users to interact with all clickable components appearing on the screen using brain activity’ says Dr. Seif Eldawlatly, Professor at German University in Cairo and the principal investigator of the project. It is expected that the impact of the developed system on the quality of life of the disabled will be widely appreciated, which will facilitate future initiatives and improve project sustainability.



LDLCT: A Framework for Lesion Detection on Lung CT Scans

Zewail City of Science and Technology

Researchers from Zewail City of Science and Technology have developed a computer-aided detection system that detects and segments lung lesions utilizing the Deep Lesion data set released by the National Institutes of Health (NIH). Lesion detection and segmentation from CT scans is an important task. However, it is a complex problem to solve as lesion and non-lesion regions can appear similar due to similarities in grey level intensities in CT slices. In addition, lesions have different types and sizes, making the lesion segmentation problem harder. Dr. Eman Badr, the principal project investigator, says “medical image analysis is a data-intensive field, especially with the continuous advancement in image acquisition devices. As a result, computer-aided detection/diagnosis has been a vital research field to help physicians in clinical screening.’ Deep learning is at the core of many recent advances in science and technology. Deep learning systems are achieving better performances at the cost of becoming more complex. The inability of users to interpret the outcomes of complex models becomes problematic, especially in healthcare applications. In this project, various models for lesion segmentation in lung CT scans have been explored, including the UNet-based model, one of the most famous Encoder-Decoder-based models in medical imaging segmentation. DeepLab has also been employed, achieving ~ 81% accuracy. The project has also focused on the interpretability part of the system. Techniques such as Grad-CAM and Saliency map have been exploited. The interpretability results show that the model generally has good behavior in estimating the right areas (where it is possible to detect a lesion). Furthermore, as the model goes deeper, it focuses on lesions. It ignores other distractions, such as other body parts (bone or tissue).