

**Theme 4-1: AI Applications - 2023**

Title	Name of the PI	List the Names of the Co-Is	Department	Abstract	Starting Date	Ending Date	Funding	Amount of Funding
Video Pre-processing and Feature Extraction Solutions for Activity Recognition Using Deep Learning	Tamer Shanableh	NA	CSE	<p>The number of digital videos is increasing exponentially due to the availability of smart mobile devices, social media and visual surveillance. The abundance of video content necessitates the use of deep learning for intelligent processing and recognition of content. Human activity recognition is one popular aspect of such content recognition that we investigate in this research proposal.</p> <p>This work proposes a number of novel video preprocessing and feature extraction solutions specific for automatic activity recognition. The first solution is based on accumulating binarized image differences and converting them into feature vectors using 2D DCT transformations and vectorization. The second solution is based on feature variables extracted from the High Efficiency Video Coding (HEVC) coder. Existing work reported in the literature do not take into account the detailed information available in HEVC video bit streams. Such bit streams contain syntactic elements pertaining to the recursive splitting of coding units, motion information and coding modes. Therefore the second propose solution uses the HEVC coder to generate feature variables suitable for automatic activity recognition of video content. The third solution relies on fusing the aforementioned solutions using two approaches. In the first approach, the generated accumulated image differences go through HEVC video coding, and bit stream level feature variables are computed. In the Second approach, feature variables are generated separately from both solutions and concatenated into one set of feature vectors. Once the feature vectors are generated, they are fed into either an LSTM network or 1D CNN network for training and classification.</p> <p>The proposed solutions are examined in terms of number of processed frames per second, classification accuracy and confusion matrices. The results shall also be compared to the latest published work.</p>	01/06/2023	30/05/2024	FRG	114,850
Low Level Features Extracted from HEVC Videos for Video Summarization Using Deep Learning	Tamer Shanableh	NA	CSE	<p>The number of digital videos is increasing exponentially due to the availability of social media and visual surveillance. A technique known as video summarization generates a meaningful summarized view of the whole video. Video summarization is needed to facilitate information retrieval and reduce data storage requirements. Existing work on video summarization using deep learning relies on generating feature maps from raw sequences of images (also known as video cubes). However, existing work does not take into consideration the wealth of information available in the bit streams of compressed video. Specifically, the High Efficiency Video Coding (HEVC) video bit stream contains information about recursive splitting of coding units, their motion vectors, and their coding modes. Therefore, this work proposes the integration of HEVC bit stream information into video summarization systems based on deep learning. The integration can have a number of forms such as combining the bit stream information with the feature maps generated from video cubes or creating a separate pipeline for deep leaning based on HEVC bit stream information and then fusing the result with that generated from deep leaning based on video cubes. The proposed work shall also examine the effect of the proposed solutions on the overall accuracy and performance of the video summarization process.</p>	01/06/2022	31/05/2023	FRG	111250
Arabic Sign Language Recognition Using Radar Technology	Amer Zakaria	Prof. Mahmoud H. Ismail	ELE	<p>In this research, a real-time word-level Arabic Sign Language (ARSL) recognition system was proposed and implemented. The work aims to facilitate the interaction between people with hearing loss and the general public. The system uses a frequency-modulated continuous wave (FM-CW) radar operating at 77 GHz millimeter frequency to transmit and capture signals from a person performing hand gestures in front of the radar. The signals are then used to train a convolutional neural network (CNN) to translate the gestures into words. The CNN is built using the Keras platform on Python and has ten layers, including two 2D convolutional layers. In the preliminary work, the system is designed to identify ten important common words. Preliminary results show that the system can classify gestures correctly in real-time with 81% accuracy.</p>	01/12/2021	01/12/2022	URG	5500
Healthcare Resources Planning Utilizing Big Data Analytics	Abdulrahim Shamayleh	Abdelkader Daghfous	INE	<p>Coronavirus-disease-2019 (COVID-19) outbreak has created massive global disruptions, threatening the healthcare (HC) sector and the quality of HC services. Existing disaster management in HC globally has failed to respond to the current pandemic adequately. Limited research addressing the role of medical resource planning and data analytics in HC risk management has been conducted. This non-interventional research study aims to assess how COVID-19 has affected the performance of the HC system over time. The areas of HC services, HC supply chain, and risk management are taken into account to describe the performance and assess their correlation. Data will be acquired from multiple resources (i.e., hospital database, and a digital survey), and appropriate tools, including both qualitative and quantitative data analytics and mathematical modeling, will be performed. A datadriven approach to risk management and decision support will be developed to serve as a guide for efficient emergency preparedness. The proposed work impact highlights the fact that organizations are increasingly turning to predictive models to better understand which patients are at risk and where resources are most needed, given the healthcare demand and constraint. The proposed research will contribute to the current combat the world is having with the COVID-19 pandemic, where most countries have been taking drastic steps to stop the spread and ensure a proper level of care through the planning of healthcare resources.</p>	01/06/2022	31/05/2024	FRG	274000