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Deep Learning-Based Diagnostic Model for Automated Detection of Monkeypox: Introducing MonkeypoxNet

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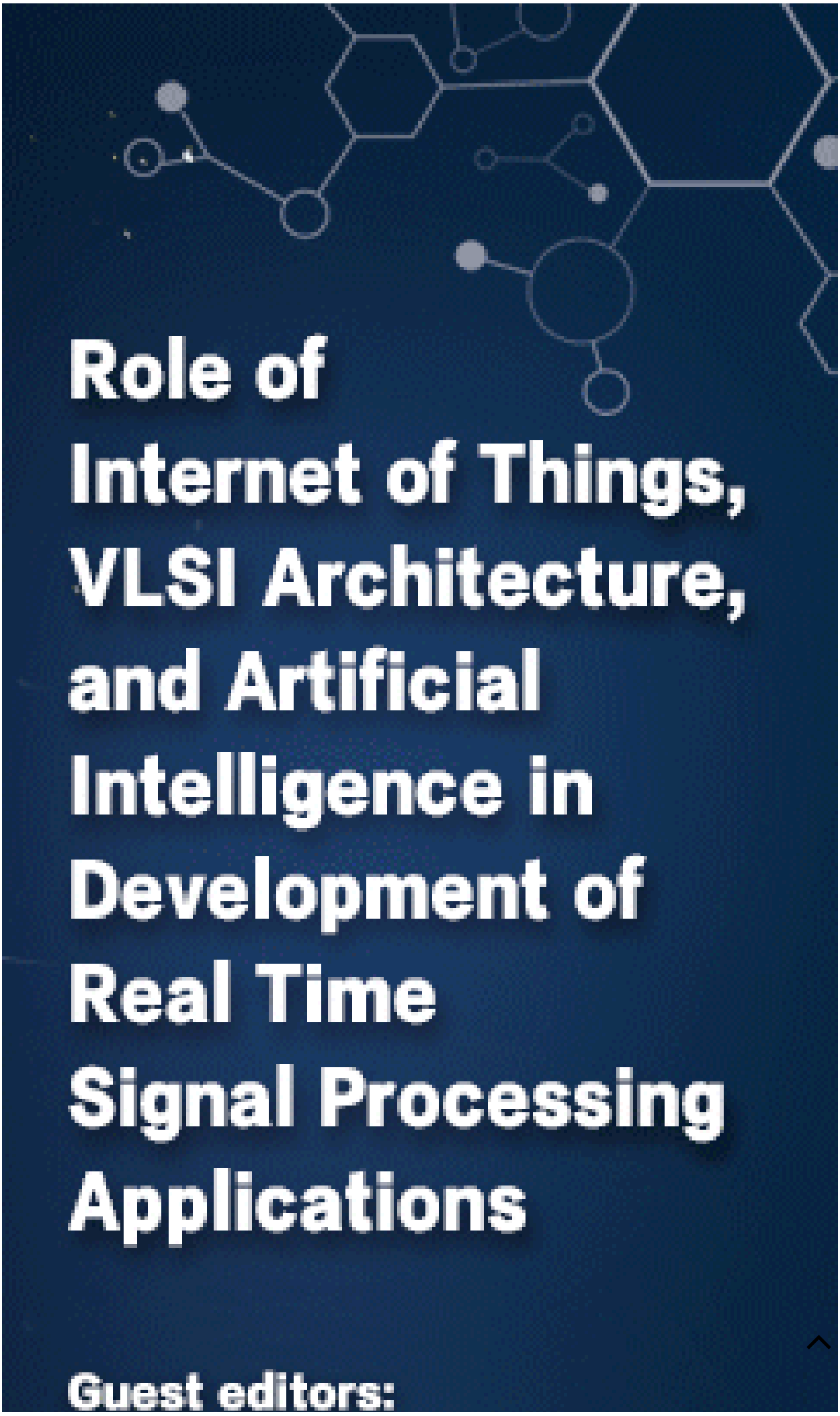
Abstract:

The swift and accurate detection of the Monkeypox virus (MPV) is integral to effective patient management and disease control. Current artificial intelligence (AI) methodologies in computer-aided diagnosis (CAD) have shown limitations in their predictive performance for MPV. Addressing this, we have developed a novel deep learning (DL) network, named MonkeypoxNet, that excels in the detection of MPV from skin images. Initially, a dataset comprising skin images, differentiated into normal and MPV-specific classes, was assembled. Image pre-processing was then conducted employing contrast-limited adaptive histogram equalization (CLAHE), which enhanced the colour and texture attributes of the images. Subsequently, a novel integration of genetic algorithm with particle swarm optimization (GA-PSO) was devised to extract and select the most relevant features from the pre-processed dataset. These features were then utilized to train our custom deep convolutional neural network (CDCNN) model. The CDCNN model was subsequently used for prediction, distinguishing between MPV and normal disease classes by comparing test features with the trained model. Remarkably, the proposed MonkeypoxNet demonstrated an accuracy of 99.06%, sensitivity of 98.66%, specificity of 99.11%, and an F-measure of 99.67%. Comparative analysis with existing methodologies confirmed that our proposed approach outperforms in all evaluated metrics. The successful implementation of MonkeypoxNet, underscored by its exceptional accuracy and efficiency, holds the potential to revolutionize early detection and diagnosis of monkeypox virus infections. This could ultimately lead to improved patient outcomes and facilitate timely interventions.

Keywords:

monkeypox virus, skin images, customized deep learning, genetic algorithm, particle swarm optimization, convolution neural network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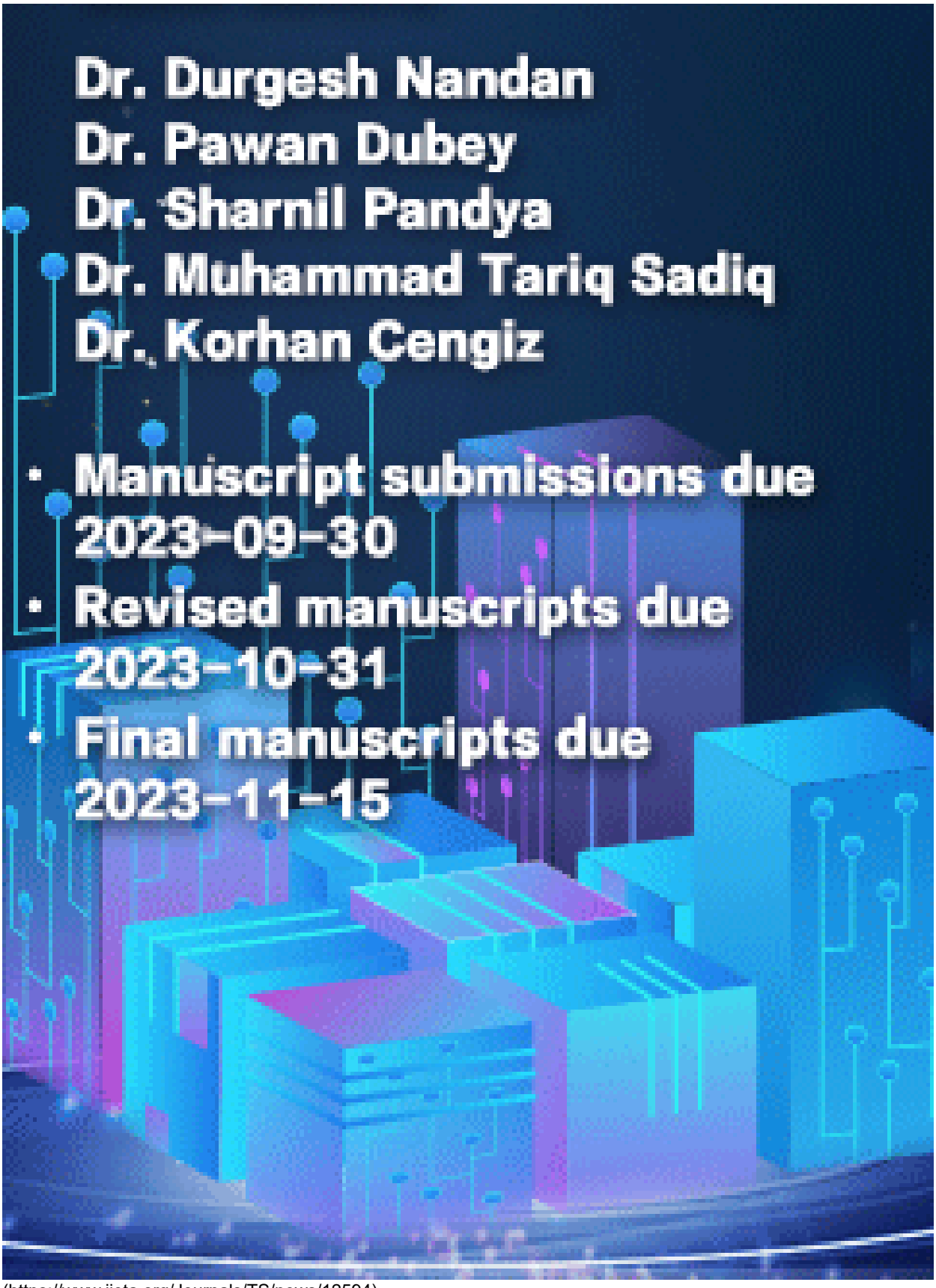

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