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# DEEPMOTILE: Motility Analysis of Human Spermatozoa Using Deep Learning in Sri Lankan Population

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**Abstract :** Male infertility is a major problem in the world, and it is a neglected and sensitive health issue in Sri Lanka. It can be determined by analyzing human semen samples. Sperm motility is one of many factors that can evaluate male's fertility potential. In Sri Lanka, this analysis is performed manually. Manual methods are time consuming and depend on the person, but they are reliable and it can depend on the expert. Machine learning and deep learning technologies are currently being investigated to automate the spermatozoa motility analysis, and these methods are unreliable. These automatic methods tend to produce false positive results and false detection. Current automatic methods support different techniques, and some of them are very expensive. Due to the geographical variance in spermatozoa characteristics, current automatic methods are not reliable for motility analysis in Sri Lanka. The suggested system, DeepMotile, is to explore a method to analyze motility of human spermatozoa automatically and present it to the andrology laboratories to overcome current issues. DeepMotile is a novel deep learning method for analyzing spermatozoa motility parameters in the Sri Lankan population. To implement the current approach, Sri Lanka patient data were collected anonymously as a dataset, and glass slides were used as a low-cost technique to analyze semen samples. Current problem was identified as microscopic object detection and tackling the problem. YOLOv5 was customized and used as the object detector, and it achieved 94 % mAP (mean average precision), 86% Precision, and 90% Recall with the gathered dataset. StrongSORT was used as the object tracker, and it was validated with andrology experts due to the unavailability of annotated ground truth data. Furthermore, this research has identified many potential ways for further investigation, and andrology experts can use this system to analyze motility parameters with realistic accuracy.

**Keywords :** computer vision, deep learning, convolutional neural networks, multi-target tracking, microscopic object detection and tracking, male infertility detection, motility analysis of human spermatozoa
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