Division of Biostatistics, IHE
Medical College of Wisconsin presents

Predictive Analysis: On Knee X-ray Image and Mosquito Spectral Data

By: Manzur Farazi, PhD

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Monday, April 18th | 12:00PM – 1:00PM

The aims of this study are to develop predictive algorithms for two practical applications: classification of knee osteoarthritis (OA) based on knee x-ray image and age prediction of mosquitoes based on near infrared spectra (NIRS) data. For the OA classification problem, we develop an automated algorithm that reads the pixel-wise color intensities for x-ray images and performs an OA severity classification. Identification of the region of interest (ROI) is a primary step for successful automated classification process. We develop an efficient algorithm to detect ROI and from the detected ROI, we extracted width-based features using pixel intensity difference (PID). The PID features are highly significant in discriminating the images according to the OA severity level. When combining with other well-known features, and applying an optimal selection method, many of the PID features ranked top among the selected features. Then, the selected features are used to classify OA severity. Applying the classification to two levels of OA severity, healthy knee vs. OA level-2 knee, we achieved more than 85% accuracy. This dissertation successfully identified ROI and developed width-based features which are easy to implement and have a strong OA discriminating power.

For the NIRS based age prediction problem on mosquito vectors, we develop a change-point model that corrects the problem of under-estimation and over-estimation of age based on existing methods. It is well-known that the NIRS spectra have a strong relationship with the mosquito's age. We demonstrate that this relationship is not linear, and the linear relationship causes the under and over-estimation of age prediction. We propose a change-point model that assume different relationships for the young and old mosquitoes. The change-point at which this relationship changes is unknown, and an algorithm is developed to estimate this change point. This algorithm yields the change-points 8-days and 7-days for two studied mosquitoes which are almost the same as the widely used 7-days for classifying mosquitoes into young or old. We show that the change-point model corrects the biasedness in age estimation of mosquitoes. The developed change-point model will be very helpful in identifying the hot-spot for mosquito prone-zone more accurately.

Manzur Farazi, PhD

Biography: Dr. Manzur Farazi graduated from Marquette University in May of 2021 with a Ph.D. in Computational Sciences (Statistics and Data Science.

He currently works as a Biostatistician I in the Department of Pediatric Surgery.

Location: Zoom | https://mcw-edu.zoom.us/j/94231355250?pwd=aTB1aVdteXhONHJYM0Z5djNsNklVZz09

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Please contact Chelsea Rowley for additional event information at Crowley@mcw.edu.