UNIVERSITY OF SOUTH FLORIDA

Defense of a Doctoral Dissertation

Automating the Classification of Mosquito Specimens using Image Processing Techniques

By

Mona Minakshi

For the Ph.D. degree in Computer Science and Engineering

Among all animals, mosquitoes are responsible for the most deaths worldwide. Interestingly, not all types of mosquitoes spread diseases, but rather, a select few alone are harmful enough to do so. In the case of any disease outbreak, an important first step is surveillance of *vectors* (i.e., mosquitoes capable of spreading diseases). To do this today, public health workers lay several mosquito traps in area of interests. Later, taxonomists have to identify only the vectors among hundred other mosquitoes to gauge their density. This process today is manual, requires complex expertise/ training, and is based on visual inspection of each trapped specimen under a microscope. It is long, cognitively stressful and self-limiting. In this dissertation, we designed an AI-enabled system trained on smart-phone images to identify mosquito species and genus employing multiple approaches based on handcrafted textural features, automatically learned features using neural networks and anatomy- aware learning. We believe that our system has significant impact in multiple disciplines of public and smart health.

Examining Committee
Robert Novak, Ph.D., Chairperson
Sriram Chellappan, Ph.D., Major Professor
Dmitry B. Goldgof, Ph.D.
Shaun Canavan, Ph.D.
Nasir Ghani, Ph.D.
Balaji Padmanabhan, Ph.D.

Friday, May 29, 2020
12:00 PM
Online (Microsoft Teams)
Email mona6@usf.edu for more information

THE PUBLIC IS INVITED

Publications

1) **Minakshi, Mona** and Bharti, Pratool, McClinton III, Willie B. and Mirzakhalov, Jamshidbek and Carney, Ryan M. and Chellappan, Sriram "Automating the surveillance of mosquito vectors from trapped specimens using computer vision techniques". In ACM COMPASS 2020 (Accepted).
2) **Mona Minakshi**, Tanvir Bhuiyan, Sherzod Kariev, Sriram Chellappan, Peace Habomugisha, and Benjamin G. Jacob "High-accuracy detection of malaria mosquito habitats using drone-based multispectral imagery and Artificial Intelligence (AI) algorithms in an agro-village peri-urban pastureland intervention site (Akonyibedo) in Unyama Sub–County Gulu District North" in Journal of Public Health and Epidemiology, 2020 (Accepted).
3) **Mona Minkashi**, Pratool Bharti, and Sriram Chellappan. "Leveraging Smart-Phone Cameras and Image Processing Techniques to Classify Mosquito Species". In: Proceedings of the 15th ACM/ EAI New York, NY, USA, 2018, pp. 77–86. isbn: 978-1-4503-6093-7. doi: 10.1145/3286978.3286998. International Conference on Mobile and Ubiquitous Systems: Computing, Networking and Services. (MobiQuitous).
4) **Mona Minkashi**, Pratool Bharti, and Sriram Chellappan, "Identifying mosquito species using smart-phone cameras," 2017 European Conference on Networks and Communications (EuCNC), Oulu, 2017, pp. 1-6.
5) **Mona Minkashi**, Pratool Bharti, Tanvir Bhuiyan, Sherzod Kariev and Sriram Chellappan" A Framework based on Deep Neural Networks to Extract Anatomy of Mosquitoes" (Submitted in Nature Scientific Report).
6) Windmon, Anthony, **Mona Minakshi**, Pratool Bharti, Sriram Chellappan, Marcia Johansson, Bradlee A. Jenkins, and Ponrathi R. Athilingam. "TussisWatch: A Smart-Phone System to Identify Cough Episodes as Early Symptoms of Chronic Obstructive Pulmonary Disease and Congestive Heart Failure." IEEE journal of biomedical and health informatics 23, no. 4 (2018): 1566-1573.
7) Windmon, Anthony, **Mona Minakshi**, Sriram Chellappan, Ponrathi Athilingam, Marcia Johansson, and Bradlee A. Jenkins. "On Detecting Chronic Obstructive Pulmonary Disease (COPD) Cough using Audio Signals Recorded from Smart-Phones." In HEALTHINF, pp. 329-338. 2018.

Robert Bishop, Ph.D.
Dean, College of Engineering

Dwayne Smith, Ph.D.
Dean, Office of Graduate Studies

Disability Accommodations:
If you require a reasonable accommodation to participate, please contact the
Office of Diversity & Equal Opportunity at 813-974-4373 at least five (5) working days prior to the event.