Mohammed Shahriar Arefin
Postdoctoral Researcher @ US FDA,Sliver Spring, MD
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Work Experience

ORISE Postdoctoral Fellow, Division of Biomedical Physics, CDRH, US Food and Drug Adminisitration, MD
Duration: June 2024- Current

Accomplishments and responsibilities:

1. Developed a framework to analyze and mitigate factors reducing accuracy in Hyperspectral imaging system
2. Implemented a data normalization framework to reduce error in spectral signal using Hyperspectral imaging system
3. Characterized image distortion and noise from endoscopic images following ISO/IEEE/EMVA standards

Graduate Research Assistant, Optical Diagnostic Research Lab, Temple University
Duration: December 2019- May 2024

Accomplishments and responsibilities:

1. **Designed and validated a multi-wavelength pulse oximeter and signal processing algorithms to estimate heart rate and oxygenation**; demonstrated feasibility in a clinical study with 40 subjects.
2. **Developed a pattern search-based optimization algorithm to noninvasively predict neonatal bilirubin levels from smartphone images**; analyzed data from 91 neonates across clinical sites in the U.S. and Africa.
3. **Engineered algorithmic enhancements to improve pulse oximeter accuracy in subjects with darker skin tones**, reducing RMSE from 3.5% to 1.5%.
4. **Designed a spectroscopy-based fiber optic probe to optimize signal acquisition from musculoskeletal tissues** for improved diagnostic capabilities.
5. **Built an optical assembly for Raman spectroscopic analysis**, enabling characterization of orthopedic tissue samples
6. **Collaborated with academic and industry partners to deliver research outcomes on projects totaling up to $600K in funding.**
7. **Supported principal investigator in securing research funding and intellectual property**, contributing to multiple grant proposals and two U.S. patent applications.
8. **Authored peer-reviewed publications and presented findings at leading biomedical optics conferences**, including SPIE and Optica.
9. **Mentored 10+ undergraduate and graduate students**, guiding research and design projects in biomedical optics and instrumentation.

Graduate Teaching Assistant, Bioengineering, Temple University
Duration: August 2019- May 2022
Responsibilities:

1. Lead recitation of lab/theoretical classes **(class size 30-60 students)** in topics related to Biomedical Instrumentation/Biomechanics and SolidWorks Design

Academic Background

PhD in Bioengineering, Temple University
Degree Completion: May 2024
GPA: 4.00/4.00
Thesis Title: *Monte-Carlo Simulations to Inform Clinical Applications of Optical Devices*

MS in Bioengineering, Temple University
Degree Completion: May 2021
GPA: 4.00/4.00

BS in Electrical and Electronic Engineering, Chittagong University of Engineering and Technology
Degree Completion: October 2018
GPA: 3.84/4.00

Technical Skills and Software:

Computational Modeling | **Monte Carlo Simulations** | **Spectroscopy** | **Signal Processing** | **Hyperspectral Imaging** | **Machine Learning** | **Optimization** | **Circuit Design** | **MATLAB** | **SolidWorks** | **Python** | **Arduino** | **Fritzing** | **Regulatory Science** | **Clinical Studies** | **Optical Data Analysis** | **Image Processing** | **Raman and Infrared Spectroscopy**| **Fiber Optics** | **Simulink** | **Optical Assembly** | **Endoscopic Imaging**

Selected Publications (* Co First-Author):

1. **Mazdeyasna, S**.*; **Arefin, M.S***.; Fales, A.; Leavesley, S.J.; Pfefer, T.J.; Wang, Q. Evaluating Normalization Methods for Robust Spectral Performance Assessments of Hyperspectral Imaging Cameras. *Biosensors* **2025, 15(1), 20**
2. **M.S. Arefin**, W. Querido, A. Spurri, N. Pleshko, C. Patil, "**Modeling transcutaneous Vis-NIR spectroscopy of metacarpal bone**," SPIE Photonics West 2024
3. **MS. Arefin,** L. Shmuylovich, C. Patil, "**Modification of oximeter ratio to reduce pigmentation bias in pulse oximetry** ", Design and Quality for Biomedical Technologies XVII, 2024
4. Keller, M.D., Harrison-Smith, B., Patil, C., **Arefin, M.S.,** 2022. **Skin colour affects the accuracy of medical oxygen sensors.** Nature 610, 449–451. **(Invited Contribution)**
5. Brandon Harrison-Smith, Alexander P. Dumont, **M.S. Arefin** et al., **"Development of a mobile phone camera-based transcutaneous bilirubinometer for low-resource settings",** Biomed. Opt. Express **13**, 2797-2809 (2022)
6. Yu Sun, Alexander P. Dumont, **Mohammed Shahriar Arefin**, Chetan A. Patil, 2022. **Model-based characterization platform of fiber optic extended-wavelength diffuse reflectance spectroscopy for identification of neurovascular bundles**. Journal of Biomedical Optics 27, 095002.

Selected Conference Presentations:

1. **Mohammed Shahriar Arefin,** William Querido, Amanda Spurri, Nancy Pleshko, Chetan A. Patil, "**Modeling transcutaneous Vis-NIR spectroscopy of metacarpal bone**," SPIE Photonics West, 2024
2. **Mohammed Shahriar Arefin**, Leonid Shmuylovich, Chetan A. Patil, "**Modification of oximeter ratio to reduce pigmentation bias in pulse oximetry**," Design and Quality for Biomedical Technologies XVII, 2024
3. **Arefin, M.S.,** Dumont, A.P., Harrison-Smith, B., Patil, C.A., **"Computational Simulations of Transcutaneous Bilirubinometer Accuracy in Pigmented Infants"**, Biophotonics Congress: Optics in the Life Sciences 2023
4. **M.S. Arefin**, A.P. Dumont, B. Harrison, C.A. Patil, "**Impact of Pigmentation in the Accuracy of Pulse Oximetry**", 47th Annual Northeast Bioengineering Conference ,Pittsburgh, USA, 2021.

Patent/License and Invention Disclosure:

1. Patil CA, Dumont AP, Keith-Harrison B, **Arefin MS** "**Spatially Resolved Diffuse Reflectance for Transcutaneous Measurements"** (PCT/US2024/023977, Patent Pending)

2. C. Patil **M.S. Arefin**, L. Shmuylovich, "**Method, System and Product for Oximetery Device for Improving Measurement Quality,**" (US Patent Application, filed January 25,2025)

Selected Certifications and Licenses:

1. Python Data Structures, Coursera
2. Biomedical Research and CITI Good Clinical Practice, CITI Program

Other Relevant Projects:

1. **Developed and implemented a non-invasive blood glucose detection system using near-infrared (NIR) LEDs**, enabling low-cost, contactless measurements.
2. **Built a smartphone-based device for hemoglobin/anemia detection from eye pallor images**, achieving 82% classification accuracy in validation studies.
3. **Created a computational modeling platform to simulate fiber optic probe performance for neurovascular bundle detection**, supporting the development of a laparoscopic surgical guidance device.

References:

Dr. Chetan A. Patil, Aimloxy LLC (Current) | Assistant Professor, Bioengineering, Temple University (Previous)
Other references will be provided based on request