

# Tsui Lab

January 2021 | Issue 2

## MISSION STATEMENT

The mission statement of Tsui Laboratory is to integrate healthcare and patient data and develop end-to-end real-time decision support for direct impact to hospital staff, patients, and public health by decreasing costs, morbidity, and mortality, well increasing efficiency and quality of care.

## FUNDERS AND PROJECTS

The Tsui Laboratory is involved in several notable projects, among them the design and deployment of an Intensive Care Warning Index (I-WIN) system. I-WIN is a real-time AI-based telehealth system for deterioration monitoring of critical-care patients in a large children's hospital.

Given the ever-increasing challenges in intensive care, there exists a critical need to develop real-time systems for remote monitoring and early warning of patient deterioration. Dr. Tsui and the Tsui Lab built and evaluated I-WIN at a quaternary-care children's hospital. I-WIN has key components including real-time data acquisition component, distributed AI platform, and a graphical user interface.

With recent funding from NSF, NIH, RK Mellon Foundation, and CHOP, Dr. Tsui's team is making an impact in the health field in deploying the following innovative systems:

- 1)** the I-WIN at CHOP for real-time clinical event monitoring and prediction using streaming waveform and EHR data;
- 2)** the IMPreSIv at the UPMC Magee-Womens Hospital for real-time infant mortality risk prediction and recommendation by employing AI and data from mobile apps, Epic and Cerner EHR systems;
- 3)** the Data Query Platform (DQP), a highly efficient patient cohort tool for clinician researchers;
- 4)** the Expertise Knowledge Platform (EKP), an expertise recommendation system recently supported by NSF (PI: F. Winston).

Helen Shi, Joe Wu, Victor Ruiz, and Dr. Tsui started a DQP study (a collaboration work with BMI group in the Anesthesiology Dept.) that involves two steps: **(1)** develop a software platform for automatic research data query and de-identification; **(2)** conduct an online survey on the general usability of the software and the user's experience. The latter step will enroll clinicians who actively

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participate in the patient-oriented pediatric research (age range: adults aged 18 or older; target department: Department of Anesthesiology and Critical Care Medicine).

## PUBLICATIONS/PRESENTATIONS

Dr. Tsui, the correspondence author, and his visiting scholar (an undergraduate student) developed waveform processing technology and published an article: ***"Comparing Different Wavelet Transforms on Removing Electrocardiogram Baseline Wanders and Special Trends"***, *BMC Medical Informatics and Decision Making*.

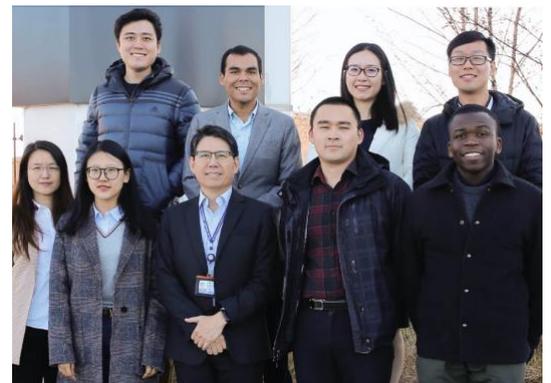
Dr. Tsui and team members including Helen Shi and Victor Ruiz presented the I-WIN deployment project at AMIA 2020 symposium: ***"Design and Deployment of a Real-Time AI-Based Telehealth System for Deterioration Prediction of Critical-Care Patients in a Large Children's Hospital"***.

Mr. Edi Okon (now at Google), Helen Shi, and Dr. Tsui developed an innovative deep neural network on processing discharge summary clinical notes to provide diagnosis ICD codes. Their work - ***"Automated Diagnostic Coding from Clinical Notes Using Attention-Augmented Recurrent Convolutional Neural Networks"*** - was also presented at AMIA 2020 symposium.

Joe Wu, Helen Shi, Sifei Han, Dr. Tsui, and Bei Li presented ***"The Extract-Transform-Load Lessons for Loading Neonatal Healthcare Data to the OMOP-CDM"*** at the Observational Health Data Scientists and Informatics (OHDSI) symposium.

## NEWS AND NOTES

- **Tsui Lab members Helen Shi and Frank Mi welcomed baby Maxwell into their family on Dec. 18!**
- **Tsui Lab Sr. Grants Writer/Project Manager Ed Gruver will be featured on PCN's PA Books TV program in February for his book on the Pittsburgh Steelers.**



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The Tsui Lab is affiliated with the Department of Biomedical and Health Informatics (DBHi), the Department of Anesthesiology and Critical Care Medicine at the Children's Hospital of Philadelphia (CHOP). Under the direction of Prof. Tsui, the lab works closely with hospitals and frontline clinicians to collect and analyze big clinical data that leads to new hypotheses, patient outcome prediction, management, and risk reduction.