

Ting-Yu Lai

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Education

University of Washington

Doctor of Philosophy in Bioengineering

Seattle, WA

Sep 2016-Present

Johns Hopkins University

Master of Science in Engineering: Bioengineering Innovation & Design

Baltimore, MD

May 2013

Case Western Reserve University

Bachelor of Science in Electrical Engineering

Cleveland, OH

May 2012

National Cheng Kung University

Bachelor of Science in Electrical Engineering

Tainan, Taiwan

May 2010

Biomedical and Electrical Engineering Research Experience

Modeling of the nonlinear field produced in plane wave mode

Jan 2017-Present

Nonlinear PWI may offer improvements in aberration and reverberation artifacts of synthetic imaging and 3D THI. Our objective is to model the nonlinear field of ultrasound arrays in PWI.

- Modeling nonlinear wave propagation using KZK (Khokhlov-Zabolotskaya-Kuznetsov) equation
- Modeling linear wave propagation simulation experience with Field II
- Experience in programming and operating Verasonics ultrasound

Repeatability of vessel density measurement in human skin by OMAG

Sep 2016- Dec 2016

As a functional variation of OCT, Optical microangiography (OMAG) was used to visualize and quantify the vessel density of human arm skin and evaluate the repeatability of the measurement in healthy subjects.

- Programming and operating OCT system
- Analyzing OCT data using MATLAB
- Statistical analysis experience using SPSS

Tendon displacement estimation in ultrasound B-mode images

Jun 2014-Jun 2016

Research Assistant –Biomedical Ultrasound Imaging Laboratory – National Cheng Kung University

A direct ultrasound based method, optimized for clinical use, to provide non-invasive estimates of the instantaneous and total displacement of the tendon in hand was developed.

- Experience in operating Terason ultrasound
- Experience in block matching speckle tracking algorithm with Kalman filter
- Statistical analysis experience using SPSS

Assessing corneal sclerosis using acoustic-radiation-force-impulse imaging

Jun 2014-Jun 2016

Research Assistant –Biomedical Ultrasound Imaging Laboratory – National Cheng Kung University

A method for high-resolution acoustic-radiation-force-impulse (ARFI) imaging based on a dual-frequency confocal transducer in order to obtain a relative stiffness map, which was used to assess corneal sclerosis, was developed.

- Experience in programming and operating high frequency single element ultrasound
- Experience in ARFI based elastography imaging
- Experience in animal studies

Biomedical and Electrical Engineering Projects

Vascular Anastomosis Monitoring:

Fall 2012 – Fall 2013

Johns Hopkins University

Each year, hundreds of thousands of patients undergo surgeries in which arteries and veins are joined together. These surgeries save lives, yet too often result in failure because the vessels break down in the immediate post-surgical period. Our project, the EchoSure system, detects post-operative complications as they arise, giving surgeons the chance to restore the surgery before it's too late. My team provides a simple system that enables routine monitoring of vascular health at the bedside for the first time.

- Developing medical device from observing unmet clinical needs to prototype development
- Analog circuit design for animal studies
- Pattern recognition algorithm for software development

Oxygen Availability in Developing Country:

Fall 2012 – Fall 2013

Johns Hopkins University

Concentrated oxygen has been essential for the delivery of basic medical services for more than a century. My team proposes a social entrepreneurship based solution in which drawbacks of both delivery mechanisms are directly addressed.

- Unmet clinical needs observing in developing country
- Present a business model for global health issues

Low power Implantable RF Telemetry System:

Summer 2011 – Summer 2012

Case Western Reserve University

The objective of this project is to design and construct an implantable RF telemetry system, specifically for the purpose of cardiac telemetry.

- Designed and built a prototype with analog circuits
- Experience in pulse width modulation for energy efficiency

Publications

1. **T.Y. Lai**, M. Bruce, M. Averkiou. "Modeling of the Acoustic Field Produced by Diagnostic Ultrasound Arrays in Plane and Diverging Wave Modes." IEEE UFFC (Under Review).
2. **T.Y. Lai**, M. Averkiou. "The Linear and Nonlinear Ultrasound Field of Convex Arrays Operating in a Diverging Wave Mode." 2018 IEEE International Ultrasonics Symposium (IUS). IEEE, 2018"
3. S.J. Men, C.L. Chen, W. Wei, **T.Y. Lai**, S.Z. Song, R.K. Wang "Repeatability of vessel density measurement in human skin by OCT-based microangiography." Skin Research and Technology, 23.4 (2017): 607-612.
4. **T.Y. Lai**, H.I Chen, and L.C Kuo, C.C. Huang. "Application of a novel Kalman filter based block matching method to ultrasound images for hand tendon displacement estimation." Medical physics 43.1 (2016): 148-158.
5. **T.Y. Lai**, H.I Chen, and L.C Kuo, C.C. Huang. "A Novel Adhesion Index for Verifying the Extent of Adhesion for the Extensor Digitorum Communis in Patients with Metacarpal Fractures." Scientific Reports 6 (2016).
6. C.C. Shih, **T.Y. Lai**, and C.C. Huang. "Evaluating the intensity of the acoustic radiation force impulse

(ARFI) in intravascular ultrasound (IVUS) imaging: Preliminary in vitro results." Ultrasonics 70 (2016): 64-74.

Honors & Awards

NCIIA BMEIdea 1st Prize Winner, 2013

Joint and Dual Degree Scholarship Award, NCKU, 2011

Dean's High Honors, Case Western Reserve University, Spring 2011

Joint and Dual Degree Program of CWRU & NCKU, selected, spring 2010

Clinical Observation Experiences

Johns Hopkins Hospital

Observing clinical needs for over 300 hours in Interventional Radiology, Electrophysiology, General Surgery, Ophthalmology, Transplant, and Plastic and Reconstructive Surgery.

University of Maryland Medical Center

Plastic and Reconstructive Surgery

Global Health - Nepal

Observing clinical needs for two weeks in Nepal to understand the clinical environment in their healthcare system from central hospital to sub health post.

Intellectual Property

Patent, WO 2014113773 A1

"Ultrasound-detectable markers, ultrasound system and methods for monitoring vascular flow and patency"

Working Experience

Biomedical Ultrasound Imaging Laboratory

Working as a research assistant to design a new method for judging tendon adhesion with the use of ultrasound imaging.

Water Disaster Mitigation Center (military service)

Assist with evaluating data of multi-hazards as a substitute civilian serviceman in central governmental organization in Taiwan

Skill

Research:

Analog Circuitry, Ultrasound Imaging, Pressure Swing Adsorption, Radio Frequency Telemetry, Infrared Spectroscopy, Electrochemical Sensor, Microcontroller, Speckle Tracking, Optical Coherence Tomography Tissue Harmonic Imaging, Beam Forming, Plane Wave Imaging, Verasonics research ultrasound.

Software Tools:

MATLAB, PSPICE, Laker, JAVA, C++, CAD, Photoshop, CHI660C, Protel DXP, Labview, FPGA

Languages:

Fluent in Mandarin, Taiwanese, English, and intermediate Japanese