

# Functional and Molecular Ultrasound Research Laboratory



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http://ultrasoundwayne4.wix.com/mehr-lab

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Wayne State University



# Multi-parametric Imaging of Cervical insufficiencies for more accurate detection of the risk of preterm birth

### Sonography of cervical length



**B-Mode Ultrasound** 

#### Photoacoustic imaging of collagen



Spectroscopic Photoacoustic Collagen to Water Ratio (CWR)

### **Elasticity imaging of biomechanics**



Shear Wave Elastography



## **Combined Multi-functional Imaging System**





# Early-stage detection of inaccessible cancers

**Miniaturized Ultrasound/ Photoacoustic Endoscopic Imaging System** 



# Enhancement of image-guided WAYNE STATE College of Engineering



# Accurate Catheter Tip Tracking (videos)





# WAYNE STATE College of Engineering

# Towards quantitative Photoacoustic tomography (qPAT)

## >Full-ring Ultrasound and Photoacoustic Tomography of Breast

## Cancer



Laser input

A full ring PAUST imaging system. Where two ring mirrors are used for illumination and a full ring transducer is used for data acquisition.

### **Acoustic and Optical Compensation**



(a) The inverse fluence map used for light fluence compensation. (b) PAT reconstructed assuming a homogeneous SOS of 1450 m sec<sup>-1</sup> (c) Fluence and SOS compensation PAT. (d) SNR and (e) CNR comparison between uncompensated PAT and SOS + fluence compensated PAT.

#### **Image Segmentation**



(a) The UST SOS map that is used as the foundation for segmentation. (b) The numerical phantom that is generated from a region seeded growing method on the (a).



(a) *In-silico* phantom structure. (b) Graph of measured  $sO_2$  values from both fluence un-/compensated PA imaging. (c) The  $sO_2$  map as calculated from normal PA. (d) The  $sO_2$  map from fluence compensated PA imaging.



# Ultrasound-guided acoustic induced hyperthermia for cancer treatment

Objective: to develop an all ultrasound-based hyperthermia therapy and temperature monitoring system for treatment of soft-tissue sarcoma.



Ultrasound ring-array tomography system with temperature regulated water channel

Initial testing of real-time ultrasound temperature monitoring through detection of changes in speed of sound of water in latex tubes surrounded by room temperature water bath in presence of lamb femur.





• Google Scholar:

https://scholar.google.com/citations?user=nhPz u8YAAAAJ&hl=en