

# Houston Imaging Sciences Symposium (Day 1)

**8:00 – 8:30: Registration (@ Shell Auditorium)**

**8:15 – 8:20: Welcome, opening remarks**

**Monday AM – Tomographic Imaging Sessions (@ Shell Auditorium)**

Session chair: Eric Miller, Chair Electrical and Computer Engineering, Tufts

**8:20 – 9:10: Invited talk:**

***Patrick La Riviere, Univ. of Chicago***

*Towards Color Computed Tomography: Algorithmic Challenges and Opportunities in Spectral CT*  
*Energy-sensitive computed tomography (CT) imaging has the potential to improve material identification in vivo, allowing natural calcium and injected iodine to be readily discriminated, enabling different types of kidney stones to be classified, and potentially paving the way for multiple contrast agents to be used simultaneously. Such energy-sensitive CT imaging introduces new demands for system designers and new challenges and opportunities for algorithm developers. While the idea of spectral computed tomography (CT) is nearly as old as CT itself, we will review the recent hardware developments that have finally brought it into the clinic, as well as emerging technologies based on photon counting. We will focus primarily on the algorithmic challenges and opportunities that arise in these technologies, such as the need to engage fully with the non-linear nature of CT acquisition, and the opportunities afforded in working with multi-channel image volumes. In addition to medical CT, we will consider applications in ultra-high resolution synchrotron tomography, where we have been exploring a form of x-ray histology using multiple metal stains and multi-energy acquisition.*

**9:10 – 9:40: Joemini Poudel, Dept. of Biomedical Engg, Washington University, St. Louis**

Iterative image reconstruction in elastic heterogeneous media with application to transcranial photoacoustic tomography

**9:40 - 10:10: Yimin Zhong, Dept. of Math., UT Austin**

One-step reconstruction for quantitative photoacoustic tomography

**10:10-10:30 Coffee Break in Shell Auditorium Lobby**

**10:30- 11:00: Luke Pfister, Dept. of Electrical and Computer Engg., Univ. of Illinois, UC**

Spectroscopic Tomography by Inverse Scattering Under Chemical Composition Constraints

**11:00-11:30: Peter Kuchment, Dept. of Math., Texas A&M**

Mathematics of Compton camera imaging for medical and homeland security applications

**11:30-12:00: Rosemary Renaut, School of Stat. and Math. Sciences, Arizona State Univ**

Connecting regularization across scales for hybrid solutions of ill-posed problems

**12:00-12:30: Demetrio Labate, Dept. of Math., Univ. of Houston**

Robust and stable region-of-interest tomographic reconstruction by sparsity inducing convex optimization

**12:30 -1:30: Lunch Break/Poster Session (@ Brockstein Pavilion)**

**12:50 – 1:30: Poster Session**

- ❖ Multigrid approach for tomographic reconstruction, *Zhicao (Wendy) Di, Argonne National Lab*
- ❖ Convex formulation of discrete tomography, *Ajinkya Kadu, Utrecht Univ.*
- ❖ Simultaneous estimation of corneal curvature, elevation and thickness from optical coherence tomography data, *Farzana Nasrin, Texas Tech.*

- ❖ Photoacoustic tomography and thermodynamic attenuation, *Sebastian Acosta, Baylor college of medicine*
- ❖ A fast adaptive wavefield compression scheme for seismic imaging, *Xiao Liu, Rice University*

## Monday PM – Reflection Imaging Session (@ Shell Auditorium)

Session chair: Bill Symes, Noah Harding Professor, Rice University

**1:30 – 2:30: Invited talk:**

***Joe Dellinger, BP***

The story of Wolfspar®, BP's low-frequency marine seismic source; or, "Sometimes the 'brute force' approach to a problem can work"!

**2:30 – 3:00: *Guillame Barnier, Stanford University***

A Modified Approach to tomographic full waveform inversion

**3:00 - 3:30: *Tristan van Leeuwen, Utrecht University***

Relaxation for non-linear seismic inversion

**3:30-3:50 Coffee Break in Shell Auditorium Lobby**

**3:50- 4:20: *Joeri Brackenhoff, Delft Univ. of Technology***

Homogeneous Green's function retrieval using the Marchenko method

**4:20-4:50: *Alex Mamonov, Univ. of Houston***

Data-to-Born transform for inversion and imaging with waves

**4:50-5:20: *Hejun Zhu, Dept. of Geophysics, UT Dallas***

Reverse time migration in complicated earth models – taking elasticity and anisotropy into account

**5:20-5:50: *Nick Luiken, Utrecht***

Sensitivity of the regularization parameter

**5:50: Reception (@ Brockstein Pavilion)**

**7:00: SIAM TX-LA business meeting dinner**

Those who are interested in SIAM TX-LA section activities for next year are invited to a buy-your-own dinner. We will probably go to one of the restaurants nearby. Please sign up at the registration desk or let Anusha/Miranda know to get a head count for reservations.

# Houston Imaging Sciences Symposium (Day 2)

**8:00 – 8:30: Registration (@ Shell Auditorium)**

**8:00 – 9:00: Invited talk (@ Shell Auditorium):**

***Gunther Uhlmann, IAS, HKUST and Univ. of Washington***

Travel Time Tomography

*We will describe some recent results on the problem of recovering the sound speed or index of refraction of a medium from travel times. An important application is global seismology: Can one determine the inner structure of the Earth by measuring travel times of seismic waves measured at the surface?*

**Tuesday AM – Image Processing Session (@ Shell Auditorium)**

Session chair: David Fuentes, Dept. of Imaging Physics, UT MD Anderson Cancer Center

**9:00 – 9:30: Tom Yankeelov, ICES, UT Austin**

Towards imaging-based computational oncology

**9:30 - 10:00: Andreas Mang, Dept. of Math., Univ. of Houston**

Parallel algorithms for optimal control based diffeomorphic image registration

**10:00-10:20 Coffee Break in Shell Auditorium Lobby**

**10:20- 10:50: Edward Castillo, Beaumont Health Research Institute and Rice Univ.**

Computing Pulmonary functional imaging from dynamic computed tomography

**10:50-11:20: Pankaj Singh, MD Anderson**

Cell viability prediction and ranking of drugs in pediatric high-grade glioma PDX cell lines

**11:20-11:50: Maksim Protasov, IPGG SB RAS**

3D diffraction imaging of the fractured zones via asymmetric data summation and image filtering

**11:50-12:20: Bob Plemmons, Dept. of Math./CS, Wake Forest Univ.**

Computational 3D Imaging: Sparse recovery and PSF engineering for 3D information from 2D data

**12:20 -1:20: Lunch Break/Poster Session (@ Farnsworth Pavilion)**

**12:45 – 1:20: Poster Session (Image Processing/Future of Imaging)**

- ❖ Novel, semi-automated pipeline for tracking cell-cell interaction dynamics in image-based co-culture assays, *Ryan Nini, UT MD Anderson cancer center*
- ❖ Higher order methods for jump detection in signal and image processing, *Wolfgang Stefan, UT MD Anderson cancer center*
- ❖ Predicting CD3 infiltration status in glioblastoma via magnetic resonance imaging radiomics, *Donnie Kim, MD Anderson Cancer Center*
- ❖ Acceleration of seismic imaging using generalized multiscale finite elements and frequency domain forward modeling, *Yongchae Cho, Texas A&M*

**1:20-1:50: Youzuo Lin, Los Alamos National Laboratory**

Efficient remote sensing imagery classification methods

**1:50 – 2:20: Lihua Zuo, Texas A&M**

Fracture Image Processing and application in fractured reservoirs

## Tuesday PM – Future of Imaging Session (@ Shell Auditorium)

Session chair: Maarten De Hoop, Simons Chair, Rice University

**2:20 – 2:50: Peter Kuchment, Dept. of Math., Texas A&M**

Mathematics of hybrid imaging modalities

**2:50 - 3:20: Souptik Barua, Rice Univ./MD Anderson**

Dictionary learning in cancer imaging: Discovering the visual correlates of malignant transformation in low-grade glioma from histopathology and radiology images

**3:20-3:40 Coffee Break in Shell Auditorium Lobby**

**3:40- 4:10: Lingyun Qiu, PGS**

Full waveform inversion with quadratic Wasserstein norm

**4:10-4:40: Javed Sovizi, UT MD Anderson cancer center**

Image reconstruction in superparamagnetic relaxometry: A deep learning approach

**4:40-5:10: Myrna Staring, Delft Univ. of Technology**

Applying source-receiver Marchenko Redatuming to field data, using an adaptive double-focusing method

**5:10-5:40: Hongyu Miao, Dept. of Biostat., UT Health Science Center**

Machine learning of brain vasculature change using two-photon imaging in NeuroAIDS studies

**5:40-6:00: Concluding remarks**