Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

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Inventors

Yanshuai Tu

Yalin Wang

Zhong-Lin Lu

Contact

Jovan Heusser
jovan.heusser@skysonginnovations.com

System for Quantification of Human Sensory Cortical Areas

Sensory maps of the human brain are of great scientific interest and could have important medical applications. The sensory areas of the brain, including the auditory cortex, visual cortex, and more, contain topographical representations of the sensory space. Functional magnetic resonance imaging (fMRI) signals can produce subject-specific cortical maps, however, due to the low signal-to-noise ratio and spatial resolution, such maps are noisy, incomplete, and even contradict neurophysiological results.

Researchers at Arizona State University and a colleague at New York University have created a novel system for precise quantification of human sensory cortical areas which could be used in disease diagnoses and prognoses. This technology improves existing sensory mapping methods of the human brain by providing qualitative descriptions of sensory maps resulting in a rigorous imaging quantification framework. This system was applied to visual retinotopic maps and excellent results were generated.

This system makes it possible to precisely quantify sensory maps of individuals and further improved the quality of sensory maps with data from multiple individuals.

Potential Applications

- Precise quantification of human sensory cortical areas for disease diagnosis and prognosis
  - Visual cortex
  - Auditory cortex
  - Somatosensory cortex
  - Olfactory cortex

Benefits and Advantages

- Reduces noise

- Fixes topology violations
- Precisely quantifies the properties of the sensory maps across time and/or individuals
- Provides utilities to better align and analyze sensory maps across time and/or subjects
- Develops both a number of deep geometry concepts and practical computational algorithms for implementation
- Quantifies sensory maps of the human brain

For more information about this opportunity, please see

Tu et al - IEEE ISBI - 2020

Tu et al - IEEE ISBI - 2020

For more information about the inventor(s) and their research, please see

Dr. Santello's departmental webpage

Dr. Santello’s laboratory webpage