

1) Novel forms of spinal cord stimulation for chronic pain

2)



Yes, I would be honored to serve as a moderator for this session. Spinal cord stimulation (SCS) for chronic pain management is a major focus of my research. Chronic pain is widespread and extremely difficult to treat. SCS for chronic pain represents the majority of the commercial neuromodulation market, however, it receives little attention at numerous scientific conferences. This area is also largely driven by industry. However, to improve clinical outcomes, we need more academic scientists and engineers working in this area. Therefore, I believe this session would be important for students, postdoctoral fellows, and faculty to learn about the science and challenges of SCS for chronic pain management.

3) Chronic pain is the biggest health problem in the United States and costs our nation ~\$635 billion a year – more than cancer, heart disease and diabetes combined. Patients with chronic pain have ~3 times higher healthcare costs as compared to healthy individuals.

Unfortunately, conventional treatments (e.g. pharmacological, orthopedic surgery) have limited effectiveness for many people with severe chronic pain. Neuromodulation therapies, such as spinal cord stimulation (SCS), can be considered for patients who are refractory to other treatments. SCS makes up more than half of the entire commercial neuromodulation market and exceeds USD 1.8 billion in annual sales, with more than 30,000 individuals opting for treatment every year. SCS for pain is expected to continue growing rapidly over the next several years. However, despite technological advances, SCS has shown limited success rates (~50%) that can largely be attributed to a poor understanding of their mechanisms of action. Furthermore, there has been an explosion in new forms of SCS (burst, high-density, multi-frequency, 10 kHz) over the last few years without understanding the basic science behind these new technologies. A strong disconnect also exists between clinicians and engineers regarding how modifying stimulation waveform parameters (e.g. pulse width, pulse frequency) affect the direct neural response to stimulation. Therefore, the time is right to present the challenges and opportunities of these novel forms of SCS to the world's best neural engineers, scientists, and clinicians.

4) Session goal: To discuss the science and limitations behind novel forms of SCS for chronic pain management.

5) Set of driving questions to be answered:

- What is the current state of the art in clinical systems?
- What was the rationale behind the development of these novel forms of SCS? How do they improve upon other forms of SCS?
- How do we improve these novel therapies (e.g. closed-loop control, new stimulation waveforms / paradigms, new lead designs, new stimulation targets)?

6) Potential speakers:

The following speakers represent a diverse group of experts in the field of SCS. These speakers are excellent presenters and will effectively present their respective topics and challenge the audience with several questions that need to be answered. These speakers will discuss four distinct and novel approaches to improve outcomes with SCS.

Multi-frequency SCS

[Redacted]

Burst SCS

[Redacted]

10 kHz SCS

[Redacted]

High-density SCS

[Redacted]

7) Format:

The suggested format would be individual presentations followed by moderated discussion. Each speaker is well respected in their field and has alternate views regarding the ideal forms of SCS. Therefore, I am confident that this panel and format would produce exciting and productive interactions between the speakers and the audience.