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Fibre-optic distributed acoustic sensing for earthquake monitoring

Institute of Mechanical Intelligence
Blue Room – Via Moruzzi, 1 - Pisa
16 May, 2023 - 11:00 a.m.

Speaker
Marcelo Soto

Abstract:

In this seminar we will review the main features of fibre-optic distributed acoustic sensing (DAS) for earthquake monitoring using telecom optical fibres. The first part of the seminar will be dedicated to reviewing the state of the art of DAS technology, including the working principle and some of the most robust interrogation schemes existing today in the literature. Then, some recent experimental analysis of distributed earthquake monitoring using a telecom submarine optical cable in Chile will be reported. The bidimensional domain (time-distance) of DAS data can enable new and more powerful signal processing approaches to improve signal quality and extend the sensing capabilities of the technology. Based on this, DAS represents a new tool and paradigm for earthquake monitoring using operating optical networks, being of special interest to exploit submarine optical cabling infrastructures existing worldwide. In this direction, this seminar will also present some of the novel signal processing approaches developed in the last years based on machine learning and acoustic beamforming to detect earthquakes and enhance the DAS sensing capabilities.

Bio:

Marcelo A. Soto received the M.Sc. degree in Electronic Engineering from Universidad Técnica Federico Santa María, Valparaíso, Chile, in 2005, and the Ph.D. degree in Innovative Technologies, major in Telecommunications, from the Scuola Superiore Sant Anna, Pisa, Italy, in 2011. During 2010–2011, he was a Research Fellow at Scuola Sant'Anna, where he worked on distributed optical fibre sensors based on Raman and Brillouin scattering. Later, he was a Postdoctoral Researcher at EPFL Swiss Federal Institute of Technology of Lausanne, Switzerland, where he worked on high-performance Brillouin and Rayleigh distributed fibre sensing, nonlinear fibre optics, optical signal processing, and optical Nyquist pulse generation. Then, in March 2018 he joined Universidad Técnica Federico Santa María, Valparaíso, Chile, where he is now Associate Professor. Between 2019 and 2021 he also had an invited position as one of the "100 distinguished invited professors" at Guangzhou University, in China. He is author or coauthor of over 200 scientific publications in international refereed journals and conferences, 3 book chapters and 8 patents in the fields of optical communications and optical fiber sensing. Dr. Soto is Senior Member of the Optical Society of America (OSA), Member of the Institute of Electrical and Electronics Engineers (IEEE), Associate Editor of the Journal of Optical Fiber Technology, and he is in the Board of Reviewers of major international journals in photonics.

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