

**Invited paper**

**Recent developments in all-optical nonlinear data processing**

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**Abstract**

*Photonic technologies for data processing in the all-optical domain are expected to play a major role in future optical communications. Nonlinear effects in optical fibres have many attractive features and great, but not yet fully explored potential in optical signal processing. Here, our recent advances in developing novel techniques and approaches to all-optical processing based on fibre nonlinearities are reviewed.*

**Extended Abstract**

Photonic technologies for data processing in the all-optical domain are expected to play a key role in future optical communications. Recent advances in phase-shift keying modulation formats and progress in coherent optical communications further stimulate the interest in processing techniques using the optical nature of the signal, in particular, the optical phase. Signal processing using the optical phase might offer advantages over traditional electronic processing methods using the signal intensity only. Nonlinear effects in optical fibres have many attractive features and great, but not yet fully explored potential in optical signal processing. Here, we overview our recent results and advances in developing novel techniques and approaches to all-optical processing based on fibre nonlinearities. Amongst other topics, we will discuss phase-preserving optical 2R regeneration, a concept for the bit-error rate improvement based on pre-receiver processing in the optical domain; the possibility of using parabolic pulses for optical signal processing and regeneration, and nonlinear optical pulse shaping. A method for passive nonlinear pulse shaping based on pulse pre-chirping and propagation in a normal dispersion fibre will be presented. New techniques of optical signal copying and conversion of optical time-domain to frequency-domain signal multiplexing using triangular optical pulses will be introduced.

**Sonia Boscolo**



Sonia Boscolo received the B.Sc. and M.Sc. degrees in physics from the Burgundy University, Dijon, France, in 1998 and the Ph.D. degree in engineering and applied science from Aston University, Birmingham, U.K., in 2002. Since 2002, she has been working with the Photonics Research Group, School of Engineering and Applied Science, Aston University, where she is a Senior Research Fellow. She has published more than 75 journal and conference papers in the fields of nonlinear physics and optical communications, and produced 3 patents. She was awarded a Leverhulme Trust Early Career Fellowship in 2005, and a full EPSRC grant in 2007 for her research aimed at developing fundamentally new optical technologies based on dissipative nonlinear structures.