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He works mainly on experimental and computational mechanics of a wide range of fibre-reinforced composite materials and structures. The primary focus of his current research is on uncertainty quantification across scales for composites, the development of image-based finite element models, structural and topology optimisation, multiscale modelling, and damage initiation and propagation in several types of fibre-reinforced composites assisted by X-ray computed tomography (CT) scans. He also focuses on the development of novel computational tools to evaluate and simulate the mechanical behaviour of composites based on the continuum damage mechanics (CDM) approach.

Humberto has attracted attention to his research from several funding bodies, where he has been awarded over £2M in individual fellowships and project grants, including the Royal Academy of Engineering, UK Department for Transport, Brazilian Aerospace Agency, Marie-Curie Individual Fellowship scheme, and Alexander von Humboldt. He has published over 60 journal papers, 3 book chapters, and disseminated his work at several relevant conferences, giving him an h-index of 28.