Habib Zaidi

Short Biography:

Professor Habib Zaidi is Chief physicist and head of the PET Instrumentation & Neuroimaging Laboratory at Geneva University Hospital and faculty member at the medical school of Geneva University. He is also a Professor at the University of Groningen (Netherlands), the University of Southern Denmark (Denmark) and Óbuda University (Hungary). His research is supported by the Swiss National Foundation, the European Commission, private foundations and industry (Total 8.8M US$) and centres on hybrid imaging instrumentation (PET/CT and PET/MRI), computational modelling and radiation dosimetry and deep learning. He was guest editor for 12 special issues of peer-reviewed journals and serves on the editorial board of leading journals in medical physics and medical imaging. He has been elevated to the grade of fellow of the IEEE, AIMBE, AAPM, IOMP, AAIA and the BIR. His academic accomplishments in the area of quantitative PET imaging have been well recognized by his peers since he is a recipient of many awards and distinctions among which the prestigious (100'000$) 2010 Kuwait Prize of Applied Sciences (known as the Middle Eastern Nobel Prize). Prof. Zaidi has been an invited speaker of over 160 keynote lectures and talks at an International level, has authored over 385 peer-reviewed articles (h-index=73, >19'500+ citations) in prominent journals and is the editor of four textbooks

Abstract:

The synthesis of pseudoCT images from MRI is a hot research topic for both the radiation therapy and molecular imaging communities following the introduction or MRI/Linac and PET/MRI technologies and the interest in MRI or PET/MRI-only radiation therapy treatment planning and MRI-guided attenuation correction in PET/MRI. The difficulties faced arise from the fact that MRI intensities reflect proton density and relaxation time properties of biological tissues rather than their electron density and photon attenuation properties. Therefore, in contrast to CT, there is a lack of standardized global mapping between the intensities of MRI signal and linear attenuation coefficients at 511 keV. Moreover, in standard MRI sequences, bones and lung tissues do not produce measurable signals owing to their low proton density and short transverse relaxation times. MR images are also inevitably subject to artifacts that degrade their quality, thus compromising their applicability in the above mentioned tasks. MRI-guided pseudoCT images synthesis can be classified in three broad categories: (i) segmentation-based approaches (including the development of dedicated UTE/ZTE sequences), (ii) atlas-registration and machine learning methods, and (iii) emission/transmission-based approaches. Novel deep learning techniques are revolutionizing clinical practice and are now offering unique capabilities to the clinical medical imaging community. This talk summarizes past and current state-of-the-art developments and latest advances in the field focusing mostly on AI-assisted algorithms. The advantages and drawbacks of each approach will be described. Future prospects and potential clinical applications of these techniques and their integration in commercial systems will also be discussed.