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AstroStatistics and AstroInformatics in the content of the SKA and LSST

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Abstract: Over recent decades cosmology has transitioned from a data-poor to a data-rich field, which has lead to dramatic improvements in our understanding of the cosmic evolution of our Universe. Nevertheless, we remain ignorant of many aspects of the scenario that has been revealed. Little is known about the fundamental physics of structure formation in the early Universe or the formation of the first large-scale structure during the epoch of reionization. A complete understanding of dark energy and dark matter, which dominate the late evolution of our Universe, also remains elusive. In coming decades the field will transition from being data-rich to being overwhelmed by data as next-generation observational facilities come online. The emerging big-data era of cosmology – spearheaded by the SKA and LSST experiments – has the potential to lead to another dramatic improvement in our understanding, addressing unanswered fundamental questions about the content and evolution of our Universe – provided that we can make sense of the overwhelming data-sets that will be acquired. I will very briefly review a variety of cutting edge data science techniques developed and applied in astrophysics, including compressive sensing approaches, algorithms that scale to overwhelming large data-sets, uncertainty quantification techniques, and machine learning approaches.

Bio: Jason McEwen is a University Reader in the Mullard Space Science Laboratory (MSSL) at University College London (UCL). He is also Director of Research (Astrophysics) of the UCL Centre for Doctoral Training (CDT) in Data Intensive Science (DIS). He has broad multidisciplinary research interests in applied mathematics, statistics, machine learning, and astrophysics. He in heavily involved in numerous astrophysical experiments, including Planck, Euclid, LSST and the SKA. He is also the Founder of KageNova, a startup company specialised in core technology for virtual and augmented reality.

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