Finding distant galaxies with generative adversarial neural networks

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Description:
The aim of this project is to use a relatively new machine learning technology, Generative Adversarial Networks, to predict the unresolved structures in submillimetre-wavelength images and then use these predictions to find candidate ultra-high redshift galaxies. Extreme high-redshift galaxies can be detected in submm-wavelength surveys made by the Herschel Space Observatory and others, but because of the redshifting, these galaxies are typically only detected at the longest wavelengths, e.g. 500 microns. At these wavelengths, the angular resolution is at its coarsest, so distant galaxies are seen as blended with foreground interlopers. Several groups have attempted to get around this by modelling the data at all wavelengths. This approach deconvolves the longest wavelength data by using the locations of galaxies detected at other wavelengths as a prior, but this is computationally difficult and solutions are not unique. Generative Adversarial Networks are a relatively new machine learning technology that, once trained, can reconstruct missing information in images. This has been shown to work in blurred images of galaxies, accurately reconstructing galaxy morphologies in many cases. This project will deploy this technology on real and simulated submm-wave images, find candidate ultra-high redshift galaxies, follow them up with ground-based and space observatories, place statistical constraints on ultraluminous star forming galaxies at the earliest accessible epochs and constrain models of high redshift star formation.

References:

Qualifications required:
DISCnet-AI asks candidates for either a first-class BSc or a masters-level qualification (e.g. 2:1 at MPhys).