The Kilonova Data Challenge

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Kilonovae are rare transient astronomical phenomena where two neutron stars, or a neutron star and a black hole collide. As a result, a massive amount of energy and light is released. We are conducting our research in anticipation of the Rubin Observatory, and its ten-year Legacy Survey of Space and Time (LSST). In preparation for this, we are researching how to find kilonovae in an image. Our project uses simulated images from a data set built for the LSST Dark Energy Science Collaboration (LSST-DESC), called the second data challenge (DC2). DC2 is a simulated image set containing galaxies, stars, supernovae, and variable stars. However, these simulated images do not contain kilonovae, so we must add them using synthetic source injection. We are taking existing images and adding artificial objects to them. Thus far, we have built several critical Jupyter notebooks. These notebooks are hosted in the Rubin Science Platform (RSP), which allows us to access and analyze DC2 data and LSST functions. One of these notebooks displays a set of images in a mosaic, allowing us to see the full area into which a kilonovae will be added. This notebook visualizes a larger area of the focal plane of the camera. The other notebook we developed displays DC2 images that highlight the host galaxies we chose for a kilonova. These notebooks we developed will be important tools in bringing the kilonova data challenge to a conclusion.