A Linked Learning Approach to Automated Galaxy Morphology Classification

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New survey telescopes and advances in observational technology have allowed astronomers to collect more detailed data about the universe than ever before. More efficient automated data analysis tools are required to sustain this increase in the volume and complexity of survey data. This project explores a linked learning approach to galaxy morphology classification. In addition to a deep convolutional neural network to analyze images of galaxies in the Sloan Digital Sky Survey, the linked method accounts for known galaxy properties and correlations established in recent literature from the context of the galaxy image. A convolutional neural network was first trained using approximately 1000 galaxy images from the SDSS. The model was then used as a consideration factor in a deep learning network trained on over a million galaxies using contextual data not able to be extracted from image analysis. Accuracy from the final model was compared to citizen scientist classifications from the Galaxy Zoo project. The linked method achieved morphology accuracy rates above 90 percent. Compared to existing, non-machine learning methods of morphology classification, the linked method is faster and demonstrates extreme promise by achieving close to industry standard accuracy using datasets of modest size. Finally, linked method classifications were visualized and proven sufficient for confirming long-term evolution trends.

Awards Won:

Fourth Award of $500