Paper ID: 65765
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50th IAA SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) – The Next Steps (A4)
SETI 1: SETI Science and Technology (1)

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THE BREAKTHROUGH LISTEN SEARCH FOR INTELLIGENT LIFE: MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE APPROACHES

Abstract

Breakthrough Listen (BL) is the largest search for extraterrestrial intelligence (SETI) project ever conducted, ingesting 100s of PB per year with astronomical facilities around the globe. At the Green Bank Telescope alone, BL observations have generated over 14 PB of archival radio data products to-date. The abundance of data generated by the BL program makes it infeasible to examine it with traditional methods, which can be prohibitively slow or require excessive human intervention. From its inception, the BL program has leveraged the dramatic recent advances in machine learning (ML) and artificial intelligence (AI) to extend existing search pipelines and develop entirely novel ways of searching for technosignatures.

Our recent work has focused on developing improved radio frequency interference rejection capabilities and generic anomaly detectors by applying unsupervised learning methods like autoencoders, as well as transfer learning with pre-trained Object Detection models.

Here we will present our latest data collection and processing techniques and describe how we have applied ML and AI models to improve the robustness of our software pipelines and increase sensitivity to a wider class of technosignatures. We will also report on a signal injection and recovery effort being conducted in collaboration with our industry partners from Google and Kaggle.