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Unmasking the Hidden: Anomaly Detection in ASKAP's Monitoring

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This study explores the intersection of astronomy and human-machine collaboration, focusing on their transformative role in our exploration of the universe. We examine the Australian Square Kilometre Array Pathfinder (ASKAP) and its monitoring data's crucial role in advancing astronomical discoveries. However, ASKAP's success in charting unprecedented numbers of galaxies presents the challenge of managing and interpreting the resulting 'data explosion'.

To tackle this challenge, we introduce a novel anomaly detection framework that synergizes the strengths of machine learning and human expertise. Our approach adapts the k-nearest neighbours (k-NN) algorithm to the unique characteristics of ASKAP's datasets, incorporating astronomical domain knowledge to enhance its effectiveness. By leveraging a hierarchical data representation and a custom distance metric informed by expert insights, our k-NN variant is well-suited to identify anomalies that are scientifically meaningful. In our approach, machines process the data and flag potential anomalies, while human experts play a crucial role in interpreting and explaining the flagged instances. The human component brings domain knowledge, intuition, and the ability to contextualize the anomalies within the broader astronomical framework. This human-provided explanation is essential for determining the scientific significance of the anomalies and guiding further exploration.

The proposed human-machine collaboration combines the power of machine learning with human expertise to efficiently handle and analyse the immense data generated by ASKAP, potentially enabling ground-breaking discoveries that expand our understanding of the universe.

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