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Dear Professor,

I am interested in the PhD position on astronomical source classification with 4MOST (UFV-PA 2022/1263). I have completed a Dual Degree (Master of Science in Astronomy and Astrophysics and Bachelor of Technology in Engineering Physics) from the Indian Institute of Space Science and Technology, Kerala, India. I have a strong physics and mathematics background with a specialization in astronomy and astrophysics. During my graduate studies, I have developed data analysis skills combined with knowledge and experience in machine learning. Therefore, I would be a perfect fit for the position, and I look forward to working as a PhD scholar at the Uppsala University.

Since childhood, I have been interested in astronomy, which has led me to pursue a career in this field. I have a keen interest in programming, fuelled by my participation in numerous coding challenges and software-development projects. I learnt machine learning and deep learning as a part of my curriculum and took up many hands-on projects with facial recognition using PCA and convolution neural networks. I did a project on spectral and timing analysis of a Low Mass X-ray Binary, MAXI J1820-070. This work showed me the importance of extensive data handling and machine learning in astronomy. I saw this as a precursor to my combined interest in astronomy and data science. I did a project on spectral fitting and spectral parameter estimation with a phased reconstruction technique using a denoising auto-encoder. In my Master's Final Year Project, we developed an automated classification pipeline based on LightGBM to classify Chandra sources and assign class membership probabilities to unknown sources. Currently, we are trying to extend the algorithm for anomalous class detection.

For any survey mission, identifying sources is the fundamental step that will lead to significant scientific results. The 4MOST is expected to generate spectra for about 40 million sources, and the classification of sources necessitates an automated machine learning algorithm. The source classification will allow discovering new sources, populating more of the sources in the existing classes, exploring new concepts, and developing novel methods. Also, the features extracted from the spectra may help to understand new properties of the sources, which are not possible based on existing physical models or otherwise. We can potentially detect an entirely new class of otherwise hidden sources by developing anomaly detection algorithms. Also, it will serve as a foundation for many upcoming research fields using in-depth follow-up observations. I want to take this opportunity to be a part of this activity as a PhD student and play an instrumental role in this collaboration. I believe that my educational background and past research experience perfectly align with the proposed work. I look forward to this exciting experience.

Kind Regards

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