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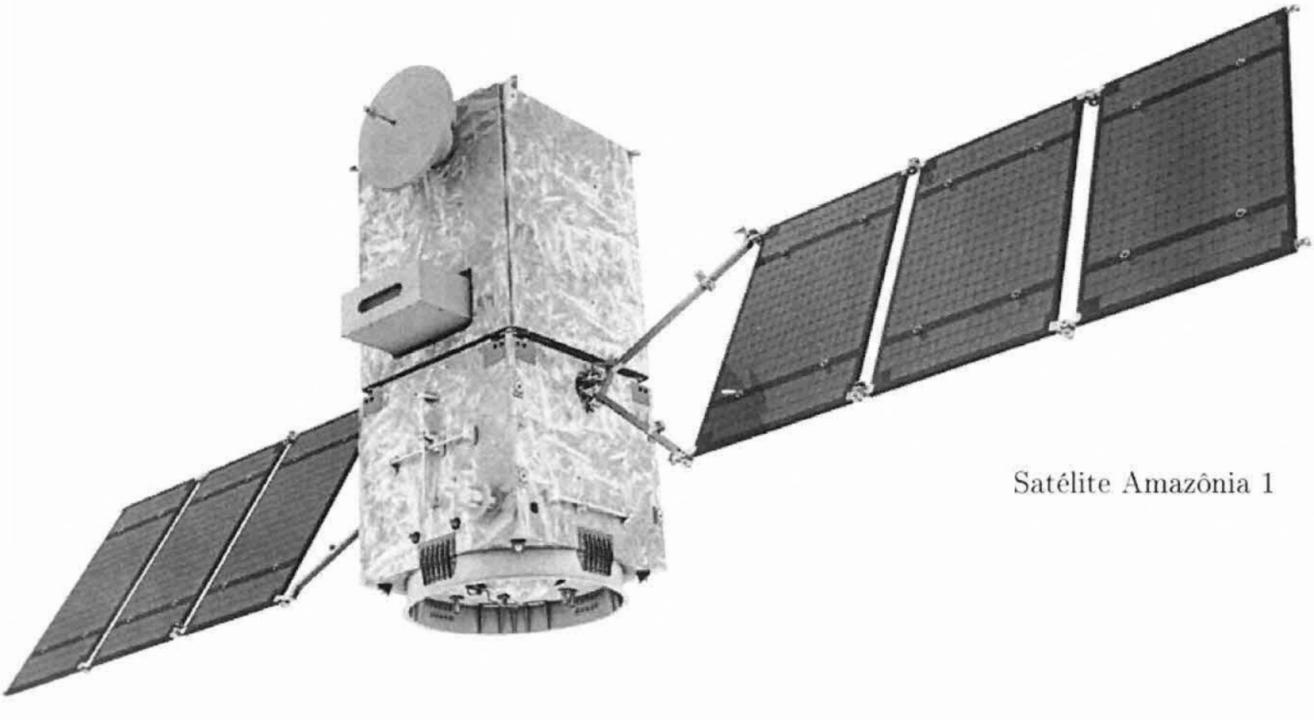
LIVRO DE RESUMOS



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Classification of asteroids' resonant arguments using Convolutional Neural Networks

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The asteroidal main belt is crossed by a web of mean-motion and secular resonances, that occur when there is a commensurability between fundamental frequencies of the asteroids and planets. Traditionally, these objects were identified by visual inspection of the time evolution of their resonant argument, which is a combination of orbital elements of the asteroid and the perturbing planet(s). Since the population of asteroids affected by these resonances is, in some cases, of the order of several thousand, this has become a taxing task for a human observer. Recent works used Convolutional Neural Networks (*CNN*) models to perform these tasks automatically. Here, we compare the outcome of such models with those of some of the most advanced and publicly available *CNN* architectures, like the *VGG, Inception* and *ResNet*. The performance of these models is first tested and optimized for overfitting issues, using validation sets and a series of regularization techniques like data augmentation, dropout, and batch normalization. The three best-performing models were then used to predict the labels of larger testing databases containing thousands of images. The *VGG* model, with and without regularizations, proved to be the most efficient method to predict labels of large datasets. Applications of such methods to asteroids interacting with secular and mean-motion resonances, like the ν_6 and M1:2 exterior resonance with Mars, already produced significant discoveries, like the identification of the (12988) Tiffanykapler asteroid family. This is the first young asteroid family ever found in a linear secular resonance, for which precise estimates of both the age and the ejection velocity field can be obtained. Since the Vera C. Rubin observatory is likely to discover up to four million new asteroids in the next few years, the use of *CNN* models might become quite valuable to identify populations of resonant minor bodies.

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