Filling in the gaps: imputing the missing properties of exoplanets with machine learning

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Understanding planet formation requires a large statistical sample. However, while the total number of extrasolar planets discovered is large, the known properties of individual worlds remains sparse. This issue cannot be resolved by more observations alone. Measurable planet properties depend on detection technique, but multiple detections are frequently impossible: a situation likely to degrade still further as we probe smaller worlds on longer orbits. One solution is to impute missing properties based on the current known distribution. In this talk, I will present one method for such an interpolation using a neural network.

Neural networks are strong at identifying complex trends within data that has a high number of dimensions, making this technique well suited to mining the maximum information from the exoplanet archive. The results focus on imputing planetary mass; a particularly tricky measurement as neither of the two main techniques for exoplanet detection --radial velocity and transit methods-- can estimate this value alone. However, the principal could be applied to other planetary properties and used to explore both formation theories or target selection schemes for future instruments.

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