

## **Overfitting Affects the Reliability of Radial Velocity Mass Estimates of the V1298 Tau Planets**

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Mass, radius, and age measurements of young ( $\sim 100$  Myr) planets have the power to shape our understanding of planet formation. However, young stars tend to be extremely variable in both photometry and radial velocity, which makes constraining these properties challenging. The V1298 Tau system of four  $\sim 0.5$  R<sub>J</sub> planets transiting a pre-main sequence star presents an important, if stress-inducing, opportunity to directly observe and measure the properties of infant planets. Suárez-Masareño et al (2021) published radial-velocity-derived masses for two of the V1298 Tau planets using a state-of-the-art Gaussian Process regression framework. The planetary densities computed from these masses were surprisingly high, implying extremely rapid contraction after formation in tension with most existing planet formation theories. In an effort to further constrain the masses of the V1298 Tau planets, we obtained 36 RVs using Keck/HIRES, and analyzed them in concert with published RVs and photometry. Through performing a suite of cross validation tests, we found evidence that the preferred model of SM21 suffers from overfitting, defined as the inability to predict unseen data, rendering the masses unreliable. In this talk, I'll detail several potential causes of this overfitting, many of which may be important for other RV analyses of other active stars, and recommend that additional time and resources be allocated to understanding and mitigating activity in active young stars such as V1298 Tau.