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Bayesian naturalness of Next-to-Minimal and Minimal Supersymmetric Models

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The discovery of a 125 GeV Higgs-like boson and null results in searches for new physics at the LHC have lead to renewed interest in next-to-minimal supersymmetric models and doubts about traditional measures of fine-tuning in supersymmetric models. We investigate fine-tuning in next-to-minimal and minimal supersymmetric models with Bayesian statistics by picking non-informative priors for superpotential and soft-breaking parameters (in contrast to informative priors for e.g., M_Z and $\tan\beta$) which, we argue, underpin fine-tuning arguments in supersymmetric models. Furthermore, we contrast our Bayesian analyses with traditional fine-tuning measures based upon derivatives of the Z-boson mass, including high- and low-scale measures, highlighting deficiencies in traditional fine-tuning measures.

Authors: Dr FOWLIE, Andrew (Monash University); Dr FARMER, Benjamin (Oskar Klein Centre); BALAZS, Csaba (Monash University); KIM, Doyoun (Monash University); HARRIES, Dylan (University of Adelaide); ATHRON, Peter

Presenter: Dr FOWLIE, Andrew (Monash University)

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