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Testing Swampland Conjectures with Machine Learning

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We consider Type IIB string theory compactification on an isotropic torus with geometric and non geometric fluxes. Employing supervised machine learning, consisting of an artificial neural network coupled to a genetic algorithm, we determine more than sixty thousand flux configurations yielding a scalar potential with at least one critical point. Stable AdS vacua with large moduli masses and small vacuum energy as well as unstable dS vacua with small tachyonic mass and large energy are absent, in accordance to the Refined de Sitter Conjecture. Hierarchical fluxes favor perturbative solutions with small values of the vacuum energy and moduli masses, as well as scenarios with the lightest modulus mass much smaller than the AdS vacuum scale.

Presenter: Dr CABO BIZET, Nana Geraldine (Universidad de Guanajuato)