A New Concept of Computability

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Abstract. This talk is about so-called SAD_n computers, a class of Turing machine-based computers that utilize the geometry of Malament-Hogarth spacetimes to perform non-Turing computable feats. It will be shown how, for example, SAD_n can decide n-quantifier arithmetic but not $(n+1)$-quantifier arithmetic, a result which reveals how neatly the SAD_n family maps into the Kleene arithmetical hierarchy. I will argue that these investigations give rise to a radically new concept of computability, one that accounts for both Turing's machine and these new non-Turing machines. Intriguingly this new concept makes no appeal to any kind Church-Turing conjecture.