Detecting Feature Influences to Quality Attributes in Large and Partially Measured Spaces using Smart Sampling and Dynamic Learning

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Abstract. Emergent application domains (e.g., Edge Computing/Cloud /B5G systems) are complex to be built manually. They are characterised by high variability and are modelled by large *Variability Models* (VMs), leading to large configuration spaces. Due to the high number of variants present in such systems, it is challenging to find the best-ranked product regarding particular *Quality Attributes* (QAs) in a short time. Moreover, measuring QAs sometimes is not trivial, requiring a lot of time and resources, as is the case of the energy footprint of software systems – the focus of this paper. Hence, we need a mechanism to analyse how features and their interactions influence energy footprint, but without measuring all configurations. While practical, sampling and predictive techniques base their accuracy on uniform spaces or some initial domain knowledge, which are not always possible to achieve. Indeed, analysing the energy footprint of products in large configuration spaces raises specific requirements that we explore in this work. This paper presents **SAVRUS** (**S**mart **A**nalyser of **V**ariability **R**equirements in **U**nknown **S**paces), an approach for sampling and dynamic statistical learning without relying on initial domain knowledge of large and partially QA-measured spaces. SAVRUS reports the degree to which features and pairwise interactions influence a particular QA, like energy efficiency. We validate and evaluate SAVRUS with a selection of likewise systems, which define large searching spaces containing scattered measurements.

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