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A Demonstration of Many Objective Robust Decision Making using OpenMORDM

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Abstract: This presentation demonstrates the application of a new open source software framework for many-objective robust decision making (MORDM), called OpenMORDM, on a challenging environmental management test case termed the "lake problem". The lake problem has been used extensively in the prior environmental decision science literature and, in this presentation, captures the challenges posed by conflicting economic and environmental objectives, a water quality "tipping point" beyond which the lake may become irreversibly polluted, and multiple deeply uncertain factors that may undermine the robustness of pollution management policies. OpenMORDM has a basis in the R programming language and represents a bridge to large communities of practice given other Python-based exploratory modelling and analysis software, such as EMA Workbench. OpenMORDM places an emphasis on the quantification of the trade-offs between alternative strategies in different scenarios, exploration of alternative definitions of robustness, and identification of key system factors that should be monitored as triggers for future actions or additional planning. As a result, OpenMORDM provides a platform for constructive decision support, allowing analysts and decision makers to interactively discover promising alternatives and potential vulnerabilities while balancing conflicting objectives. In this presentation, we will demonstrate the application of OpenMORDM to elicit robust policies for the lake problem given deeply uncertain environmental conditions, identify key system factors and signposts for monitoring the lake's "tipping point" using the Patient Rule Induction Method (PRIM) and Classification and Regression Trees (CART), and demonstrate the use of visual analytics to understand the tradeoffs between robustness and system performance. Additionally, we will visually demonstrate how the stakeholder's definition of robustness can dramatically impact which policy is ultimately preferred and the importance of visual analytics in addressing these challenges.