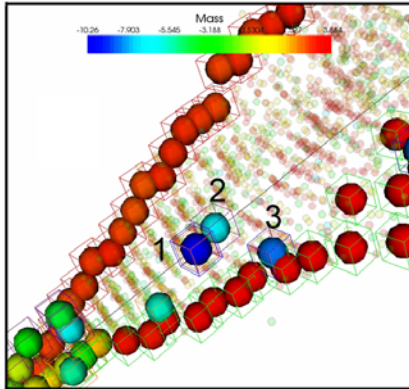# *Cyber-Enabled Discovery & Negotiation Given Conflicting Design Objectives*

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A growing number of practitioners in both the water resources and the broader engineering design communities are seeking to use multiobjective optimization to solve large design problems (defined in terms of the number of decisions and objectives). Initially this presentation will provide an overview of what multiobjective optimization is and why it is important for determining optimal tradeoffs (also called Pareto optimal solutions). Our recent research has helped to advance designers ability to discover their tradeoffs for large numbers of design objectives and use these data to advance design and decision making. Our VIDEO framework (<u>Vi</u>sually <u>I</u>nteractive <u>D</u>ecision-making and <u>D</u>esign using <u>E</u>volutionary <u>O</u>ptimization) allows users to visually navigate large multiobjective solution sets while aiding decision makers in identifying one or more optimal designs. Our goal in the development of the VIDEO framework is to affirm the need and value of combining interactive visualization with Pareto optimization to improve *a posteriori* decision making where user preferences are elicited after optimization. This seminar will present a specific demonstration of the VIDEO framework within an illustrative long-term groundwater monitoring (LTM) design application. LTM design has long been recognized to have "many objectives" and is an excellent example application for showing that visualization combined with multiobjective solution sets can facilitate discovery and negotiation in the design and decision-making process. Our use of the terms discovery and negotiation is motivated by the potential of "many objective" solution sets to identify alternatives that capture a broad suite of system behaviors relevant to both modeled and unmodeled objectives, helping decision makers to "discover" system dependencies and/or tradeoffs and exploit this information in the negotiated selection of a solution.