RISE RESEARCH INNOVATION SCHOLARSHIP ENTREPRENEURSHIP

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EvoDash: An Interactive Dashboard for Evolutionary Computing and Intelligent Decision-Support

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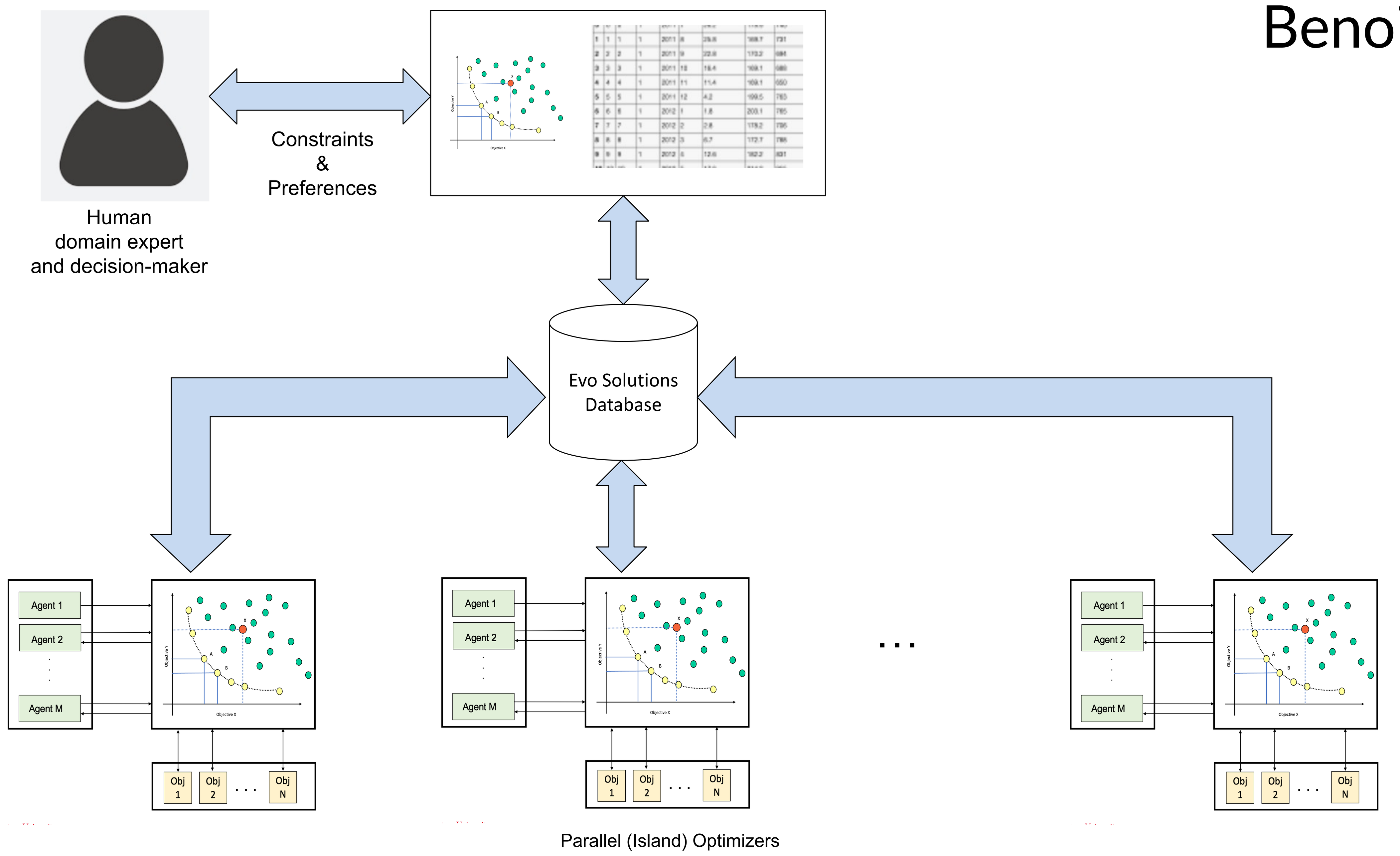

Figure 1: EvoDash Architecture with Parallel (Island) Optimizers

Multi-objective optimization has many applications in transportation logistics, supply-chain optimization, and resource allocation. Evo is a multi-objective evolutionary computing framework that allows the human decision maker to impose dynamic selection constraints on the evolving population of candidate solutions. EvoDash helps direct this evolution by visualizing the multi-dimensional tradeoffs among user-defined objectives. This facilitates rapid decision support by directing the population towards Pareto-optimality.

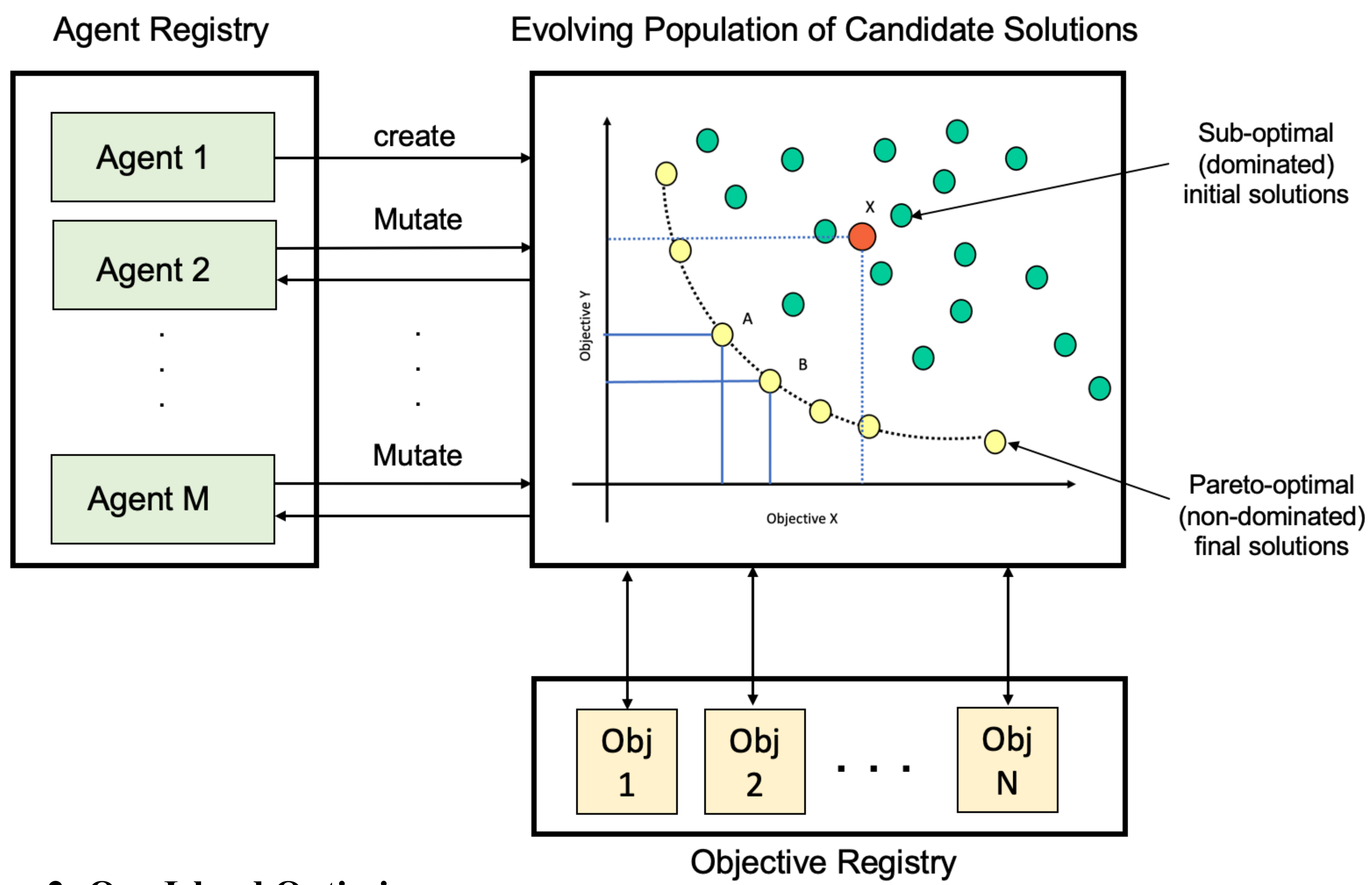

Figure 2: One Island Optimizer

Each Evo optimizer maintains a collection of candidate solution alternatives evaluated with respect to multiple declared objects. Agents mutate existing solutions in order to search the multi-dimensional objective space, causing the population to eventually converge to Pareto optimality.

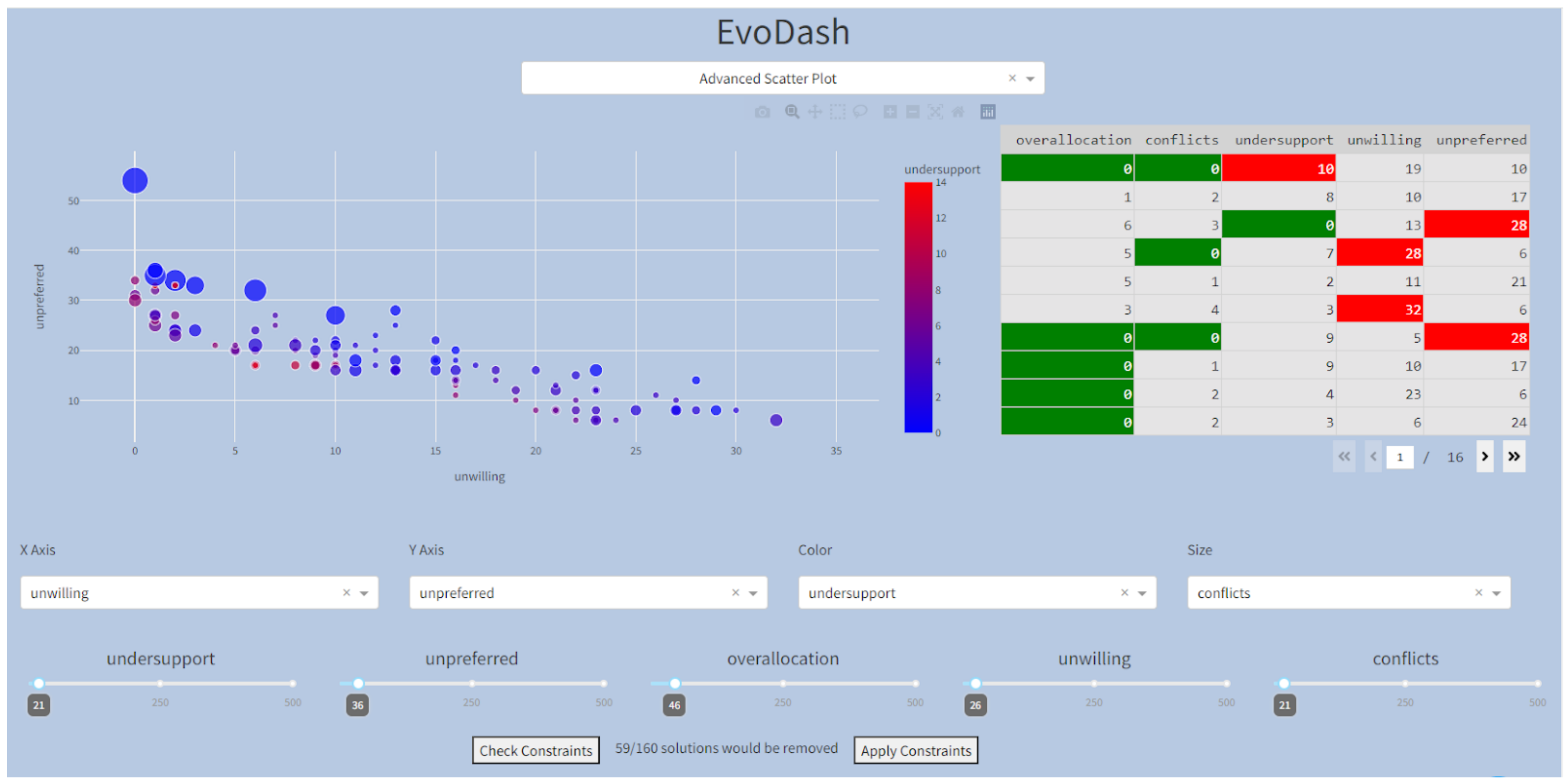

Figure 3: TA to Lab Resource Allocation

We employ EvoDash to solve the problem of allocating TAs to Lab/Practicums. Here we visualize tradeoffs between four pertinent objectives: over and under TA allocation, minimizing time conflicts, and maximizing TA preferences. During program execution, users specify objective boundary constraints to limit the search-space, resulting in faster convergence to a solution acceptable to the decision-maker.

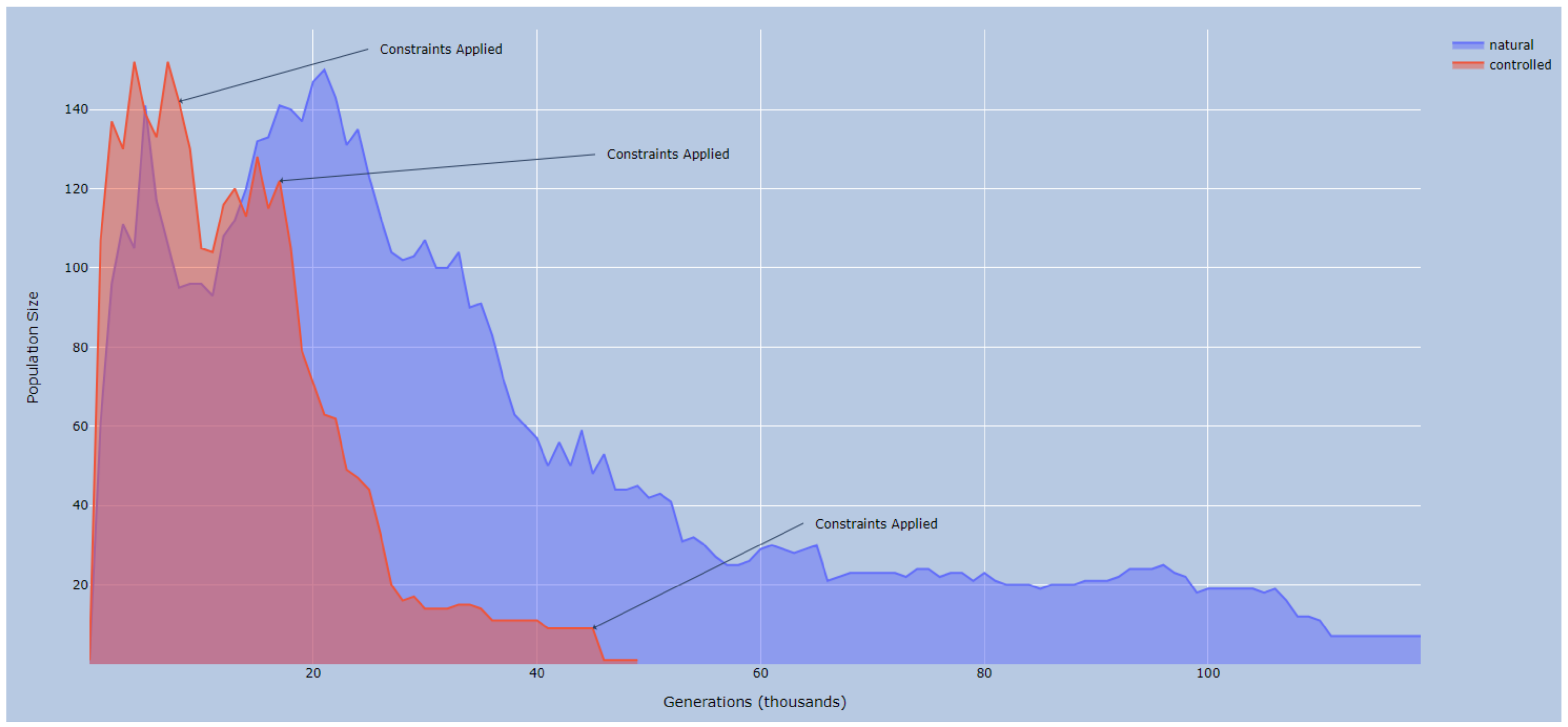

Figure 4: The Advantage Directed Evolution

Directed evolution using dynamically-defined user constraints promotes faster convergence to Pareto-optimality in a multi-objective intelligent-decision support context. This is achieved by aggressively culling solutions that fail to satisfy domain-specific user requirements.