SIGEVO Summer School 2017 Challenge

Challenge posed by Dr Mike Preuss

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Question

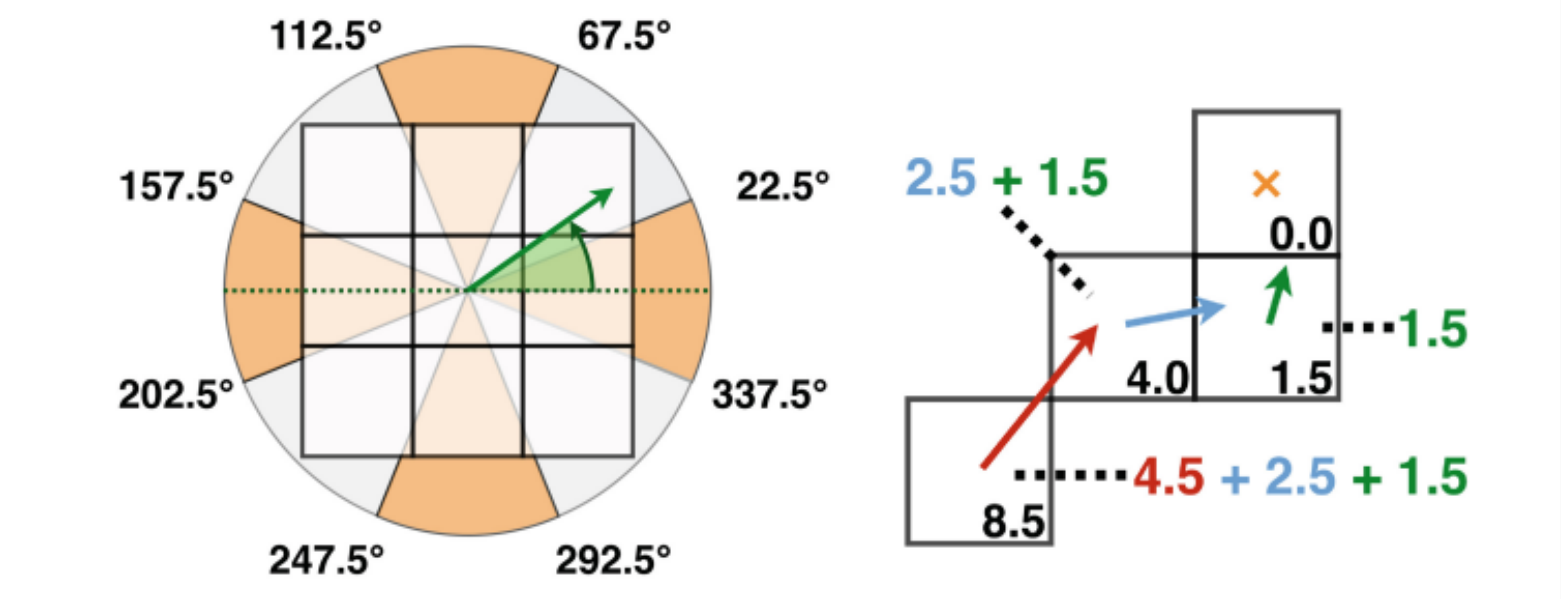
How does a "Cumulated Gradient Paths" heatmap help me selecting a suitable algorithm/good parameters for a multi-objective optimization problem?

Response

- The context to this concept is provided in Kerschke et al. 2017, *An Expedition to Multimodal Multi-objective Optimization Landscapes*
- The work identifies a **Combined Gradient** as: $\overrightarrow{v} = \frac{\overrightarrow{v_1}}{||\overrightarrow{v_1}||} + \frac{\overrightarrow{v_2}}{||\overrightarrow{v_2}||}$
- A gradient field is then defined when the search-space is divided in a number of grids, and for each grid we calculate the combined gradient.
- A path connecting each cell's gradient vector is calculated to find out the shape of search-space

continued..

Response (contd..)



- While creating the path, a neighboring cell is selected based on the direction of the gradient vector.

Response (contd..)

- Visualizing this path as heat-maps helps show up basins and ridges of local and global efficient sets in the search space.
- An area of a local/global efficient set is marked by decreasing gradients in the region
- This method even allows to visualize and detect disjoint local optimal sets