Optimization Model for SCRUM-Based Development

Decision Variables

Let the decision vector be $x = (x_1, x_2, \ldots, x_{11})$ where:

$$x_1 = \text{sprint length (days)},$$
$$x_2 = \text{team size (members)},$$
$$x_3 = \text{budget allocation (\%)},$$
$$x_4 = \text{features per sprint},$$
$$x_5 = \text{story point cap},$$
$$x_6 = \text{test cases per feature},$$
$$x_7 = \text{documentation hours},$$
$$x_8 = \text{training hours},$$
$$x_9 = \text{daily scrum duration (min)},$$
$$x_{10} = \text{buffer time (\%)},$$
$$x_{11} = \text{release frequency (per quarter)}.$$

Objective Functions

$$
\begin{aligned}
\text{Maximize:} \quad & f_1(x) = \text{Velocity}(x), \\
& f_2(x) = \text{CustomerSatisfaction}(x), \\
& f_3(x) = \text{FeatureThroughput}(x), \\
& f_4(x) = \text{TeamUtilization}(x), \\
& f_5(x) = \text{BacklogHealth}(x), \\
& f_6(x) = \text{RoadmapAdherence}(x), \\
\text{Minimize:} \quad & f_7(x) = \text{Bugs}(x), \\
& f_8(x) = \text{SprintOverrun}(x), \\
& f_9(x) = \text{CycleTime}(x), \\
& f_{10}(x) = \text{ContextSwitches}(x), \\
& f_{11}(x) = \text{ReleaseDefects}(x).
\end{aligned}
$$

Constraints

$$g_1(x) : \text{TotalCost}(x) \leq \text{Budget},$$

$$g_2(x) : \sum \text{StoryPointsAssigned}(x) \leq \text{TeamCapacity},$$

$$g_3(x) : \text{SkillMatch}(x) = 1,$$

$$g_4(x) : \text{Availability}(x) = 1,$$

$$g_5(x) : x_1 = 14,$$

$$g_6(x) : \text{CriticalFeaturesDone}(x) = 1,$$

$$g_7(x) : \text{ComplianceViolations}(x) = 0,$$

$$g_8(x) : x_2 \leq \text{MaxTeamSize},$$

$$g_9(x) : \text{BacklogEntries}(x) \leq \text{MaxBacklogSize},$$

$$g_{10}(x) : \text{WIP}(x) \leq \text{WIPLimit},$$

$$g_{11}(x) : \text{ActiveSprints}(x) \leq 3.$$

Variable Bounds

$$x_1 \in [7, 28], \quad x_2 \in [3, 12], \quad x_3 \in [0, 100],$$

$$x_4 \in [1, 10], \quad x_5 \in [10, 100], \quad x_6 \in [0, 500],$$

$$x_7 \in [0, 40], \quad x_8 \in [0, 16], \quad x_9 \in [10, 30],$$

$$x_{10} \in [0, 20], \quad x_{11} \in [1, 4].$$