Optimizing column location in flat slab system using Particle Swarm Optimization vs Genetic Algorithms

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Abstract. One of the key architectural advantages of a concrete flat slab system is its flexibility in design. The absence of beams and columns allows for larger, open spaces with minimal obstructions, giving architects the freedom to create unique and innovative layouts. However, the location of the middle columns (one of the main factors affecting the construction cost) is commonly aligned based on experience which may entail an uneconomic design alternative. This paper aims to propose different machine learning optimization algorithms, namely, particle swarm optimization (PSO) and genetic algorithms (GA) to optimize the location of columns within a flat slab plan considering different serviceability requirements. Both optimization systems showed good performance for allocating the concrete columns, However, the GA algorithm showed better results in terms of maximum deflection with less computational effort.