Multi-objective Optimization

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Dimensionality reduction

- Multiple conflicting objectives to optimize – Pareto-optimal solutions (trade-offs between objectives);

- Large number of objectives – increasing difficulty for the multi-objective optimizers;

- Difficulty to represent and visualize the Pareto-optimal frontier with more than three objectives;

- Statistical tools: Principal Components Analysis, Biplots…

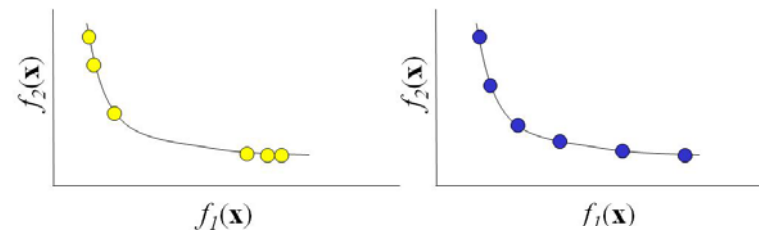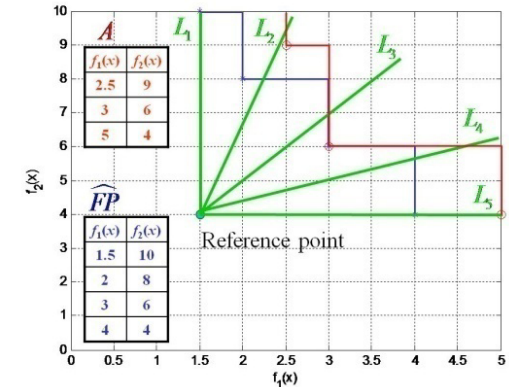- Application of these techniques before, during or after the search.
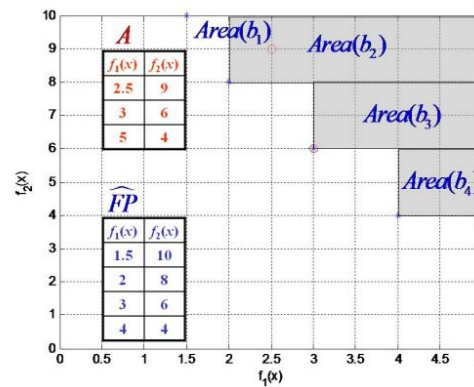
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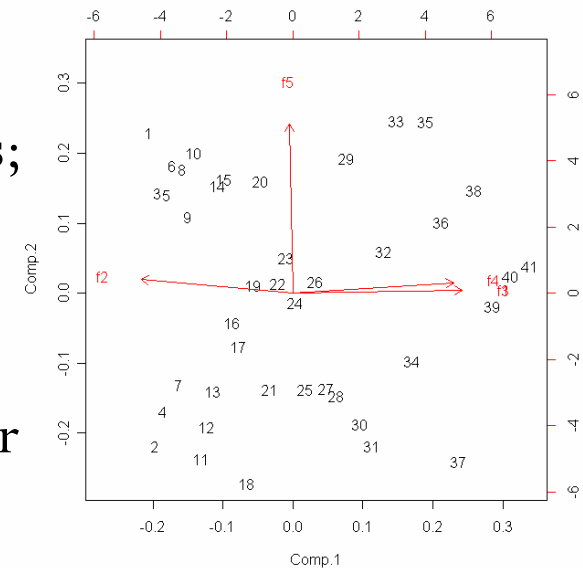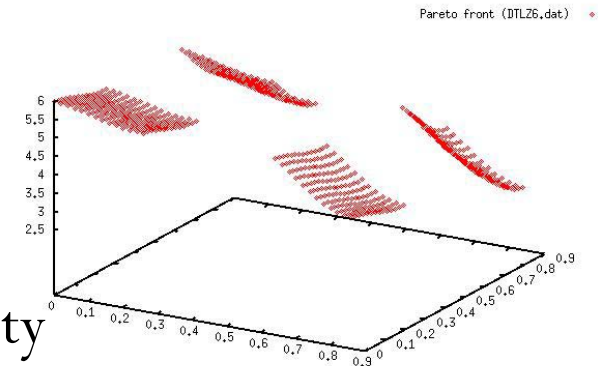
Performance Metrics

- Evaluating closeness to the Pareto-optimal front
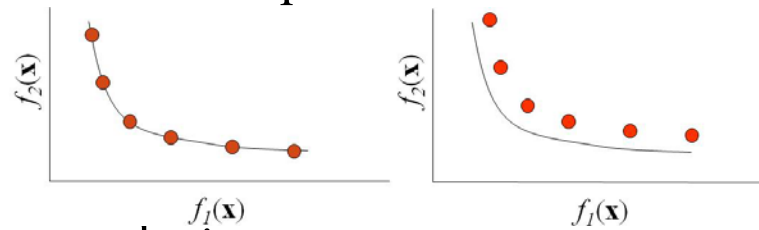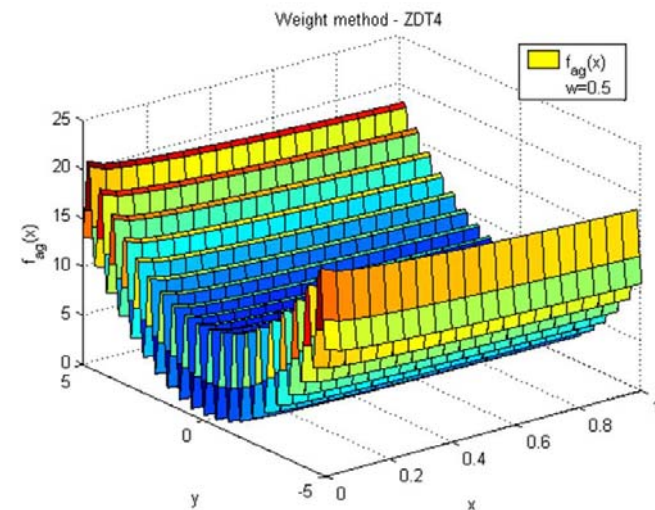

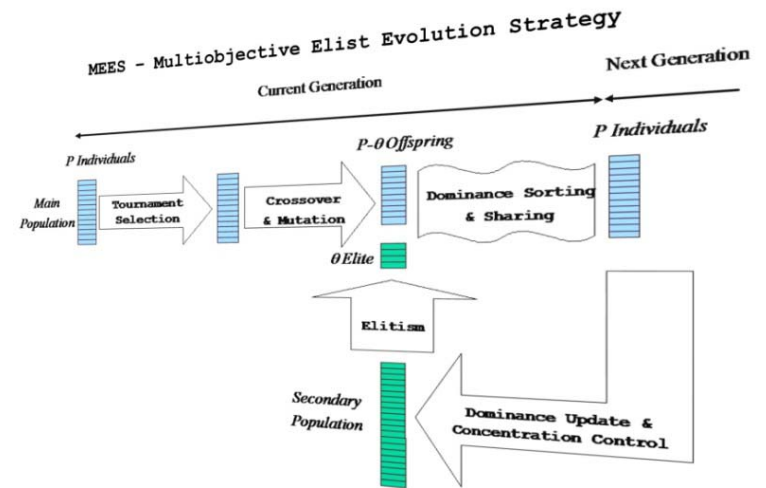- Evaluating diversity among solutions

- Statistical measures:
 - Hyper-volume
  - Attainment surfaces
  - Entropy…

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Evolutionary Algorithms

- Population based algorithms

- Genetic Algorithms, Evolution Strategies, Differential Evolution, …

- Elitism strategies

- Constraint handling techniques

- Scalarization methods

- Hybridization with other algorithms

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Real world applications

- Laminated plate design optimization

- Optimization of the sensor and actuator capabilities of piezoelectric laminated plates
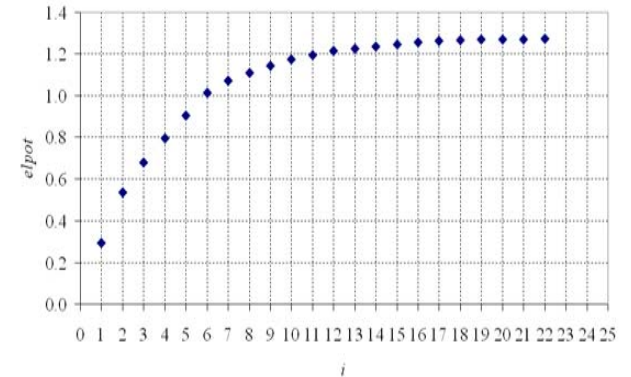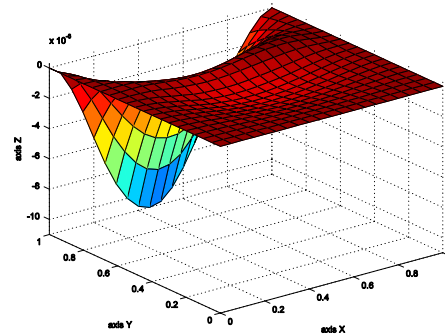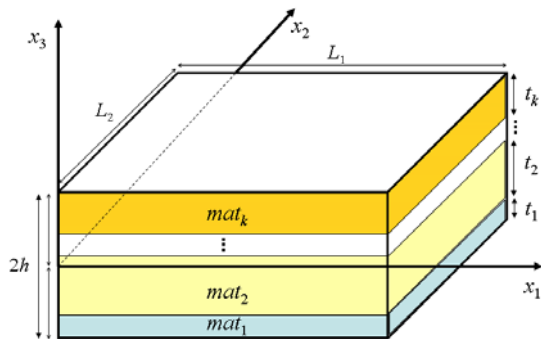
- Inverse analysis techniques on displacements measured during caverns excavation

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