Surrogate-Assisted Evolutionary Multi-Objective Optimization for Hardware Design Space Exploration

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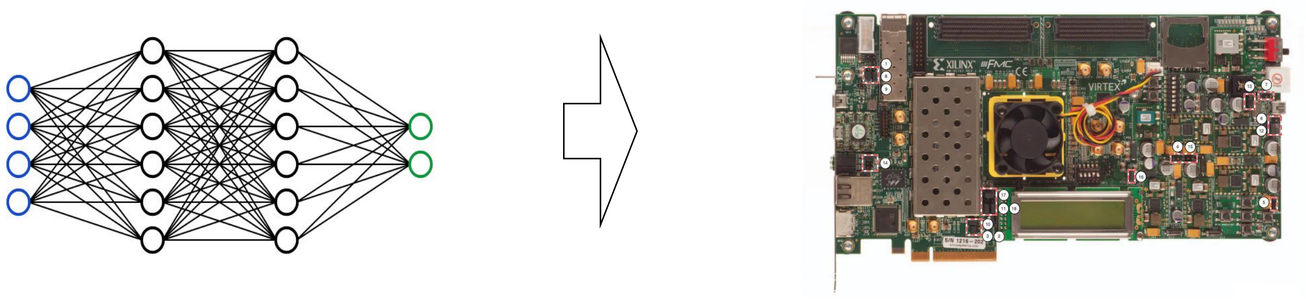
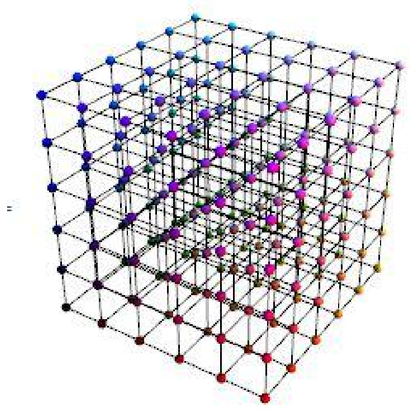
Motivation

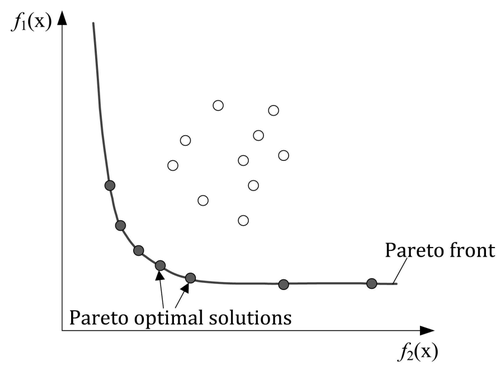
- Hardware design space exploration involves finding a suitable micro-architecture, usually considers multiple conflicting performance indicators, which in practice are computationally expensive.



- Three main challenges:



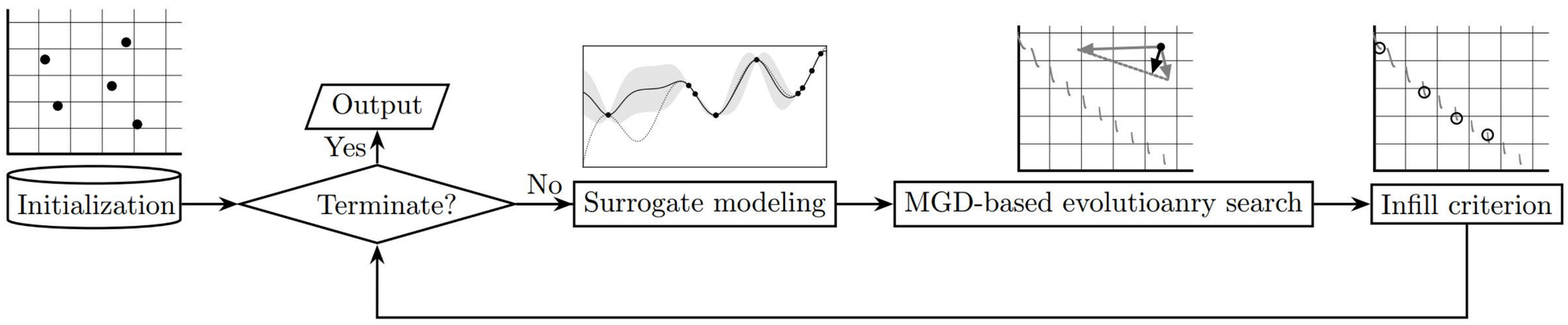
Integer Decision Space



Irregular Pareto Front

Time Consuming

Proposed Method and Experimental Results



- Benchmark problem

- Hardware design problem
  - The hardware accelerated General Matrix Multiply (GEMM)
  - The hardware accelerated Stochastic Gradient Descent (SGD)
  - The hardware accelerated K-Means

DSE Problem	Number of parameters	Size of the design space
GEMM	6	2.7×10^4
SGD	5	3.3×10^4
k-Means	6	8.9×10^3