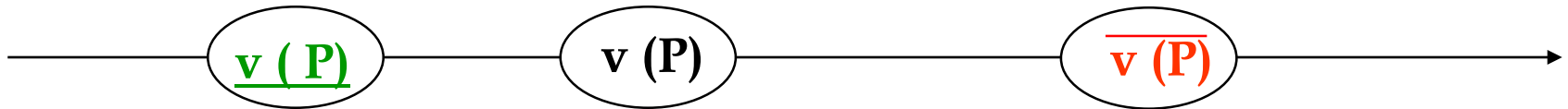


# Solving methods and libraries

[Search range]



Exact methods

MP (CPLEX, Xpress, Gurobi, COIN, BOB++) or CP (Kalis, Choco, CP solver)

- Based on implicit enumeration of the solution set (Branch-and-X, DP, A\*, D&C, ...)
- Generic components (operators of search, generation, branching, lower bounding, cutting, pricing...)
- *Parallelism: node evaluation, tree traversal, searching range*

Matheuristics

Metaheuristics  
(LocalSolver,  
ParadisEO)

- Based on the solution set search methods (SA, TS, GA, ...)
- Generic components (operators of search, selection, replacement, termination,...)
- *Parallelism: solution evaluation, neighborhood partitionning, cooperative searching*

Parallelism : faster/bigger/+robust/+efficient

# Branch-and-Bound (B&B) procedure

```
void Procedure_BB(x0) {
    /** Minimization **/
    ub = g(x0);

    /** Create a priority queue h **/
    h = MakeHeap(x0);
    while (h != NULL) {

        /** Choose the best node to explore **/
        x = DeleteMin(&h);
        for (each son y of x) {

            /** Update the UpperBound and prune **/
            if (y is a feasible solution)
                && (g(y) < ub) {
                    ub = g(y); DeleteGreater(ub, &h);
                }

            /** Add new son nodes in the queue **/
            if (y is not a terminal node) && (f(y) < ub)
                Insert(y, &h);

        } /* end for */
    } /* end while */
} /* end BB */
```

# Generic B&B data and runtime model

