Goldfish manual

ver. 1.0

November 2023

Goldfish installation

Goldfish plug-in can be downloaded from the Food4Rhino website.

Goldfish installation is done by copy-pasting the files: **Goldfish.gh**; **Goldfish.dll** to the **Components Folder in the Grasshopper's Libraries** which can be found in the Grasshopper window tabs: **File** > **Special Folders** > **Components Folder** or by path: C:\Users\user\AppData\Roaming\Grasshopper\Libraries
*Note: The AppData folder may be hidden in the user folder. To find this folder mark **Hidden Items** icon in the **View** tab of the Windows window.*

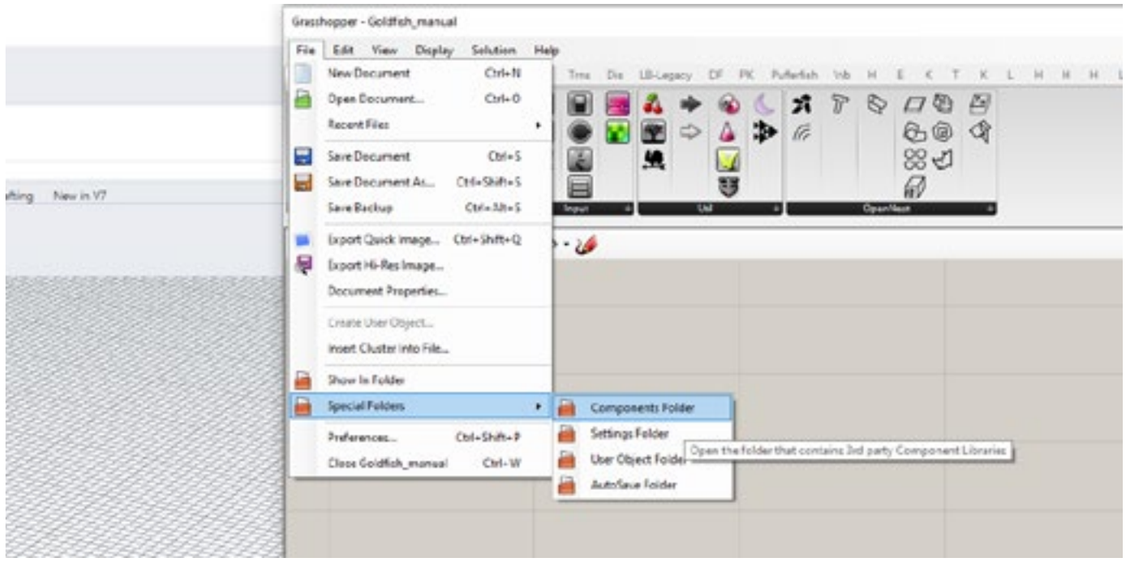


Fig. 1 Libraries folder location.

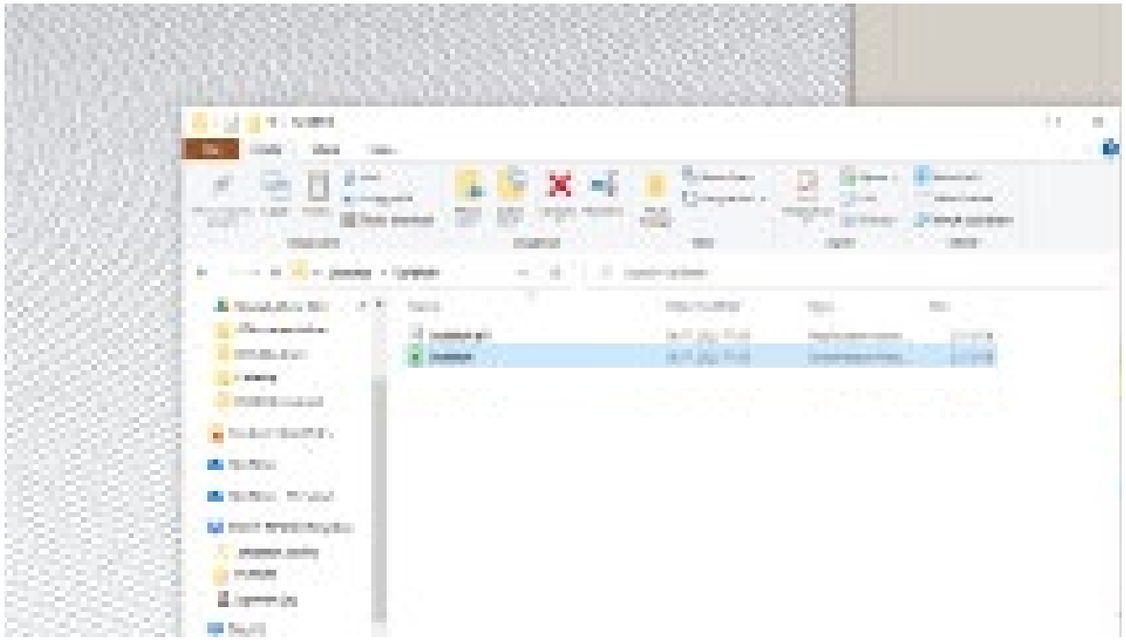


Fig. 2 Pasting Goldfish's installation files to the Libraries folder.

After installing **Goldfish** plug-in, the component is available under the Util tab.

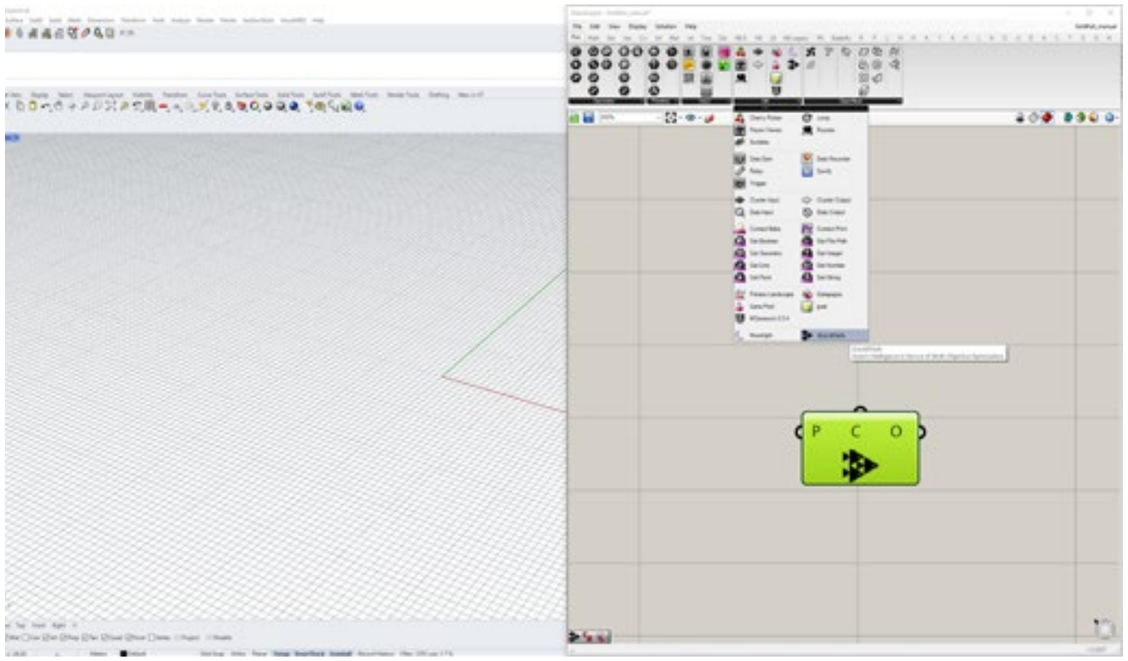


Fig. 3 Location of the Goldfish component in the Grasshopper's tabs.

In order to open **Goldfish** editor window, first the user need to link parameters (P) and/or objectives (O) to the Goldfish's input parameters, otherwise the "Missing links" error window will appear.

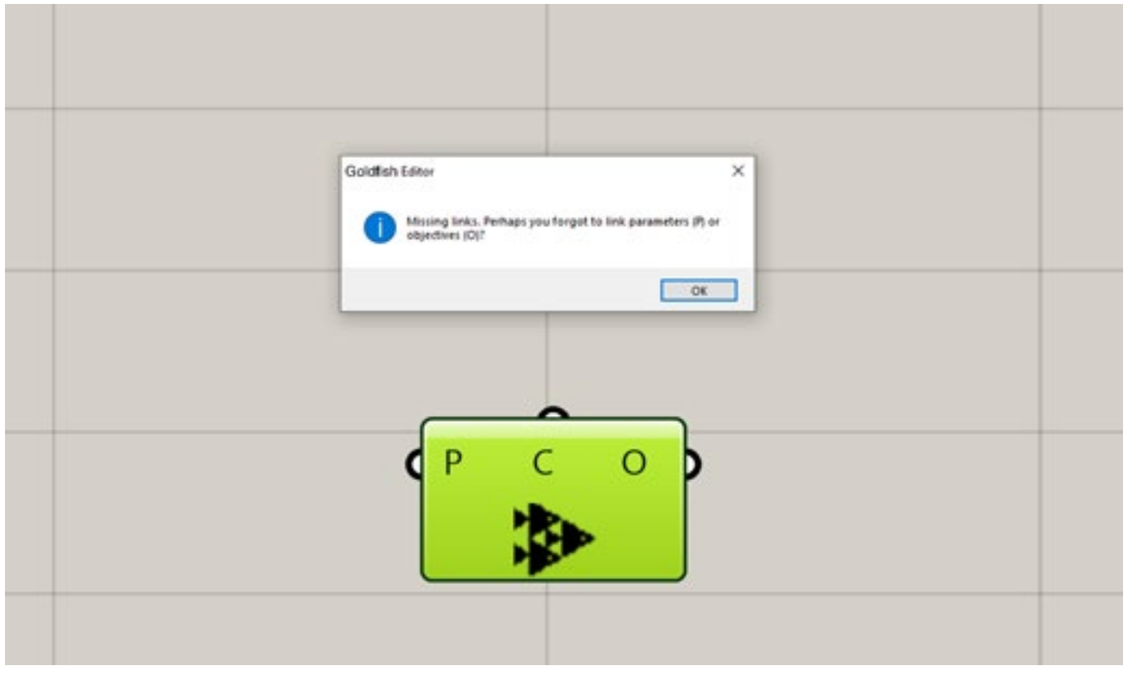


Fig. 4 "Missing links" error window.

- The parameters (P) input requires **Number slider** component to be linked.
  *Note: It is not possible to link other than **Number slider** component.*

- The objective (O) output requires **Number** primitive component linked with the Objective value coming from the objective function.
  *Note: It is not possible to link other than **Number** primitive component.*

- The constaints (C) input requires **Boolean** primitive component linked with the Constaint condition value (False or True) coming from the constaint condition. (This input is optional and depend on the optimization problem, if it's constrained or not)
  *Note: It is not possible to link other than **Boolean** primitive component.*

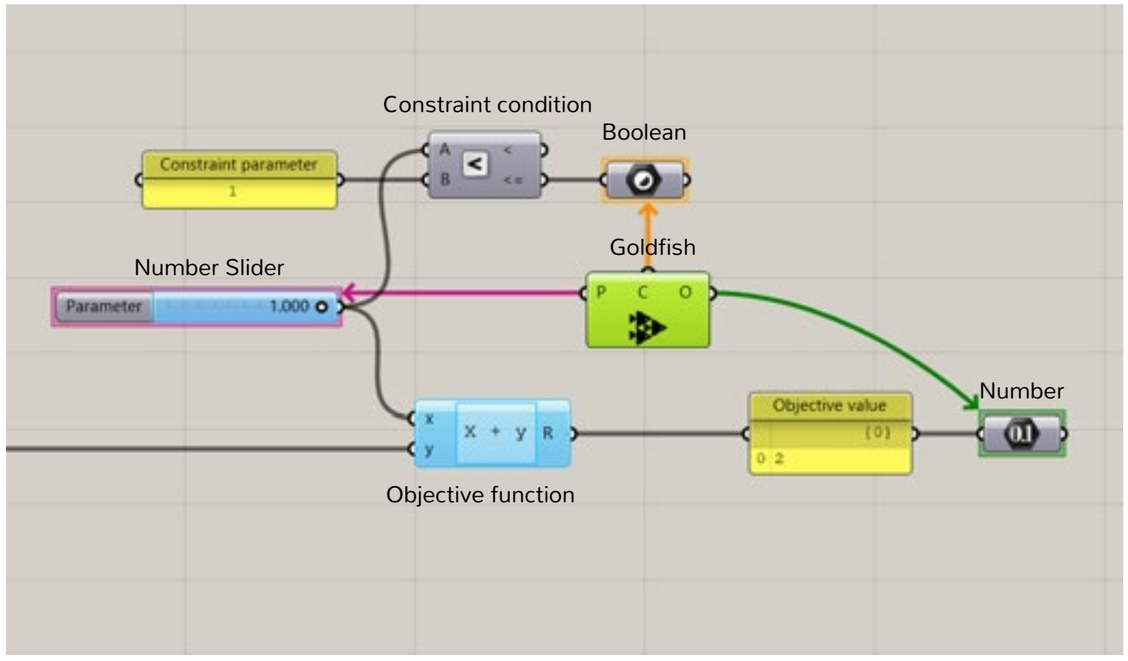


Fig. 5 Linking the parameters (P), objectives (O) and constaints (C) to the component.

After linking input parameters, objectives and constaints the user can open Goldfish editor.

After opening the Goldfish, the editor window will appear. The editor is divided into few sections:
Option tab - allowing user to set optimization options such as:
Basic Options:

- Iterations: number of iterations per population;
- Population Size: number of particles searching the hyperspace
- Repository Size: indicates max size of the solutions in the repository
- Number of SubSwarms: number indicating the division of the swarm into smaller subswarms

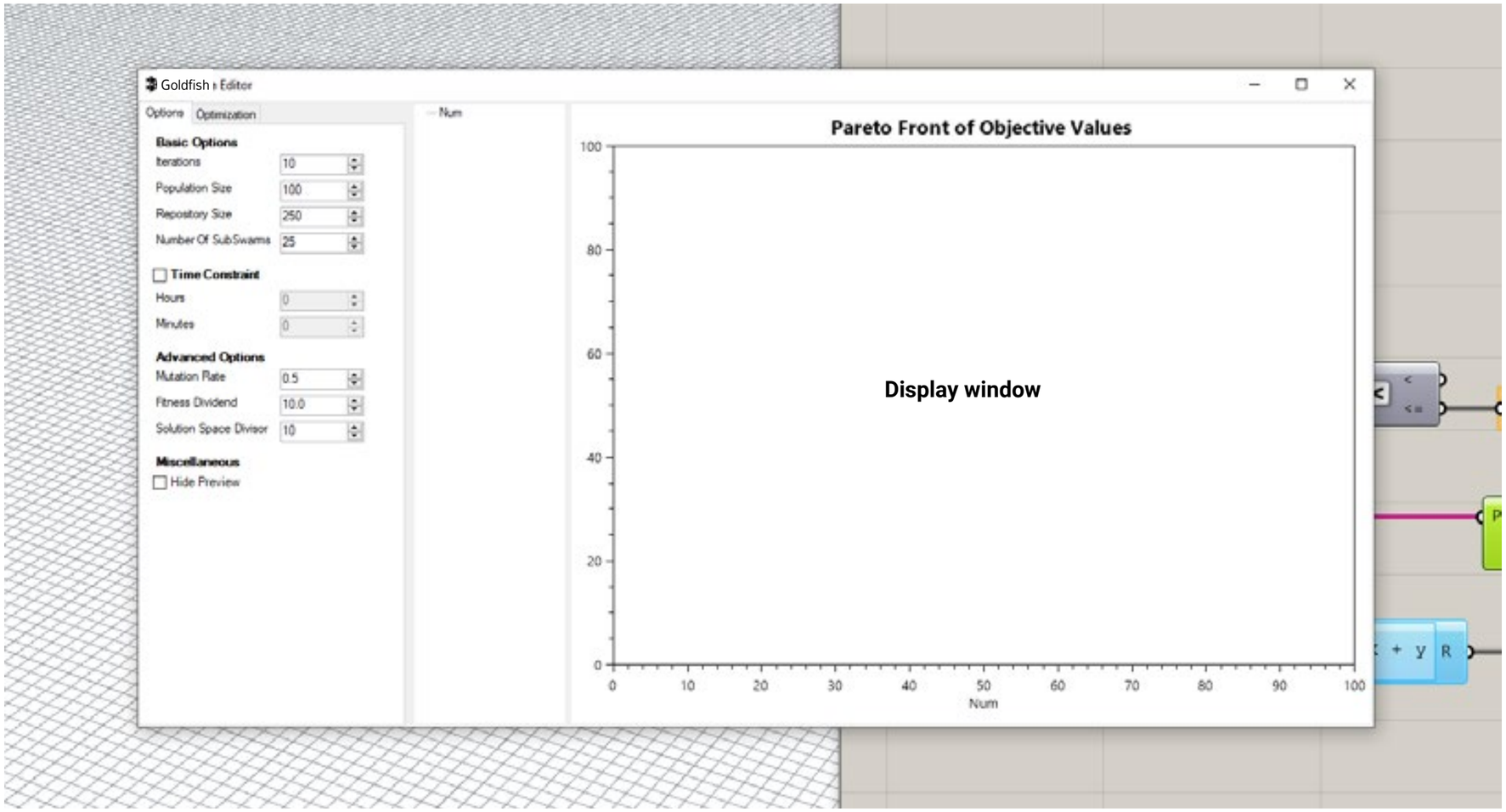
Time constraint: allows to limit the time of the optimization

Advanced options:

- Mutation Rare: mutation coefficient
- Fitness Divident
- Solution Space Dicisor

Miscellaneous:

- Hide Preview: hides the solutions on the display window



Display window
Pareto Front Display - displays the optimization solutions as the Pareto Front.

Fig. 6 Options tab

Note: Each optimization design requires individual options setting approarch.

After opening the Goldfish, the editor window will appear. The editor is divided into few sections:
Optimization tab - allowing user to see the optimization status:
Evaluation Statistics:

- Nb of Parameters: number of parameters linked to the Goldfish component
- Nb of Objectives: number objectives linked to the Goldfish component
- Nb of Constraints: number constraints linked to the Goldfish component
- Evaluating Swarm: index of evaluating subswarm
- Evaluating Particle: index of evaluating particle
- Iteration: index of current iteration
- Optimization Status: **Status** - before starting optimization; **Goldfish is swimming** - during optimization; **Finished** - after starting optimization;
- Avg. Particle Eval. Time: average single particle evaluation time
- Avg. Population Eval. Time: average population evaluation time
- Total Elapsed Time: total evaluation time
- ETA: remaining optimization time

Buttons:

- Start: start optimization
- Pause: pause optimization
- Reset: reset optimization (erases all data)
- Export: export data as .csv file

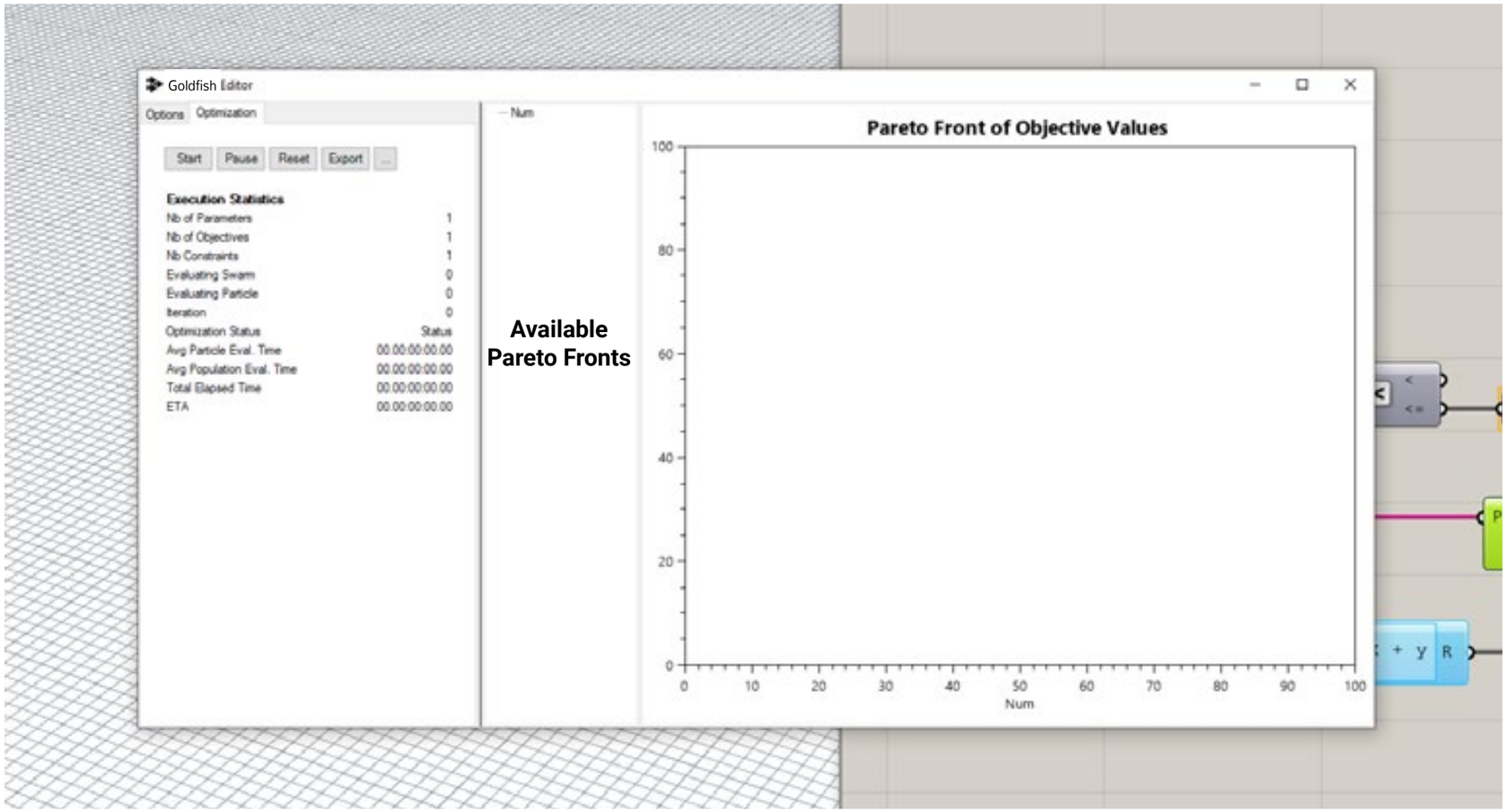


Fig. 7 Optimization tab

If there is more than 2 objectives then Goldfish creates the list of **Available Pareto Fronts** to compare all objectives according to the manner:
Objective 1 - Objective 2
Objective 2 - Objective 3
Objective 3 - Objective 1

Goldfish offers few export options of the results.
The user can export data as numeric data using Export button in the left Optimization tab:
- .csv file: raw data consisting of parameters, objective values and feasibility (using the Export button)

Graphic representation by clicking on (right mouse button) the display window:
- PNG file
- PDF file
- SVG file

Also by clicking on (right mouse button) the display window the user can **Select All** solutions (dots) or **Unselect All** solutions (dots) from the Pareto Front

Option tab - allowing user to set optimization options such as:
Basic Options:
- Iterations: number of iterations per population;
- Population Size: number of particles searching the hyperspace
- Repository Size: indicates max size of the solutions in the repository
- Number of SubSwarms: number indicating the division of the swarm into smaller subswarms

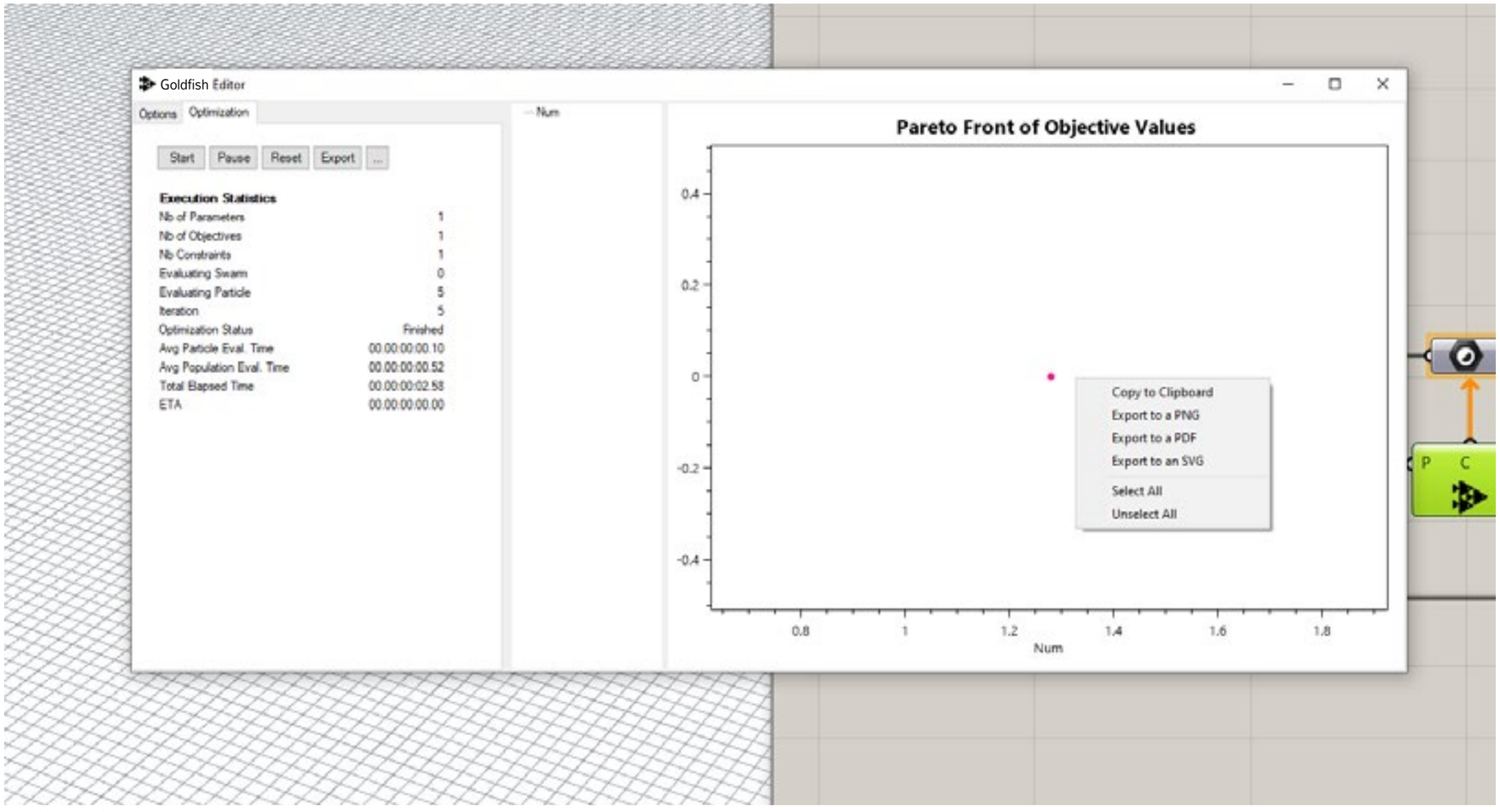


Fig. 8 Export options

Reinstate
By cliking on the solution dot (right mouse button) the user can reinstate selected solution which automatically will set the parameters values on the Number Slider to the ones which corespond with the objective value of the solution.

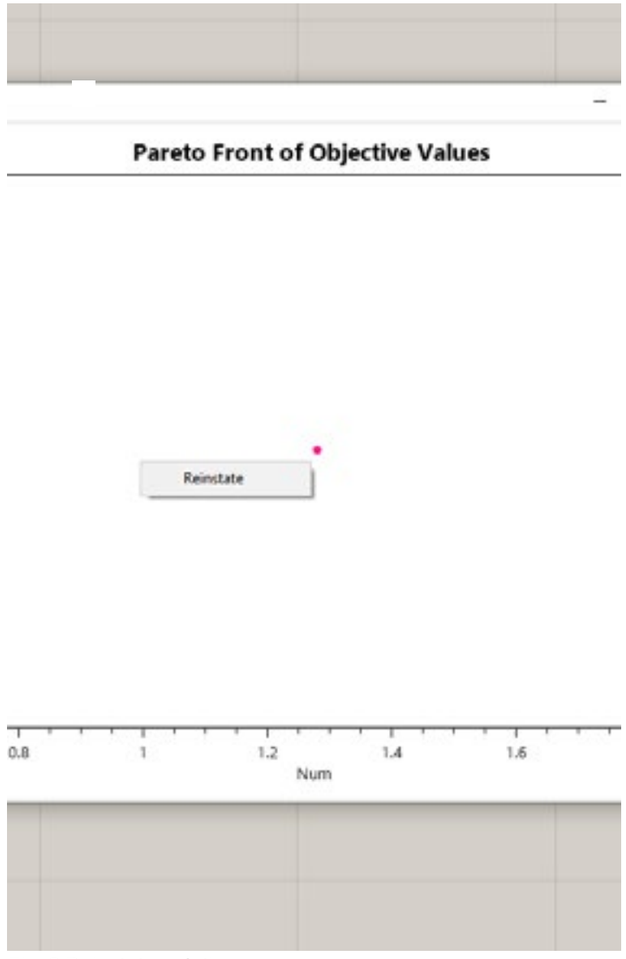


Fig. 9 Reinstate solution