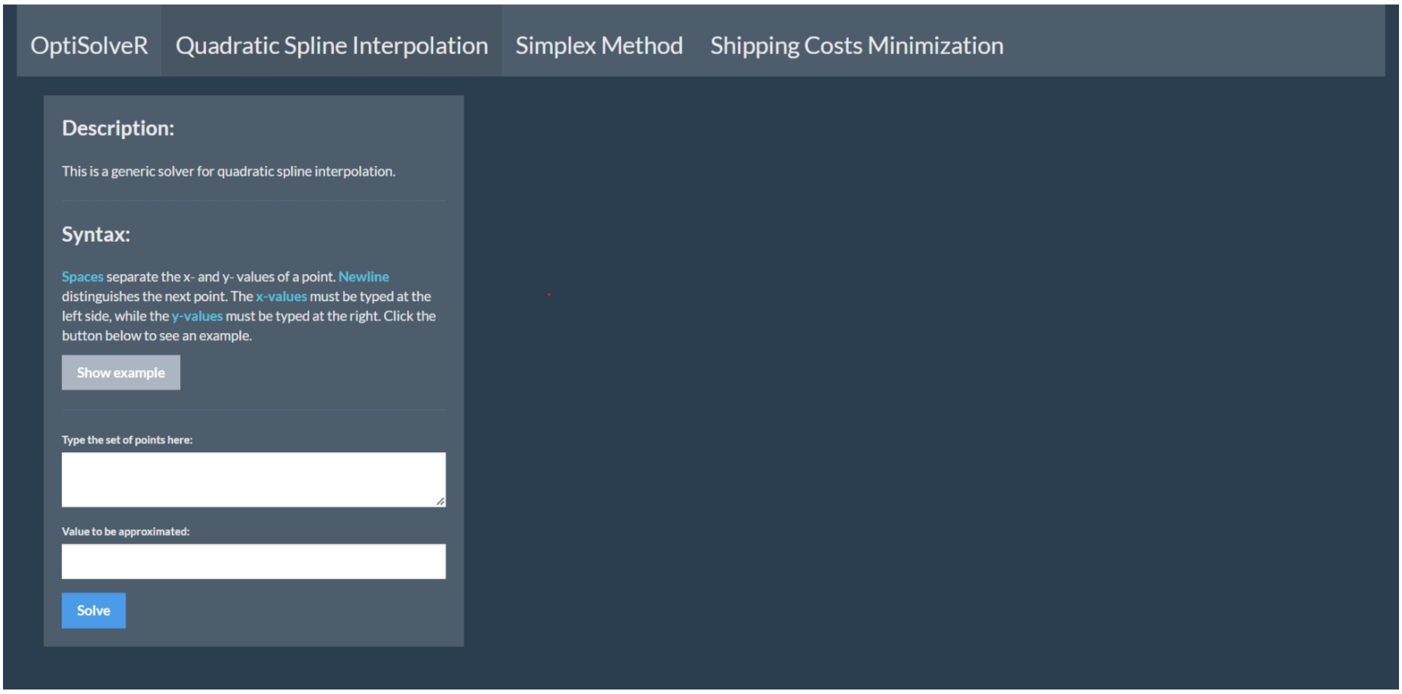
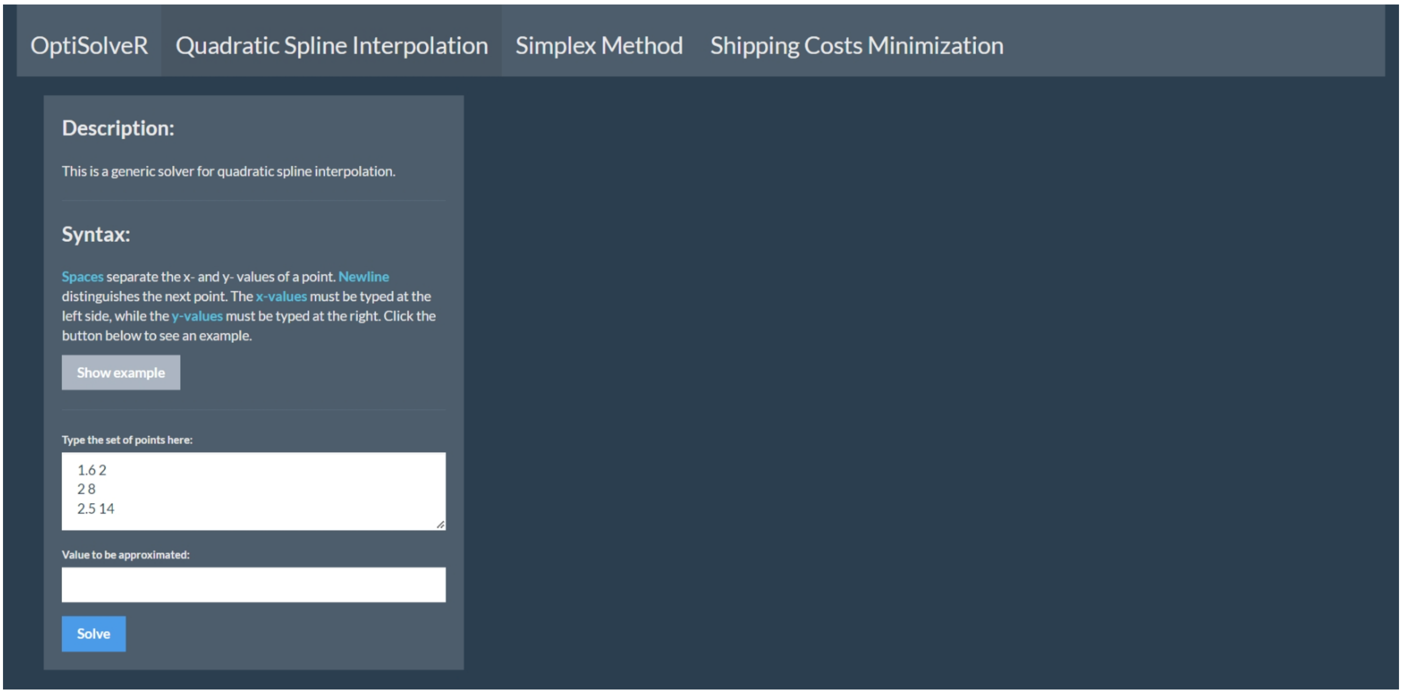
OptiSolveR

This manual provides in-depth information on how to use the generic solvers of OptiSolveR for quadratic spline interpolation and the simplex method, as well as the simplex method implementation for shipping costs minimization. Every solver in the application comes with its basic description, brief instructions, and syntax.

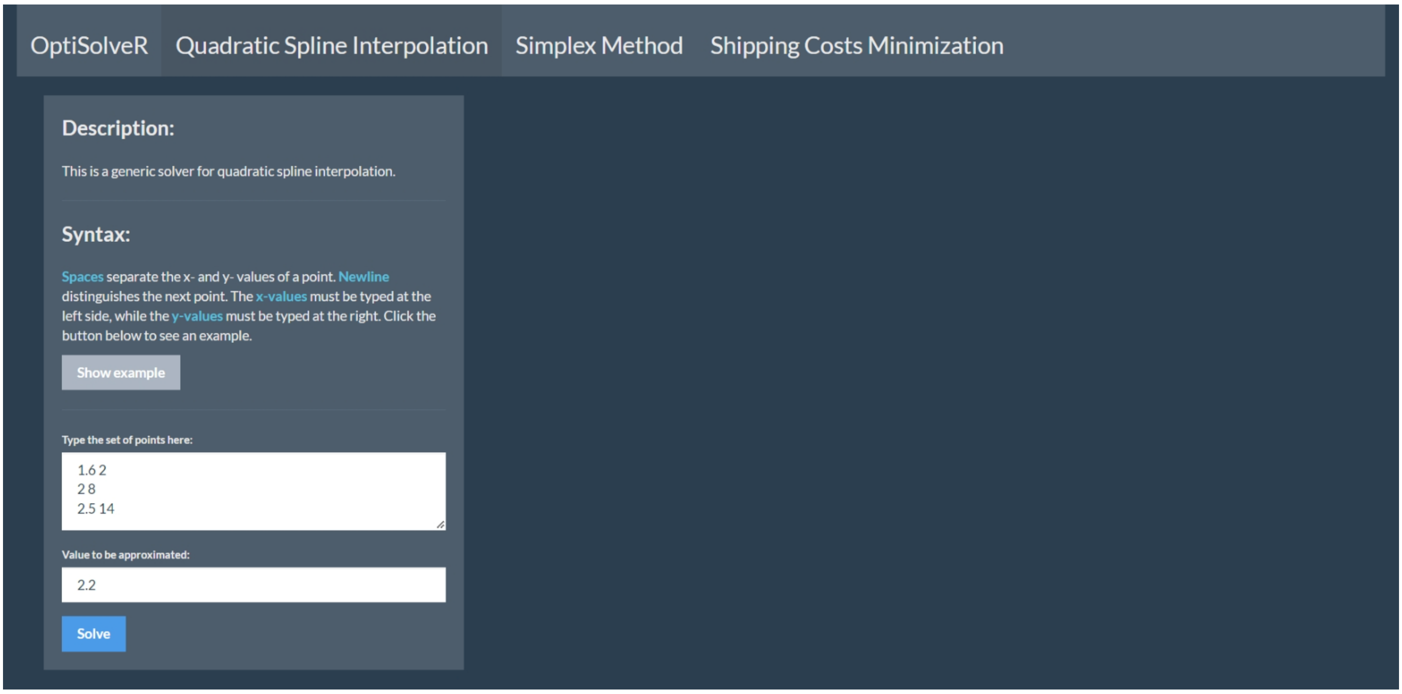
Quadratic Spline Interpolation



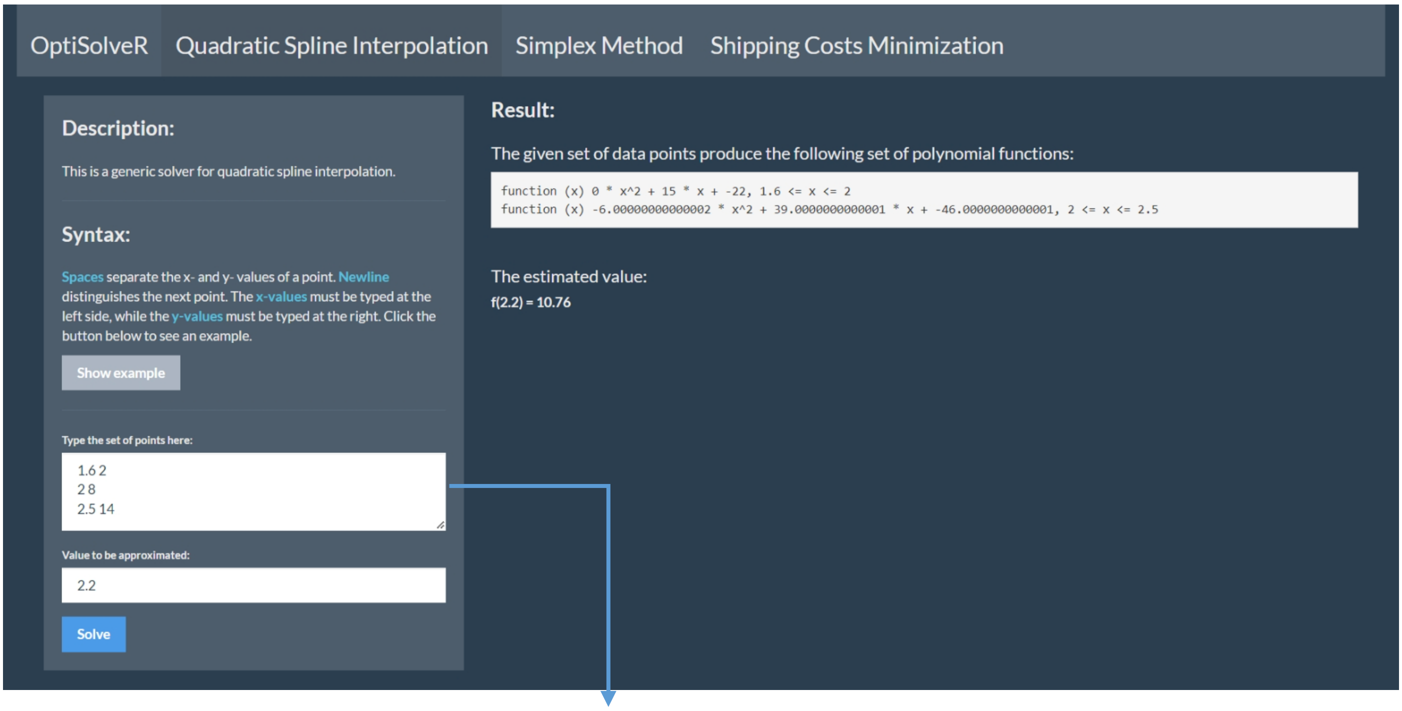
1. Enter your set of points in the given text field. Spaces separate the x- and y- values of your data points. Meanwhile, a newline distinguishes the next point. The x-values should be at the left side of every line, while the y-values are typed at the right.



2. Enter the value you want to be approximated.



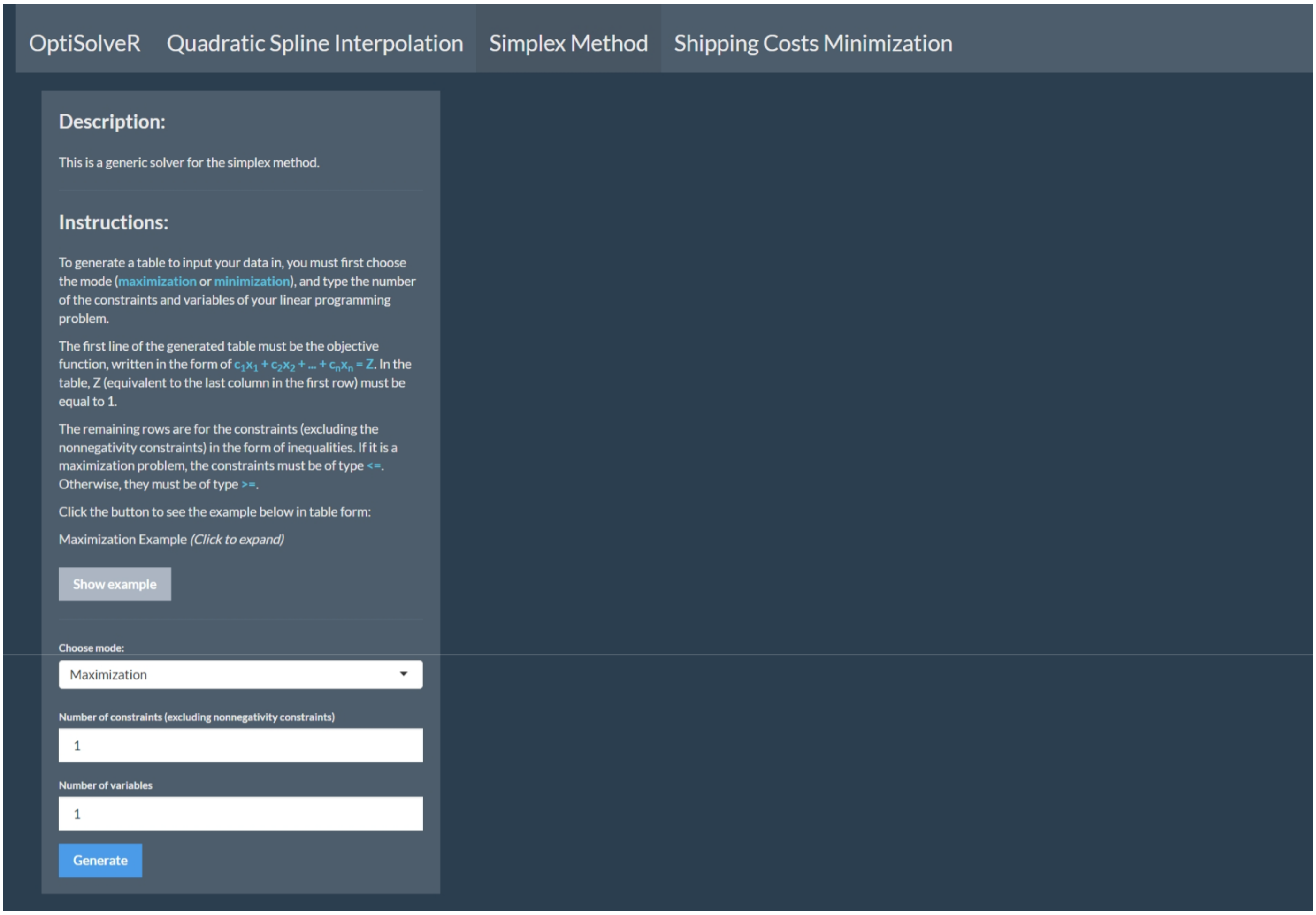
3. Click solve. You will see the set of polynomial functions produced by your set of data points and the estimated value of $f_n(x)$ using the appropriate function for an interval based on the value of your given x.



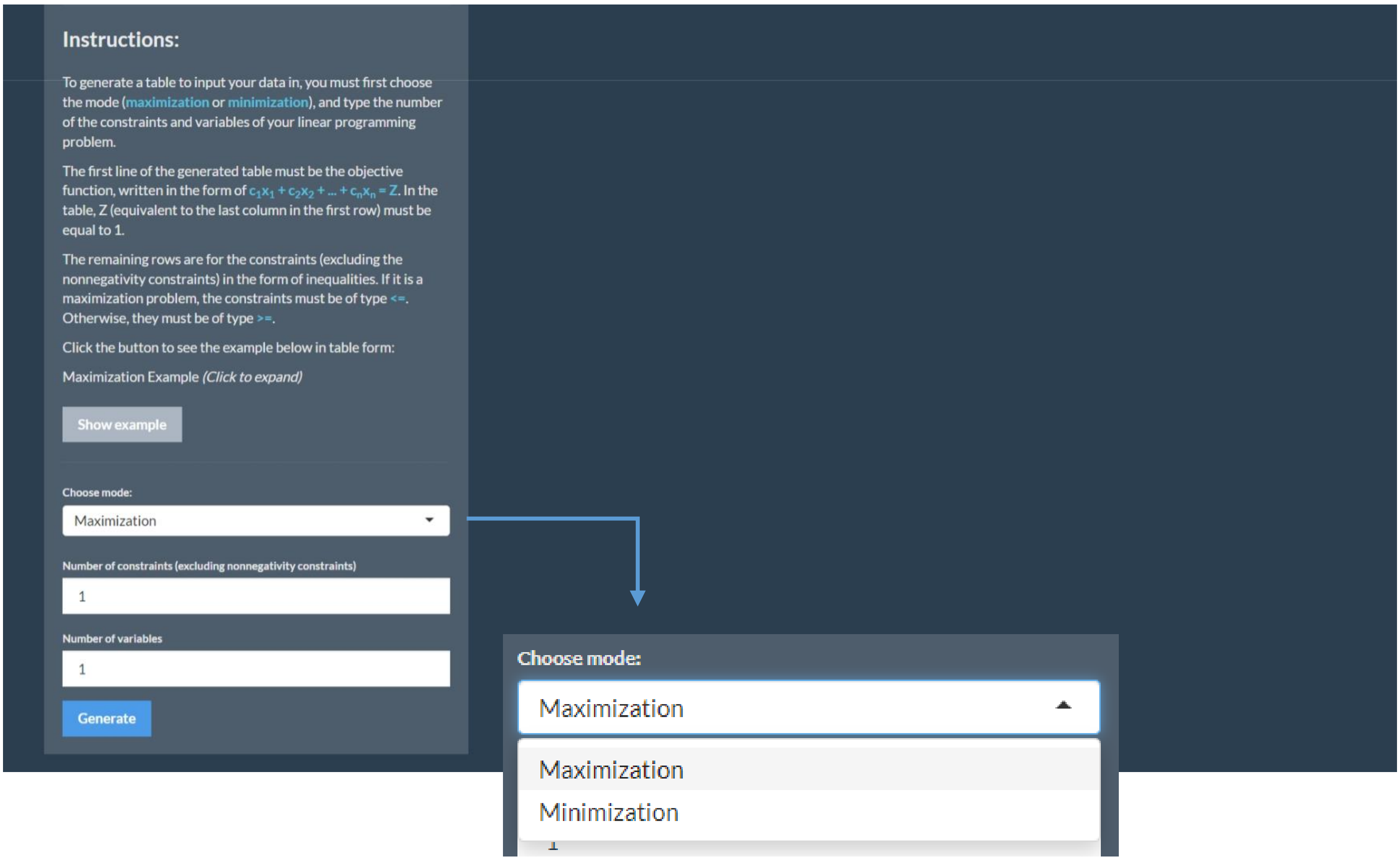
x	1.6	2	2.5
y	2	8	14

4. You can also click the show example button to see the same sample input.

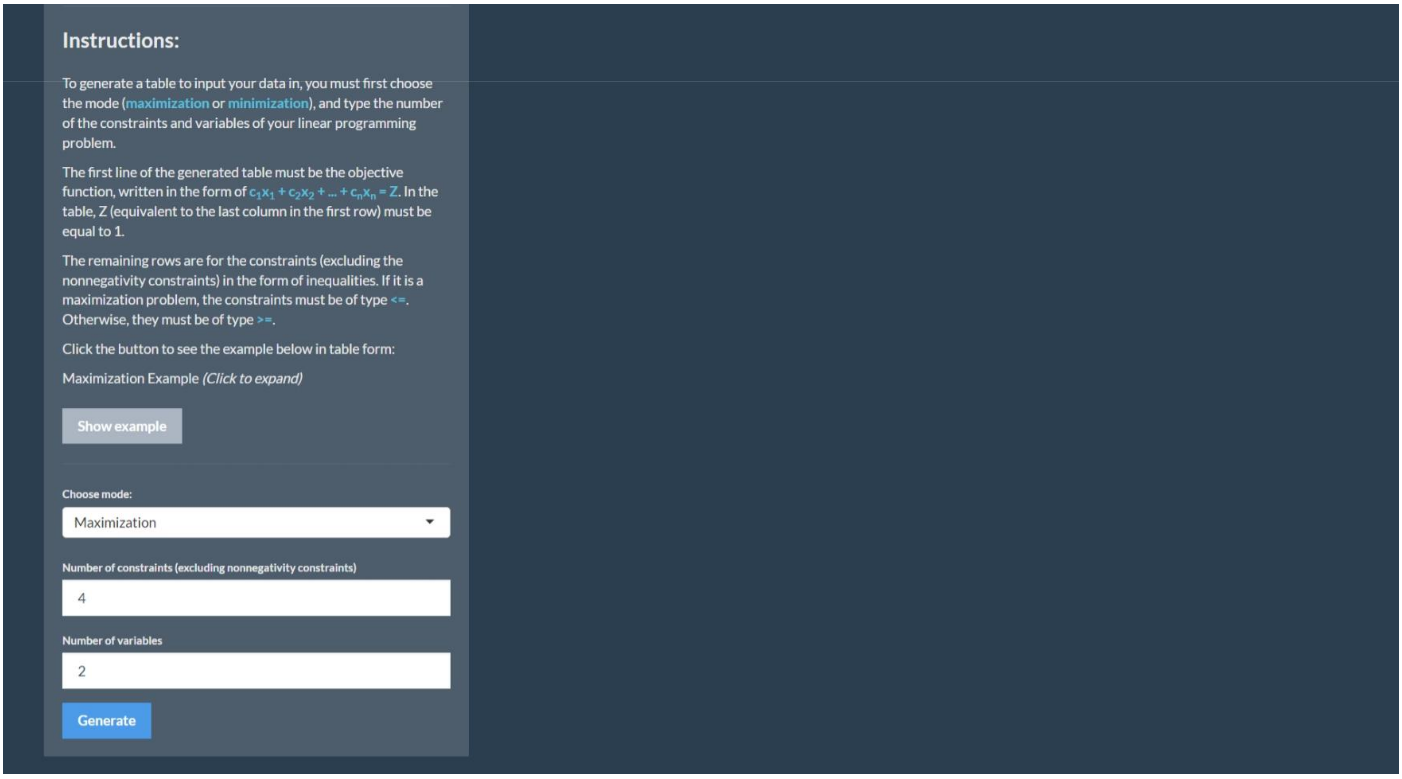
Simplex Method



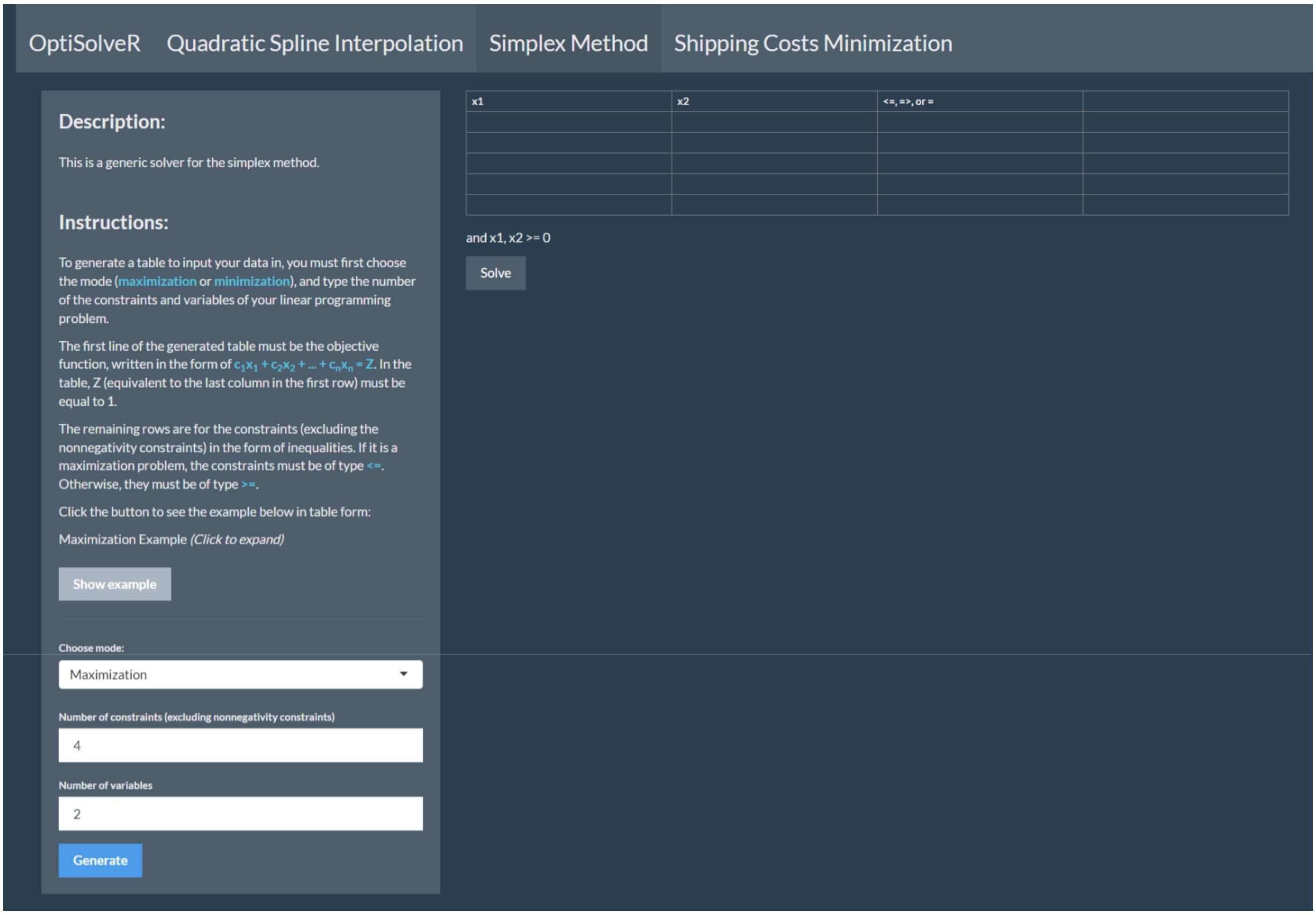
1. Choose the type of your linear programming problem.



2. Enter the number of constraints and variables.



3. Click the button to generate a table for your data.



4. Enter your data. The first row of the table must be the objective function, written in the form of $c_1x_1 + c_2x_2 + ... + c_nx_n = Z$. For example, if you want to maximize $Z = 150x_1 + 175x_2$, then it can be rewritten as $150x_1 + 175x_2 = Z$. To input this in the table, enter 150 in the x_1 column, 175 in the x_2 column, the equal sign (=) in the third column, and 1 in the last column.

x1	x2	<=, =>, or =	
150	175	=	1

5. Insert in the remaining rows the constraints, excluding the nonnegativity constraints. They should be in the form of inequalities. If you have a maximization problem, the constraints must be of type <=. Otherwise, they must be of type >=.

x1	x2	<=, =>, or =	
150	175	=	1
7	11	<=	77
10	8	<=	80
1	0	<=	9
0	1	<=	6

and x1, x2 >= 0

6. Click solve. The result has three parts, the final tableau, the final solution (from the basic solution of the final iteration), and the optimum value.

OptiSolveR Quadratic Spline Interpolation Simplex Method Shipping Costs Minimization

Description:

This is a generic solver for the simplex method.

Instructions:

To generate a table to input your data in, you must first choose the mode (maximization or minimization), and type the number of the constraints and variables of your linear programming problem.

The first line of the generated table must be the objective function, written in the form of $c_1x_1 + c_2x_2 + ... + c_nx_n = Z$. In the table, Z (equivalent to the last column in the first row) must be equal to 1.

The remaining rows are for the constraints (excluding the nonnegativity constraints) in the form of inequalities. If it is a maximization problem, the constraints must be of type <=. Otherwise, they must be of type >=.

Click the button to see the example below in table form:

Maximization Example *(Click to expand)*

Show example

Choose mode:

Maximization

Number of constraints (excluding nonnegativity constraints)

4

Number of variables

2

Generate

x1	x2	<=, =>, or =	
150	175	=	1
7	11	<=	77
10	8	<=	80
1	0	<=	9
0	1	<=	6

and x1, x2 >= 0

Solve

Result:

The final tableau:

x1	x2	S1	S2	S3	S4	Z	Solution
1.0000	0.0000	-0.1481	0.2037	0.0000	0.0000	0.0000	4.8889
0.0000	0.0000	-0.1852	0.1296	0.0000	1.0000	0.0000	2.1112
0.0000	0.0000	0.1481	-0.2037	1.0000	0.0000	0.0000	4.1111
0.0000	1.0000	0.1852	-0.1296	0.0000	0.0000	0.0000	3.8888
0.0000	0.0000	10.1915	7.8680	0.0000	0.0000	1.0000	1413.8810

The final solution:

	x1	x2	S1	S2	S3	S4	Z
1	4.8889	3.8888	0.0000	0.0000	4.1111	2.1112	1413.8810

The optimum value is **1413.881**.

7. You can click the show example to see the same sample input.

Maximization Example *(Click to expand)*

Maximize

$Z = 150x_1 + 175x_2$

subject to

$7x_1 + 11x_2 \leq 77$

$10x_1 + 8x_2 \leq 80$

$x_1 \leq 9$

$x_2 \leq 6$

$x_1, x_2 \geq 0$

Show example

8. Try this minimization example.

x1	x2	<=, =>, or =	
4	20	=	1
1	7	>=	14
2	6	>=	20

Result:

The final tableau:

S1	S2	x1	x2	Z	Solution
0.0000	1.0000	0.8750	-0.1250	0.0000	1.0000
1.0000	0.0000	-0.7500	0.2500	0.0000	2.0000
0.0000	0.0000	7.0000	1.0000	1.0000	48.0000

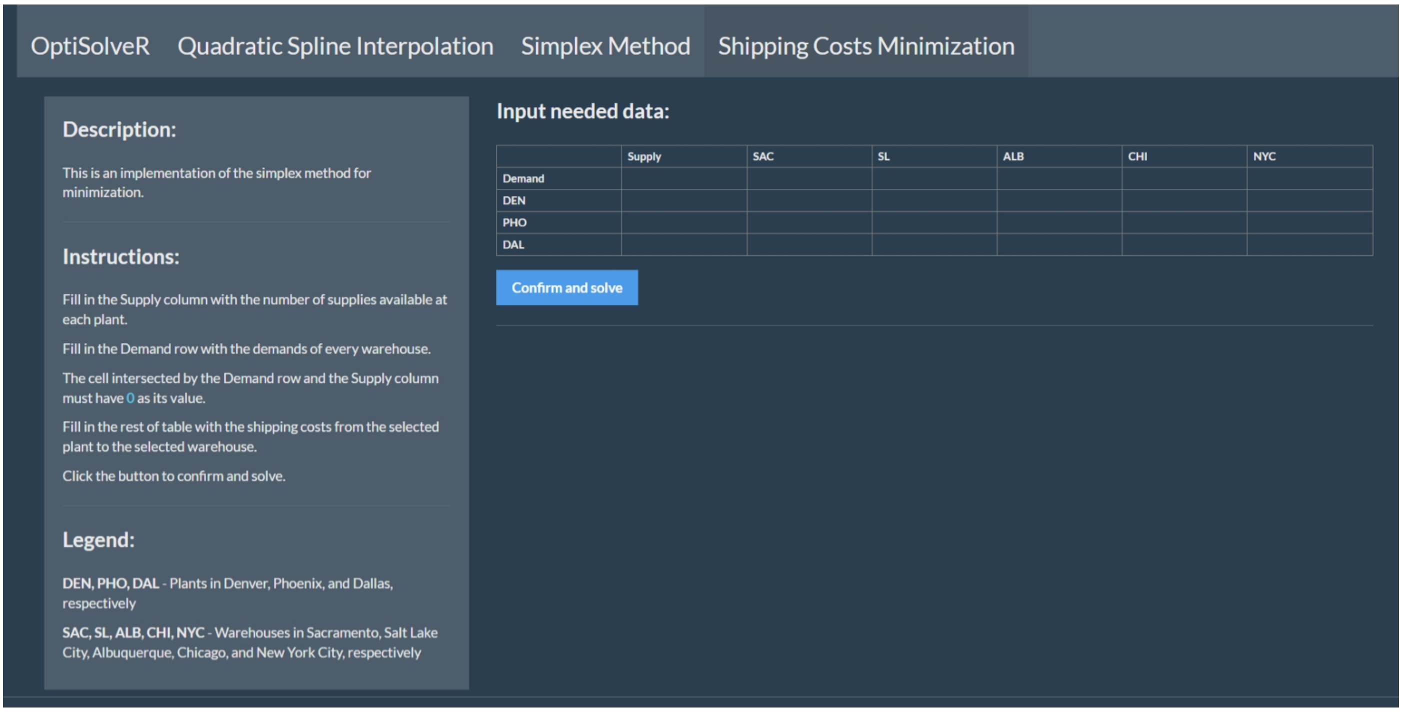
The final solution:

	data
S1	0.0000
S2	0.0000
x1	7.0000
x2	1.0000
Z	1.0000
Solution	48.0000

The optimum value is **48**.

**Note that for minimization problems, you may get a different look for the final solution (a single column instead of a single row). The values should still be correct. You can verify this by comparing it to the last row of the final tableau.*

Shipping Costs Minimization (Simplex Method Implementation)



Given this test case:

Test Case 1						
		SAC	***SL***	***ALB***	***CHI***	***NYC***
	Demands	180	80	200	160	220
Plants	***Supply***	***Shipping costs from plant to warehouse***				
DEN	310	10	8	6	5	4
PHO	260	6	5	4	3	6
DAL	280	3	4	5	5	9
Minimum Cost	3200					

1. Fill in the supply column with the number of supplies available at each plant.

	Supply	SAC	SL	ALB	CHI	NYC
Demand						
DEN						
PHO						
DAL						

2. Fill in the demand column with the demands of every warehouse.

	Supply	SAC	SL	ALB	CHI	NYC
Demand		180	80	200	160	220
DEN	310					
PHO	260					
DAL	280					

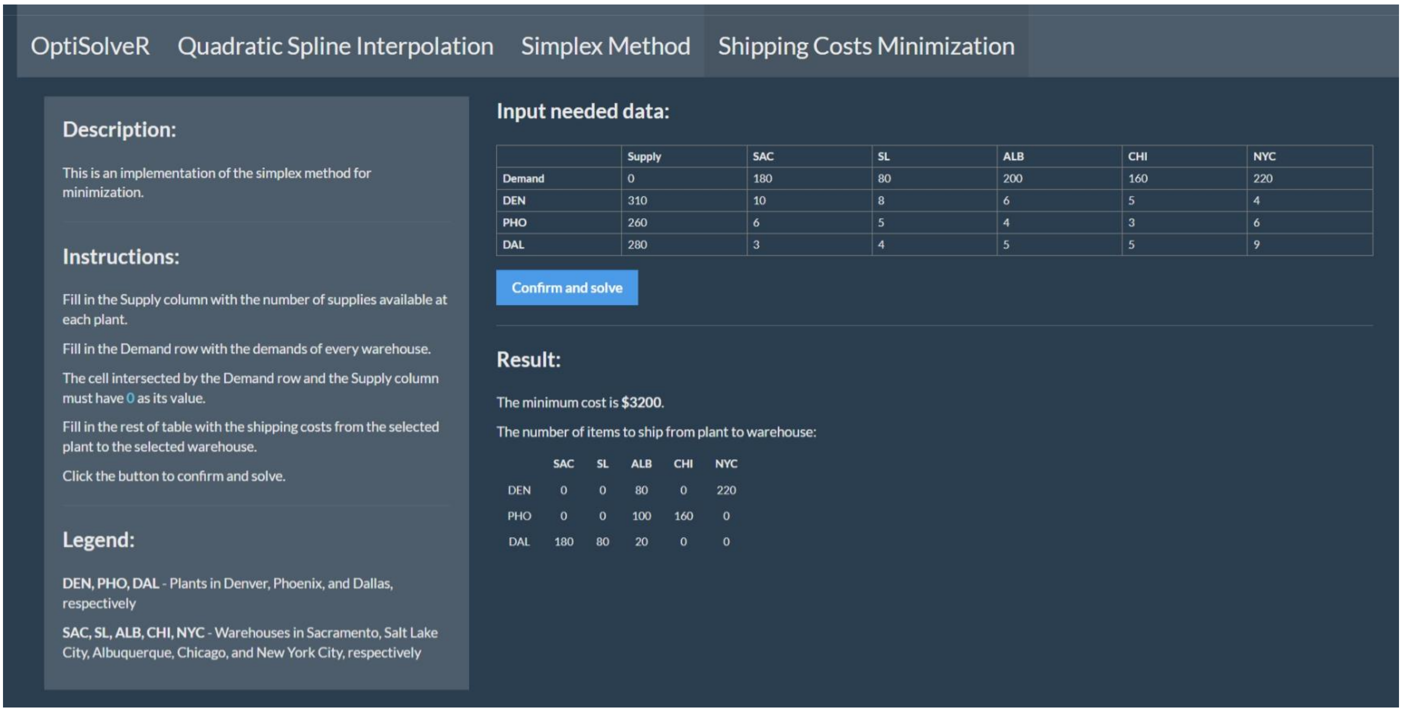
3. The cell intersected by the demand row and the supply column must have a value of 0.

	Supply	SAC	SL	ALB	CHI	NYC
Demand	0	180	80	200	160	220
DEN	310					
PHO	260					
DAL	280					

4. Fill in the rest of the table with the shipping costs from the selected plant to the selected warehouse.

	Supply	SAC	SL	ALB	CHI	NYC
Demand	0	180	80	200	160	220
DEN	310	10	8	6	5	4
PHO	260	6	5	4	3	6
DAL	280	3	4	5	5	9

5. Confirm the values and click solve. The result has two parts, the minimum cost and a table of the number of items shipped from a plant to a warehouse.



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