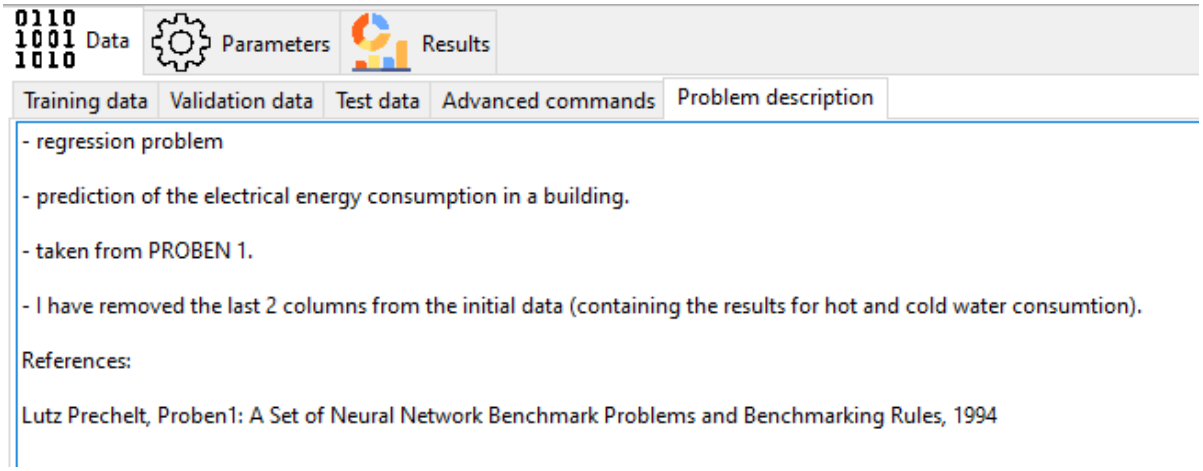
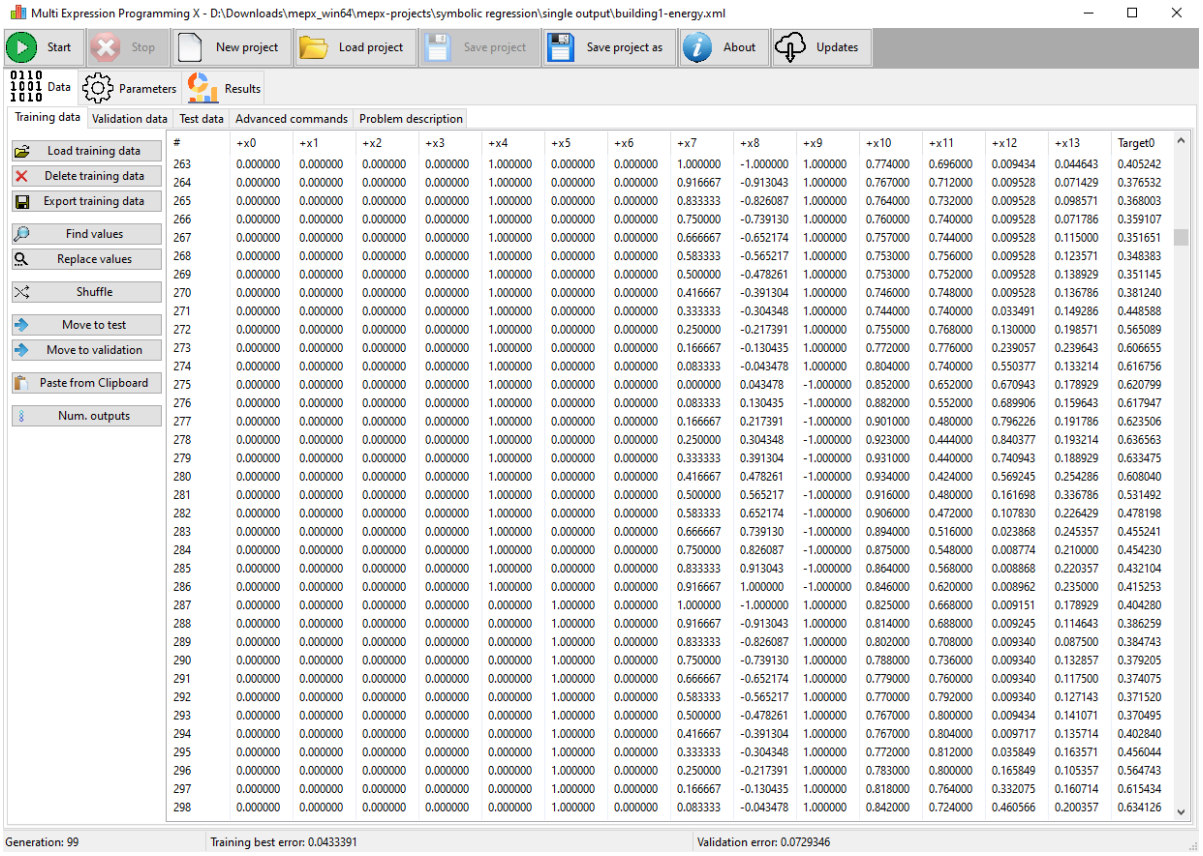
Ejemplo MEPX

En este ejemplo, tenemos un problema de regresión en el que se busca predecir el consumo de energía eléctrica en un edificio.

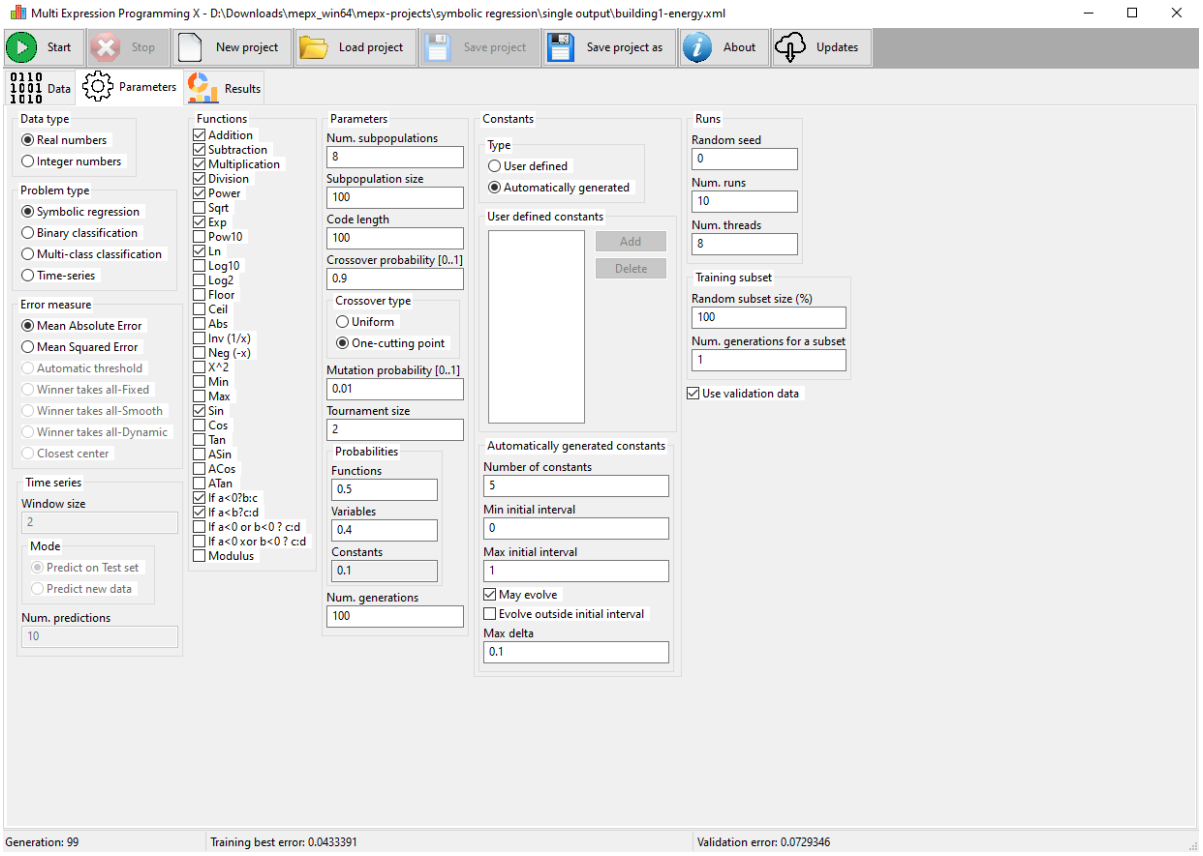


Tenemos los datos de entrenamiento. Estos datos y su significancia exacta no están especificados en la descripción del proyecto ni se encuentran en la fuente de donde se obtiene el problema:

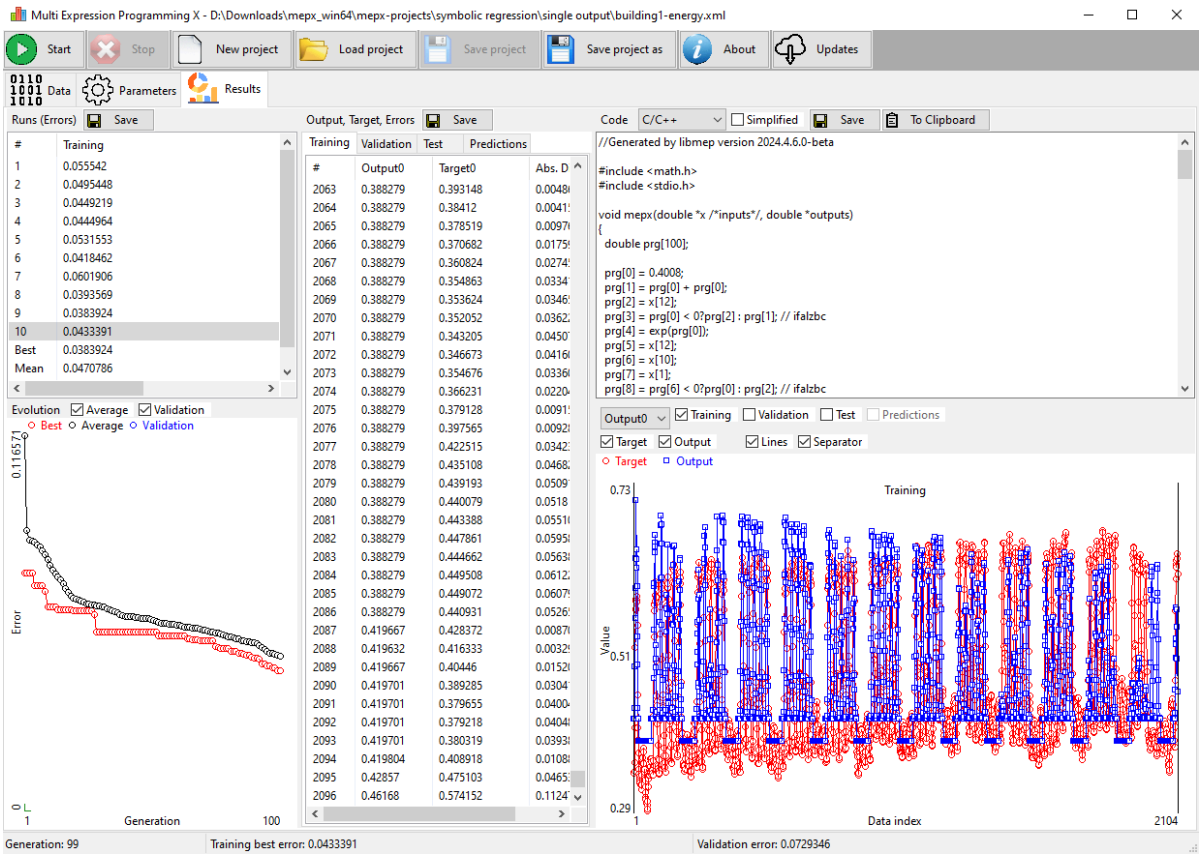


#	+x0	+x1	+x2	+x3	+x4	+x5	+x6	+x7	+x8	+x9	+x10	+x11	+x12	+x13	Target0
263	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	1.000000	-1.000000	1.000000	0.774000	0.696000	0.009434	0.044643	0.405242
264	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.916667	-0.913043	1.000000	0.767000	0.712000	0.009528	0.071429	0.376532
265	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.833333	-0.826087	1.000000	0.764000	0.732000	0.009528	0.098571	0.368003
266	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.750000	-0.739130	1.000000	0.760000	0.740000	0.009528	0.071786	0.359107
267	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.666667	-0.652174	1.000000	0.757000	0.744000	0.009528	0.115000	0.351651
268	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.583333	-0.565217	1.000000	0.753000	0.756000	0.009528	0.123571	0.348383
269	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.500000	-0.478261	1.000000	0.753000	0.752000	0.009528	0.138929	0.351145
270	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.416667	-0.391304	1.000000	0.746000	0.748000	0.009528	0.136786	0.381240
271	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.333333	-0.304348	1.000000	0.744000	0.740000	0.033491	0.149286	0.448588
272	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.250000	-0.217391	1.000000	0.755000	0.768000	0.130000	0.198571	0.565089
273	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.166667	-0.130435	1.000000	0.772000	0.776000	0.239057	0.239643	0.606655
274	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.083333	-0.043478	1.000000	0.804000	0.740000	0.550377	0.133214	0.616756
275	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.043478	-1.000000	0.852000	0.652000	0.670943	0.178929	0.620799
276	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.083333	0.130435	-1.000000	0.882000	0.552000	0.689906	0.159643	0.617947
277	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.166667	0.217391	-1.000000	0.901000	0.480000	0.796226	0.191786	0.623506
278	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.250000	0.304348	-1.000000	0.923000	0.444000	0.840377	0.193214	0.636563
279	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.333333	0.391304	-1.000000	0.931000	0.440000	0.740943	0.188929	0.633475
280	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.416667	0.478261	-1.000000	0.934000	0.424000	0.569245	0.254286	0.608040
281	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.500000	0.565217	-1.000000	0.916000	0.480000	0.161698	0.336786	0.531492
282	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.583333	0.652174	-1.000000	0.906000	0.472000	0.107830	0.226429	0.478198
283	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.666667	0.739130	-1.000000	0.894000	0.516000	0.023868	0.245357	0.455241
284	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.750000	0.826087	-1.000000	0.875000	0.548000	0.008774	0.210000	0.454230
285	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.833333	0.913043	-1.000000	0.864000	0.568000	0.008868	0.220357	0.432104
286	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.916667	1.000000	-1.000000	0.846000	0.620000	0.008962	0.235000	0.415253
287	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	1.000000	-1.000000	1.000000	0.825000	0.668000	0.009151	0.178929	0.404280
288	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.916667	-0.913043	1.000000	0.814000	0.688000	0.009245	0.114643	0.386259
289	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.833333	-0.826087	1.000000	0.802000	0.708000	0.009340	0.087500	0.384743
290	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.750000	-0.739130	1.000000	0.788000	0.736000	0.009340	0.132857	0.379205
291	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.666667	-0.652174	1.000000	0.779000	0.760000	0.009340	0.117500	0.374075
292	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.583333	-0.565217	1.000000	0.770000	0.792000	0.009340	0.127143	0.371520
293	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.500000	-0.478261	1.000000	0.767000	0.800000	0.009434	0.141071	0.370495
294	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.416667	-0.391304	1.000000	0.767000	0.804000	0.009717	0.135714	0.402840
295	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.333333	-0.304348	1.000000	0.772000	0.812000	0.035849	0.163571	0.456044
296	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.250000	-0.217391	1.000000	0.783000	0.800000	0.165849	0.105357	0.564743
297	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.166667	-0.130435	1.000000	0.818000	0.764000	0.332075	0.160714	0.615434
298	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.083333	-0.043478	1.000000	0.842000	0.724000	0.460566	0.200357	0.634126

Las funciones de las que disponen los individuos y otros parámetros del programa.



Y los resultados del programa, en donde se logra un error relativamente bajo aproximado de 0.0464 luego de 100 generaciones:


Multi Expression Programming X - D:\Downloads\mepx_win64\mepx-projects\symbolic regression\single output\building1-energy.xml
Start
Stop
New project
Load project
Save project
Save project as
About
Updates
Data
Parameters
Results
Runs (Errors)
Save
Training
1 0.055542
2 0.0495448
3 0.0449219
4 0.0444964
5 0.0531553
6 0.0418462
7 0.0601906
8 0.0393569
9 0.0383924
10 0.0433391
Best 0.0383924
Mean 0.0470786
Evolution
Average
Validation
Best
Average
Validation
0.116571
Error
0
1
Generation
100
Output, Target, Errors
Save
Training
Validation
Test
Predictions
Output0 Target0 Abs. D
2063 0.388279 0.393148 0.0048
2064 0.388279 0.38412 0.0041
2065 0.388279 0.378519 0.0097
2066 0.388279 0.370682 0.0175
2067 0.388279 0.360824 0.0274
2068 0.388279 0.354863 0.0334
2069 0.388279 0.353624 0.0346
2070 0.388279 0.352052 0.0362
2071 0.388279 0.343205 0.0450
2072 0.388279 0.346673 0.0416
2073 0.388279 0.354676 0.0336
2074 0.388279 0.366231 0.0220
2075 0.388279 0.379128 0.0091
2076 0.388279 0.397565 0.0092
2077 0.388279 0.422515 0.0342
2078 0.388279 0.435108 0.0468
2079 0.388279 0.439193 0.0509
2080 0.388279 0.440079 0.0518
2081 0.388279 0.443388 0.0551
2082 0.388279 0.447861 0.0595
2083 0.388279 0.444662 0.0563
2084 0.388279 0.449508 0.0612
2085 0.388279 0.449072 0.0607
2086 0.388279 0.440931 0.0526
2087 0.419667 0.428372 0.0087
2088 0.419632 0.416333 0.0032
2089 0.419667 0.40446 0.0152
2090 0.419701 0.389285 0.0304
2091 0.419701 0.379655 0.0400
2092 0.419701 0.379218 0.0404
2093 0.419701 0.380319 0.0393
2094 0.419804 0.408918 0.0108
2095 0.42857 0.475103 0.0465
2096 0.46168 0.574152 0.1124
Code
C/C++
Simplified
Save
To Clipboard
//Generated by libmep version 2024.4.6.0-beta
#include <math.h>
#include <stdio.h>
void mepx(double *x /*inputs*/, double *outputs)
{
double prg[100];
prg[0] = 0.4008;
prg[1] = prg[0] + prg[0];
prg[2] = x[12];
prg[3] = prg[0] < 0?prg[2] : prg[1]; // ifalzbc
prg[4] = exp(prg[0]);
prg[5] = x[12];
prg[6] = x[10];
prg[7] = x[1];
prg[8] = prg[6] < 0?prg[0] : prg[2]; // ifalzbc
Output0
Training
Validation
Test
Predictions
Target
Output
Lines
Separator
Target
Output
Training
0.73
Value
0.51
0.29
1
Data index
2104
Generation: 99
Training best error: 0.0433391
Validation error: 0.0729346