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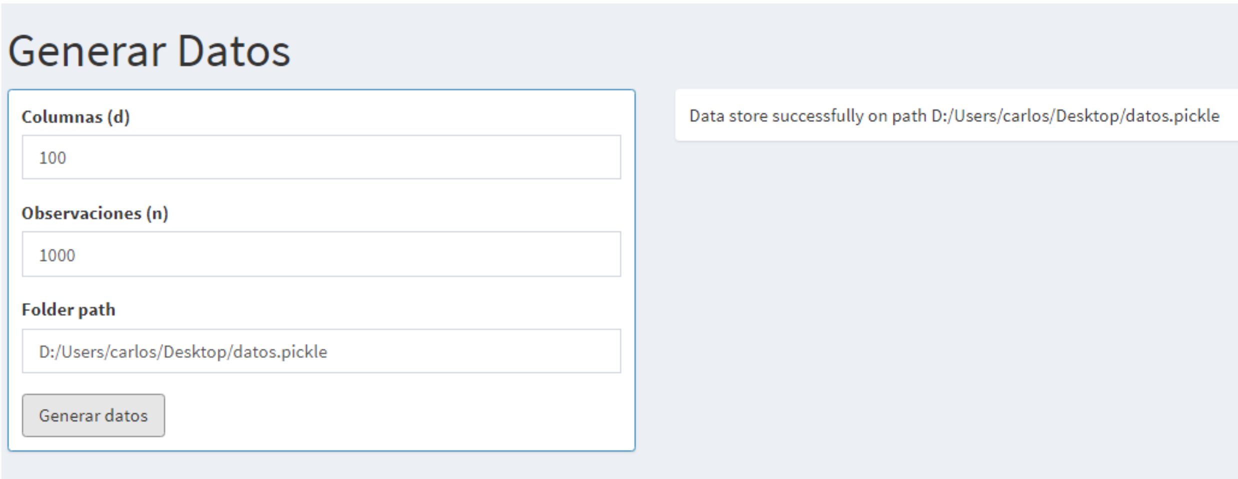
Algoritmos para la ciencia de datos

Lab #4

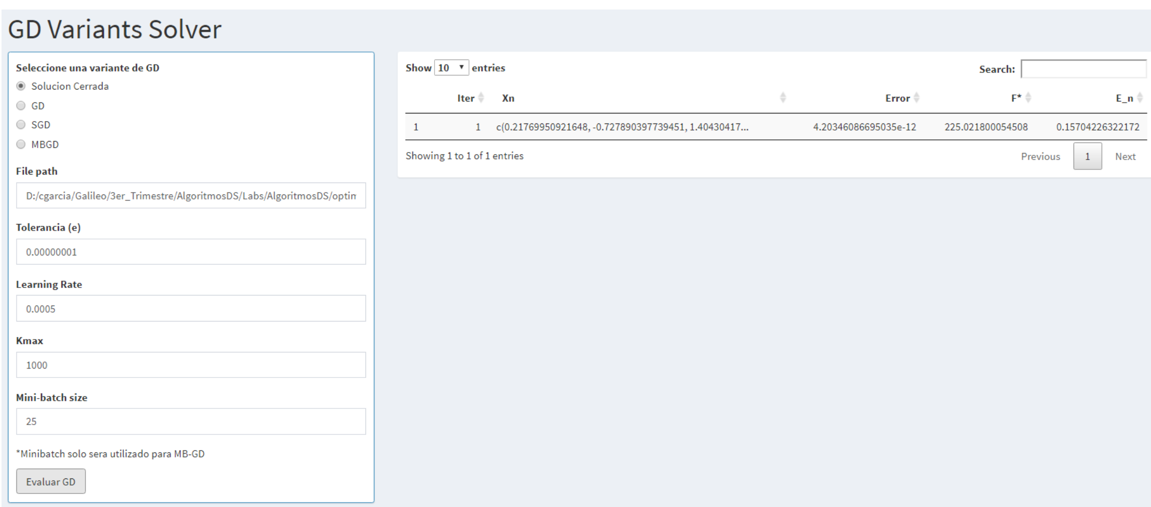
PROBLEMA 1

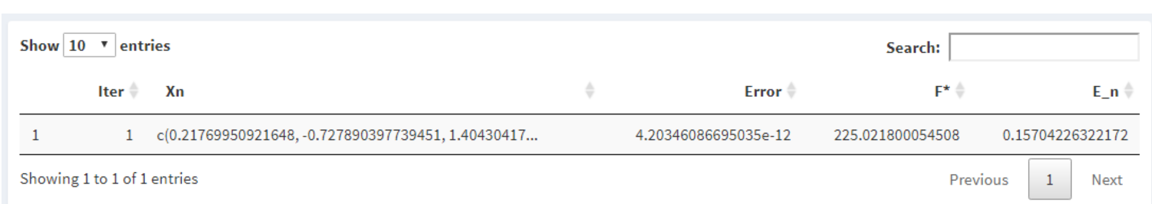
Parte 0 – Generación de datos



Parte 1 – Solución Cerrada

En la práctica no se suele aplicar una solución cerrada para la resolución del problema de mínimos cuadrados ya que para altos volúmenes de datos el cálculo se vuelve computacionalmente demandante.





Show 10 entries | Search:

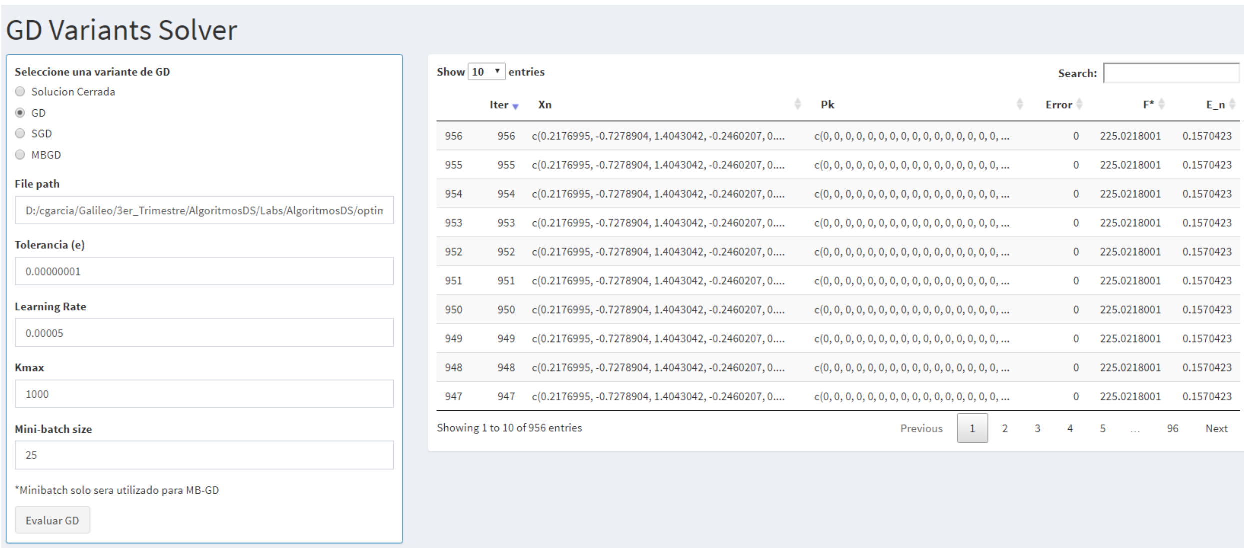
	Iter	Xn	Error	F*	E_n
1	1	c(0.21769950921648, -0.727890397739451, 1.40430417...	4.20346086695035e-12	225.021800054508	0.15704226322172

Showing 1 to 1 of 1 entries | Previous | 1 | Next

Nota. La columna E_n representa el error entre X_true y X al computar *||x_k – x_true||

Parte 2 – GD

Un step size muy pequeño puede ocasionar un proceso de aprendizaje lento, por lo cual la función objetivo a minimizar requiere de un mayor número de iteraciones para converger, mientras un valor muy grande puede ocasionar que diverja. En este ejercicio el primer valor 0.00005 es muy pequeño por lo cual en la gráfica se observa que su error disminuye más lento que los otros dos. El step size que mejor funciona en esta práctica es el step size mayor con un valor de 0.0007.



	Iter	Xn	Pk	Error	F*	E_n
956	956	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
955	955	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
954	954	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
953	953	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
952	952	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
951	951	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
950	950	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
949	949	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
948	948	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
947	947	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423

Lr = 0.00005

Show 10 entries Search:

	Iter	Xn	Pk	Error	F*	E_n
956	956	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
955	955	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
954	954	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
953	953	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
952	952	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
951	951	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
950	950	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
949	949	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
948	948	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
947	947	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423

Showing 1 to 10 of 956 entries Previous 1 2 3 4 5 … 96 Next

Lr = 0.0005

Show 10 entries Search:

	Iter	Xn	Pk	Error	F*	E_n
86	86	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
85	85	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
84	84	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
83	83	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
82	82	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
81	81	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
80	80	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
79	79	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	1e-7	225.0218001	0.1570423
78	78	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	1e-7	225.0218001	0.1570423
77	77	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	1e-7	225.0218001	0.1570423

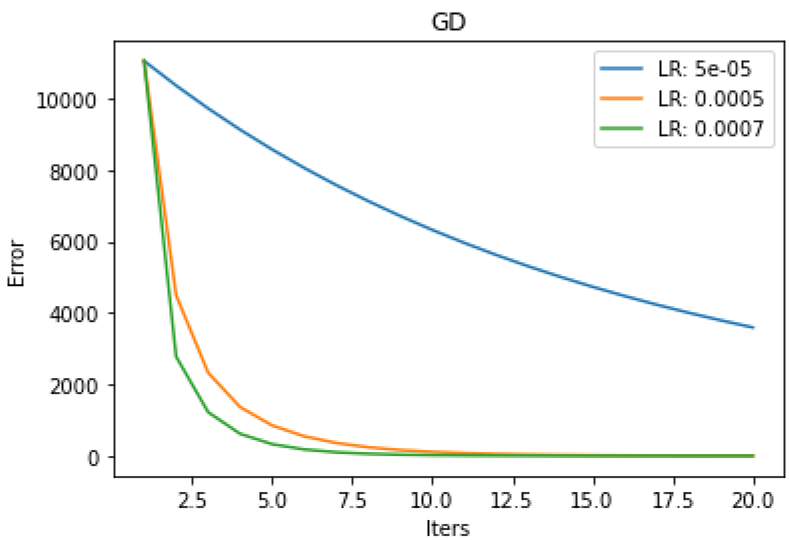
Showing 1 to 10 of 86 entries Previous 1 2 3 4 5 … 9 Next

Lr = 0.0007

Show 10 entries Search:

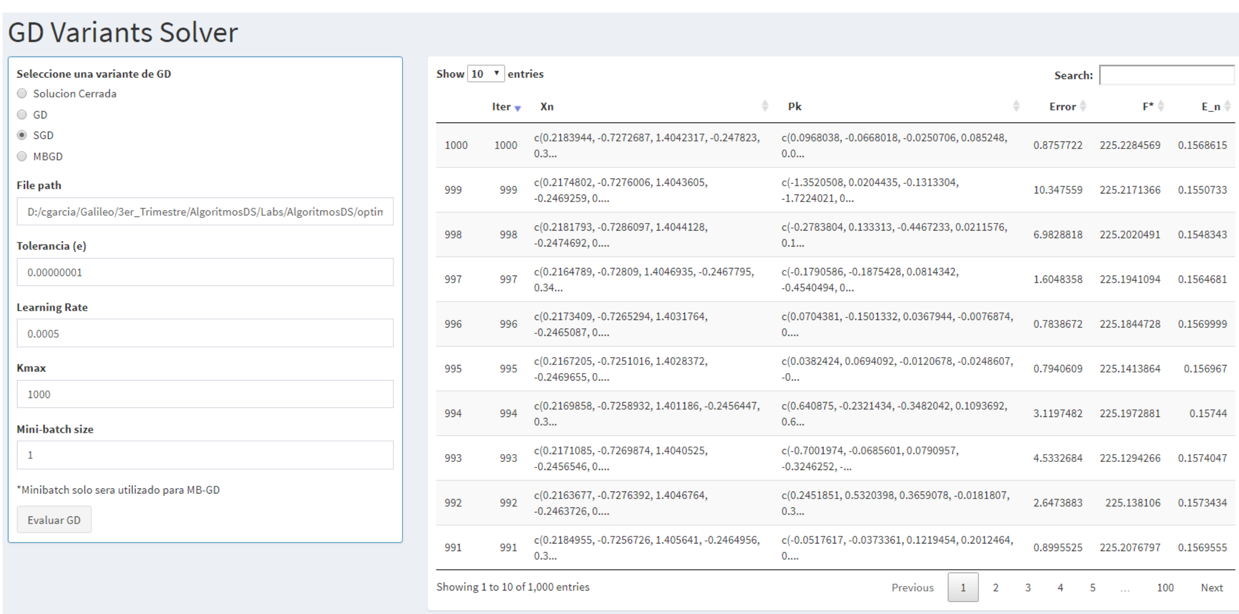
	Iter	Xn	Pk	Error	F*	E_n
58	58	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
57	57	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
56	56	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
55	55	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
54	54	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	0	225.0218001	0.1570423
53	53	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	1e-7	225.0218001	0.1570423
52	52	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	1e-7	225.0218001	0.1570423
51	51	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...	1e-7	225.0218001	0.1570423
50	50	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -1e-07, 0, 0...	2e-7	225.0218001	0.1570423
49	49	c(0.2176995, -0.7278904, 1.4043042, -0.2460207, 0....	c(0, 0, 0, 0, 0, 0, 0, 0, 0, 1e-07, 0, 0, -1e-07, ...	3e-7	225.0218001	0.1570423

Showing 1 to 10 of 58 entries Previous 1 2 3 4 5 6 Next



Parte 3 – SGD

En el caso de SGD el step size se comporta igual que en lo descrito para GD, sin embargo, es importante tomar en consideración que dado la actualización de los parámetros de forma recurrente que genera este algoritmo, la función objetivo fluctúa y no es monótona decreciente. En general el step size de 0.0005 genera valores más bajos que los demás dado que es menor y evita que la función diverja.



	Iter	Xn	Pk	Error	F*	E_n
1000	1000	c(0.2183944, -0.7272687, 1.4042317, -0.247823, 0.3...	c(0.0968038, -0.0668018, -0.0250706, 0.085248, 0.0...	0.8757722	225.2284569	0.1568615
999	999	c(0.2174802, -0.7276006, 1.4043605, -0.2469259, 0....	c(-1.3520508, 0.0204435, -0.1313304, -1.7224021, 0...	10.347559	225.2171366	0.1550733
998	998	c(0.2181793, -0.7286097, 1.4044128, -0.2474692, 0....	c(-0.2783804, 0.133313, -0.4467233, 0.0211576, 0.1...	6.9828818	225.2020491	0.1548343
997	997	c(0.2164789, -0.72809, 1.4046935, -0.2467795, 0.34...	c(-0.1790586, -0.1875428, 0.0814342, -0.4540494, 0...	1.6048358	225.1941094	0.1564681
996	996	c(0.2173409, -0.7265294, 1.4031764, -0.2465087, 0....	c(0.0704381, -0.1501332, 0.0367944, -0.0076874, 0....	0.7838672	225.1844728	0.1569999
995	995	c(0.2167205, -0.7251016, 1.4028372, -0.2469655, 0....	c(0.0382424, 0.0694092, -0.0120678, -0.0248607, -0...	0.7940609	225.1413864	0.156967
994	994	c(0.2169858, -0.7258932, 1.401186, -0.2456447, 0.3...	c(0.640875, -0.2321434, -0.3482042, 0.1093692, 0.6...	3.1197482	225.1972881	0.15744
993	993	c(0.2171085, -0.7269874, 1.4040525, -0.2456546, 0....	c(-0.7001974, -0.0685601, 0.0790957, -0.3246252, -...	4.5332684	225.1294266	0.1574047
992	992	c(0.2163677, -0.7276392, 1.4046764, -0.2463726, 0....	c(0.2451851, 0.5320398, 0.3659078, -0.0181807, 0.3...	2.6473883	225.138106	0.1573434
991	991	c(0.2184955, -0.7256726, 1.405641, -0.2464956, 0.3...	c(-0.0517617, -0.0373361, 0.1219454, 0.2012464, 0....	0.8995525	225.2076797	0.1569555

Showing 1 to 10 of 1,000 entries

Previous 1 2 3 4 5 … 100 Next

Lr = 0.0005

Show 10 entries

Search:

	Iter	Xn	Pk	Error	F*	E_n
1000	1000	c(0.2183944, -0.7272687, 1.4042317, -0.247823, 0.3...	c(0.0968038, -0.0668018, -0.0250706, 0.085248, 0.0...	0.8757722	225.2284569	0.1568615
999	999	c(0.2174802, -0.7276006, 1.4043605, -0.2469259, 0....	c(-1.3520508, 0.0204435, -0.1313304, -1.7224021, 0...	10.347559	225.2171366	0.1550733
998	998	c(0.2181793, -0.7286097, 1.4044128, -0.2474692, 0....	c(-0.2783804, 0.133313, -0.4467233, 0.0211576, 0.1...	6.9828818	225.2020491	0.1548343
997	997	c(0.2164789, -0.72809, 1.4046935, -0.2467795, 0.34...	c(-0.1790586, -0.1875428, 0.0814342, -0.4540494, 0...	1.6048358	225.1941094	0.1564681
996	996	c(0.2173409, -0.7265294, 1.4031764, -0.2465087, 0....	c(0.0704381, -0.1501332, 0.0367944, -0.0076874, 0....	0.7838672	225.1844728	0.1569999

Lr = 0.005

Show 10 entries

Search:

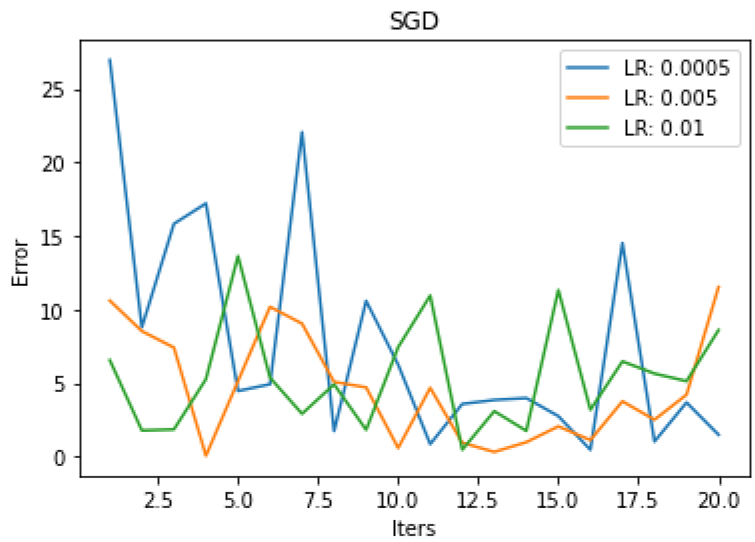
	Iter	Xn	Pk	Error	F*	E_n
1000	1000	c(0.2422101, -0.7329947, 1.3886038, -0.1770028, 0....	c(-0.1701694, 0.0914637, -0.0671831, -0.3044425, 0...	2.5583536	305.7202127	0.3276617
999	999	c(0.1897133, -0.7217438, 1.4328917, -0.2701082, 0....	c(-1.1404992, 1.0665235, 0.6102068, 0.5368463, -0....	6.9621267	285.2180752	0.2914956
998	998	c(0.2275646, -0.7781923, 1.4207747, -0.2485388, 0....	c(0.1638462, -0.1076662, 0.6108325, -0.7505592, -0...	5.0282458	289.1627278	0.2942787
997	997	c(0.2398791, -0.7268998, 1.3890545, -0.2636472, 0....	c(-1.1536714, 0.6279076, -1.5842493, -0.6985853, -...	13.8786246	285.1985759	0.3022362
996	996	c(0.2267822, -0.7224249, 1.4347496, -0.2189591, 0....	c(-0.1349218, 0.0062201, -0.1744518, 0.1302051, -0...	1.7929403	293.7402232	0.2860799

Lr = 0.01

Show 10 entries

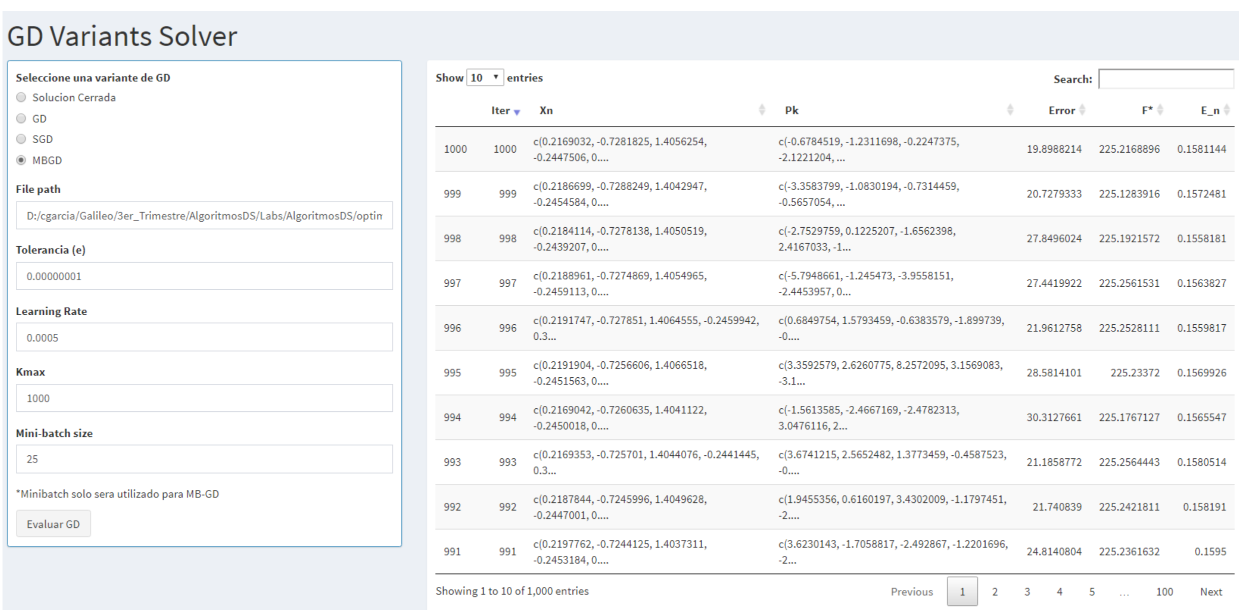
Search:

	Iter	Xn	Pk	Error	F*	E_n
1000	1000	c(0.1978909, -0.720702, 1.395652, -0.2636069, 0.25...	c(-0.1350846, -0.4886863, -1.1012594, -0.9593585, ...	8.3867901	491.9861265	0.5226502
999	999	c(0.3421366, -0.7307005, 1.3863443, -0.2584764, 0....	c(-0.0097062, 0.0112132, 0.0557695, -0.0476386, -0...	0.267624	428.9500685	0.4405968
998	998	c(0.2446594, -0.7872959, 1.4074952, -0.2220766, 0....	c(0.3209135, -0.1455852, 0.0495347, 0.2471216, -0....	2.5558305	536.9191302	0.5610361
997	997	c(0.18037, -0.7767065, 1.4899819, -0.2278221, 0.29...	c(-0.9123182, -2.3549744, -2.51389, -0.4375693, 0....	17.1981523	426.7547064	0.4845017
996	996	c(0.2034179, -0.7136672, 1.4052034, -0.2766779, 0....	c(-0.4250318, -0.3176067, -0.7037151, -0.6835359, ...	6.3899399	484.1466833	0.5097531



Parte 4 – MBGD

- Un mini batch size muy grande generar mayor error en el conjunto de datos, por lo cual el mini batch de 25 es el que presenta mejor desempeño
- Los mejores resultados se obtienen con un step size de 0.0005 y un mini batch size de 25, esto dado que presenta el menor error de todos los valores evaluados.



GD Variants Solver

Seleccione una variante de GD

- ( ) Solucion Cerrada
- ( ) GD
- ( ) SGD
- (•) MBGD

File path

D:/cgarcia/Galileo/3er_Trimestre/AlgoritmosDS/Labs/AlgoritmosDS/optin

Tolerancia (e)

0.00000001

Learning Rate

0.0005

Kmax

1000

Mini-batch size

25

*Minibatch solo sera utilizado para MB-GD

Evaluar GD

Show 10 entries Search:

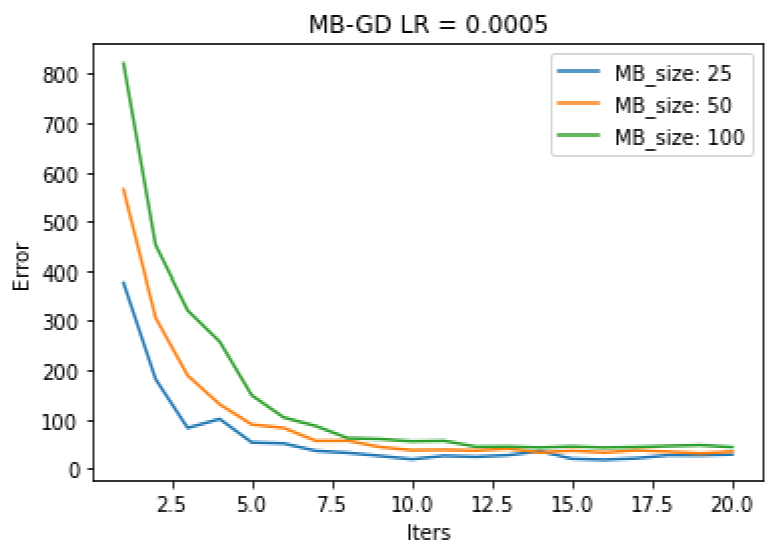
	Iter	Xn	Pk	Error	F*	E_n
1000	1000	c(0.2169032, -0.7281825, 1.4056254, -0.2447506, 0....	c(-0.6784519, -1.2311698, -0.2247375, -2.1221204, ...	19.8988214	225.2168896	0.1581144
999	999	c(0.2186699, -0.7288249, 1.4042947, -0.2454584, 0....	c(-3.3583799, -1.0830194, -0.7314459, -0.5657054, ...	20.7279333	225.1283916	0.1572481
998	998	c(0.2184114, -0.7278138, 1.4050519, -0.2439207, 0....	c(-2.7529759, 0.1225207, -1.6562398, 2.4167033, -1...	27.8496024	225.1921572	0.1558181
997	997	c(0.2188961, -0.7274869, 1.4054965, -0.2459113, 0....	c(-5.7948661, -1.245473, -3.9558151, -2.4453957, 0...	27.4419922	225.2561531	0.1563827
996	996	c(0.2191747, -0.727851, 1.4064555, -0.2459942, 0.3...	c(0.6849754, 1.5793459, -0.6383579, -1.899739, -0....	21.9612758	225.2528111	0.1559817
995	995	c(0.2191904, -0.7256606, 1.4066518, -0.2451563, 0....	c(3.3592579, 2.6260775, 8.2572095, 3.1569083, -3.1...	28.5814101	225.23372	0.1569926
994	994	c(0.2169042, -0.7260635, 1.4041122, -0.2450018, 0....	c(-1.5613585, -2.4667169, -2.4782313, 3.0476116, 2...	30.3127661	225.1767127	0.1565547
993	993	c(0.2169353, -0.725701, 1.4044076, -0.2441445, 0.3...	c(3.6741215, 2.5652482, 1.3773459, -0.4587523, -0....	21.1858772	225.2564443	0.1580514
992	992	c(0.2187844, -0.7245996, 1.4049628, -0.2447001, 0....	c(1.9455356, 0.6160197, 3.4302009, -1.1797451, -2....	21.740839	225.2421811	0.158191
991	991	c(0.2197762, -0.7244125, 1.4037311, -0.2453184, 0....	c(3.6230143, -1.7058817, -2.492867, -1.2201696, -2...	24.8140804	225.2361632	0.1595

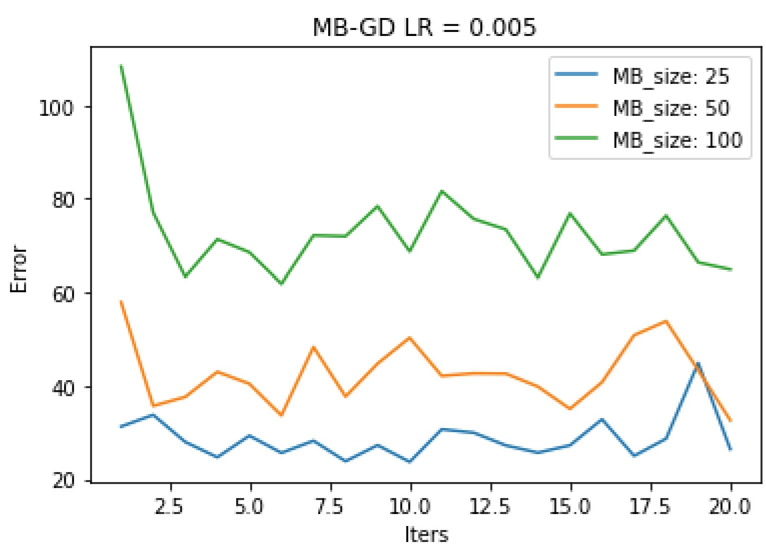
Showing 1 to 10 of 1,000 entries Previous 1 2 3 4 5 … 100 Next

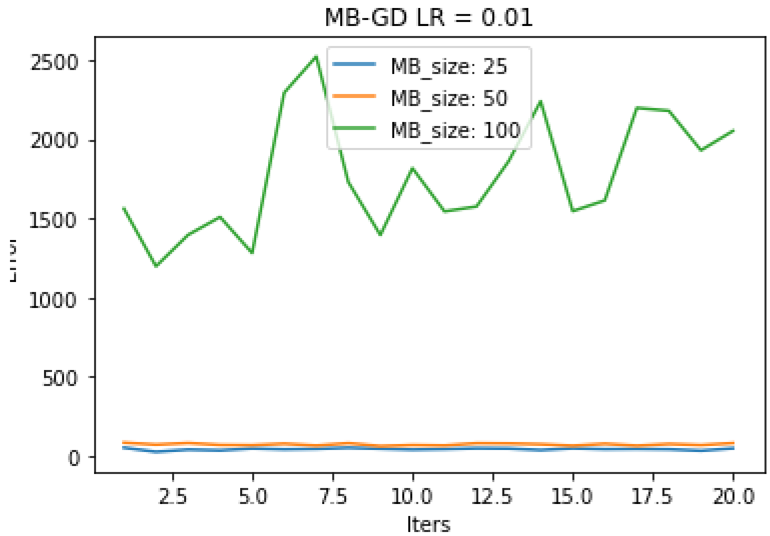
Show 10 entries

Search:

	Iter	Xn	Pk	Error	F*	E_n
1000	1000	c(0.2169032, -0.7281825, 1.4056254, -0.2447506, 0....	c(-0.6784519, -1.2311698, -0.2247375, -2.1221204, ...	19.8988214	225.2168896	0.1581144
999	999	c(0.2186699, -0.7288249, 1.4042947, -0.2454584, 0....	c(-3.3583799, -1.0830194, -0.7314459, -0.5657054, ...	20.7279333	225.1283916	0.1572481
998	998	c(0.2184114, -0.7278138, 1.4050519, -0.2439207, 0....	c(-2.7529759, 0.1225207, -1.6562398, 2.4167033, -1...	27.8496024	225.1921572	0.1558181
997	997	c(0.2188961, -0.7274869, 1.4054965, -0.2459113, 0....	c(-5.7948661, -1.245473, -3.9558151, -2.4453957, 0...	27.4419922	225.2561531	0.1563827
996	996	c(0.2191747, -0.727851, 1.4064555, -0.2459942, 0.3...	c(0.6849754, 1.5793459, -0.6383579, -1.899739, -0....	21.9612758	225.2528111	0.1559817







Parte 5 – Comparación

Es posible observar que los algoritmos tienen un desempeño similar con respecto a la optimización de la función objetivo. Sin embargo, la diferencia en su comparación se resaltar a nivel de número de iteraciones entre los cuales la aplicación de la solución cerrada, así como el método clásico de GD obtienen el mejor desempeño en cuento a tiempo y resultado. A este análisis es necesario agregarle las virtudes que pueden tener los otros algoritmos ya que no utilizan todos los datos (MBGD) o bien pueden ser usados para online learning (SGD).

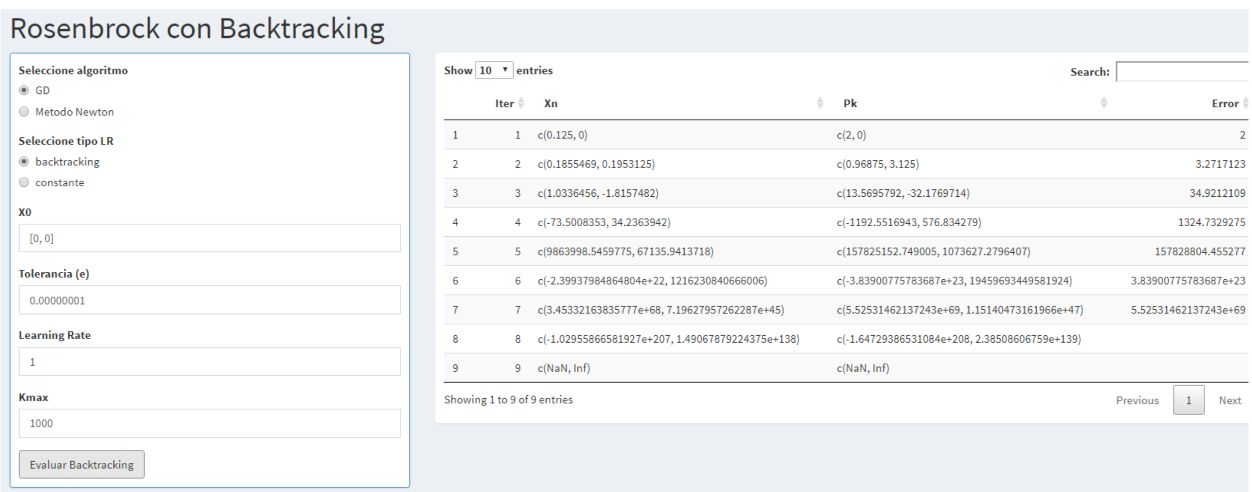
Método	LR	Mini Batch size	Valor óptimo (f^*)	No. Iteraciones	Error (x_k, x_true)
Cerrado	-	-	225.02	1	0.157
GD	0.0007	1000	225.02	58	0.157
SGD	0.0005	1	225.18	1000	0.156
MB-GD	0.0005	25	225.19	1000	0.158

PROBLEMA 2

Parte 1 – GD con Backtracking Line Search

X_0	Error Backtracking	Error LR constante
(0, 0)	Inf	0.69
(0.6, 0.6)	0.17	0.22
(-0.5, 1)	0.77	2.18
(-1.2, 1)	2.09	2.11

Usando un step size constante de 0.0005 es posible notar que backtracking funciona mejor para todos los puntos iniciales con excepción del punto (0, 0). Adicionalmente la selección del step size constante fue a través de experimentación y evaluación de resultados pues valores mayores al utilizado tienden a divergir, mientras que backtracking determina el step size de forma automática según el algoritmo.



	Iter	Xn	Pk	Error
1	1	c(0.125, 0)	c(2, 0)	2
2	2	c(0.1855469, 0.1953125)	c(0.96875, 3.125)	3.2717123
3	3	c(1.0336456, -1.8157482)	c(13.5695792, -32.1769714)	34.9212109
4	4	c(-73.5008353, 34.2363942)	c(-1192.5516943, 576.834279)	1324.7329275
5	5	c(9863998.5459775, 67135.9413718)	c(157825152.749005, 1073627.2796407)	157828804.455277
6	6	c(-2.39937984864804e+22, 1216230840666006)	c(-3.83900775783687e+23, 19459693449581924)	3.83900775783687e+23
7	7	c(3.45332163835777e+68, 7.19627957262287e+45)	c(5.52531462137243e+69, 1.15140473161966e+47)	5.52531462137243e+69
8	8	c(-1.02955866581927e+207, 1.49067879224375e+138)	c(-1.64729386531084e+208, 2.38508606759e+139)	
9	9	c(NaN, Inf)	c(NaN, Inf)	

Showing 1 to 9 of 9 entries   Previous 1 Next

X_0 = [0, 0]

Show 10 entries   Search:

	Iter	Xn	Pk	Error
9	9	c(NaN, Inf)	c(NaN, Inf)	
8	8	c(-1.02955866581927e+207, 1.49067879224375e+138)	c(-1.64729386531084e+208, 2.38508606759e+139)	1.64729386531084e+208
7	7	c(3.45332163835777e+68, 7.19627957262287e+45)	c(5.52531462137243e+69, 1.15140473161966e+47)	5.52531462137243e+69
6	6	c(-2.39937984864804e+22, 1216230840666006)	c(-3.83900775783687e+23, 19459693449581924)	3.83900775783687e+23

X_0 = [0.6, 0.6]

Show 10 entries Search:

	Iter	Xn	Pk	Error
1000	1000	c(0.8379667, 0.7014747)	c(0.0849577, 0.1427852)	0.1661488
999	999	c(0.8378838, 0.7013353)	c(0.0850137, 0.142865)	0.166246
998	998	c(0.8378007, 0.7011957)	c(0.0850696, 0.142945)	0.1663433
997	997	c(0.8377177, 0.7010562)	c(0.0851256, 0.143025)	0.1664407

X_0 = [-0.5, 1]

Show 10 entries Search:

	Iter	Xn	Pk	Error
1000	1000	c(0.4695584, 0.2178303)	c(0.5634576, 0.5314685)	0.77456
999	999	c(0.4690082, 0.2173113)	c(0.5646658, 0.5319816)	0.7757911
998	998	c(0.4684567, 0.2167918)	c(0.5658786, 0.5324949)	0.777026

X_0 = [-1.2, 1]

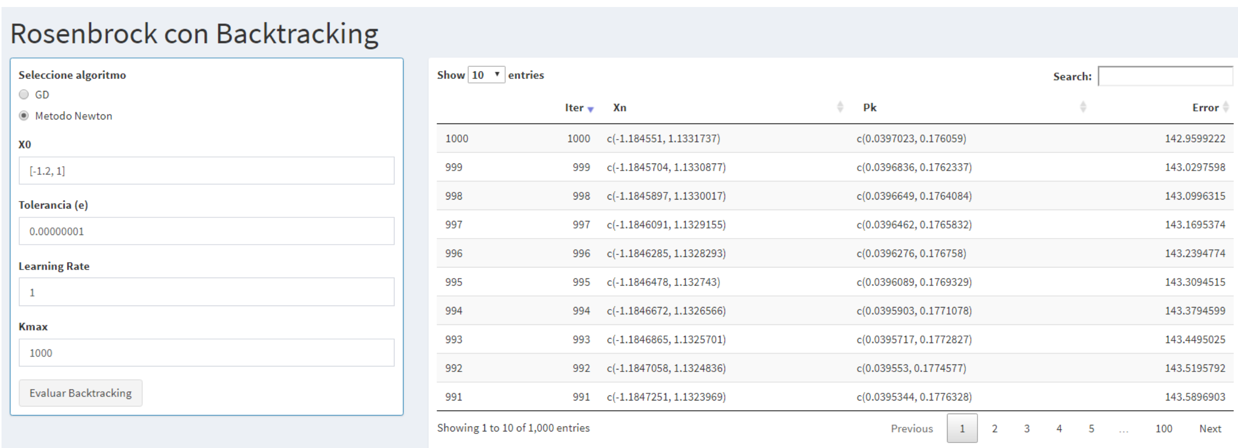
Show 10 entries Search:

	Iter	Xn	Pk	Error
1000	1000	c(-0.5320881, 0.2907745)	c(1.4332242, -1.5318962)	2.0978174
999	999	c(-0.532788, 0.2915225)	c(1.4318908, -1.5324489)	2.0973104
998	998	c(-0.5334871, 0.2922708)	c(1.4305596, -1.5329986)	2.0968036
997	997	c(-0.5341856, 0.2930193)	c(1.4292308, -1.5335454)	2.0962972
996	996	c(-0.5348835, 0.2937681)	c(1.4279042, -1.5340892)	2.0957911

Parte 2 – Método de Newton con Backtracking Line Search

X_0	Error Backtracking	Iteraciones Backtracking	Error LR constante	Iteracions LR constante
(0, 0)	0	344	0	3
(0.6, 0.6)	4.03	3000	0	6
(-0.5, 1)	11.21	3000	0	6
(-1.2, 1)	53.83	3000	7	0

En el caso del método de Newton este algoritmo se beneficia de tener un step size constante en contraste de calcularlo a través de backtracking, pues el número de iteraciones es menor al tener un step size constante de 1 mientras con backtracking solo en el primer punto inicial logra converger a 0.


Rosenbrock con Backtracking

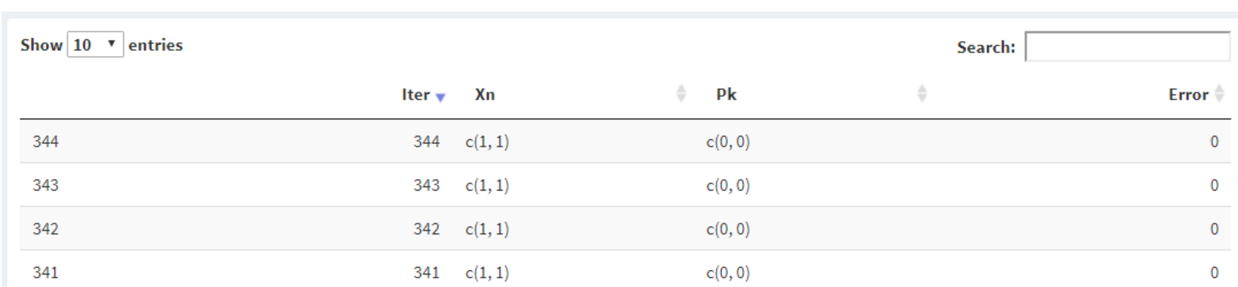
Seleccione algoritmo
GD
Metodo Newton
X0
[-1.2, 1]
Tolerancia (e)
0.00000001
Learning Rate
1
Kmax
1000
Evaluar Backtracking

Show 10 entries Search:

	Iter	Xn	Pk	Error
1000	1000	c(-1.184551, 1.1331737)	c(0.0397023, 0.176059)	142.9599222
999	999	c(-1.1845704, 1.1330877)	c(0.0396836, 0.1762337)	143.0297598
998	998	c(-1.1845897, 1.1330017)	c(0.0396649, 0.1764084)	143.0996315
997	997	c(-1.1846091, 1.1329155)	c(0.0396462, 0.1765832)	143.1695374
996	996	c(-1.1846285, 1.1328293)	c(0.0396276, 0.176758)	143.2394774
995	995	c(-1.1846478, 1.132743)	c(0.0396089, 0.1769329)	143.3094515
994	994	c(-1.1846672, 1.1326566)	c(0.0395903, 0.1771078)	143.3794599
993	993	c(-1.1846865, 1.1325701)	c(0.0395717, 0.1772827)	143.4495025
992	992	c(-1.1847058, 1.1324836)	c(0.039553, 0.1774577)	143.5195792
991	991	c(-1.1847251, 1.1323969)	c(0.0395344, 0.1776328)	143.5896903

Showing 1 to 10 of 1,000 entries Previous 1 2 3 4 5 … 100 Next

X_0 = [0, 0]


Show 10 entries Search:

	Iter	Xn	Pk	Error
344	344	c(1, 1)	c(0, 0)	0
343	343	c(1, 1)	c(0, 0)	0
342	342	c(1, 1)	c(0, 0)	0
341	341	c(1, 1)	c(0, 0)	0

$X_0 = [0.6, 0.6]$

Show 10 entries Search:

	Iter	Xn	Pk	Error
3000	3000	c(0.3574143, 0.1405122)	c(-0.4127199, -0.3081366)	4.0282712
2999	2999	c(0.3578173, 0.1408131)	c(-0.4117917, -0.3078161)	4.0322458
2998	2998	c(0.3582195, 0.1411137)	c(-0.4108664, -0.3074956)	4.0362241
2997	2997	c(0.3586207, 0.141414)	c(-0.4099441, -0.307175)	4.0402062

$X_0 = [-0.5, 1]$

Show 10 entries Search:

	Iter	Xn	Pk	Error
3000	3000	c(-0.7026381, 0.5336865)	c(-0.2430244, 0.3013758)	11.2052606
2999	2999	c(-0.7024008, 0.5333922)	c(-0.2427191, 0.3007926)	11.2162356
2998	2998	c(-0.7021638, 0.5330984)	c(-0.2424142, 0.3002104)	11.2272213
2997	2997	c(-0.701927, 0.5328052)	c(-0.2421097, 0.2996293)	11.2382177
2996	2996	c(-0.7016906, 0.5325126)	c(-0.2418058, 0.2990492)	11.2492248

$X_0 = [-1.2, 1]$

Show 10 entries Search:

	Iter	Xn	Pk	Error
3000	3000	c(-1.1207279, 1.1543755)	c(0.0993755, -0.1210504)	53.8283272
2999	2999	c(-1.1207764, 1.1544346)	c(0.0993316, -0.1209117)	53.8546214
2998	2998	c(-1.1208249, 1.1544936)	c(0.0992876, -0.1207731)	53.8809284
2997	2997	c(-1.1208734, 1.1545526)	c(0.0992437, -0.1206345)	53.9072483
2996	2996	c(-1.1209218, 1.1546115)	c(0.0991997, -0.1204959)	53.933581