Programación Evolutiva
Práctica 2
Grupo 08

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Introducción:

Para esta práctica, hemos introducido los siguientes cambios opcionales, que no estaban presentes en la primera:

- **Escalado lineal** para las selecciones en las que este tiene sentido. Nos hemos encontrado con el problema de que algoritmos de selección que dependen del fitness, como la ruleta, estaban introduciendo demasiada presión selectiva y la evolución se acababa estancando. Es para reducir dicha presión, por lo que introducimos el escalado lineal en la ruleta, selección universal estocástica.

- **Selección por ranking**: esta selección la hemos implementado de forma que la diferencia entre la posibilidad de elegir al mejor y al peor no sea muy grande. La probabilidad de elegirlos es lineal entre todos, y se escogen de manera similar a la ruleta.

- **Gráfico de presión selectiva**: muestra con un valor entre 2 y 1 lo cerca que está la media de los mínimos y máximos. Un valor cercano a 1 significa que hay poca diversidad y la media se acerca mucho al máximo, mientras que un valor cercano a 2, significa que hay demasiada diversidad, por tanto, no se está priorizando la evolución de los mejores individuos. Nos proporciona información muy útil para elegir la mejor combinación de parámetros.

- **Consola en la GUI:** esta nos permite ver más información en la interfaz gráfica, como la población final. Cualquier cosa que el programa escriba en salida estándar se mostrará aquí, pudiendo utilizarlo también para *debuguear*.
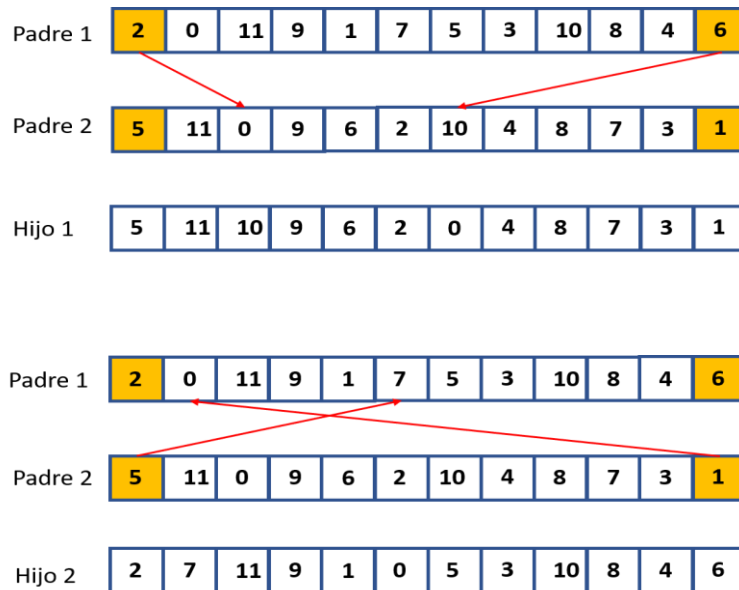
- **Barra de progreso:** al tener tiempos de ejecución elevados, debidos a algoritmos con individuos muy grandes o gran número de generaciones, necesitamos una indicación que nos asegure que se está realizando la evolución.

Introducción:

Aclaraciones e interpretaciones

Cruces

Corners: método de cruce de invención propia que contempla las siguientes características:

- Se toman los valores de los extremos del individuo(padre).
- El hijo se genera intercambiando en el otro padre, las posiciones que indican los valores tomados.

ERX: en la implementación de este método se han aplicado los siguientes criterios:

- A la hora de realizar la tabla de conectividades, no se considera conexión circular. Es decir, el primer y último elemento no tienen proximidad.
- En la generación de los hijos, cuando se llega a un bloqueo, se vuelve a empezar de nuevo.
- Se establece un número de veces máximo en el que se reinicia la creación del hijo. Agotado este número de intentos, se establece como hijo los valores del padre contrario. Por tanto, para crear el primer hijo, partimos del primer valor del 'padre 1', si por bloqueos no se genera, asignamos al 'hijo 1', los valores del 'padre 2'. Haciendo lo inverso en el caso del 'hijo 2'.
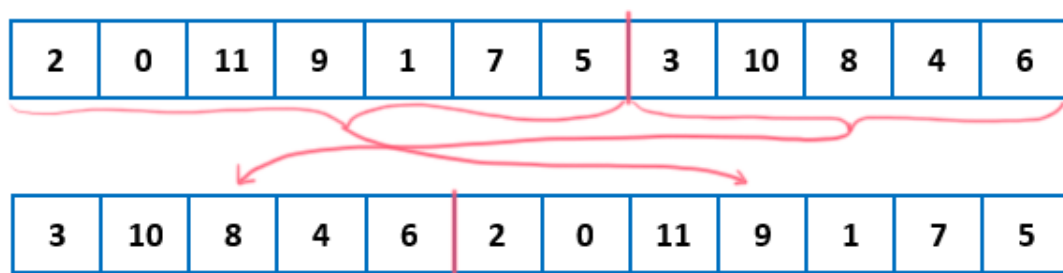
OX-OP: se añade esta variante del cruce OX a la práctica.

Mutaciones:

Intercambio múltiple: como hacer un solo intercambio varía muy poco el individuo cuando este es muy grande, el intercambio múltiple repite un número aleatorio de veces el intercambio.

Desplazamiento: repetición de un número aleatorio de veces de la inserción. La inserción se puede hacer hacia cualquier sentido.

Corte: similar a una baraja de cartas, se corta por un punto y se intercambian los dos segmentos generados. En el ejemplo dado cortamos entre el 5 y el tres, y movemos el segmento generado al principio.

Esta es una mutación que cambia muchos elementos, pero aun así mantiene el orden de la gran mayoría. Si este fuese un problema circular este cruce no alteraría el orden de los elementos, pero lo podemos utilizar ya que este no es el caso.

Heurística/Desplazamiento y Heurística/Inserción: La mutación heurística genera muchísima presión selectiva, al elegir siempre al mejor individuo de los generados. Para remediarlo, estas dos mutaciones hacen el desplazamiento o inserción respectivamente un 70% de las veces, y mutan mediante heurística el 30% restante. Así obtenemos la aleatoriedad de las mutaciones con la ventaja de obtener el mejor con la mutación heurística.

Con los parámetros que hemos elegido queremos mostrar varias combinaciones con las que se pueden obtener resultados óptimos, variando la selección, tipo de cruce y de mutación. También se ha priorizado el tiempo de ejecución, que se empieza a hacer cuantioso con individuos grandes y muchas generaciones. Por esto limitamos el número de generaciones a 2000 y el tamaño de la población a 100. Determinamos que estos valores ofrecen un tiempo de espera razonable para el usuario, obteniendo buenos resultados de igual manera.
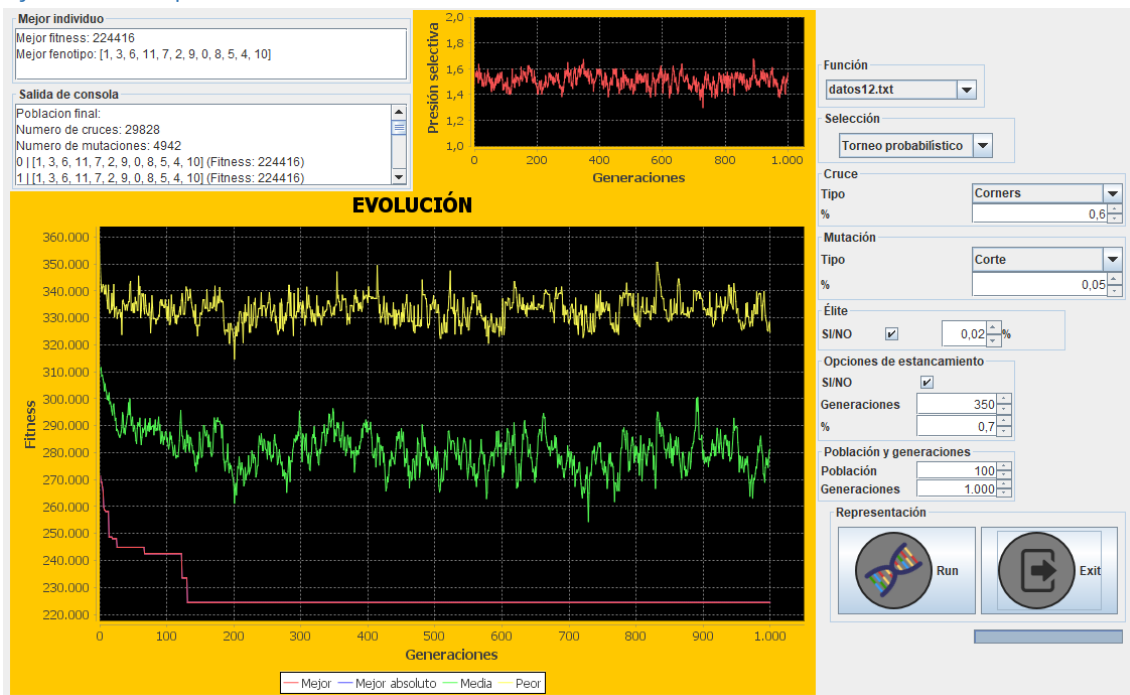
RESULTADOS

A continuación, se exponen los resultados obtenidos para cada uno de los tres problemas dados. En cada uno de ellos se han realizado 20 ejecuciones con los parámetros que se muestran en las imágenes. Se ha tratado de mantener valores próximos a 1,5 en la gráfica de presión selectiva.

Se aporta en detalle los datos de la mejor ejecución y de manera resumida los resultados de todas las ejecuciones.

Problema 1: datos12.dat

Ejecución representativa:

Individuo solución: [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10]

Aptitud máxima: 224416

Aptitud media: 281162.48

Aptitud mínima: 324672

Numero de cruces: 29828

Numero de mutaciones: 4942

Población final:

0 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)
1 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)
2 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)
3 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)
4 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)
5 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)

6 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)
7 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 4, 5, 10] (Fitness: 242190)
8 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 4, 5, 10] (Fitness: 242190)
9 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)
10 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)
11 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)
12 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)
13 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)
14 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)
15 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)
16 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)
17 | [1, 3, 6, 11, 9, 2, 7, 0, 8, 5, 4, 10] (Fitness: 248766)
18 | [1, 3, 6, 11, 7, 2, 5, 0, 8, 9, 4, 10] (Fitness: 249280)
19 | [1, 3, 6, 11, 0, 2, 9, 7, 8, 5, 4, 10] (Fitness: 250764)
20 | [1, 5, 6, 11, 7, 2, 9, 0, 8, 4, 3, 10] (Fitness: 252696)
21 | [1, 5, 6, 11, 7, 2, 9, 0, 8, 4, 3, 10] (Fitness: 252696)
22 | [1, 4, 6, 11, 9, 2, 7, 0, 8, 5, 3, 10] (Fitness: 252876)
23 | [1, 4, 6, 11, 9, 2, 7, 0, 8, 5, 3, 10] (Fitness: 252876)
24 | [1, 4, 6, 11, 9, 2, 7, 0, 8, 5, 3, 10] (Fitness: 252876)
25 | [5, 3, 6, 11, 7, 2, 9, 0, 8, 1, 4, 10] (Fitness: 253712)
26 | [1, 3, 0, 11, 7, 2, 9, 6, 8, 5, 4, 10] (Fitness: 256010)
27 | [1, 3, 6, 11, 7, 8, 9, 0, 2, 5, 4, 10] (Fitness: 257150)
28 | [5, 3, 6, 11, 8, 2, 9, 0, 7, 1, 4, 10] (Fitness: 258380)
29 | [1, 3, 6, 11, 7, 4, 9, 0, 8, 5, 2, 10] (Fitness: 259248)
30 | [1, 3, 6, 11, 7, 4, 9, 0, 8, 5, 2, 10] (Fitness: 259248)
31 | [1, 3, 6, 11, 7, 2, 4, 0, 8, 5, 9, 10] (Fitness: 259580)
32 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 3, 5, 10] (Fitness: 259728)
33 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 3, 5, 10] (Fitness: 259728)
34 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 3, 5, 10] (Fitness: 259728)
35 | [4, 1, 6, 11, 7, 3, 9, 0, 8, 5, 2, 10] (Fitness: 264536)
36 | [5, 3, 6, 11, 7, 2, 4, 0, 8, 1, 9, 10] (Fitness: 265524)
37 | [1, 2, 6, 11, 7, 3, 9, 0, 8, 5, 4, 10] (Fitness: 266706)
38 | [1, 2, 6, 11, 7, 3, 9, 0, 8, 5, 4, 10] (Fitness: 266706)
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40 | [1, 6, 3, 11, 7, 5, 9, 0, 8, 4, 2, 10] (Fitness: 268318)
41 | [1, 4, 6, 11, 7, 5, 9, 0, 8, 3, 2, 10] (Fitness: 271902)
42 | [2, 1, 6, 11, 7, 3, 9, 0, 8, 5, 4, 10] (Fitness: 274418)
43 | [5, 9, 6, 11, 7, 2, 4, 0, 8, 1, 3, 10] (Fitness: 274516)
44 | [1, 2, 6, 11, 7, 5, 9, 0, 8, 4, 3, 10] (Fitness: 276698)
45 | [1, 4, 9, 11, 7, 10, 6, 0, 8, 5, 3, 2] (Fitness: 277186)
46 | [1, 4, 9, 11, 7, 10, 6, 0, 8, 5, 3, 2] (Fitness: 277186)
47 | [5, 3, 6, 11, 7, 2, 9, 1, 8, 0, 4, 10] (Fitness: 277512)
48 | [1, 2, 6, 11, 7, 4, 9, 0, 8, 5, 3, 10] (Fitness: 279626)
49 | [1, 5, 0, 11, 7, 2, 9, 6, 8, 3, 4, 10] (Fitness: 282002)
50 | [5, 3, 0, 11, 8, 2, 9, 6, 7, 1, 4, 10] (Fitness: 282828)
51 | [5, 1, 6, 11, 7, 2, 4, 0, 8, 9, 3, 10] (Fitness: 283072)
52 | [6, 3, 9, 0, 8, 2, 5, 11, 4, 1, 7, 10] (Fitness: 283774)
53 | [3, 5, 6, 11, 7, 2, 4, 0, 8, 1, 9, 10] (Fitness: 286538)

54 | [5, 9, 6, 3, 7, 2, 4, 0, 8, 1, 11, 10] (Fitness: 287992)
55 | [2, 9, 0, 8, 5, 11, 10, 1, 4, 6, 3, 7] (Fitness: 288214)
56 | [1, 0, 3, 11, 7, 2, 9, 6, 8, 5, 4, 10] (Fitness: 289444)
57 | [8, 4, 6, 11, 7, 2, 9, 3, 5, 0, 10, 1] (Fitness: 289520)
58 | [1, 3, 0, 11, 7, 10, 6, 9, 8, 5, 4, 2] (Fitness: 289836)
59 | [1, 3, 0, 11, 7, 4, 9, 6, 8, 5, 2, 10] (Fitness: 291862)
60 | [5, 9, 0, 11, 7, 2, 4, 6, 8, 1, 3, 10] (Fitness: 296372)
61 | [10, 6, 3, 1, 7, 11, 2, 4, 0, 5, 8, 9] (Fitness: 296684)
62 | [1, 4, 0, 11, 7, 3, 9, 6, 8, 5, 2, 10] (Fitness: 296968)
63 | [2, 11, 0, 8, 5, 9, 10, 1, 4, 6, 3, 7] (Fitness: 297252)
64 | [10, 9, 11, 1, 5, 4, 6, 3, 7, 2, 8, 0] (Fitness: 299456)
65 | [6, 10, 3, 1, 4, 11, 2, 7, 0, 5, 8, 9] (Fitness: 299476)
66 | [10, 6, 4, 1, 7, 11, 2, 3, 0, 5, 8, 9] (Fitness: 300222)
67 | [9, 0, 8, 5, 2, 10, 1, 4, 6, 11, 7, 3] (Fitness: 300672)
68 | [6, 2, 8, 1, 9, 0, 10, 5, 3, 7, 11, 4] (Fitness: 303772)
69 | [7, 5, 3, 8, 4, 11, 1, 10, 0, 6, 2, 9] (Fitness: 305588)
70 | [1, 5, 3, 10, 8, 9, 6, 11, 7, 2, 4, 0] (Fitness: 307652)
71 | [2, 11, 0, 8, 5, 3, 10, 1, 4, 6, 9, 7] (Fitness: 312304)
72 | [2, 11, 0, 8, 5, 3, 10, 1, 4, 6, 9, 7] (Fitness: 312304)
73 | [10, 1, 5, 6, 11, 7, 2, 9, 0, 8, 4, 3] (Fitness: 312326)
74 | [6, 11, 5, 8, 4, 2, 1, 10, 0, 7, 3, 9] (Fitness: 312588)
75 | [0, 11, 5, 8, 4, 2, 1, 10, 6, 7, 3, 9] (Fitness: 312894)
76 | [0, 11, 8, 4, 10, 5, 2, 7, 3, 9, 6, 1] (Fitness: 313792)
77 | [0, 11, 8, 4, 10, 5, 2, 7, 3, 9, 6, 1] (Fitness: 313792)
78 | [6, 11, 8, 1, 9, 0, 10, 5, 3, 7, 2, 4] (Fitness: 314872)
79 | [7, 2, 3, 1, 11, 8, 5, 9, 0, 10, 6, 4] (Fitness: 315392)
80 | [8, 4, 2, 10, 11, 9, 6, 1, 7, 3, 5, 0] (Fitness: 315492)
81 | [7, 11, 0, 8, 5, 3, 10, 1, 4, 6, 9, 2] (Fitness: 316832)
82 | [1, 9, 3, 10, 8, 4, 6, 11, 7, 2, 5, 0] (Fitness: 318328)
83 | [7, 5, 3, 8, 4, 2, 1, 10, 0, 6, 11, 9] (Fitness: 319484)
84 | [7, 5, 3, 8, 4, 2, 1, 10, 0, 6, 11, 9] (Fitness: 319484)
85 | [7, 5, 3, 8, 4, 2, 1, 10, 0, 6, 11, 9] (Fitness: 319484)
86 | [6, 3, 5, 8, 4, 2, 1, 10, 0, 7, 11, 9] (Fitness: 319554)
87 | [8, 10, 3, 1, 4, 11, 2, 7, 0, 5, 6, 9] (Fitness: 319892)
88 | [0, 11, 8, 4, 10, 5, 2, 7, 3, 6, 9, 1] (Fitness: 320358)
89 | [1, 5, 3, 10, 8, 4, 6, 11, 7, 2, 9, 0] (Fitness: 321084)
90 | [8, 5, 4, 10, 1, 2, 0, 11, 7, 3, 9, 6] (Fitness: 321380)
91 | [1, 0, 5, 8, 4, 2, 3, 10, 11, 7, 6, 9] (Fitness: 321576)
92 | [10, 6, 4, 1, 7, 5, 2, 3, 0, 8, 11, 9] (Fitness: 322192)
93 | [9, 11, 7, 10, 6, 4, 8, 5, 0, 2, 1, 3] (Fitness: 323104)
94 | [0, 2, 3, 1, 11, 8, 5, 9, 7, 10, 6, 4] (Fitness: 323196)
95 | [2, 9, 0, 8, 5, 3, 10, 1, 4, 6, 11, 7] (Fitness: 323802)
96 | [2, 9, 0, 8, 5, 3, 10, 1, 4, 6, 11, 7] (Fitness: 323802)
97 | [10, 9, 11, 1, 8, 4, 6, 3, 7, 2, 5, 0] (Fitness: 323846)
98 | [8, 4, 2, 10, 1, 9, 6, 11, 7, 3, 5, 0] (Fitness: 324672)
99 | [8, 4, 2, 10, 1, 9, 6, 11, 7, 3, 5, 0] (Fitness: 324672)

Tabla resumen:

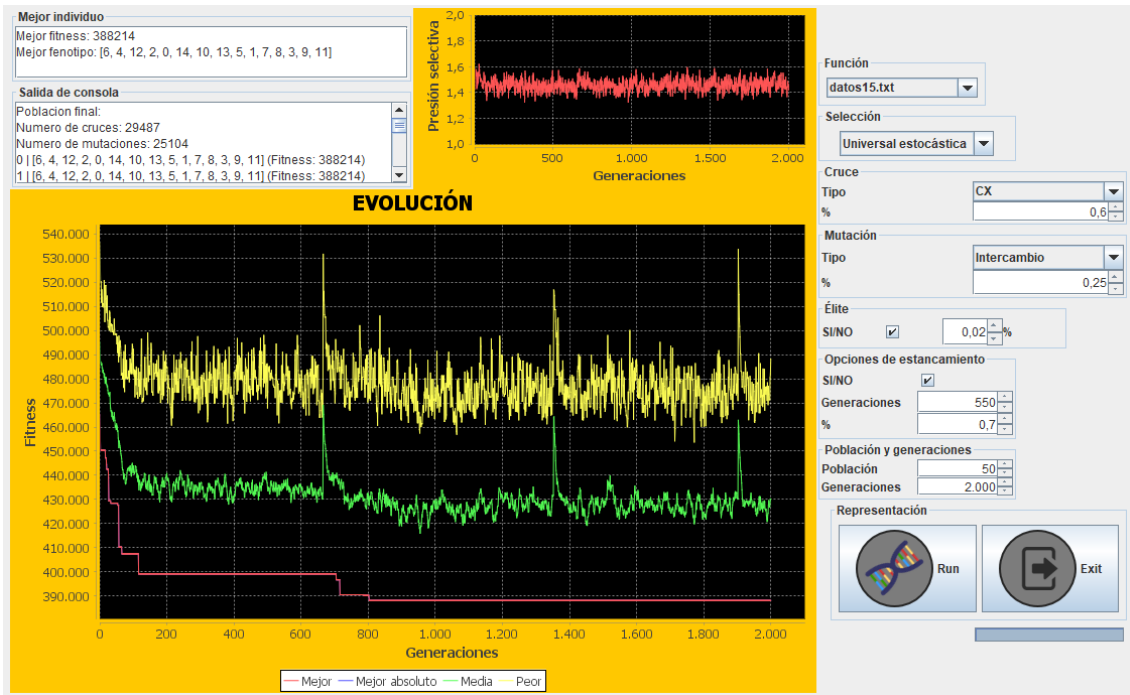| Nº Ejecución	Individuo	Aptitud
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2	[10, 11, 3, 0, 8, 9, 5, 7, 1, 4, 2, 6]	233848
3	[1, 9, 4, 3, 5, 11, 8, 0, 10, 7, 6, 2]	239302
4	[10, 7, 3, 0, 8, 5, 9, 4, 6, 11, 2, 1]	234788
5	[9, 2, 10, 11, 5, 4, 1, 3, 8, 7, 0, 6]	237756
6	[10, 11, 3, 0, 8, 9, 5, 7, 1, 4, 2, 6]	233848
7	[7, 3, 8, 11, 1, 2, 9, 0, 6, 4, 5, 10]	229092
8	[1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10]	224416
9	[10, 11, 3, 0, 1, 9, 4, 8, 7, 5, 2, 6]	230704
10	[7, 3, 8, 11, 1, 2, 9, 0, 6, 4, 5, 10]	229092
11	[1, 2, 7, 0, 4, 9, 10, 8, 6, 11, 5, 3]	240492
12	[10, 11, 3, 0, 1, 9, 4, 8, 7, 5, 2, 6]	230704
13	[6, 7, 4, 0, 10, 5, 9, 8, 3, 2, 11, 1]	241360
14	[2, 4, 9, 3, 8, 7, 10, 0, 6, 11, 5, 1]	243460
15	[9, 3, 5, 0, 2, 6, 8, 7, 1, 4, 11, 10]	236006
16	[10, 7, 3, 0, 8, 5, 9, 4, 6, 11, 2, 1]	234788
17	[10, 11, 3, 0, 1, 9, 4, 8, 7, 5, 2, 6]	230704
18	[1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10]	224416
19	[9, 11, 5, 0, 10, 1, 4, 8, 3, 7, 2, 6]	235554
20	[1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10]	224416

Mejor solución: 224416

Peor solución: 243460

Media: 233650.8

Desviación típica: 5513.0485

Problema 2: datos15.dat

Ejecución representativa:

Individuo solución: [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11]

Aptitud máxima: 388214

Aptitud media: 430203.52

Aptitud mínima: 488198

Numero de cruces: 29487

Numero de mutaciones: 25104

Población final:

0 | [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 388214)
1 | [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 388214)
2 | [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 388214)
3 | [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 388214)
4 | [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 388214)
5 | [9, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 6, 11] (Fitness: 396320)
6 | [9, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 6, 11] (Fitness: 396320)
7 | [10, 4, 12, 2, 0, 14, 9, 13, 5, 1, 7, 8, 3, 6, 11] (Fitness: 398432)
8 | [6, 4, 12, 2, 0, 14, 8, 13, 5, 1, 7, 10, 3, 9, 11] (Fitness: 399236)
9 | [6, 4, 12, 3, 0, 14, 10, 13, 5, 1, 7, 8, 2, 9, 11] (Fitness: 402462)
10 | [6, 4, 12, 2, 7, 0, 10, 9, 5, 1, 13, 8, 3, 14, 11] (Fitness: 405898)
11 | [6, 4, 12, 8, 0, 14, 10, 13, 5, 1, 7, 2, 3, 9, 11] (Fitness: 405980)
12 | [6, 4, 12, 8, 0, 14, 10, 13, 5, 1, 7, 2, 3, 9, 11] (Fitness: 405980)
13 | [6, 4, 12, 2, 0, 14, 10, 13, 7, 1, 5, 8, 3, 9, 11] (Fitness: 410200)
14 | [6, 4, 12, 2, 0, 9, 10, 13, 5, 1, 7, 8, 3, 14, 11] (Fitness: 411476)
15 | [6, 4, 12, 2, 0, 9, 10, 13, 5, 1, 7, 8, 3, 14, 11] (Fitness: 411476)

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17 | [6, 4, 12, 2, 0, 14, 10, 13, 11, 1, 7, 8, 3, 9, 5] (Fitness: 415776)
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19 | [6, 1, 12, 2, 0, 14, 10, 13, 5, 4, 7, 8, 3, 9, 11] (Fitness: 421494)
20 | [6, 14, 12, 2, 0, 4, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 422024)
21 | [6, 4, 12, 2, 0, 14, 13, 11, 5, 1, 8, 10, 3, 9, 7] (Fitness: 423418)
22 | [0, 4, 12, 2, 6, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 424664)
23 | [9, 4, 2, 12, 0, 14, 10, 13, 5, 1, 7, 8, 3, 6, 11] (Fitness: 430468)
24 | [14, 4, 12, 2, 0, 6, 10, 13, 5, 9, 7, 8, 3, 1, 11] (Fitness: 430712)
25 | [3, 4, 12, 2, 14, 11, 10, 9, 5, 1, 7, 8, 13, 6, 0] (Fitness: 430810)
26 | [9, 4, 1, 2, 0, 14, 10, 13, 5, 12, 7, 8, 3, 6, 11] (Fitness: 431684)
27 | [6, 8, 9, 2, 0, 14, 10, 13, 5, 1, 7, 4, 3, 12, 11] (Fitness: 434238)
28 | [11, 8, 12, 2, 0, 14, 10, 5, 13, 1, 7, 4, 3, 9, 6] (Fitness: 434288)
29 | [3, 4, 12, 2, 13, 0, 10, 14, 5, 1, 7, 9, 6, 8, 11] (Fitness: 435106)
30 | [6, 1, 12, 2, 4, 14, 10, 13, 5, 0, 7, 8, 3, 9, 11] (Fitness: 435936)
31 | [6, 4, 12, 1, 0, 14, 10, 13, 5, 8, 7, 2, 3, 9, 11] (Fitness: 437544)
32 | [6, 4, 13, 2, 0, 11, 10, 12, 5, 1, 14, 8, 3, 9, 7] (Fitness: 438358)
33 | [9, 4, 5, 2, 12, 7, 10, 13, 0, 1, 14, 8, 3, 6, 11] (Fitness: 440144)
34 | [6, 4, 8, 12, 0, 14, 10, 13, 5, 9, 7, 2, 3, 1, 11] (Fitness: 440552)
35 | [12, 4, 9, 2, 0, 14, 10, 13, 1, 5, 7, 8, 3, 6, 11] (Fitness: 444266)
36 | [3, 4, 12, 2, 0, 14, 10, 7, 5, 1, 6, 11, 8, 9, 13] (Fitness: 448348)
37 | [6, 10, 12, 4, 0, 7, 2, 13, 5, 1, 14, 8, 3, 9, 11] (Fitness: 455214)
38 | [3, 4, 12, 2, 7, 14, 0, 8, 5, 1, 10, 13, 6, 9, 11] (Fitness: 459726)
39 | [6, 4, 12, 5, 11, 14, 10, 2, 13, 1, 7, 0, 3, 9, 8] (Fitness: 461144)
40 | [10, 14, 12, 2, 9, 4, 6, 13, 7, 1, 5, 8, 3, 0, 11] (Fitness: 461972)
41 | [9, 10, 1, 2, 0, 14, 8, 13, 5, 12, 7, 4, 3, 6, 11] (Fitness: 462468)
42 | [2, 6, 12, 4, 8, 14, 10, 13, 5, 1, 7, 0, 3, 9, 11] (Fitness: 463932)
43 | [14, 4, 3, 2, 0, 8, 10, 13, 1, 5, 7, 11, 12, 9, 6] (Fitness: 464622)
44 | [9, 4, 3, 2, 6, 14, 10, 13, 8, 1, 7, 5, 12, 0, 11] (Fitness: 464820)
45 | [12, 4, 6, 2, 0, 11, 10, 14, 8, 5, 13, 1, 3, 9, 7] (Fitness: 468120)
46 | [6, 4, 12, 2, 7, 14, 10, 1, 9, 13, 11, 8, 3, 5, 0] (Fitness: 471424)
47 | [6, 5, 1, 8, 7, 14, 10, 3, 4, 12, 0, 2, 9, 13, 11] (Fitness: 471704)
48 | [6, 4, 10, 2, 0, 14, 12, 13, 5, 11, 7, 8, 3, 9, 1] (Fitness: 480336)
49 | [9, 4, 12, 0, 2, 3, 10, 11, 14, 1, 7, 8, 6, 5, 13] (Fitness: 488198)

Tabla resumen:

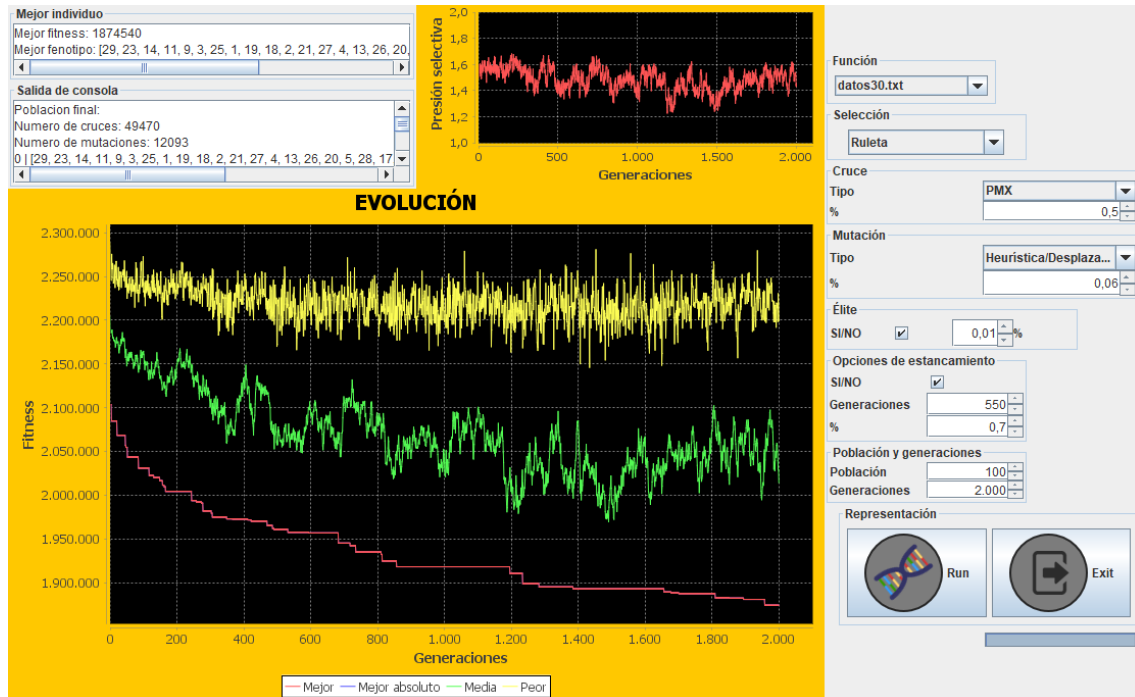| Nº Ejecución	Individuo	Aptitud
1	[5, 0, 12, 7, 4, 3, 6, 11, 8, 9, 13, 14, 1, 10, 2]	396492
2	[13, 0, 12, 2, 8, 4, 6, 5, 3, 10, 11, 7, 1, 9, 14]	394654
3	[13, 0, 12, 2, 8, 4, 6, 5, 3, 10, 11, 7, 1, 9, 14]	394654
4	[14, 4, 13, 7, 12, 2, 6, 11, 1, 0, 8, 9, 10, 5, 3]	399670
5	[3, 0, 13, 11, 12, 4, 6, 7, 8, 9, 14, 5, 10, 1, 2]	394658
6	[8, 7, 12, 0, 6, 1, 4, 13, 3, 11, 10, 14, 2, 5, 9]	401276
7	[13, 8, 14, 11, 12, 3, 10, 4, 9, 0, 2, 5, 6, 7, 1]	391586
8	[9, 1, 12, 14, 4, 2, 6, 10, 13, 11, 8, 7, 0, 5, 3]	392520
9	[6, 8, 4, 2, 12, 7, 5, 3, 0, 10, 1, 11, 13, 9, 14]	401936
10	[6, 4, 12, 3, 9, 0, 8, 7, 5, 1, 13, 14, 2, 10, 11]	391744
11	[0, 8, 4, 11, 12, 2, 6, 14, 13, 7, 1, 5, 10, 9, 3]	391288
12	[0, 11, 2, 8, 1, 3, 10, 6, 14, 13, 9, 5, 4, 7, 12]	395612
13	[12, 5, 13, 8, 1, 6, 4, 2, 7, 3, 10, 11, 0, 14, 9]	399452
14	[6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11]	388214
15	[9, 3, 2, 4, 7, 0, 8, 1, 11, 10, 14, 13, 5, 6, 12]	391170
16	[8, 6, 7, 12, 11, 0, 10, 9, 2, 14, 5, 1, 3, 4, 13]	404332
17	[9, 13, 12, 0, 14, 3, 10, 7, 1, 11, 4, 5, 6, 8, 2]	404012
18	[8, 4, 12, 7, 0, 3, 10, 5, 1, 11, 13, 14, 9, 6, 2]	402290
19	[8, 5, 13, 9, 7, 6, 2, 4, 1, 11, 14, 10, 3, 12, 0]	398010
20	[10, 9, 0, 6, 14, 11, 3, 1, 4, 8, 12, 5, 13, 2, 7]	405440

Mejor solución: 388214

Peor solución: 405440

Media: 396950.5

Desviación típica: 4991.986653628

Problema 3: datos30.dat

Ejecución representativa:

Individuo solución: [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6]

Aptitud máxima: 1874540

Aptitud media: 2014473.68

Aptitud mínima: 2198958

Numero de cruces: 49470

Numero de mutaciones: 12093

Población final:

0 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)
1 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)
2 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)
3 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)
4 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)
5 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)
6 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)

7 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)

8 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 15, 22, 6] (Fitness: 1898796)

9 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 15, 22, 6] (Fitness: 1898796)

10 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 6, 22, 15] (Fitness: 1906110)

11 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 5, 4, 13, 26, 20, 27, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1909386)

12 | [29, 23, 14, 7, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 11, 16, 6, 10, 12, 24, 0, 15, 22, 8] (Fitness: 1911564)

13 | [29, 6, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 23] (Fitness: 1920704)

14 | [29, 6, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 23] (Fitness: 1920704)

15 | [29, 23, 14, 11, 9, 3, 26, 1, 25, 18, 2, 21, 27, 4, 13, 19, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1920890)

16 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 22, 15, 6] (Fitness: 1921586)

17 | [29, 23, 14, 6, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 11, 22, 15] (Fitness: 1922730)

18 | [29, 23, 14, 11, 9, 3, 19, 1, 25, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 6] (Fitness: 1926204)

19 | [29, 23, 14, 11, 9, 3, 19, 1, 25, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 15, 24, 0, 12, 22, 6] (Fitness: 1928222)

20 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 6, 22, 15] (Fitness: 1931556)

21 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 6, 22, 15] (Fitness: 1931556)

22 | [6, 23, 14, 11, 9, 3, 25, 1, 26, 18, 2, 21, 27, 4, 13, 19, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 29] (Fitness: 1936576)

23 | [6, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 29] (Fitness: 1940618)

24 | [6, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 29] (Fitness: 1940618)

25 | [6, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 29] (Fitness: 1940618)

26 | [6, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 29] (Fitness: 1940618)

27 | [6, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 29] (Fitness: 1940618)

28 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 6, 22, 15, 0] (Fitness: 1950322)

29 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 6, 22, 15] (Fitness: 1953356)

30 | [6, 20, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 23, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 29, 22, 15] (Fitness: 1962814)

31 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 5, 4, 13, 26, 20, 27, 28, 17, 7, 16, 8, 10, 24, 12, 0, 6, 22, 15] (Fitness: 1963174)

32 | [29, 23, 14, 11, 9, 3, 0, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 25, 6, 22, 15] (Fitness: 1963868)

33 | [29, 23, 14, 11, 9, 3, 19, 1, 25, 18, 2, 21, 27, 0, 13, 26, 20, 5, 28, 17, 7, 16, 8, 12, 24, 22, 4, 15, 10, 6] (Fitness: 1967132)

34 | [29, 10, 14, 0, 9, 3, 25, 1, 19, 18, 2, 21, 5, 4, 13, 26, 20, 27, 28, 17, 7, 16, 8, 22, 12, 24, 11, 15, 23, 6] (Fitness: 1971730)

35 | [29, 6, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 15, 12, 0, 24, 22, 23] (Fitness: 1973908)

36 | [6, 23, 14, 9, 11, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 29] (Fitness: 1974356)

37 | [29, 23, 14, 11, 9, 3, 0, 19, 26, 18, 2, 21, 27, 4, 13, 1, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 25, 15, 22, 6] (Fitness: 1977374)

38 | [29, 23, 22, 7, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 11, 16, 8, 10, 24, 12, 0, 6, 14, 15] (Fitness: 1984368)

39 | [29, 23, 22, 7, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 11, 16, 8, 10, 24, 12, 0, 6, 14, 15] (Fitness: 1984368)

40 | [11, 23, 14, 15, 9, 3, 25, 1, 19, 18, 2, 21, 0, 4, 13, 26, 20, 5, 28, 17, 7, 29, 16, 10, 12, 6, 27, 22, 8, 24] (Fitness: 1985328)

41 | [11, 23, 14, 15, 9, 3, 25, 1, 19, 18, 2, 21, 0, 4, 13, 26, 20, 5, 28, 17, 7, 29, 16, 10, 12, 6, 27, 22, 8, 24] (Fitness: 1985328)

42 | [29, 23, 15, 7, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 11, 16, 8, 10, 24, 12, 0, 6, 14, 22] (Fitness: 1989226)

43 | [12, 29, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 23, 28, 17, 7, 16, 8, 10, 22, 24, 0, 6, 5, 15] (Fitness: 1989810)

44 | [29, 23, 14, 6, 9, 3, 0, 1, 19, 18, 2, 21, 27, 16, 13, 26, 20, 5, 28, 17, 7, 11, 8, 10, 12, 24, 25, 22, 15, 4] (Fitness: 1991810)

45 | [29, 23, 14, 6, 9, 3, 0, 1, 19, 18, 2, 21, 27, 16, 13, 26, 20, 5, 28, 17, 7, 11, 8, 10, 12, 24, 25, 22, 15, 4] (Fitness: 1991810)

46 | [29, 1, 22, 11, 9, 3, 25, 23, 19, 18, 2, 21, 27, 0, 13, 26, 20, 5, 28, 17, 7, 16, 6, 10, 12, 24, 4, 15, 14, 8] (Fitness: 1992492)

47 | [8, 15, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 23, 5, 28, 17, 7, 29, 16, 10, 12, 24, 0, 20, 22, 6] (Fitness: 1996588)

48 | [8, 15, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 23, 5, 28, 17, 7, 29, 16, 10, 12, 24, 0, 20, 22, 6] (Fitness: 1996588)

49 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 0, 4, 13, 26, 20, 5, 28, 17, 7, 16, 10, 15, 12, 27, 24, 22, 8, 6] (Fitness: 2019208)

50 | [29, 1, 14, 11, 9, 25, 10, 23, 19, 18, 2, 21, 27, 0, 13, 26, 20, 5, 28, 17, 7, 16, 8, 12, 24, 22, 4, 15, 3, 6] (Fitness: 2019814)

51 | [29, 1, 14, 11, 9, 25, 10, 23, 19, 18, 2, 21, 27, 0, 13, 26, 20, 5, 28, 17, 7, 16, 8, 12, 24, 22, 4, 15, 3, 6] (Fitness: 2019814)

52 | [25, 20, 14, 11, 9, 3, 29, 23, 19, 18, 2, 21, 27, 4, 13, 26, 1, 5, 28, 17, 7, 16, 6, 10, 12, 8, 0, 24, 22, 15] (Fitness: 2020354)

53 | [29, 12, 14, 11, 9, 0, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 10, 28, 17, 7, 16, 8, 5, 24, 6, 3, 15, 22, 23] (Fitness: 2022456)

54 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 7, 5, 28, 17, 16, 8, 12, 15, 24, 6, 22, 10, 0] (Fitness: 2022794)

55 | [29, 18, 14, 6, 9, 3, 25, 1, 19, 4, 11, 21, 2, 27, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 15, 22, 23] (Fitness: 2025254)

56 | [8, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 13, 26, 6, 15, 5, 28, 17, 7, 29, 16, 10, 12, 24, 0, 20, 22, 4] (Fitness: 2026296)

57 | [29, 0, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 15, 7, 16, 6, 23, 12, 24, 10, 22, 17, 8] (Fitness: 2031830)

58 | [29, 23, 10, 11, 9, 3, 26, 1, 25, 16, 2, 21, 27, 4, 13, 19, 20, 5, 28, 17, 7, 18, 8, 12, 24, 22, 0, 15, 14, 6] (Fitness: 2034232)

59 | [29, 1, 14, 11, 9, 25, 12, 23, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 15, 24, 6, 22, 3, 0] (Fitness: 2039392)

60 | [29, 10, 14, 0, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 15, 7, 16, 6, 23, 12, 24, 11, 17, 22, 8] (Fitness: 2041692)

61 | [29, 23, 14, 11, 9, 3, 0, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 7, 5, 28, 17, 16, 8, 12, 15, 24, 6, 22, 10, 25] (Fitness: 2048862)

62 | [29, 23, 14, 11, 9, 3, 0, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 7, 5, 28, 17, 16, 8, 12, 15, 24, 6, 22, 10, 25] (Fitness: 2048862)

63 | [29, 23, 14, 11, 9, 3, 0, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 7, 5, 28, 17, 16, 8, 12, 15, 24, 6, 22, 10, 25] (Fitness: 2048862)

64 | [24, 1, 14, 6, 9, 3, 25, 23, 19, 18, 2, 21, 27, 4, 13, 26, 12, 5, 11, 17, 7, 16, 20, 10, 28, 0, 29, 8, 22, 15] (Fitness: 2049910)

65 | [29, 23, 14, 11, 9, 3, 19, 1, 21, 0, 13, 26, 27, 4, 2, 25, 12, 28, 5, 17, 7, 18, 8, 10, 24, 20, 16, 15, 22, 6] (Fitness: 2053300)

66 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 22, 26, 5, 28, 17, 7, 16, 8, 10, 13, 12, 24, 0, 15, 20, 6] (Fitness: 2053430)

67 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 4, 6, 21, 2, 27, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 22, 15, 18] (Fitness: 2054530)

68 | [24, 1, 14, 6, 9, 3, 25, 7, 19, 18, 2, 21, 27, 4, 13, 26, 12, 28, 17, 15, 5, 16, 20, 10, 11, 0, 29, 8, 22, 23] (Fitness: 2064476)

69 | [6, 1, 14, 0, 9, 3, 25, 23, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 15, 7, 24, 8, 10, 12, 16, 11, 17, 22, 29] (Fitness: 2067542)

70 | [20, 25, 14, 11, 9, 22, 2, 1, 21, 19, 18, 4, 27, 13, 26, 23, 29, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 6, 3, 15] (Fitness: 2069652)

71 | [29, 23, 14, 6, 9, 3, 25, 1, 19, 4, 11, 21, 2, 27, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 22, 15, 18] (Fitness: 2071866)

72 | [23, 15, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 20, 5, 28, 17, 7, 16, 29, 8, 10, 12, 24, 26, 22, 0, 6] (Fitness: 2073116)

73 | [29, 23, 14, 16, 9, 3, 19, 1, 25, 18, 2, 21, 27, 13, 26, 20, 8, 5, 28, 17, 7, 6, 11, 10, 12, 15, 24, 0, 4, 22] (Fitness: 2081370)

74 | [4, 23, 14, 9, 3, 11, 25, 1, 19, 18, 2, 21, 27, 13, 26, 6, 15, 5, 17, 28, 7, 16, 8, 10, 12, 24, 0, 20, 22, 29] (Fitness: 2082932)

75 | [29, 23, 6, 11, 9, 3, 26, 1, 25, 16, 2, 21, 0, 4, 13, 19, 20, 5, 28, 17, 7, 18, 10, 15, 12, 27, 24, 22, 8, 14] (Fitness: 2084036)

76 | [29, 10, 22, 0, 9, 3, 25, 1, 19, 24, 2, 21, 27, 4, 13, 26, 20, 5, 28, 15, 7, 16, 6, 23, 12, 18, 11, 17, 14, 8] (Fitness: 2087088)

77 | [29, 23, 12, 11, 9, 3, 25, 1, 19, 17, 2, 21, 0, 4, 13, 26, 20, 5, 28, 18, 7, 16, 15, 8, 24, 22, 27, 10, 14, 6] (Fitness: 2087450)

78 | [24, 1, 14, 6, 9, 3, 25, 23, 19, 18, 2, 21, 27, 4, 13, 26, 12, 28, 17, 15, 5, 16, 20, 10, 7, 0, 29, 8, 22, 11] (Fitness: 2091844)

79 | [24, 1, 14, 6, 9, 3, 25, 23, 19, 18, 2, 21, 27, 4, 13, 26, 12, 28, 17, 15, 5, 16, 20, 10, 7, 0, 29, 8, 22, 11] (Fitness: 2091844)

80 | [23, 10, 14, 19, 9, 3, 6, 1, 29, 2, 25, 21, 27, 4, 13, 26, 20, 5, 11, 17, 7, 28, 15, 8, 24, 12, 22, 0, 16, 18] (Fitness: 2094452)

81 | [23, 15, 14, 11, 9, 3, 0, 19, 26, 18, 2, 21, 27, 4, 13, 20, 5, 28, 17, 7, 16, 29, 8, 10, 12, 24, 1, 22, 25, 6] (Fitness: 2098620)

82 | [0, 11, 23, 22, 9, 14, 20, 26, 19, 18, 2, 21, 27, 4, 13, 6, 15, 5, 28, 17, 7, 24, 8, 10, 12, 1, 3, 16, 29, 25] (Fitness: 2101664)

83 | [0, 11, 23, 22, 9, 14, 20, 26, 19, 18, 2, 21, 27, 4, 13, 6, 15, 5, 28, 17, 7, 24, 8, 10, 12, 1, 3, 16, 29, 25] (Fitness: 2101664)

84 | [0, 11, 23, 22, 9, 14, 20, 26, 19, 18, 2, 21, 27, 4, 13, 6, 15, 5, 28, 17, 7, 24, 8, 10, 12, 1, 3, 16, 29, 25] (Fitness: 2101664)

85 | [12, 23, 14, 11, 9, 3, 0, 1, 21, 19, 18, 4, 27, 13, 26, 20, 29, 25, 28, 17, 7, 16, 8, 10, 22, 24, 2, 6, 5, 15] (Fitness: 2104222)

86 | [12, 20, 14, 11, 9, 22, 2, 1, 21, 19, 18, 4, 27, 13, 26, 23, 29, 25, 28, 17, 7, 16, 8, 10, 3, 24, 0, 6, 5, 15] (Fitness: 2110062)

87 | [29, 23, 12, 11, 9, 3, 25, 1, 19, 17, 2, 21, 4, 13, 26, 0, 20, 5, 28, 18, 7, 16, 15, 8, 24, 22, 27, 10, 14, 6] (Fitness: 2112042)

88 | [29, 3, 23, 11, 25, 1, 19, 2, 9, 6, 21, 14, 4, 27, 26, 13, 20, 5, 28, 17, 7, 16, 8, 10, 12, 18, 0, 24, 15, 22] (Fitness: 2114402)

89 | [6, 14, 9, 11, 3, 23, 19, 1, 25, 18, 2, 21, 27, 13, 26, 20, 8, 5, 28, 17, 7, 29, 16, 10, 12, 15, 24, 0, 4, 22] (Fitness: 2117956)

90 | [6, 23, 14, 11, 9, 3, 25, 1, 19, 4, 16, 21, 2, 27, 13, 26, 20, 5, 28, 15, 24, 18, 10, 7, 12, 17, 29, 22, 8, 0] (Fitness: 2118322)

91 | [1, 6, 3, 11, 14, 9, 25, 23, 19, 18, 2, 21, 27, 4, 13, 26, 20, 7, 5, 28, 17, 16, 8, 12, 15, 10, 0, 24, 22, 29] (Fitness: 2145086)

92 | [18, 23, 14, 7, 9, 3, 19, 1, 29, 2, 25, 21, 27, 4, 13, 26, 20, 28, 17, 15, 5, 16, 6, 10, 12, 8, 0, 24, 22, 11] (Fitness: 2151178)

93 | [29, 20, 14, 11, 9, 22, 25, 2, 1, 18, 0, 21, 27, 4, 13, 19, 26, 23, 7, 5, 28, 17, 16, 8, 12, 15, 24, 6, 3, 10] (Fitness: 2172130)

94 | [18, 23, 14, 11, 9, 19, 1, 2, 25, 21, 27, 20, 4, 13, 26, 3, 5, 28, 17, 7, 29, 0, 16, 6, 10, 12, 8, 24, 22, 15] (Fitness: 2179392)

95 | [29, 12, 8, 26, 21, 9, 3, 23, 25, 1, 11, 19, 2, 17, 0, 4, 13, 20, 5, 18, 7, 16, 24, 22, 27, 10, 28, 14, 15, 6] (Fitness: 2181810)

96 | [1, 29, 11, 9, 3, 6, 19, 24, 18, 2, 21, 14, 4, 27, 26, 20, 5, 28, 17, 7, 16, 8, 10, 13, 12, 15, 0, 22, 23, 25] (Fitness: 2188540)

97 | [24, 2, 23, 8, 9, 14, 28, 5, 11, 13, 7, 17, 18, 1, 21, 4, 3, 26, 20, 27, 19, 16, 22, 10, 15, 12, 0, 6, 29, 25] (Fitness: 2192042)

98 | [29, 3, 23, 11, 25, 1, 19, 2, 9, 6, 21, 14, 4, 27, 26, 20, 5, 28, 17, 7, 16, 8, 10, 13, 12, 24, 0, 18, 15, 22] (Fitness: 2198514)

99 | [3, 11, 20, 19, 9, 6, 27, 25, 13, 1, 14, 28, 21, 29, 4, 7, 16, 26, 8, 15, 24, 23, 0, 18, 17, 5, 2, 12, 10, 22] (Fitness: 2198958)

Tabla resumen:

Nº Ejecución	Individuo	Aptitud
1	[6, 20, 27, 19, 28, 21, 3, 2, 4, 8, 7, 23, 11, 24, 12, 5, 18, 29, 25, 10, 1, 9, 26, 16, 0, 17, 22, 14, 15, 13]	1916578
2	[14, 18, 25, 8, 11, 7, 12, 1, 9, 16, 15, 4, 10, 17, 27, 20, 21, 0, 6, 23, 5, 29, 26, 24, 3, 2, 19, 13, 22, 28]	1888216
3	[0, 11, 1, 4, 26, 25, 21, 18, 28, 16, 29, 12, 17, 15, 20, 9, 10, 22, 5, 8, 24, 3, 13, 7, 2, 19, 27, 23, 6, 14]	1905400
4	[13, 11, 12, 6, 26, 29, 9, 21, 23, 1, 4, 19, 18, 22, 24, 16, 7, 15, 25, 5, 3, 20, 17, 0, 2, 28, 27, 14, 8, 10]	1912518
5	[8, 6, 25, 17, 7, 9, 11, 5, 27, 2, 12, 18, 16, 14, 24, 15, 26, 23, 4, 20, 3, 21, 29, 1, 0, 10, 19, 13, 22, 28]	1918272
6	[27, 19, 0, 21, 22, 18, 23, 3, 15, 9, 17, 10, 1, 29, 20, 8, 24, 2, 28, 6, 7, 5, 14, 16, 4, 13, 11, 12, 25, 26]	1910258
7	[18, 20, 1, 4, 29, 19, 8, 10, 9, 0, 3, 21, 5, 15, 24, 23, 17, 25, 27, 13, 12, 26, 2, 22, 28, 6, 16, 11, 14, 7]	1903182
8	[0, 2, 13, 15, 9, 7, 6, 16, 14, 19, 3, 18, 21, 4, 23, 22, 1, 10, 8, 25, 17, 28, 12, 20, 26, 29, 27, 5, 24, 11]	1909976
9	[17, 19, 9, 26, 25, 15, 11, 0, 6, 27, 3, 16, 29, 7, 12, 8, 1, 21, 5, 24, 22, 4, 14, 23, 20, 13, 18, 28, 10, 2]	1894928
10	[17, 6, 12, 2, 9, 27, 16, 19, 8, 13, 11, 1, 0, 26, 3, 24, 10, 18, 7, 23, 28, 4, 25, 14, 5, 29, 21, 22, 20, 15]	1902742
11	[23, 14, 1, 9, 25, 28, 11, 8, 6, 21, 19, 3, 17, 18, 12, 15, 2, 22, 20, 24, 27, 26, 29, 16, 4, 13, 10, 7, 5, 0]	1907024
12	[14, 8, 25, 11, 26, 28, 4, 19, 13, 20, 5, 0, 22, 24, 27, 16, 21, 12, 2, 10, 18, 23, 1, 7, 15, 3, 29, 9, 17, 6]	1907448
13	[29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6]	1874540
14	[5, 27, 23, 2, 11, 7, 4, 1, 24, 0, 20, 18, 25, 13, 14, 3, 12, 10, 6, 16, 17, 29, 26, 15, 8, 19, 22, 9, 21, 28]	1876188
15	[11, 15, 1, 8, 23, 9, 4, 22, 12, 16, 28, 19, 5, 10, 27, 26, 20, 6, 2, 0, 17, 29, 21, 24, 25, 3, 14, 18, 7, 13]	1898272
16	[10, 27, 12, 20, 4, 3, 19, 15, 28, 22, 7, 9, 17, 14, 13, 5, 8, 18, 1, 25, 2, 26, 23, 0, 11, 16, 6, 21, 29, 24]	1914482
17	[29, 20, 6, 26, 18, 14, 9, 7, 0, 13, 17, 5, 25, 16, 8, 28, 24, 3, 2, 1, 10, 15, 22, 12, 21, 23, 11, 19, 27, 4]	1890264
18	[14, 5, 0, 25, 4, 6, 2, 1, 24, 16, 19, 17, 15, 20, 29, 11, 21, 7, 8, 10, 18, 23, 26, 9, 3, 27, 22, 13, 12, 28]	1880728
19	[17, 18, 1, 0, 4, 13, 29, 8, 11, 27, 24, 22, 7, 16, 19, 3, 28, 15, 6, 20, 14, 9, 25, 12, 26, 5, 23, 10, 2, 21]	1899872
20	[17, 18, 1, 0, 4, 13, 29, 8, 11, 27, 24, 22, 7, 16, 19, 3, 28, 15, 6, 20, 14, 9, 25, 12, 26, 5, 23, 10, 2, 21]	1899872

Mejor solución: 1874540

Peor solución: 1918272

Media: 1900538

Desviación típica: 12599.0578