



ALGORITMOS GENÉTICOS



01 introducción

04 mutación

02 selección

05 corte

03 cruza

06 conclusiones

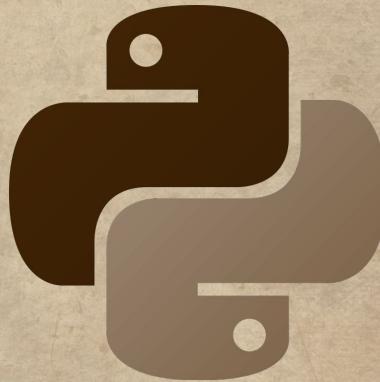
INTRODUCCIÓN



TECNOLOGÍAS UTILIZADAS



PyTHON



matplotlib

GLOVES



01

WEAPON



02

ITEMS



05

HELMET



04

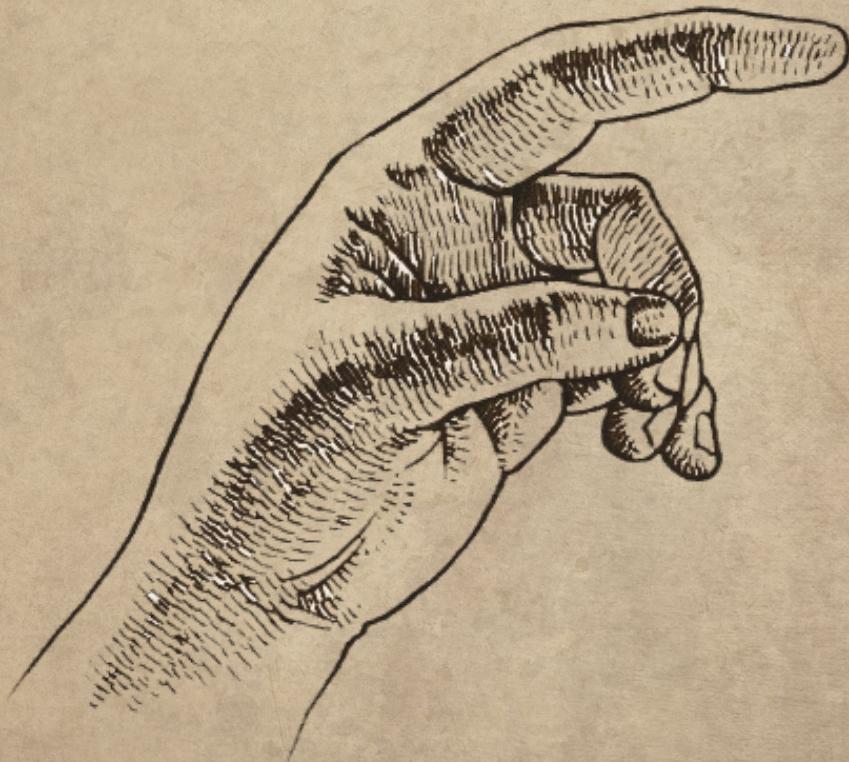
BREASTPLATE



03

BOOTS

SELECCIÓN



TIPOS DE SELECCIÓN

01

ELITE

02

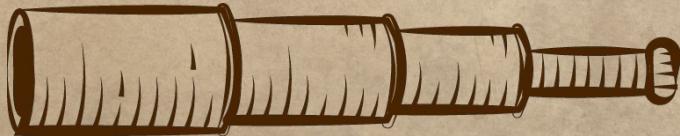
ROULETTE

03

UNIVERSAL

04

BOLTZMANN



TIPOS DE SELECCIÓN

05

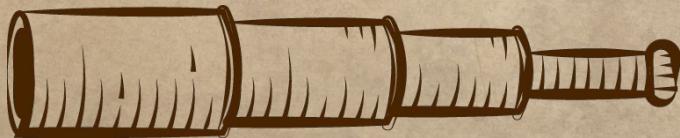
TORNEOS
DETERMINÍSTICOS

06

TORNEOS
PROBABILÍSTICOS

07

Ranking



PSEUDO FITNESS

BOLTZMANN

$$ExpVal(i, g, T) = \frac{e^{f(i)/T}}{\langle e^{f(x)/T} \rangle_g}$$

i : Individuo ; T : Temperatura
 $\langle \rangle_g$: Avg(population(g)) $f(i)$: Fitness

$$\tau(t) = \tau_{\min} + (\tau_0 - \tau_{\min}) * e^{-kt}$$

RANKING

$$f'(i) = \frac{N - rank(i)}{N}$$
$$rank(i) \in [1, N]$$

rank(i): ranking ordenado de mayor a menor aptitud real

SELECCIÓN POST MUTACIÓN

08

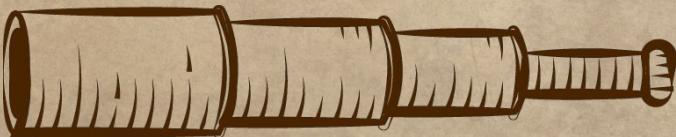
FILL ALL

Se toman N individuos entre la generación actual y los hijos

09

FILL PARENT

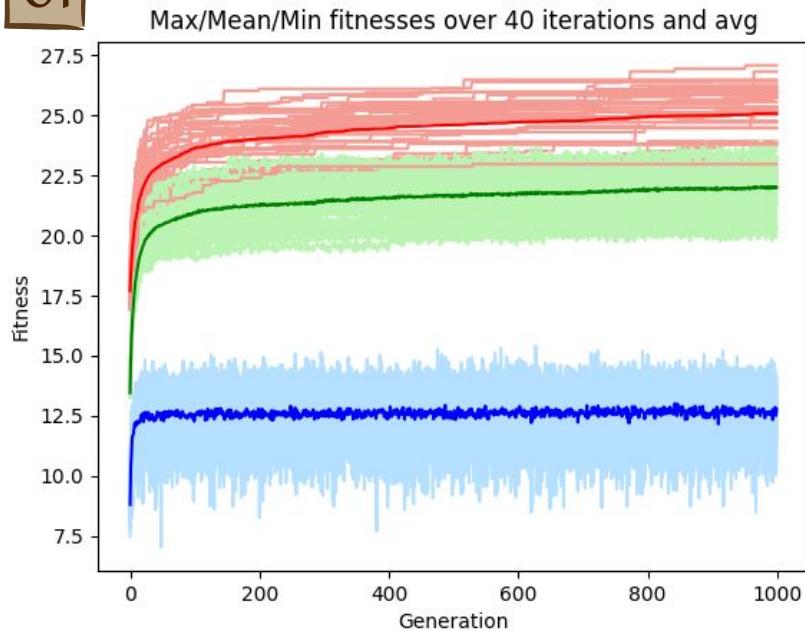
Se toman todos los hijos posibles y si necesito más individuos, tomo de los padres



TODO ELITE PARA MÚLTIPLES CLASES

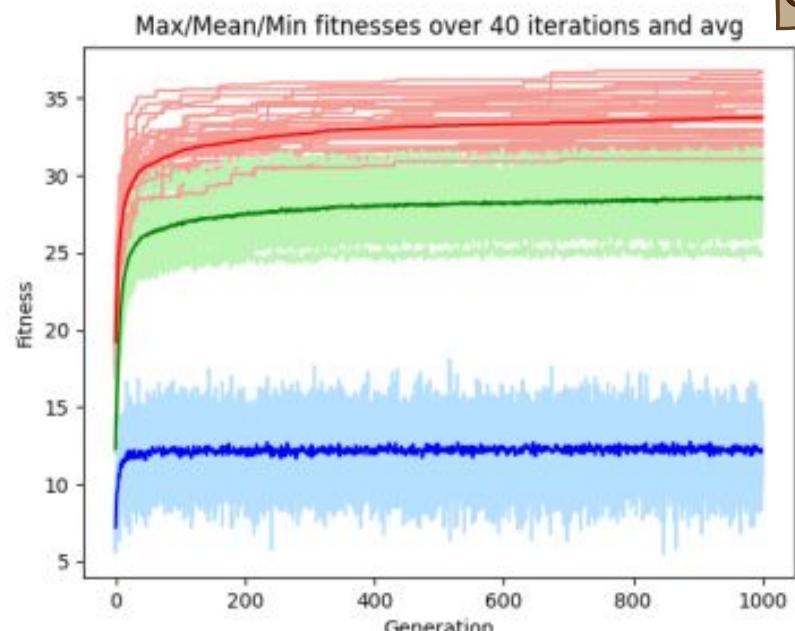
Warrior

01



Infiltrate

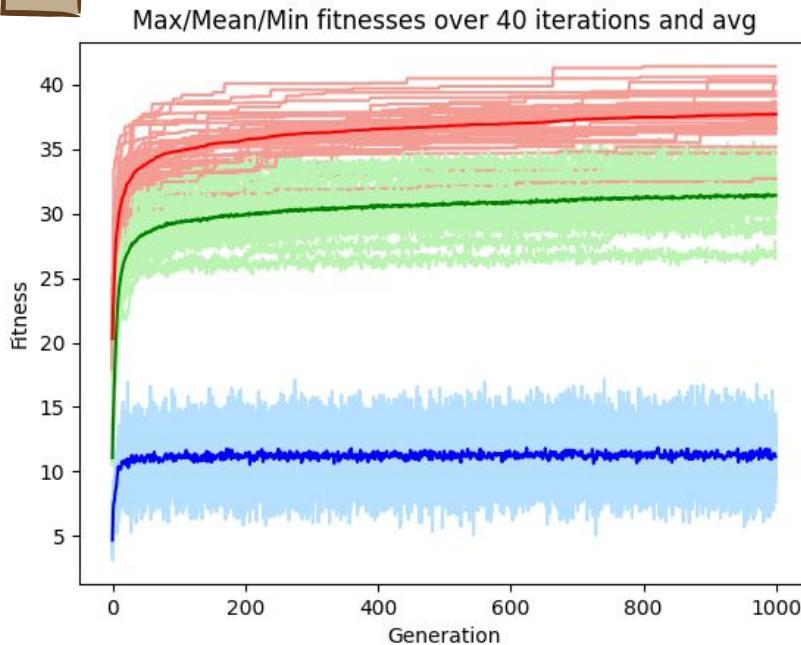
02



TODO ELITE PARA MÚLTIPLES CLASES

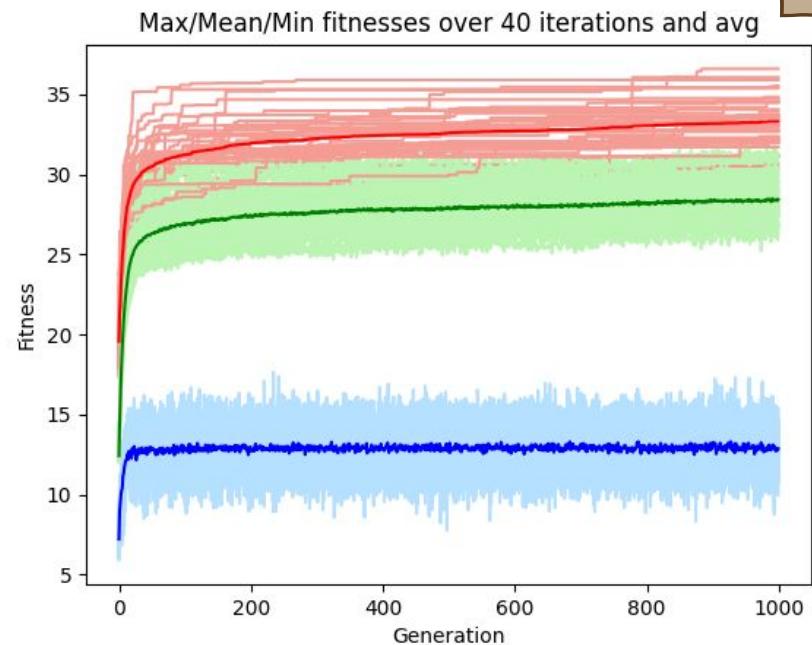
Archer

03



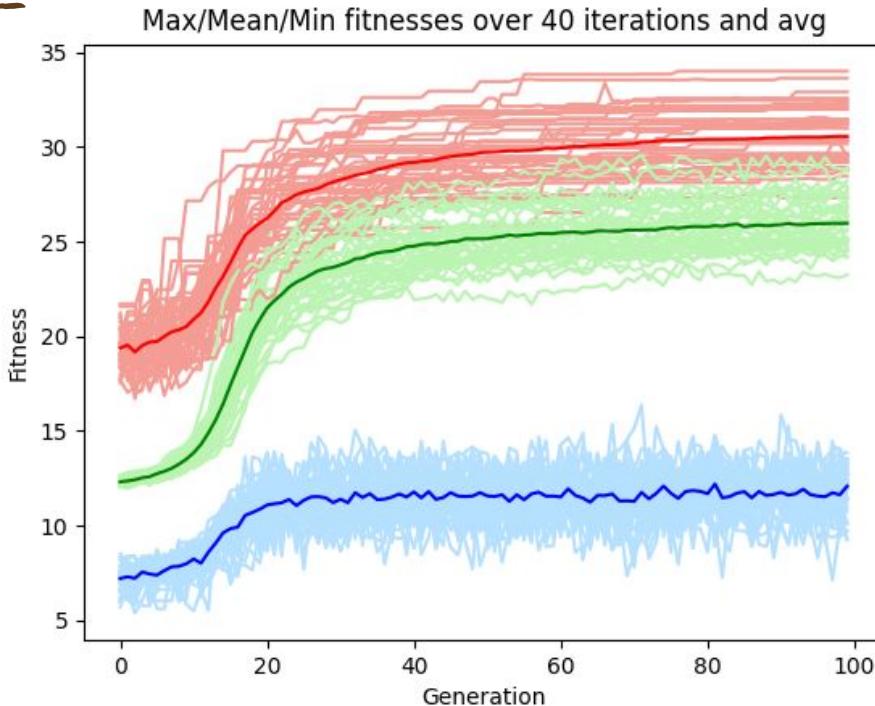
Defender

04



TODO BOLTZMANN

05

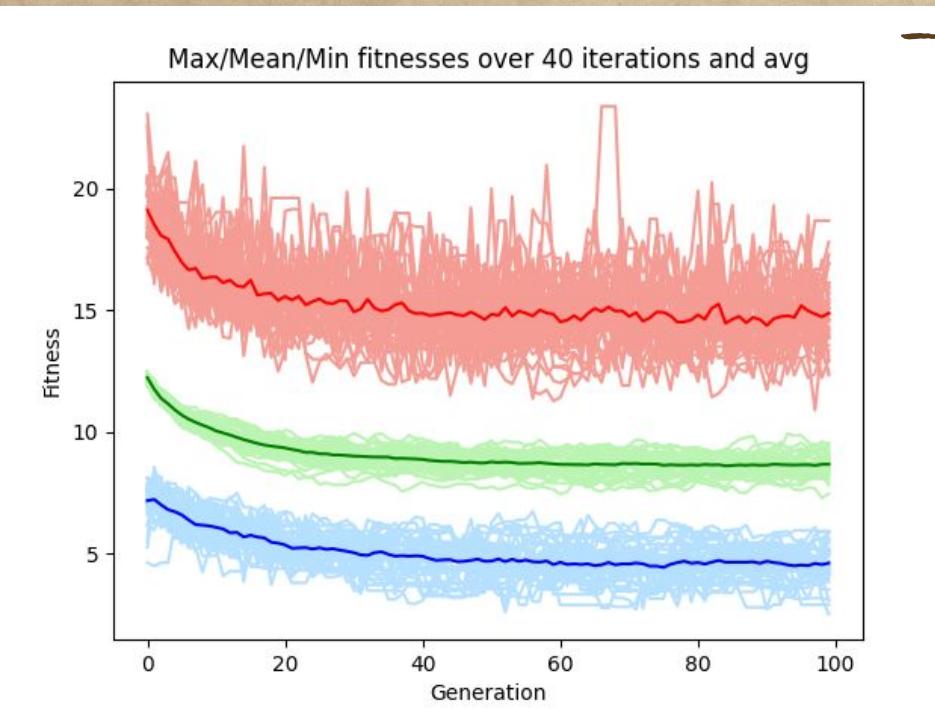


*Gráfico realizado para la clase Infiltrate

TORNEO PROBABILISTICO

Threshold = 0.5

06

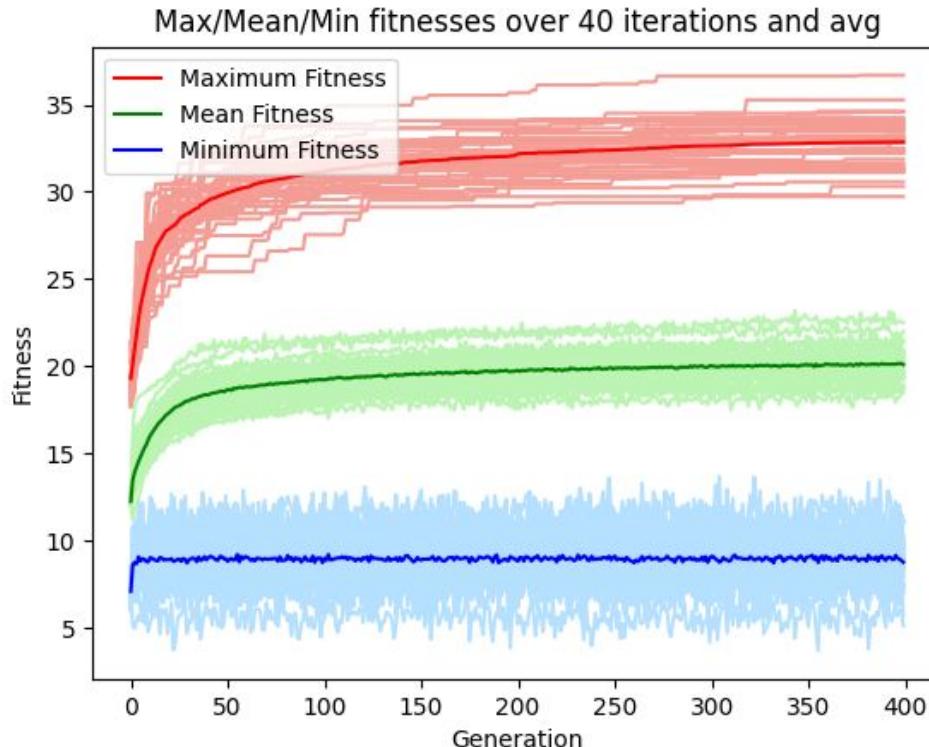


*Gráfico realizado para la clase Infiltrate

EJEMPLO DE MEZCLA DE ALGORITMOS 2

Elite y ranking para padres e individuos con 50%

07 →

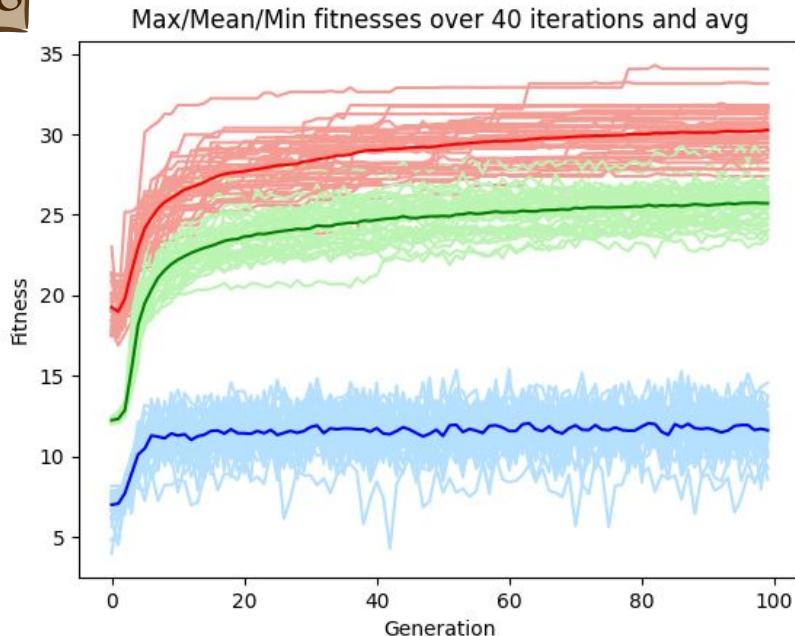


EJEMPLO DE TODO BOLTZMANN CON DISTINTO K

Elite y ranking para padres e individuos con 50%

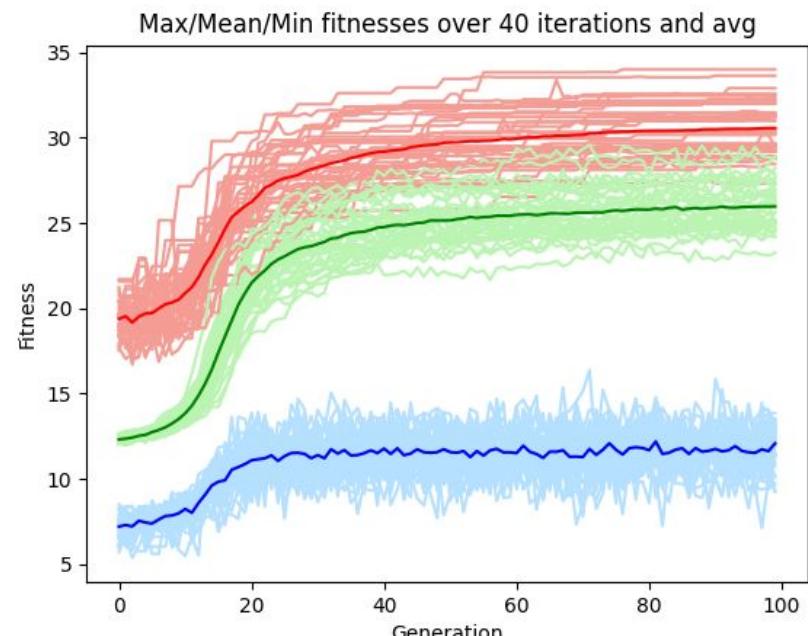
$$K = 2 / \text{Temp} = 50$$

08



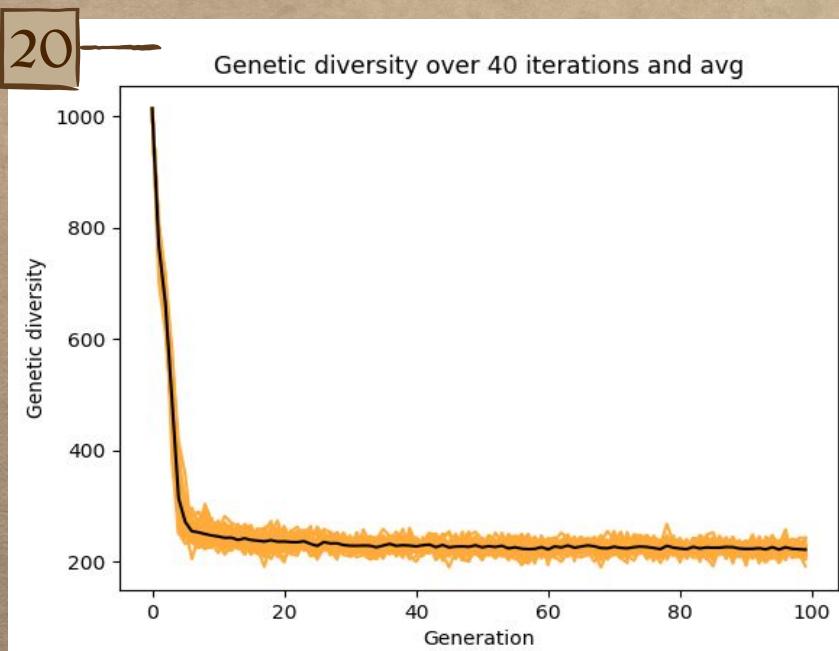
$$K = 0.2 / \text{Temp} = 50$$

09

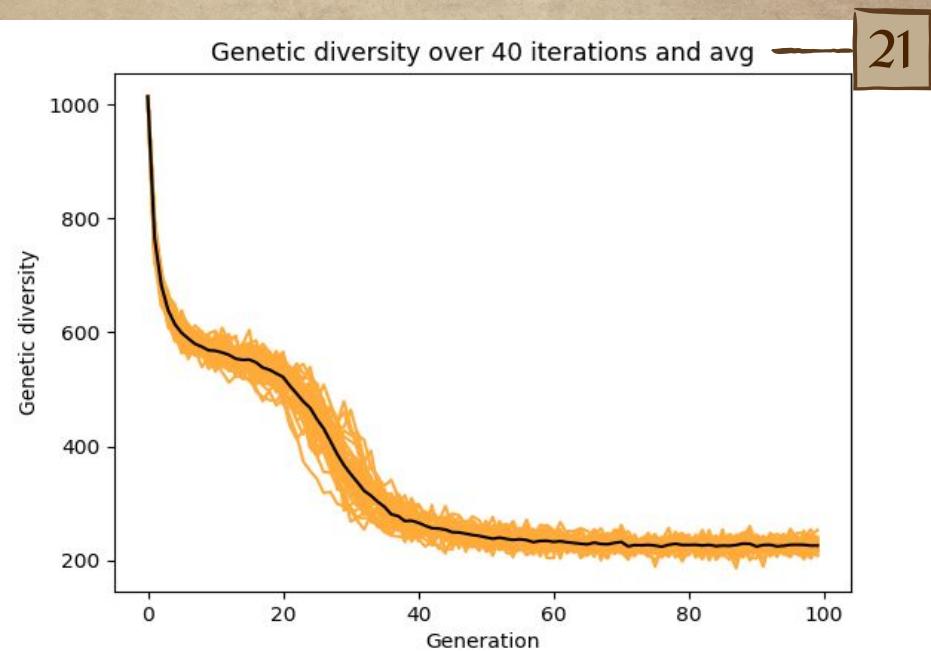


DIVERSIDAD PARA BOLTZMANN

K = 2



K = 0.1

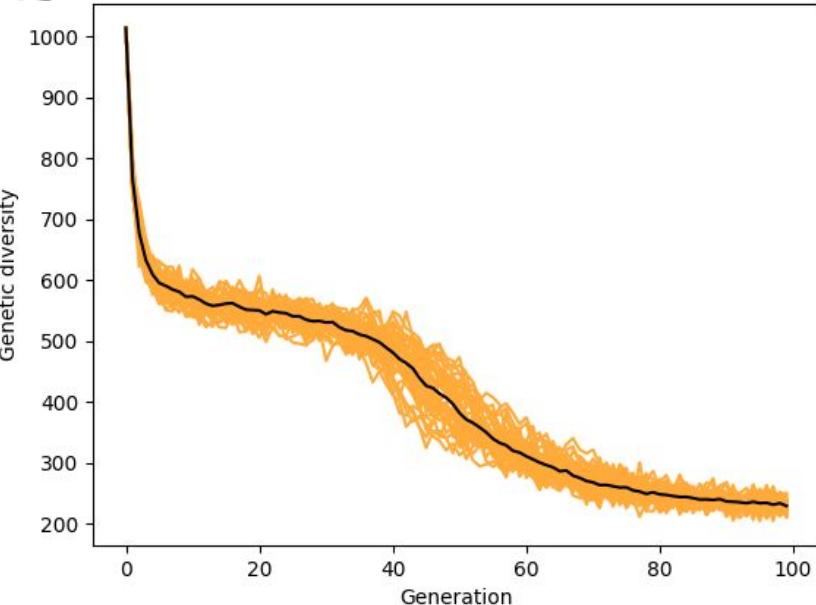


DIVERSIDAD PARA BOLTZMANN

K = 0.05

22

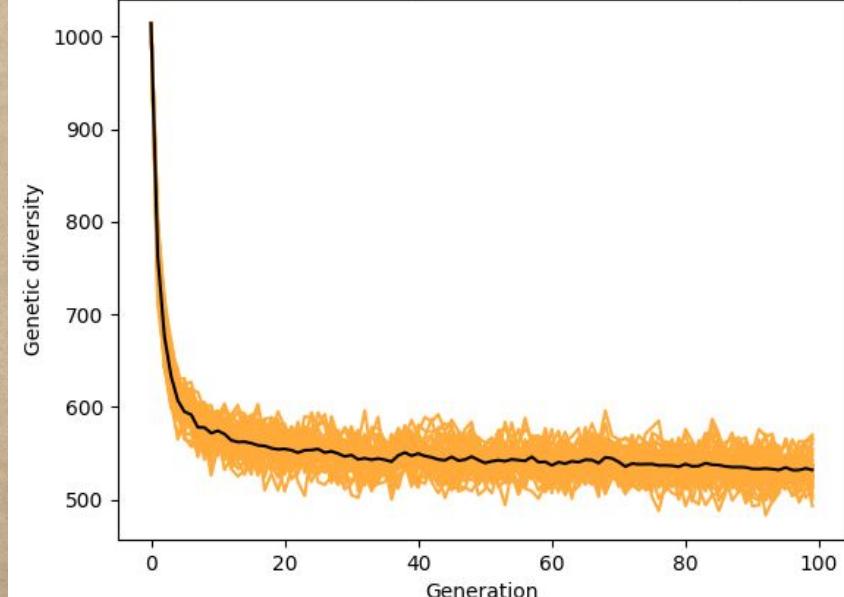
Genetic diversity over 40 iterations and avg



K = 0.01

23

Genetic diversity over 40 iterations and avg

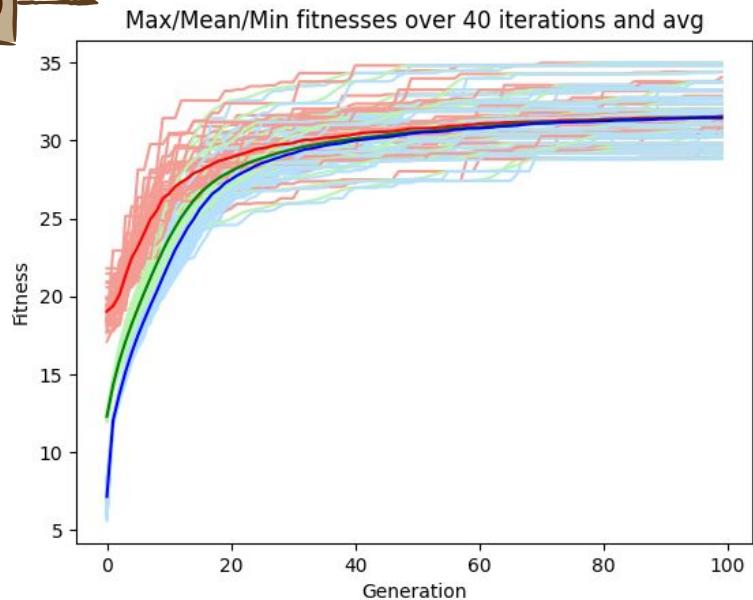


COMPARACION FILL ALL Y FILL PARENT

Ruleta y Torneo Probabilístico para padres ($\alpha=0.8$) y solo Élite para selección de individuos

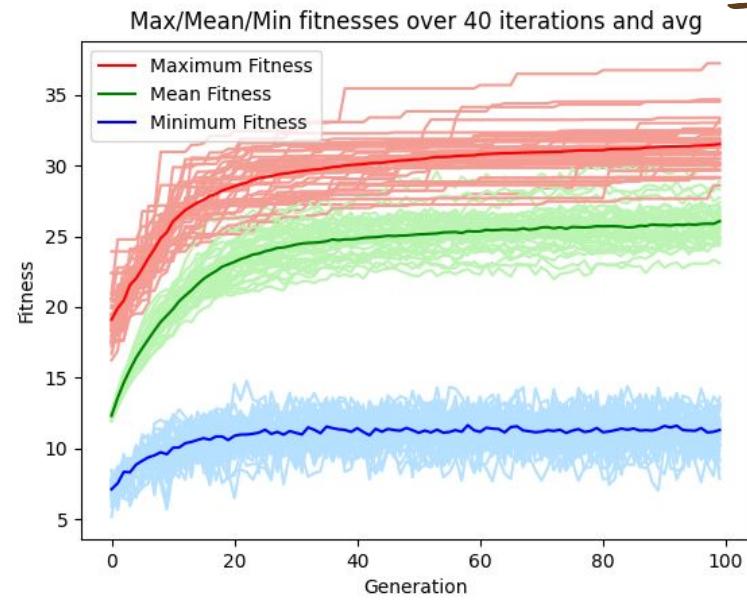
FILL ALL

10

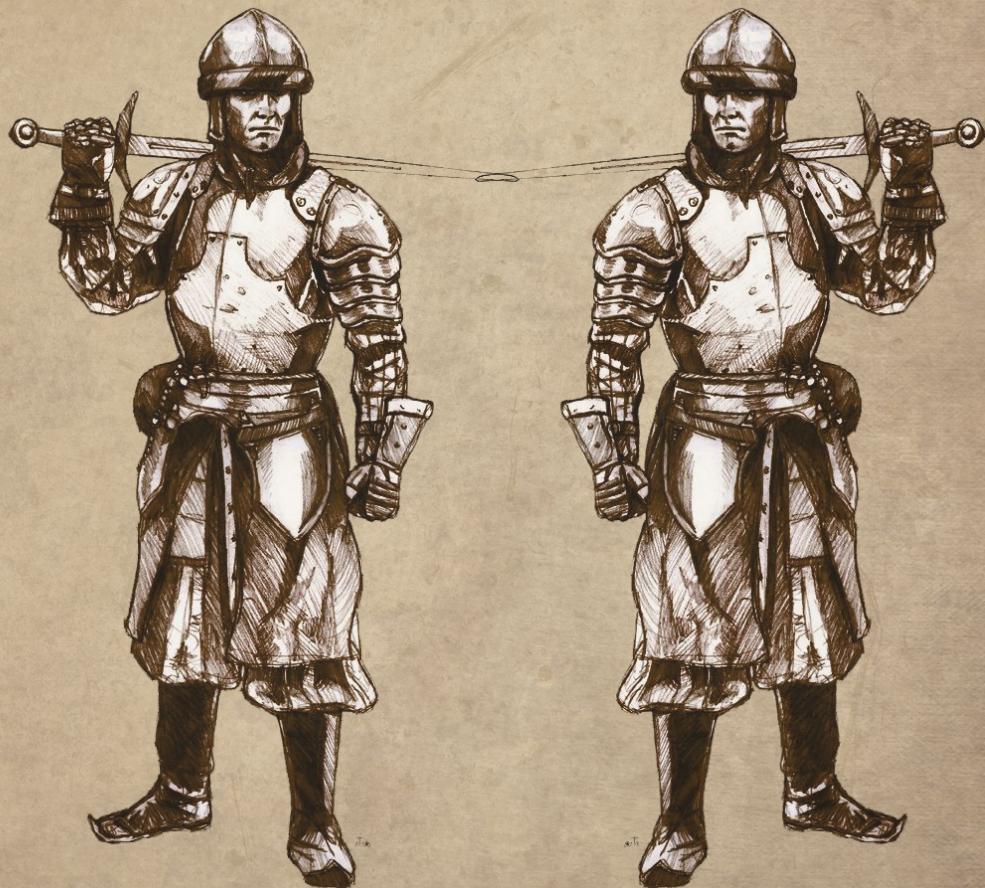


FILL PARENT

11



cruza



TIPOS DE CRUZA

01

UN PUNTO

Se toma un número al azar y se intercambian los alelos a partir de ese punto

02

DOS PUNTOS

Se toman dos números al azar y se intercambian los alelos entre esos puntos

03

CRUCE
ANULAR

Se toma un punto al azar P y una longitud L. Se cambian los L genes a partir de P

04

CRUCE
UNIFORME

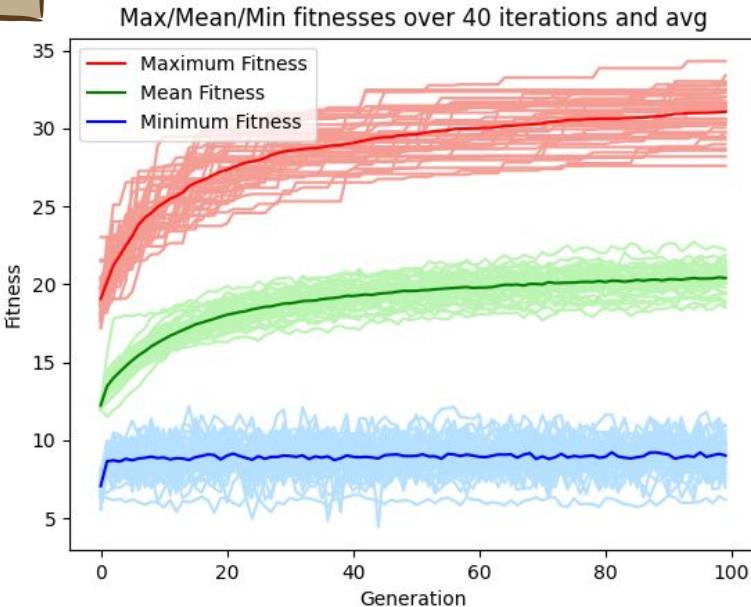
Se cambian los alelos en cada gen con probabilidad P elegida

CRUZA DE GENES

Usando selección de elite y ranking para la nueva y vieja generación ($\alpha, \beta = 0.6$)

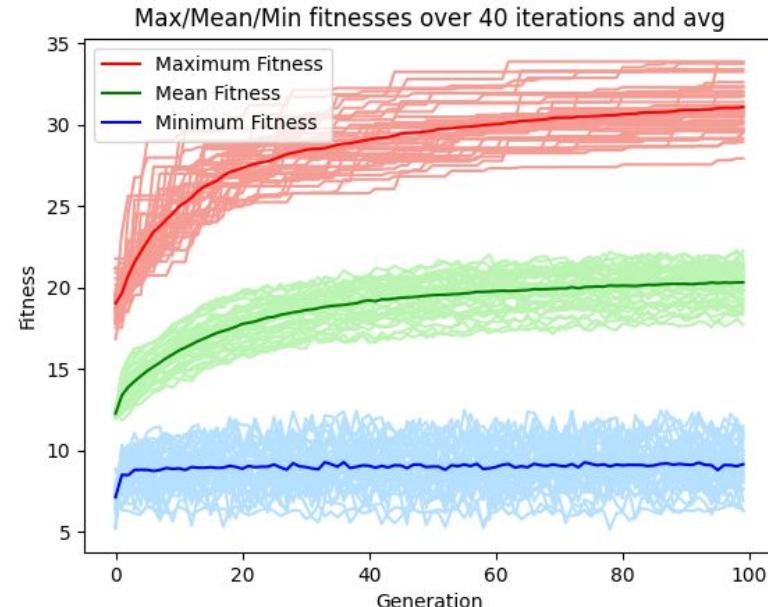
ONE POINT

12



TWO POINTS

13

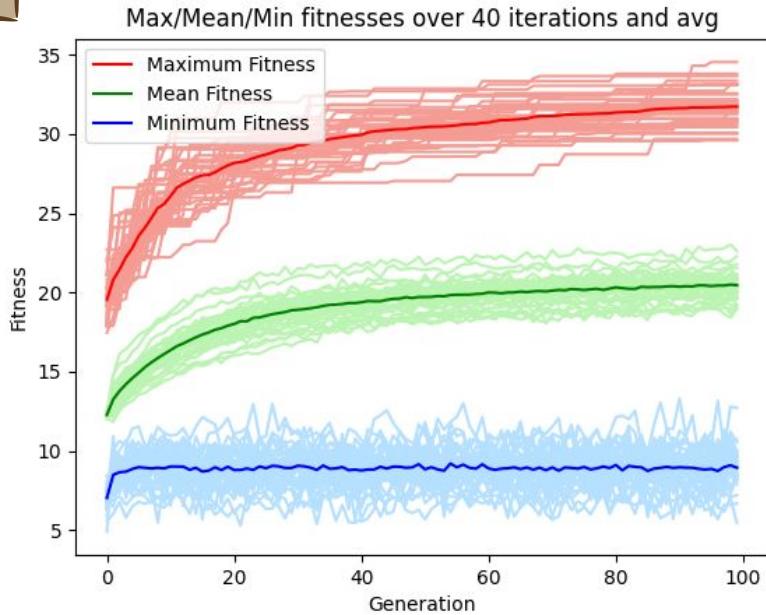


CRUZA DE GENES

Usando selección de elite y ranking para la nueva y vieja generación ($\alpha, \beta = 0.6$)

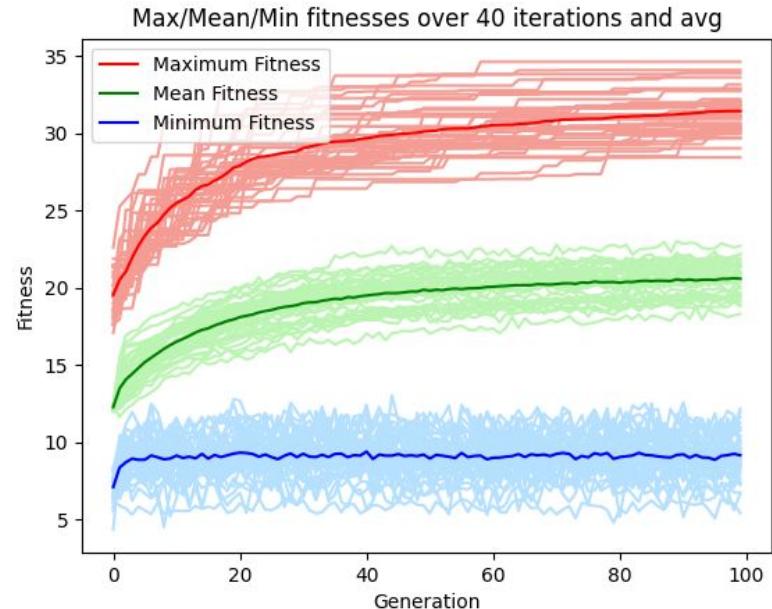
anular

14



uniform

15



mutación



TIPOS DE MUTACIÓN

01

gen

Muta un solo gen del individuo con cierta probabilidad

02

MULTIGEN
LIMITADA

Se selecciona una cantidad de 1 a 6 aleatorios para mutar con cierta probabilidad

03

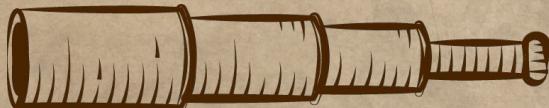
MULTIGEN
UNIFORME

Cada gen puede ser mutado con cierta probabilidad

04

comPLETA

Se mutan todos los genes de un individuo con cierta probabilidad

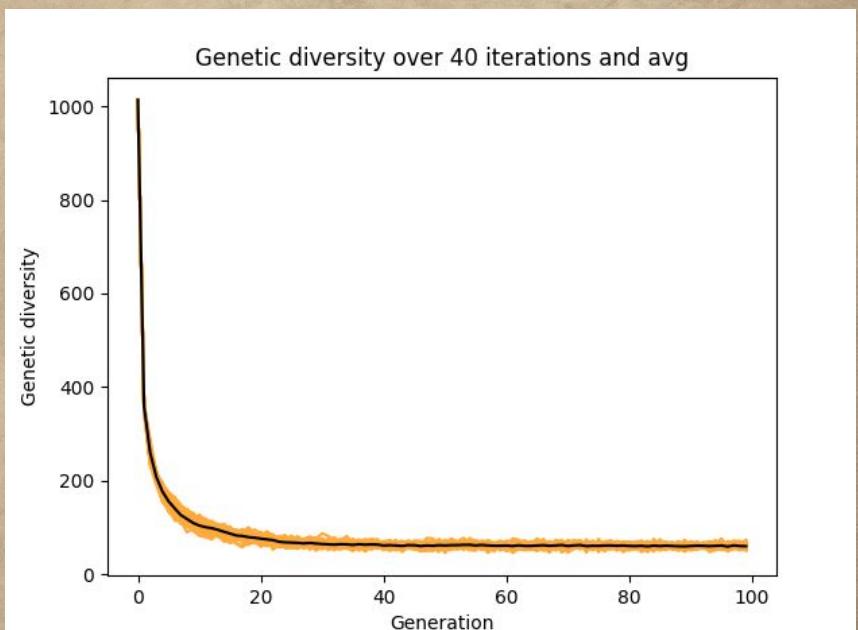
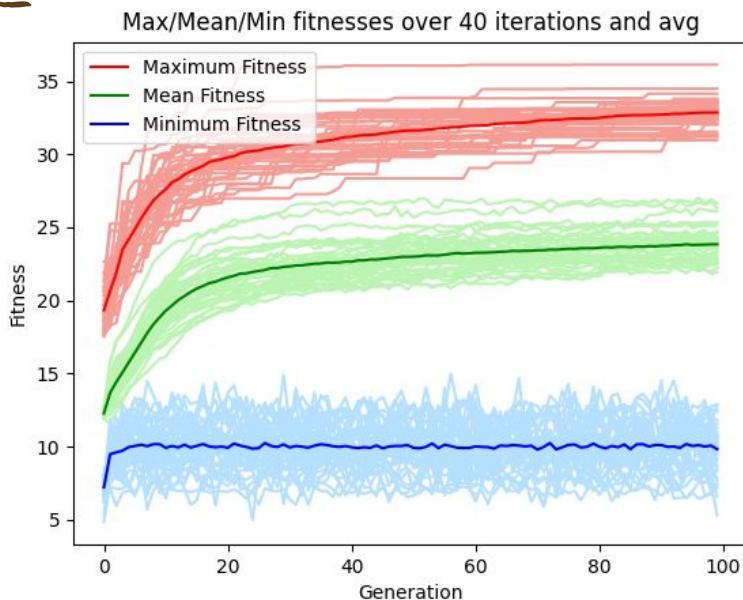


MUTACIÓN DE GENES

Usando selección de elite y ranking para la nueva y vieja generación ($\alpha, \beta = 0.6$)

GEN

16

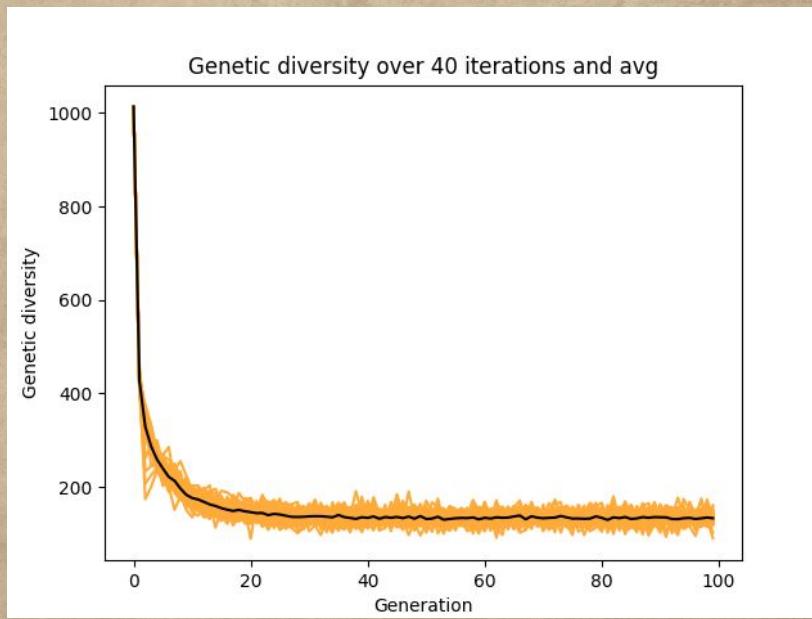
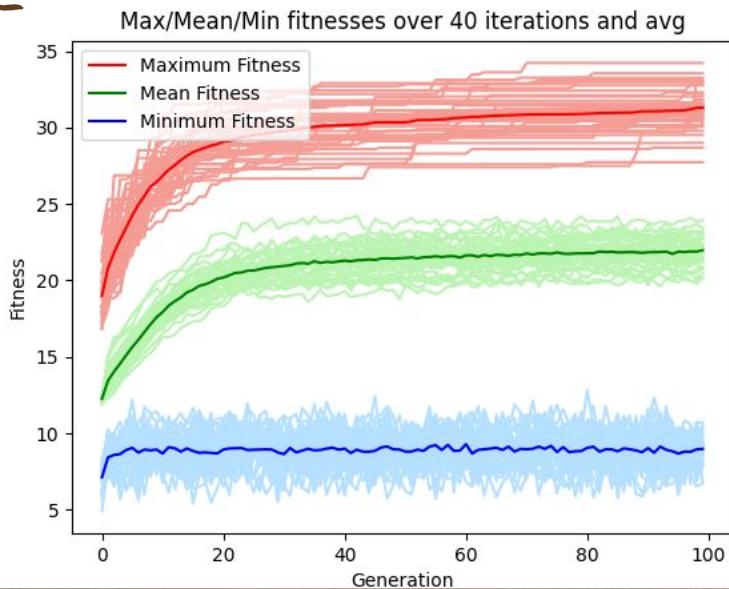


MUTACIÓN DE GENES

Usando selección de elite y ranking para la nueva y vieja generación ($\alpha, \beta = 0.6$)

MULTI LIMITED

17

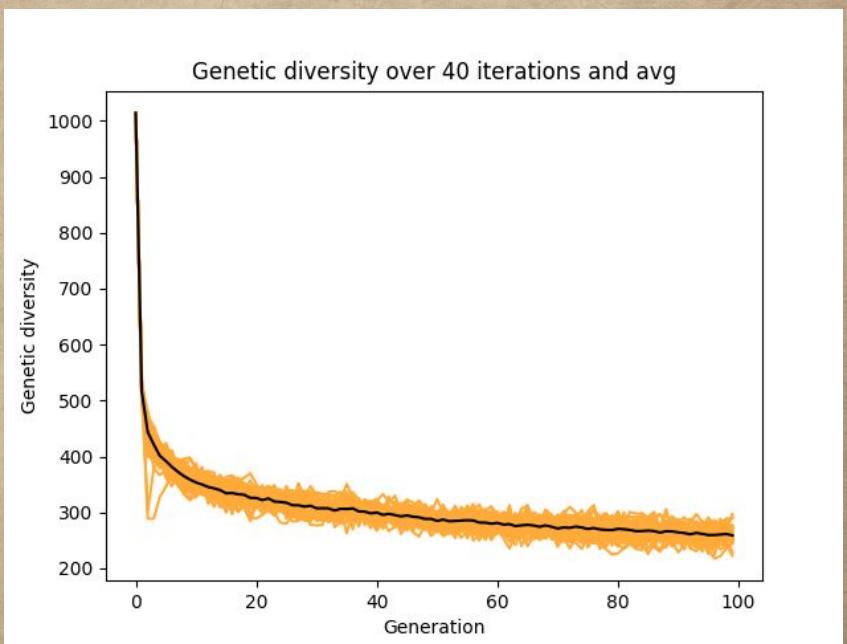
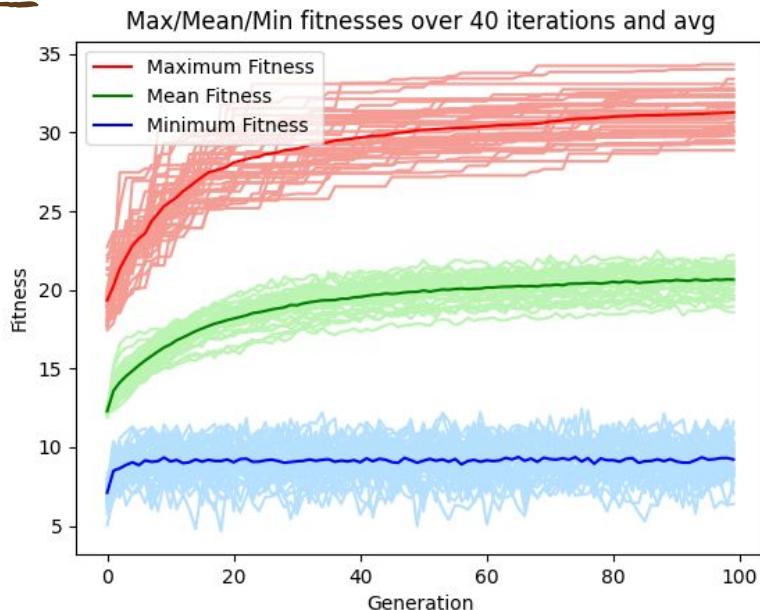


MUTACIÓN DE GENES

Usando selección de elite y ranking para la nueva y vieja generación ($\alpha, \beta = 0.6$)

MULTI UNIFORM

18

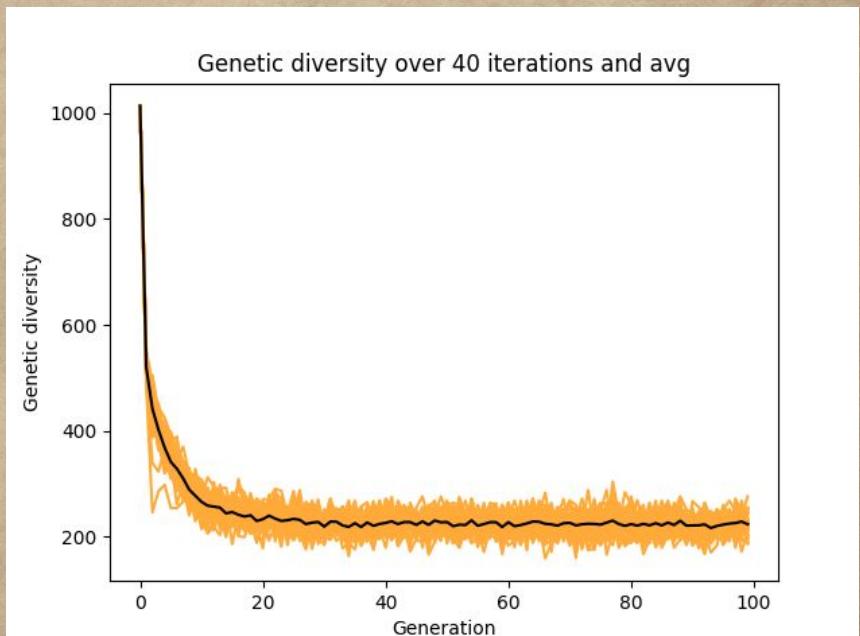
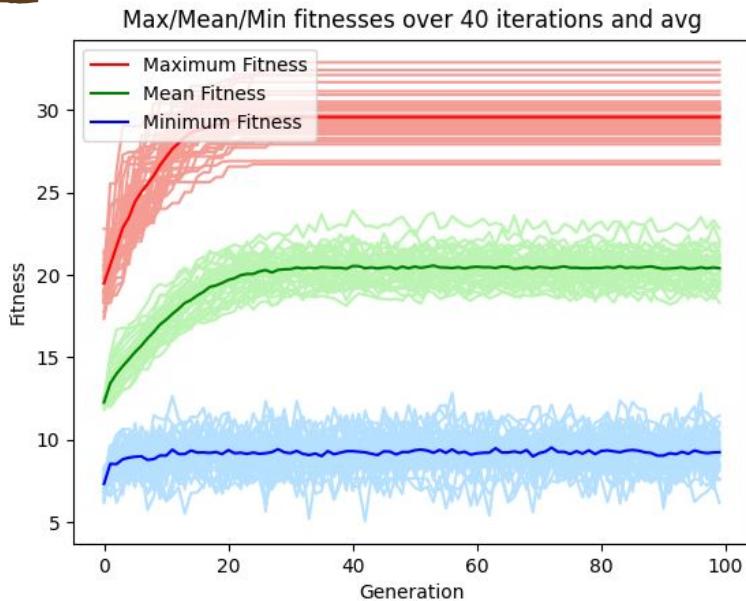


MUTACIÓN DE GENES

Usando selección de elite y ranking para la nueva y vieja generación ($\alpha, \beta = 0.6$)

FULL

19



CORTE



TIPOS DE CORTE

01

TIEMPO

Corta luego de cierto tiempo

02

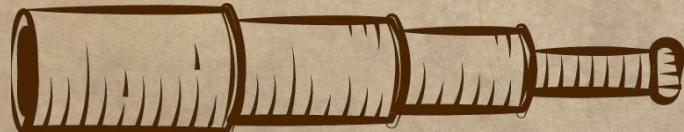
GENERACIÓN

Corta luego de ciertas generaciones

03

ACEPTABLE

Corta cuando la media de la generación actual es mayor o igual a un fitness aceptable



TIPOS DE CORTE

04

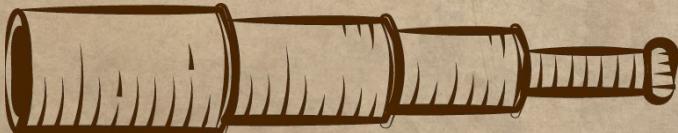
ESTRUCTURA

Corta cuando para las últimas generaciones, no hay cambios mayores a un cierto porcentaje

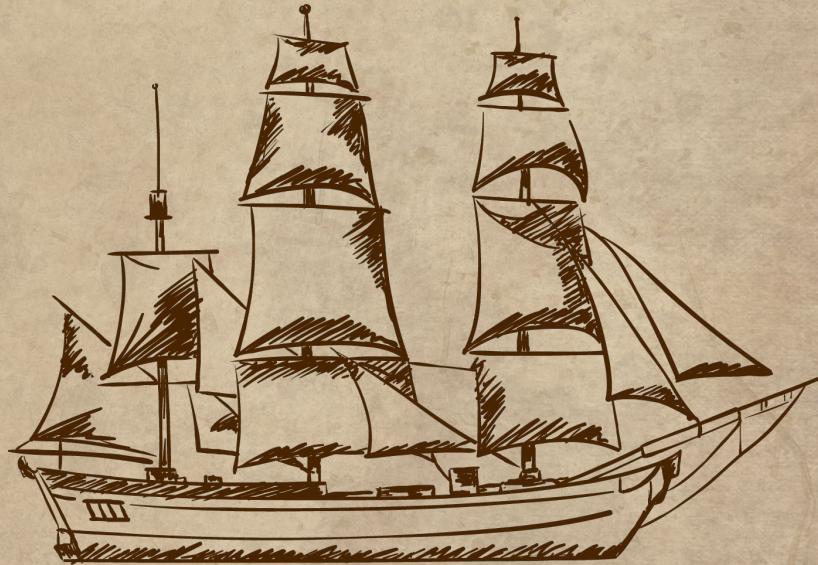
05

CONTEXTO

Corta cuando para las últimas generaciones, el fitness maximo no cambia



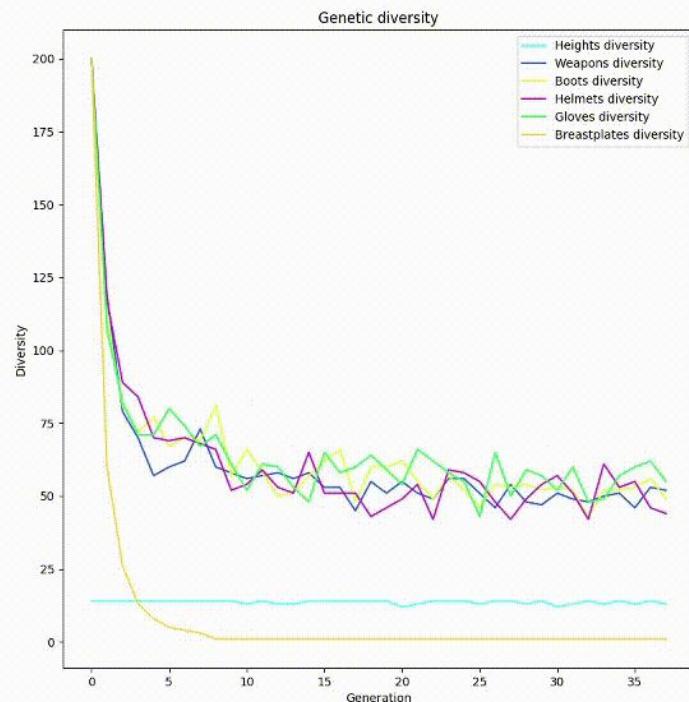
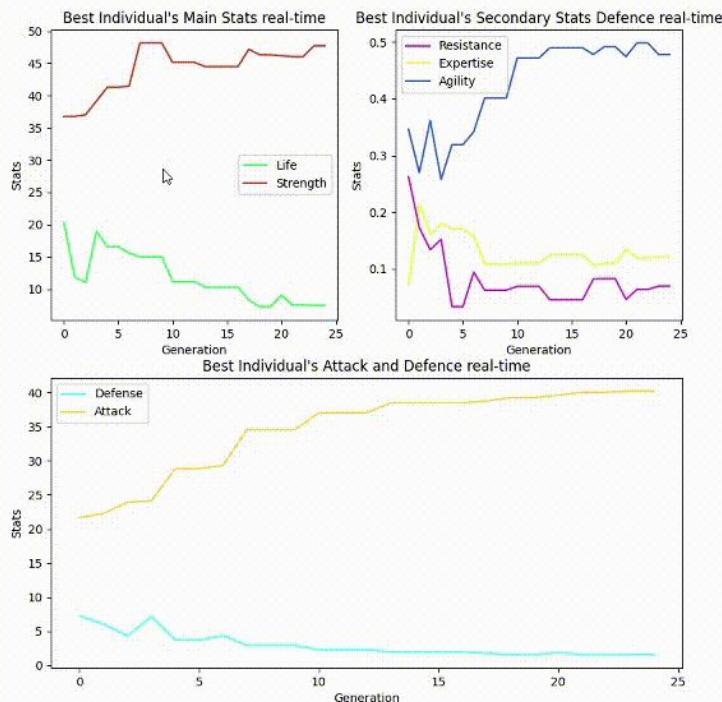
GRÁFICOS EN VIVO



CLASE: INFILTRATE

Progresión de las estadísticas utilizando sólo elite

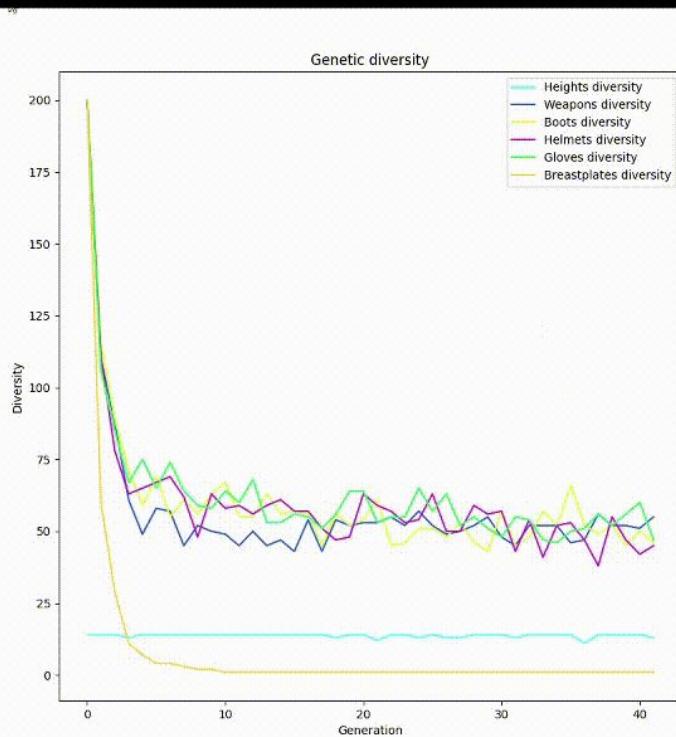
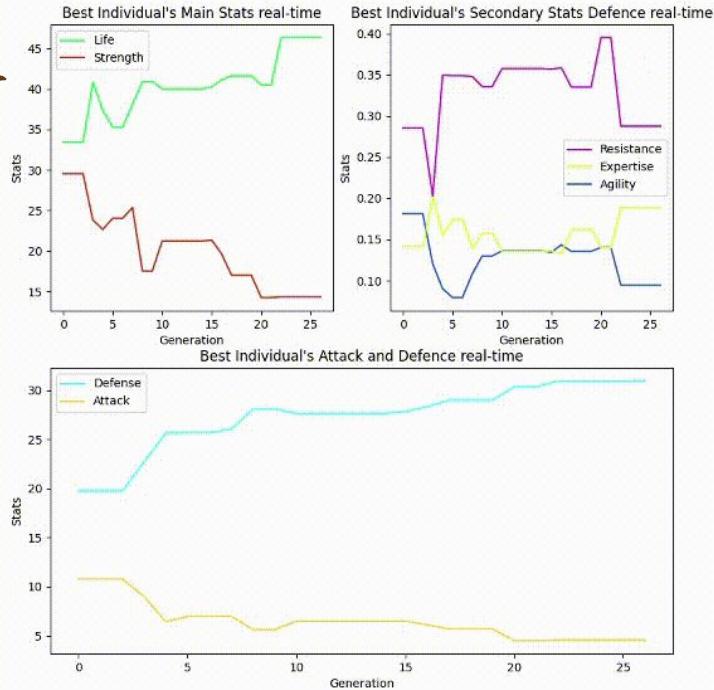
24



CLASE: WARRIOR

Progresión de las estadísticas utilizando sólo elite

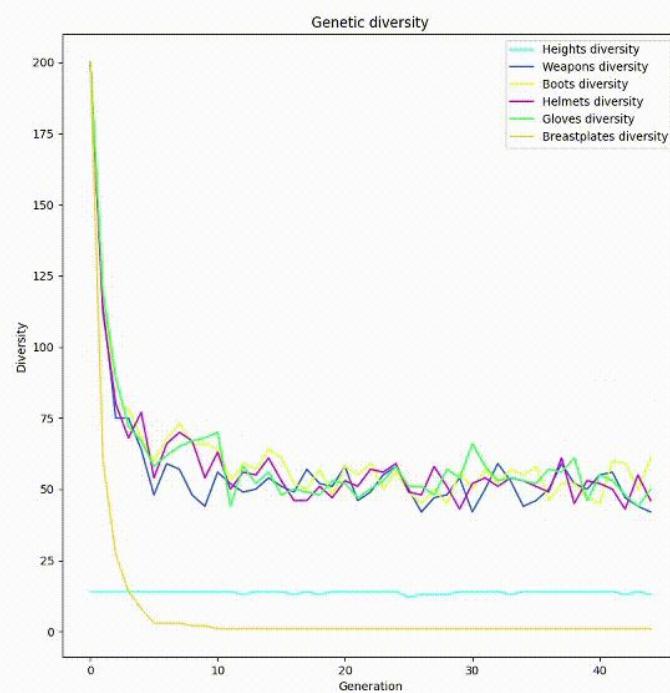
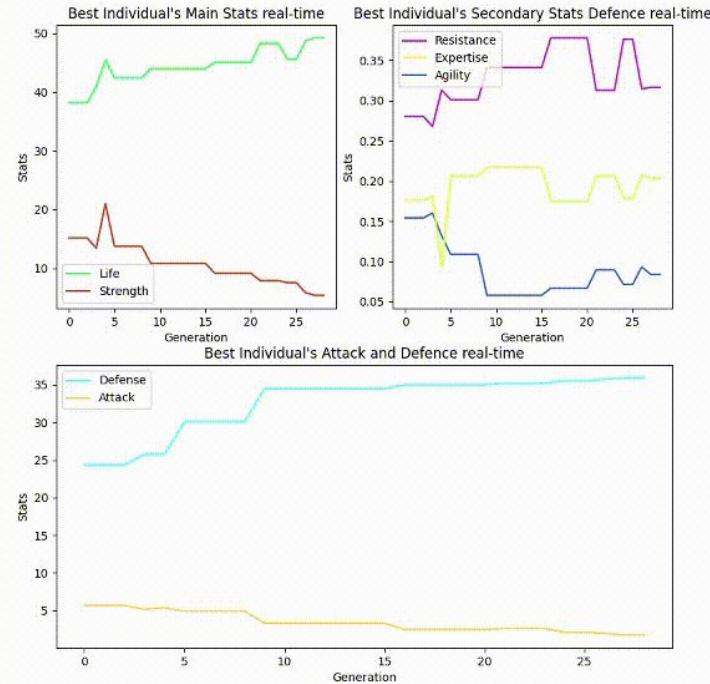
25



CLASE: DEFENDER

Progresión de las estadísticas utilizando sólo elite

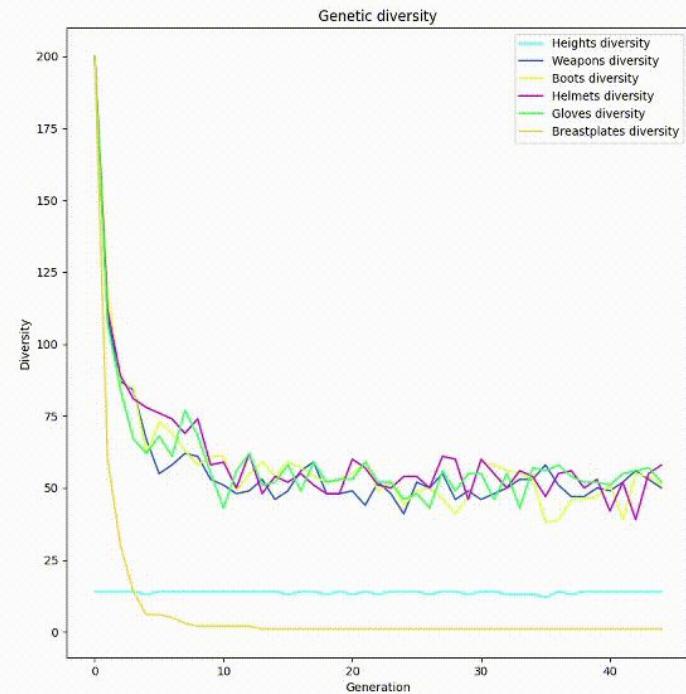
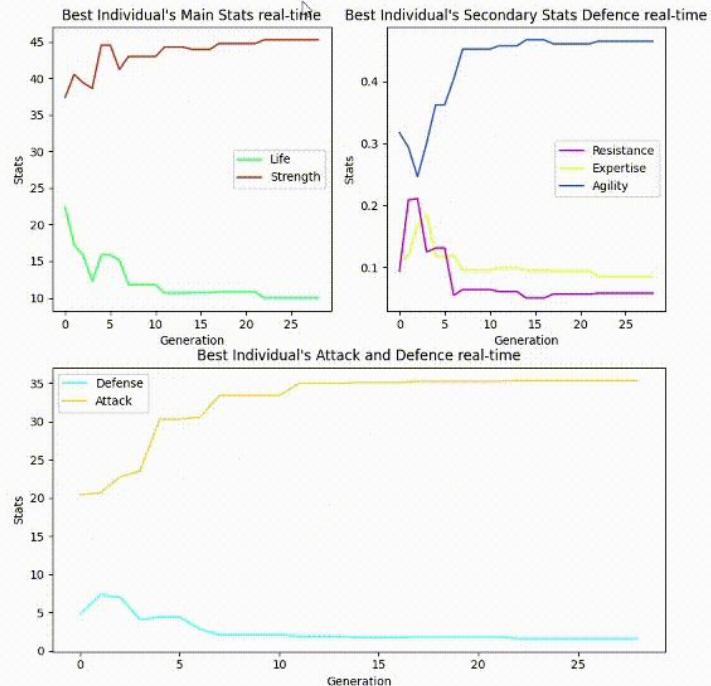
26



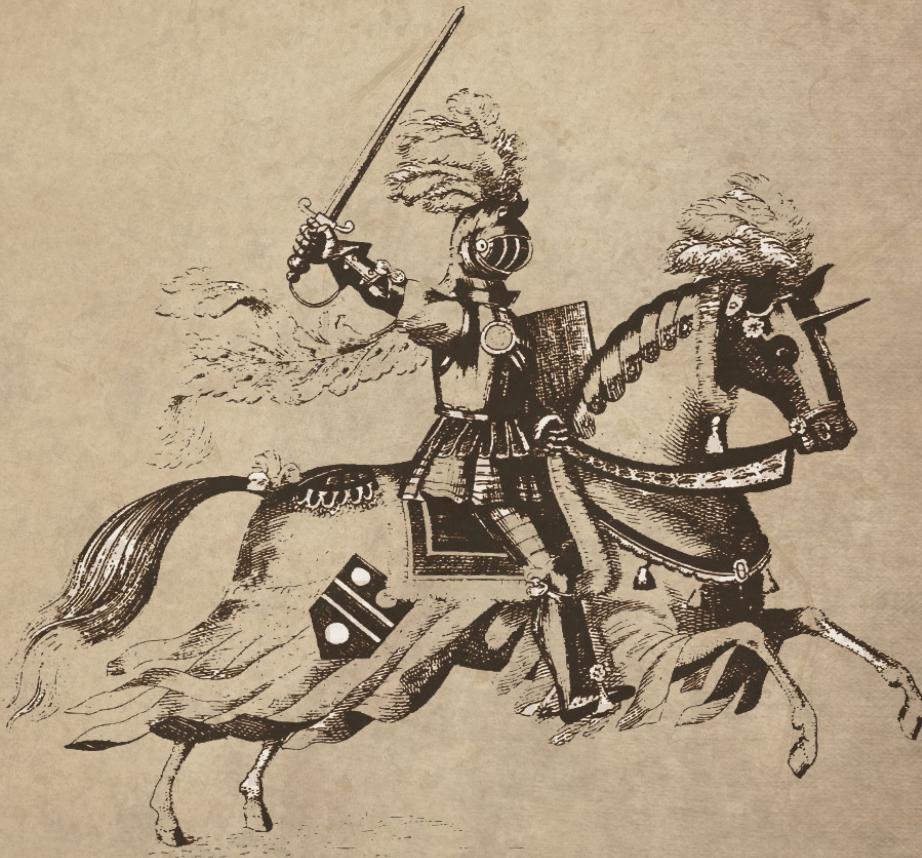
CLASE: ARCHER

Progresión de las estadísticas utilizando sólo elite

27



conclusiones



¿EXPLOTACIÓN O EXPLORACIÓN?

A través de los múltiples escenarios nos encontramos que explorar mucho llevaba a mucho mayor tiempo necesario para llegar a una mejor solución. Siguiendo algoritmos elitistas de selección llevaba a una maximización en menor tiempo.

El problema es que esta **selección elitista llevaba muchas veces a un máximo local**.





EL BALANCE

En muchas ocasiones, una buena forma de conseguir un buen balance entre exploración y explotación (además de establecer diferentes algoritmos de mutación) es utilizar una función de temperatura para el algoritmo de selección de *Boltzmann* que permita **explorar mucho al comienzo y luego dar lugar a una buena explotación.**

FILL-ALL VS FILL-PARENT

Ninguno de estas dos implementaciones es mejor que la otra. **Ambas regulan el nivel de explotación que el algoritmo genético se encuentra aplicando.**

Vimos que si usábamos selección de individuos elitista y *fill-all*, rápidamente el mínimo fitness de una población se acercaba al máximo.

Sin embargo, esto no anula el hecho de que en cada iteración, se siguiera explorando en cierta medida debido al algoritmo de mutación elegido.





TORNEOS PROBABILÍSTICOS DE PROBABILIDAD 0.5

En este caso en el cual la mitad de las veces se elige al mejor de entre dos individuos y la otra mitad al peor, pudimos observar que la mayor parte de las generaciones que procesamos no cambiaban significativamente respecto de las generaciones anteriores porque en definitiva no seguía ningún criterio que le permita llevar a una mejor aptitud. En definitiva, **no distinguía si entre dos individuos, uno era más apto que el otro.**

De aquí la importancia de que **para mejorar la aptitud promedio de los individuos a través de las generaciones se necesite algún criterio que permita elegir a los más aptos de ellos.**

¡GRACIAS TOTALES!

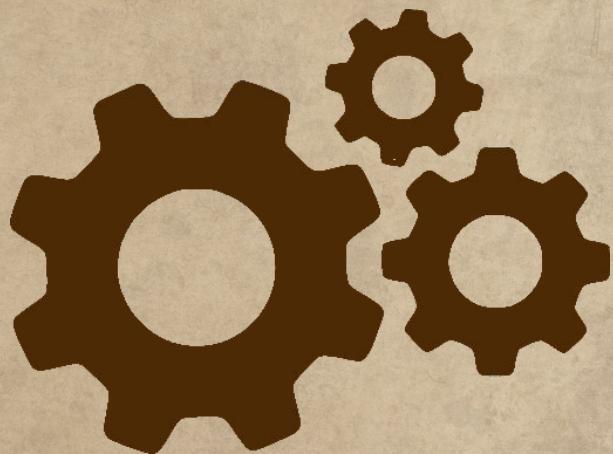
Baiges Matias 59076
mbaiges@itba.edu.ar

Bilevich Andres 59108
abilevich@itba.edu.ar

Margossian Gabriel 59130
gmargossian@itba.edu.ar



CONFIGURACIONES UTILIZADAS



CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.8
        B: 0.8
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method2: elite
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method4: elite
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 1000, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7
, 'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: casclos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: warrior
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

01

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.8
        B: 0.8
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method2: elite
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method4: elite
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 1000, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7
, 'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascots.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.8
        B: 0.8
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method2: elite
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method4: elite
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 1000, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7
, 'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: archer
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

03

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.8
        B: 0.8
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method2: elite
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method4: elite
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 1000, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7
, 'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
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        helmets: cascots.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: defender
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.8
        B: 0.8
        method1: boltzmann
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.2, 'pt_threshold': 0.5}
        method2: boltzmann
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.2, 'pt_threshold': 0.5}
        method3: boltzmann
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.2, 'pt_threshold': 0.5}
        method4: boltzmann
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.2, 'pt_threshold': 0.5}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
        'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascots.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

05

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.8
        B: 0.8
        method1: prob_tournaments
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method2: prob_tournaments
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method3: prob_tournaments
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method4: prob_tournaments
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascots.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.5
        B: 0.5
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method2: ranking
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method4: ranking
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 400, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: casclos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

07

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.8
        B: 0.8
        method1: boltzmann
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method2: boltzmann
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method3: boltzmann
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
        method4: boltzmann
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.5}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascoss.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.8
        B: 0.8
        method1: boltzmann
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.2, 'pt_threshold': 0.5}
        method2: boltzmann
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.2, 'pt_threshold': 0.5}
        method3: boltzmann
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.2, 'pt_threshold': 0.5}
        method4: boltzmann
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.2, 'pt_threshold': 0.5}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

09

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.8
        B: 0.2
        method1: roulette
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method2: prob_tournaments
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method4: elite
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
    implementation: fill_all
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
    'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.8
        B: 0.2
        method1: roulette
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method2: prob_tournaments
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method4: elite
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: casclos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: one_point
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.6
        B: 0.6
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method2: ranking
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method4: ranking
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: two_points
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.6
        B: 0.6
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method2: ranking
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method4: ranking
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascoss.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: anular
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.6
        B: 0.6
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method2: ranking
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method4: ranking
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
    'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: casclos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.6
        B: 0.6
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method2: ranking
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method4: ranking
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: casclos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: gen
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.6
        B: 0.6
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method2: ranking
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method4: ranking
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
    'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascoss.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_limited
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.6
        B: 0.6
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method2: ranking
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method4: ranking
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.6
        B: 0.6
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method2: ranking
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method4: ranking
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascoss.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: full
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.6
        B: 0.6
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method2: ranking
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
        method4: ranking
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.8}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7,
'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascoss.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 1
        B: 1
        method1: boltzmann
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.
8}
        method2: boltzmann
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.
8}
        method3: boltzmann
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.
8}
        method4: boltzmann
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 2, 'pt_threshold': 0.
8}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7, 'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 1
        B: 1
        method1: boltzmann
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.1, 'pt_threshold':
0.8}
        method2: boltzmann
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.1, 'pt_threshold':
0.8}
        method3: boltzmann
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.1, 'pt_threshold':
0.8}
        method4: boltzmann
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.1, 'pt_threshold':
0.8}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100,
'relevant_percentage_of_change': 0.7, 'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: True
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 1
        B: 1
        method1: boltzmann
            method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.05, 'pt_threshold':
0.8}
        method2: boltzmann
            method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.05, 'pt_threshold':
0.8}
        method3: boltzmann
            method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.05, 'pt_threshold':
0.8}
        method4: boltzmann
            method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.05, 'pt_threshold':
0.8}
    implementation: fill_parent
stop: gens
    stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7, 'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
character_class: infiltrate
initial_population: 200
multiple_times:
    run: True
    iterations: 40
```

CONFIGURACIONES

```
crossover: uniform
    crossover_params: {'l': 3, 'p': 0.5}
mutation: multi_uniform
    mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
selection:
    K: 100
    A: 1
    B: 1
    method1: boltzmann
        method1_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.01, 'pt_threshold':
0.8}
    method2: boltzmann
        method2_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.01, 'pt_threshold':
0.8}
    method3: boltzmann
        method3_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.01, 'pt_threshold':
0.8}
    method4: boltzmann
        method4_params: {'initial_temp': 50, 'min_temp': 1, 'k': 0.01, 'pt_threshold':
0.8}
implementation: fill_parent
stop: gens
    stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7, 'considered_gens': 15, 'max_generations_counter': 5}
items_dataset:
    path: allitems
    weapons: armas.tsv
    boots: botas.tsv
    helmets: cascos.tsv
    gloves: guantes.tsv
    breastplates: pecheras.tsv
character_class: infiltrate
initial_population: 200
multiple_times:
    run: True
    iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.6
        B: 0.4
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
        method2: elite
            method2_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
        method4: elite
            method4_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7, 'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: infiltrate
    initial_population: 200
    multiple_times:
        run: False
        iterations: 40
```

CONFIGURACIONES

25

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.6
        B: 0.4
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
        method2: elite
            method2_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
        method4: elite
            method4_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7, 'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: warrior
    initial_population: 200
    multiple_times:
        run: False
        iterations: 40
```

CONFIGURACIONES

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.6
        B: 0.4
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
        method2: elite
            method2_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
        method4: elite
            method4_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7, 'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: casclos.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: defender
    initial_population: 200
    multiple_times:
        run: False
        iterations: 40
```

CONFIGURACIONES

27

```
Config:
    crossover: uniform
        crossover_params: {'l': 3, 'p': 0.5}
    mutation: multi_uniform
        mutation_params: {'pg': 0.5, 'pml': 0.5, 'pmu': 0.5, 'pf': 0.5}
    selection:
        K: 100
        A: 0.6
        B: 0.4
        method1: elite
            method1_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
        method2: elite
            method2_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
        method3: elite
            method3_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
        method4: elite
            method4_params: {'initial_temp': 50, 'min_temp': 10, 'k': 2, 'pt_threshold': 0.7}
    implementation: fill_parent
    stop: gens
        stop_params: {'max_time': 10, 'max_generation': 100, 'mean_acceptable_fitness': 100, 'relevant_percentage_of_change': 0.7, 'considered_gens': 15, 'max_generations_counter': 5}
    items_dataset:
        path: allitems
        weapons: armas.tsv
        boots: botas.tsv
        helmets: cascots.tsv
        gloves: guantes.tsv
        breastplates: pecheras.tsv
    character_class: archer
    initial_population: 200
    multiple_times:
        run: False
        iterations: 40
```

