

The background features a complex network of thin grey lines connecting various points, forming a web-like structure. Scattered throughout are numerous triangles of different sizes and orientations, some with solid outlines and others with dashed or dotted lines. The overall aesthetic is technical and modern, typical of a presentation on artificial intelligence or computer science.

# Algoritmos Genéticos

**Sistemas de Inteligencia Artificial**  
Grethe - Nagelberg - Grabina | Grupo 2

# Problema



CALL OF DUTY

# Implementación



Java 8 (parallel)

Maven

OOP

config.properties

Plotter

# Métricas Clave y Condiciones de Corte

**Fitness Promedio**

**Fitness Máximo**

**Generaciones**

**Entorno a óptimo**

**Fitness  
no cambia**

**Población  
no cambia**

**Cant. max.  
generaciones**



# Convergencia Prematura



**Tamaño inicial  
pequeño**

Ej. 100 individuos

**Métodos de selección  
incorrectos**

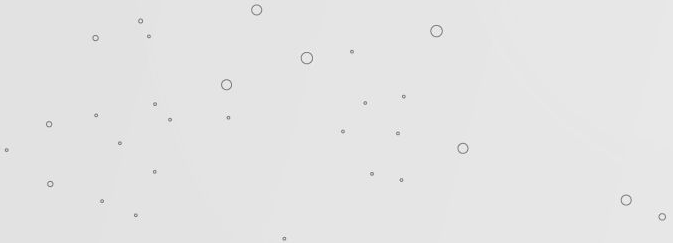
Ej. 100% Elite

**Poca probabilidad de  
mutación**

Ej. 0.1 %

# Comparaciones

- ★ Variación de % de selección
- ★ Variación de métodos de selección
- ★ Boltzman
- ★ Variación métodos de reemplazo
- ★ Variación métodos de mutación
- ★ Variación métodos de cruce
- ★ Variación tamaño inicial de población

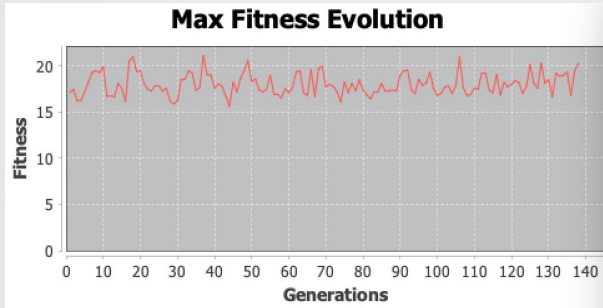


# Configuración base

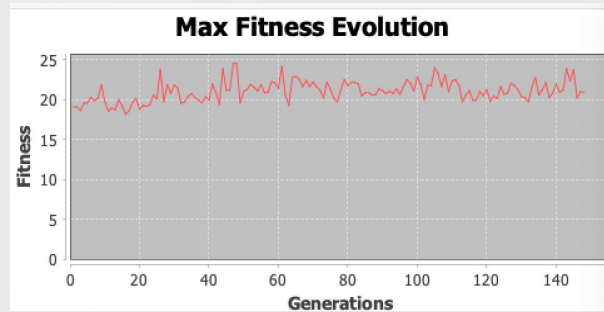
- ★ replacementMethodA=Elite
- ★ replacementMethodB=Ranking
- ★ selectionMethodA=Elite
- ★ selectionMethodB=Ranking
- ★ isBoltzmann=false
- ★ crossOverMethod=UniformCross
- ★ mutationMethod=GenUniform
- ★ replacementMethod=3
- ★ maxGenerations=5000
- ★ optimalFitness=40.0
- ★ fitnessEpsilon=0.2
- ★ maxGenerationFitnessUnchanged = 200
- ★ maxGenerationPopulationUnchanged = 100
- ★ populationEpsilon=0.2
- ★ mutationUniformProbability=0.1
- ★ selectionMethodAPercentage=0.5
- ★ replacementMethodAPercentage=0.5
- ★ initialSize=1000
- ★ nextGenerationPercentage=0.8
- ★ crossOverProbability = 0.6
- ★ type=Warrior
- ★ tournamentsM=3

# Variación de % de selección

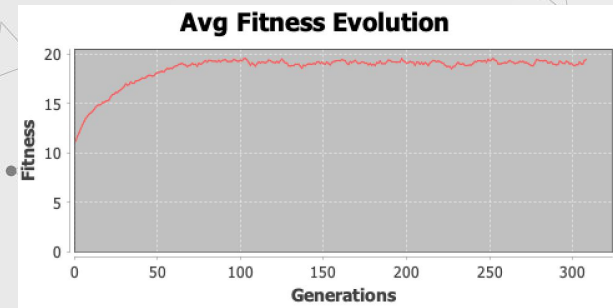
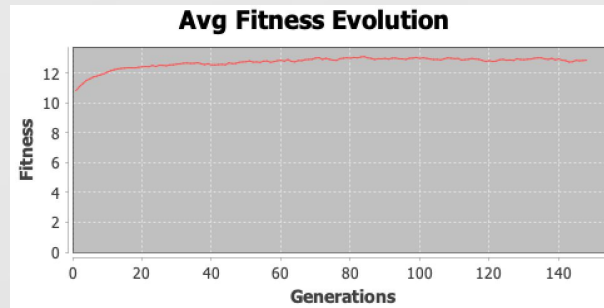
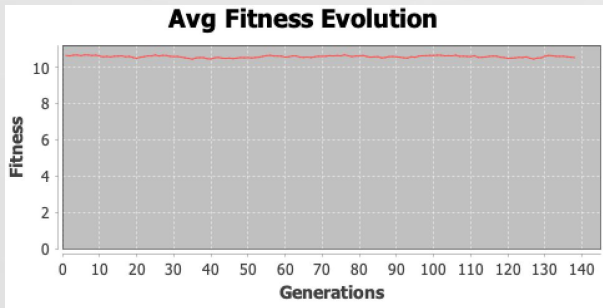
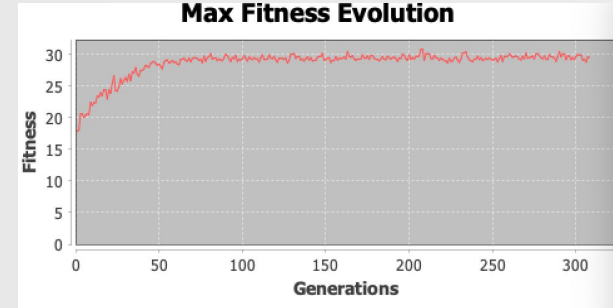
100% Elite - 0% Ruleta



85% Élite - 15% Ruleta



50% Elite - 50% Ruleta

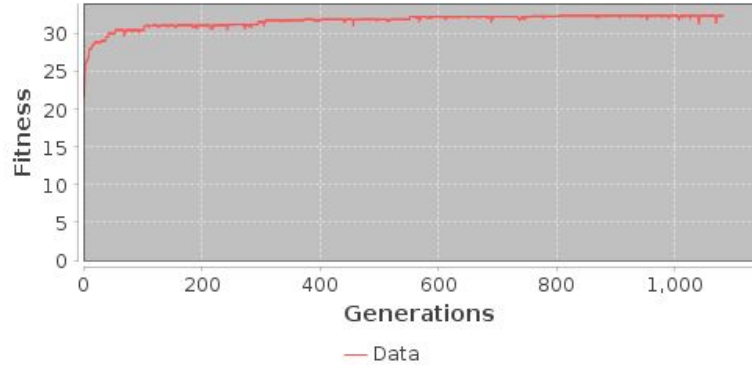




# Variación de métodos de selección

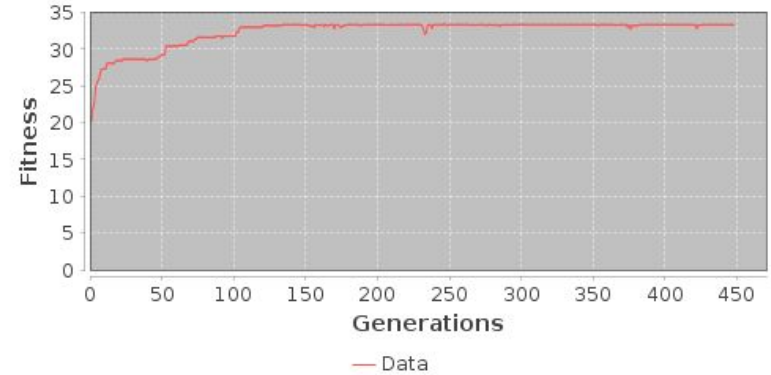
50% Elite - 50% Tournaments Deterministic

**Max Fitness Evolution**



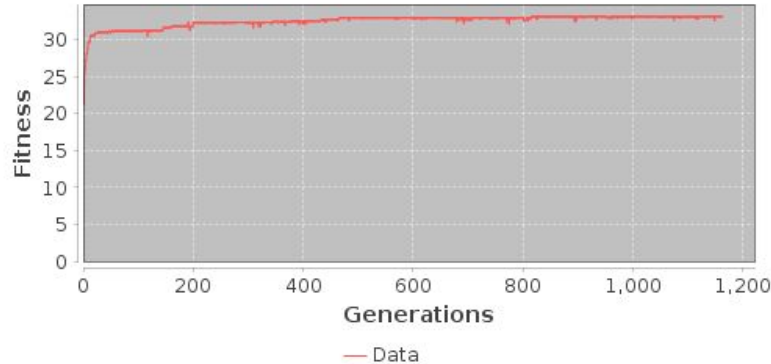
50% Roulette - 50% Ranking

**Max Fitness Evolution**



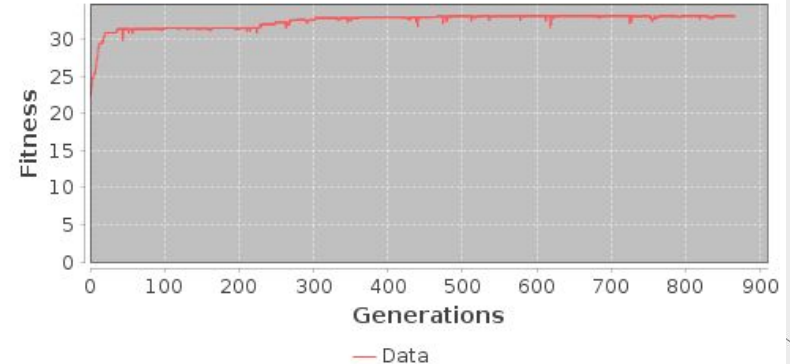
50 % Elite - 50% Ranking

**Max Fitness Evolution**



50 Roulette - 50% Tournaments Deterministic

**Max Fitness Evolution**



# Variación de métodos de selección

50% Elite - 50% Tournaments Deterministic

Generation 1081

Max Fitness: 32.445251165558595

PromFitness: 24.67800084553079

50% Roulette - 50% Ranking

Generation 448

Max Fitness: 33.33669484165846 |

PromFitness: 21.90132680500888

Generation 515

Max Fitness: 34.003930279826015

PromFitness: 24.118202967921764

Generation 1307

Max Fitness: 32.68664111649985

PromFitness: 23.360035163233952

50 % Elite - 50% Ranking

Generation 1162

Max Fitness: 33.12965655190983

PromFitness: 25.545213355674978

50 Roulette - 50% Tournaments Deterministic

Generation 866

Max Fitness: 33.05678747676323

PromFitness: 25.5176908155406

Generation 1304

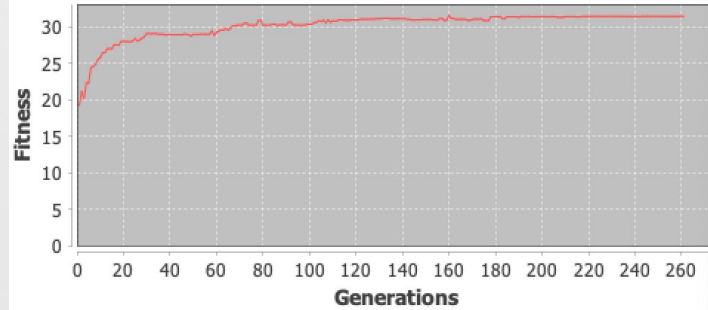
Max Fitness: 34.69983281794151

PromFitness: 24.330002413543557

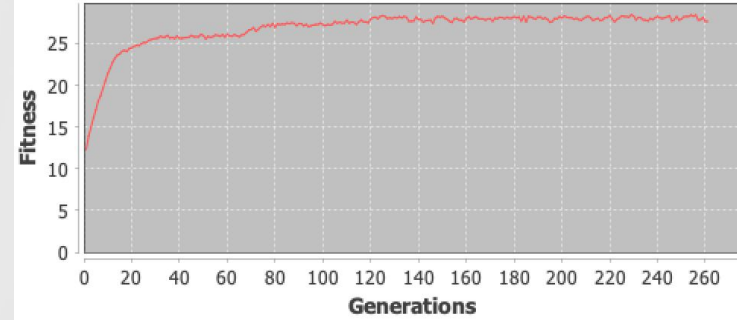
# Boltzmann

SIN

**Max Fitness Evolution**

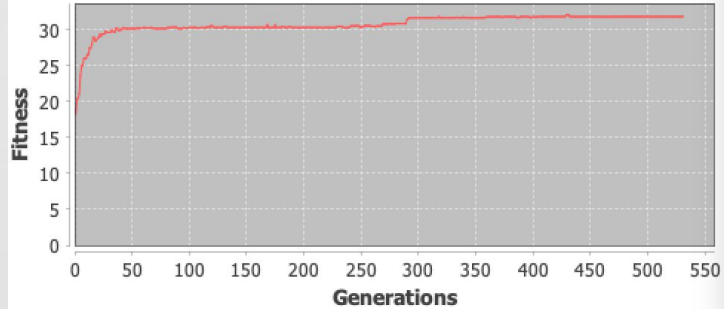


**Avg Fitness Evolution**

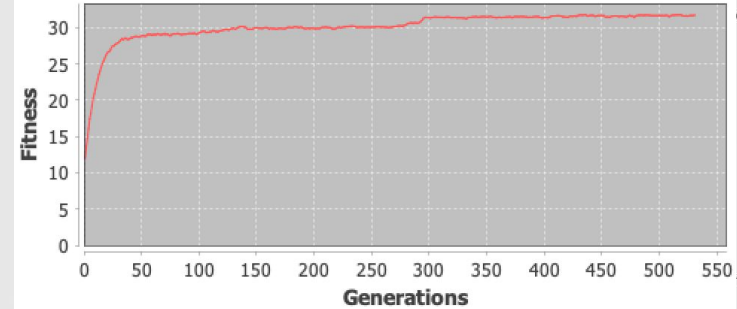


CON

**Max Fitness Evolution**



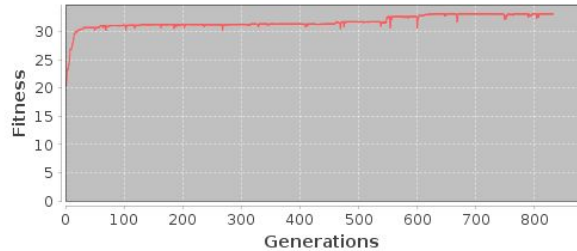
**Avg Fitness Evolution**



# Variación métodos de reemplazo

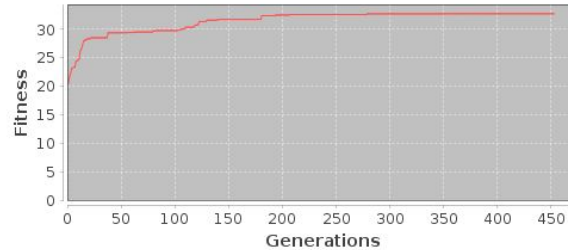
Método 1

**Max Fitness Evolution**



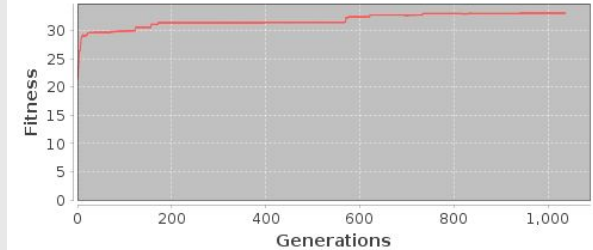
Método 2

**Max Fitness Evolution**

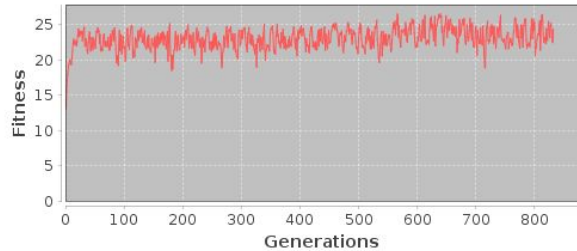


Método 3

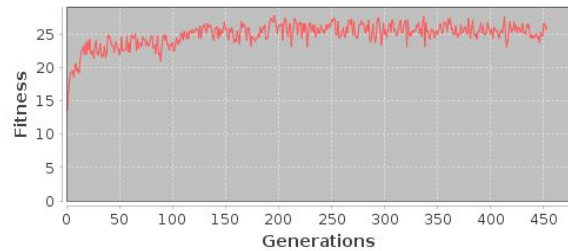
**Max Fitness Evolution**



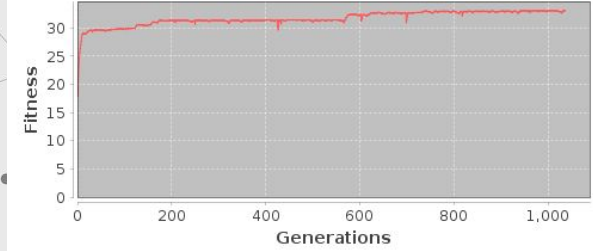
**Avg Fitness Evolution**



**Avg Fitness Evolution**

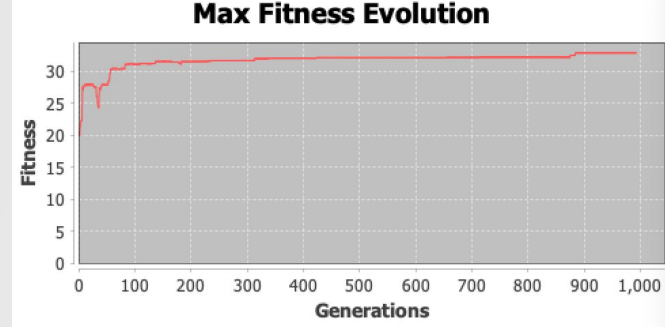
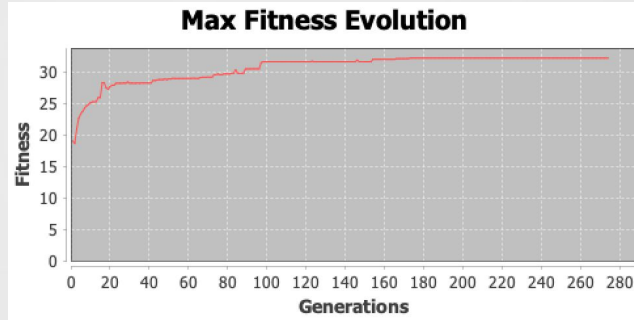


**Avg Fitness Evolution**

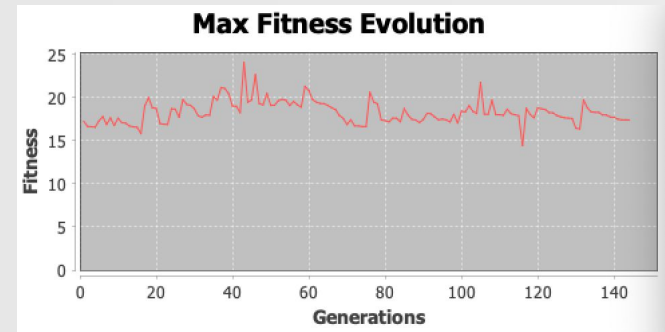
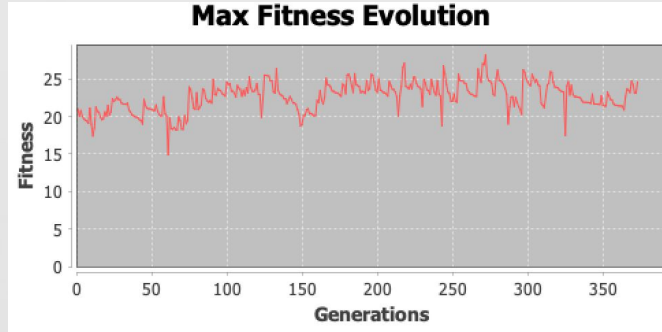


# Variación métodos de mutación

GEN



MULTIGEN

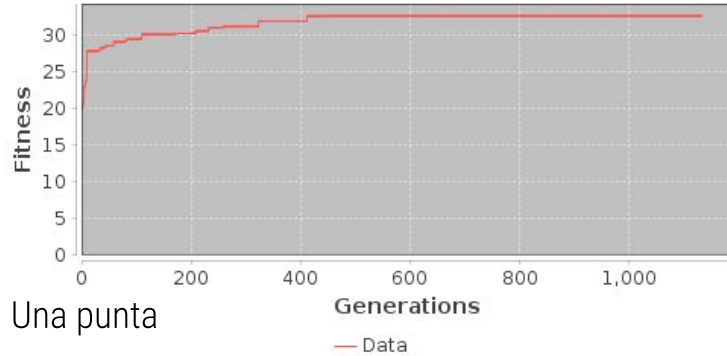


Uniforme

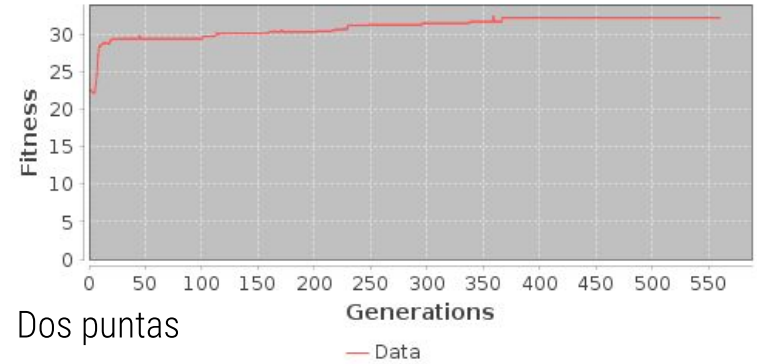
No Uniforme

# Variación métodos de cruce

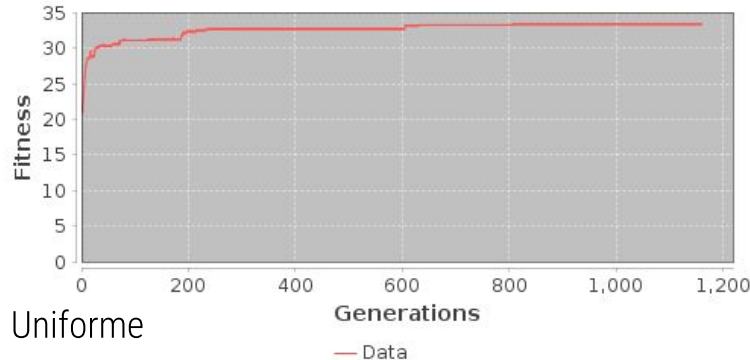
**Max Fitness Evolution**



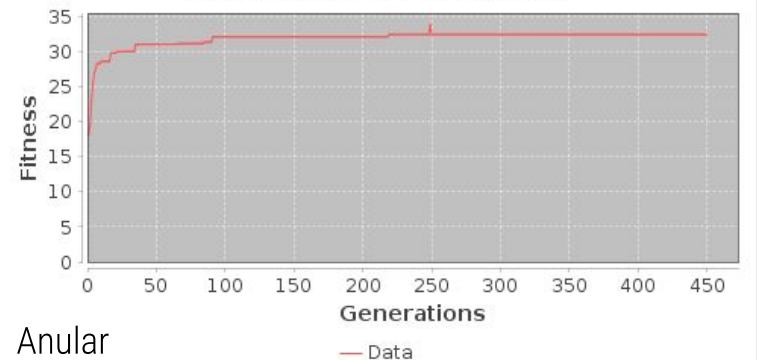
**Max Fitness Evolution**



**Max Fitness Evolution**



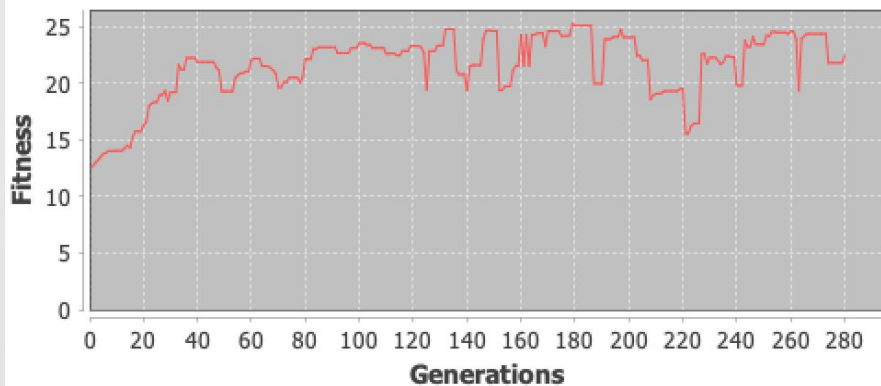
**Max Fitness Evolution**



# Variación tamaño inicial de población

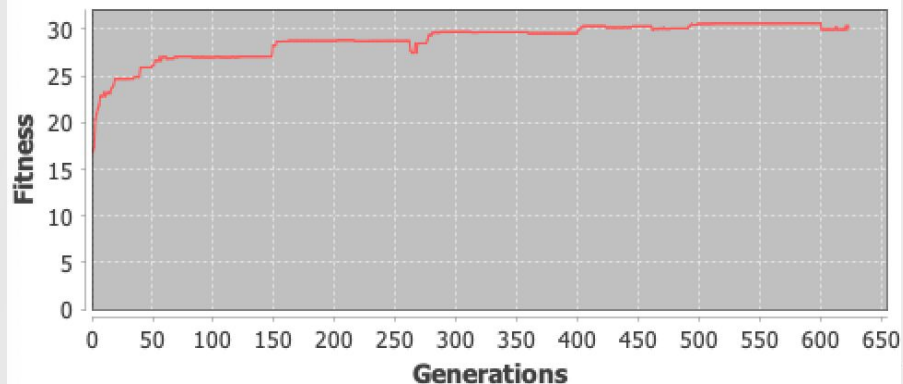
10

**Max Fitness Evolution**

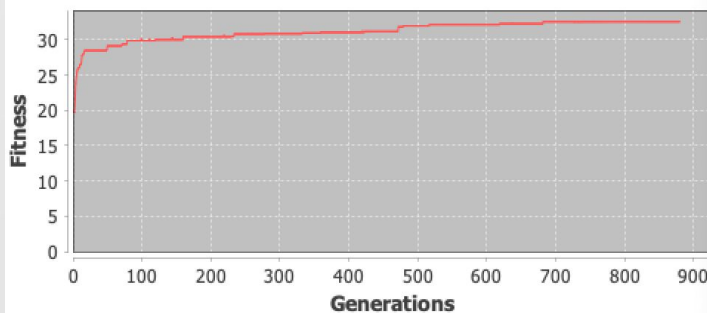


100

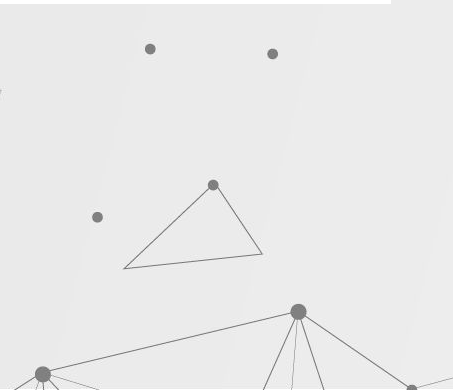
**Max Fitness Evolution**



**Max Fitness Evolution**

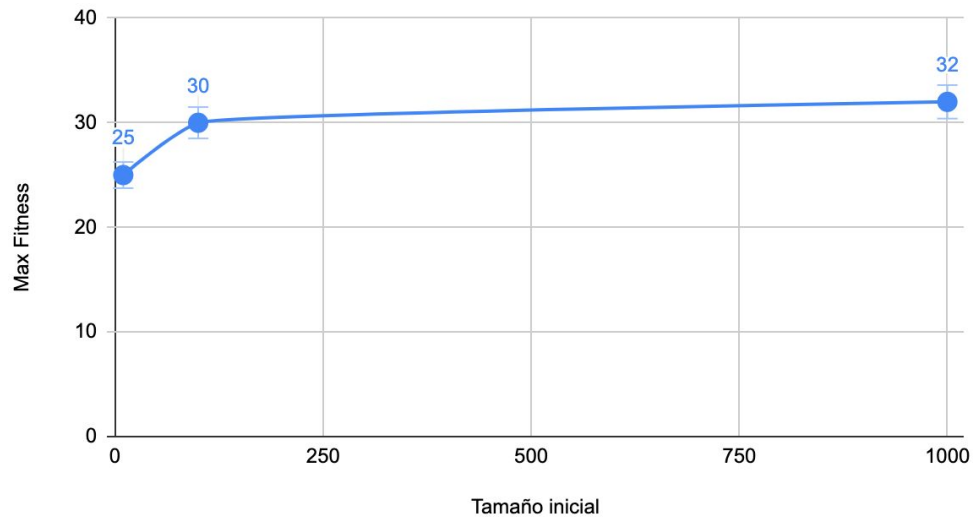


1000



# Variación tamaño inicial de población

Max Fitness por Tamaño inicial





# Personaje óptimo - Warrior



- ★ **height**=1.67
- ★ **VEST** id=480374
- ★ **GLOVES** id=340516
- ★ **HELMET** id=356049
- ★ **BOOTS** id=924388
- ★ **WEAPON** id=84630,

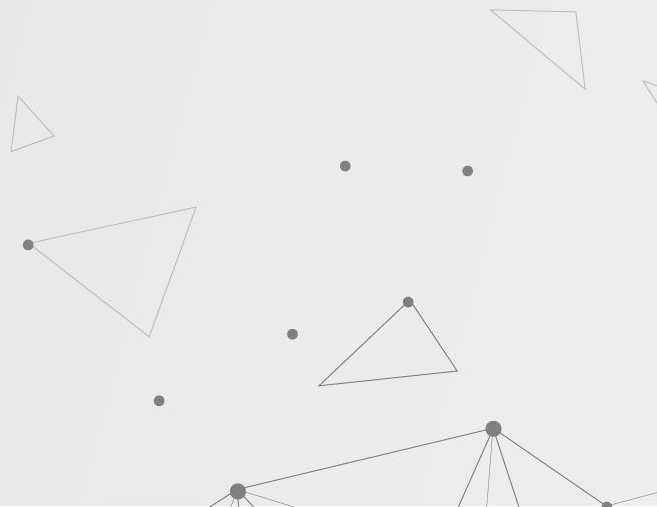
**Generation** 1536

**Max Fitness:** 34.339525324307395

**Avg Fitness:** 24.86920120976502

# Conclusiones

- ★ Es fundamental poseer variedad poblacional para no caer en máximos locales.
- ★ Una mala parametrización puede conllevar a convergencia prematura.
- ★ A mayor tamaño inicial, convergencia más estable y mejores resultados (evita óptimos locales) pero tiene un tiempo de procesamiento mayor.
- ★ Es importante agregar cierta aleatoriedad para evitar caer en máximos locales.
- ★ El método de reemplazo 3 obtuvo mejores promedios de fitness en la población, pero los máximos los encontramos con el método 2.
- ★ Los métodos de cruce incidían en la velocidad de convergencia.





**Gracias!**

**Preguntas?**