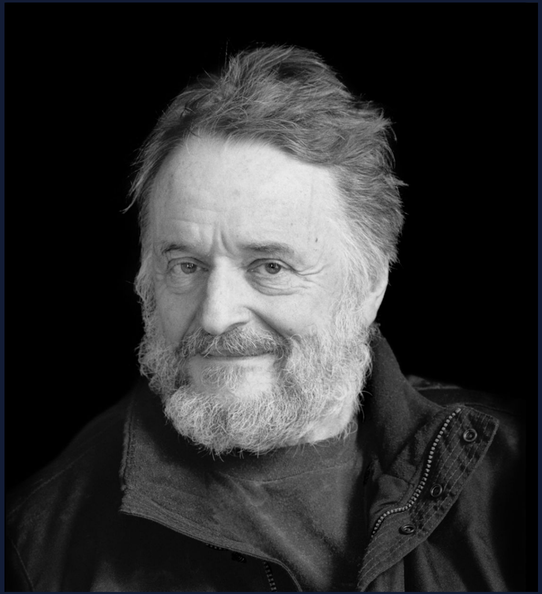
MULTIMEDIA TECHNOLOGIES COURSE

CONWAY’S GAME OF LIFE

> The Game of Life is an example of how simple rules can give rise to complex and unpredictable behavior, which is a hallmark of many natural systems.

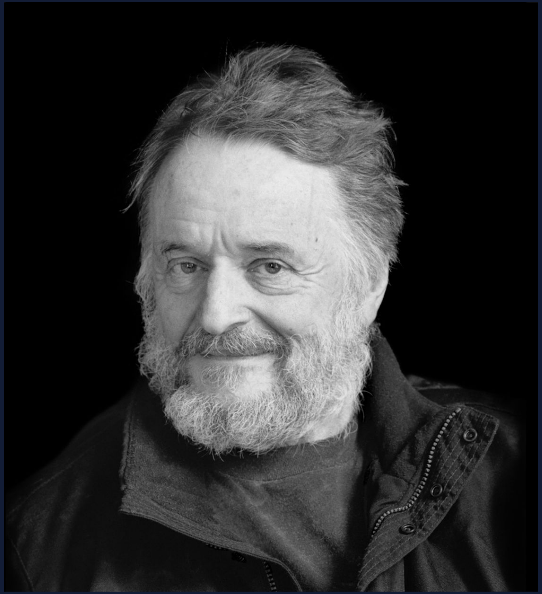
James Gleick



JOHN CONWAY

The game was created by mathematician John Horton Conway in 1970 and has since gained popularity in computer science, mathematics, and even art.

Despite its simplicity, the game is known for its ability to produce complex patterns and behaviors.



JOHN CONWAY

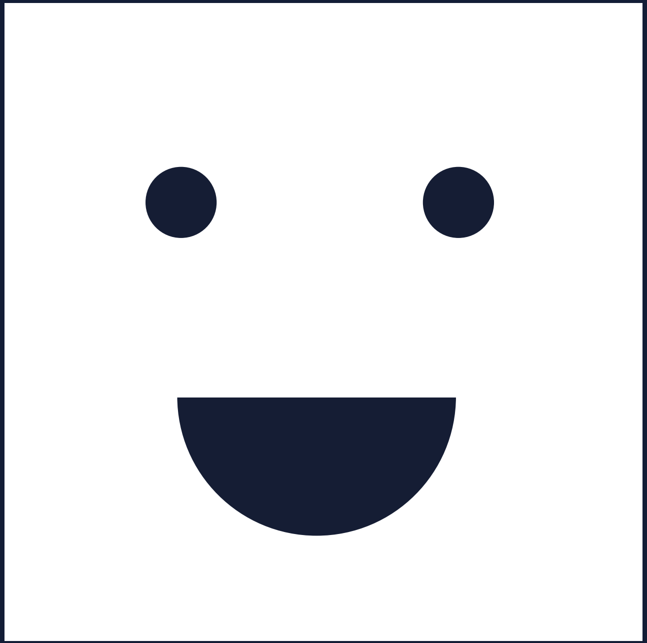
The game was created by mathematician John Horton Conway in 1970 and has since gained popularity in computer science, mathematics, and even art.

Despite its simplicity, the game is known for its ability to produce complex patterns and behaviors.

The rules of the game are as follows:

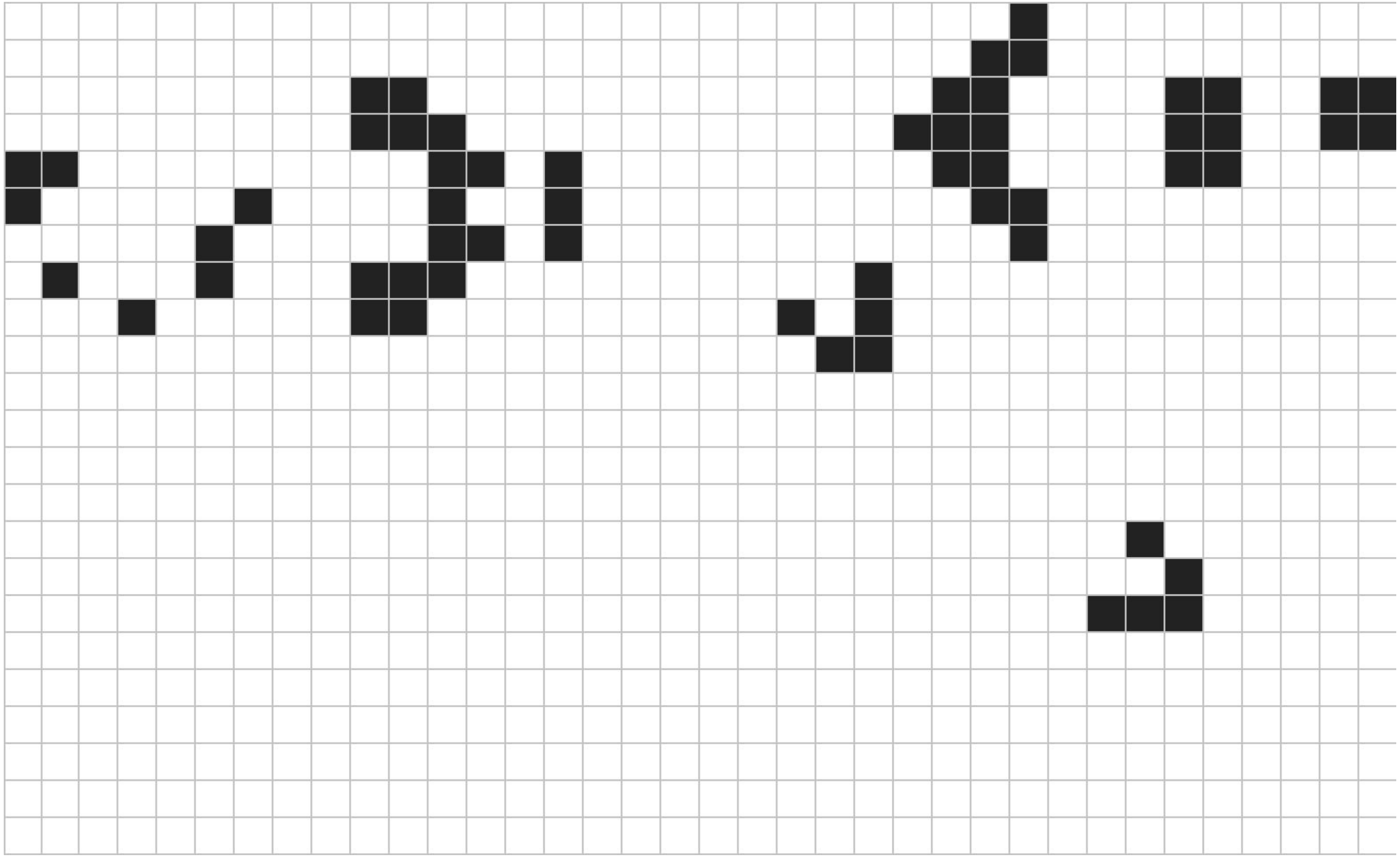
1. A living cell with two or three living neighbors survives to the next generation.
2. A living cell with fewer than two living neighbors dies from underpopulation.
3. A living cell with more than three living neighbors dies from overpopulation.
4. A dead cell with exactly three living neighbors becomes a living cell by reproduction.

ALIVE



DEAD

THE WORLD



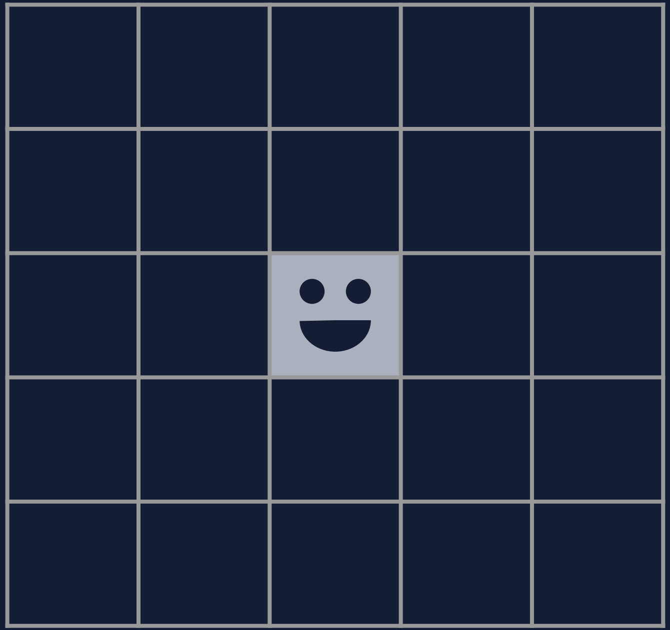
A living cell with two or three living neighbors survives to the next generation.

GENERATION | 0

#1 RULE

#1 RULE

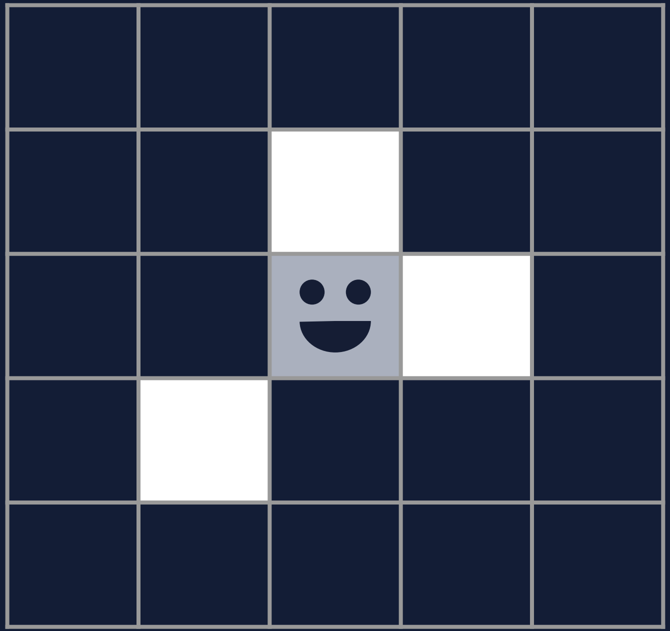
A living cell with two or three living neighbors survives to the next generation.



GENERATION | 1

#1 RULE

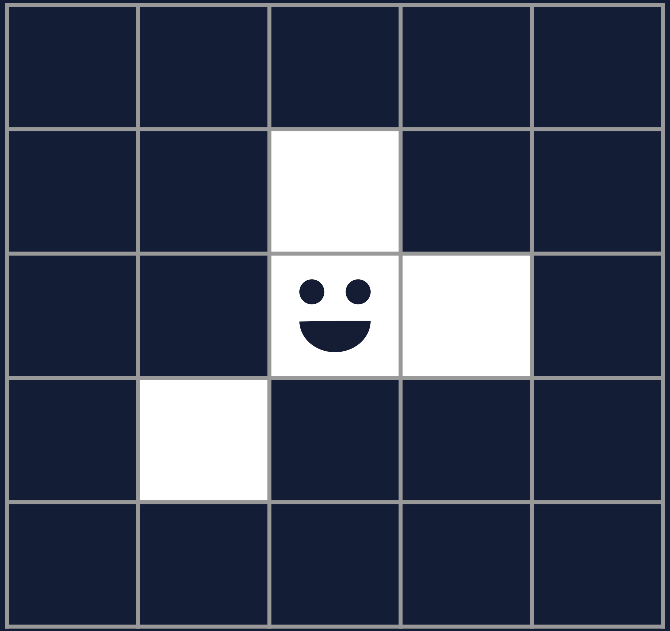
A living cell with two or three living neighbors survives to the next generation.



GENERATION | 1

#1 RULE

A living cell with two or three living neighbors survives to the next generation.



GENERATION | 2

#1 RULE

The first rule of Conway's Game of Life states that any living cell with two or three living neighbors survives to the next generation. This means that if a cell is alive and has either two or three living neighbors, it will continue to be alive in the next generation.

The idea behind this rule is that a living cell that is surrounded by other living cells is likely to be part of a stable, self-sustaining structure. For example, a group of three living cells in a row, with one cell above and one cell below, would satisfy this rule and would form a stable pattern known as a "blinker" that oscillates back and forth between two different configurations.

This rule is important because it **helps to maintain stability in the system**. Without it, the number of living cells in the grid would tend to either grow uncontrollably or shrink to zero. By allowing cells with two or three neighbors to survive, the system is able to maintain a balance between growth and decay, resulting in a wide variety of interesting patterns and behaviors.

RULE #2

A living cell with fewer than two living neighbors dies from underpopulation.

GENERATION | 0

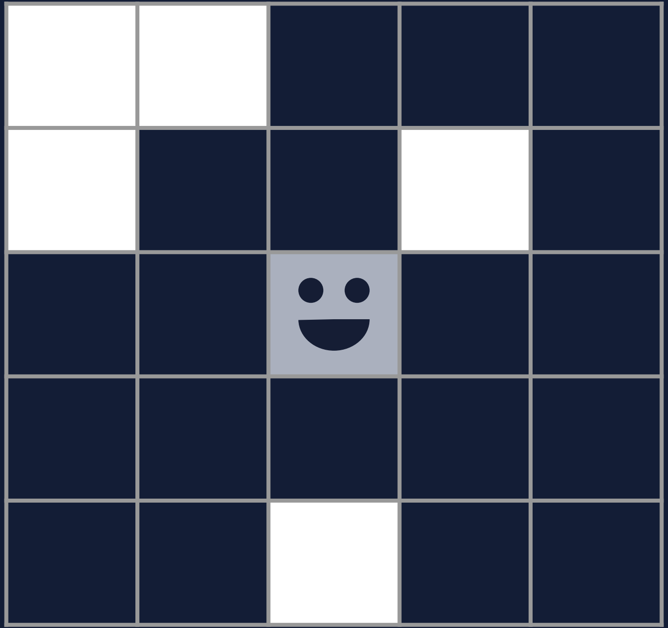
A living cell with fewer than two living neighbors dies from underpopulation.

GENERATION | 1

#2 RULE

#2 RULE

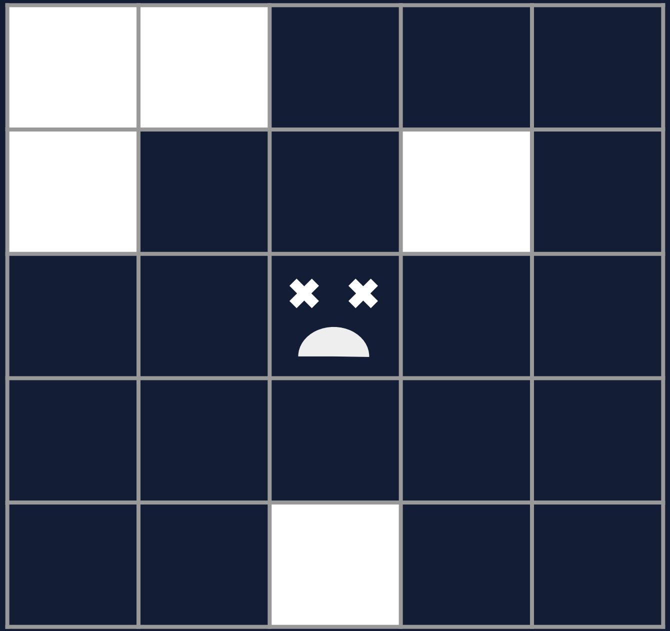
A living cell with fewer than two living neighbors dies from underpopulation.



GENERATION | 1

#2 RULE

A living cell with fewer than two living neighbors dies from underpopulation.



GENERATION | 2

#2 RULE

The second rule of Conway's Game of Life states that any living cell with fewer than two living neighbors dies, as if by underpopulation. This means that if a cell is alive and has fewer than two living neighbors (i.e., it is isolated), it will die in the next generation.

The idea behind it is that a living cell that is isolated from its neighbors is unlikely to be part of a stable, self-sustaining structure. Instead, it will tend to wither away and eventually die out.

This rule is important because it helps to prevent the grid from becoming overcrowded with isolated, dying cells. By removing these cells, the system is able to focus on the more interesting patterns and structures that emerge from larger groups of cells.

However, it is worth noting that it can also be **responsible for causing patterns to die out over time**. For example, a group of cells that is initially arranged in a straight line will quickly die out because each cell only has one neighbor, which is not enough to keep it alive. This can lead to the emergence of more complex patterns as the system continues to evolve.

A living cell with more than three living neighbors dies from overpopulation.

GENERATION | 0

#3 RULE

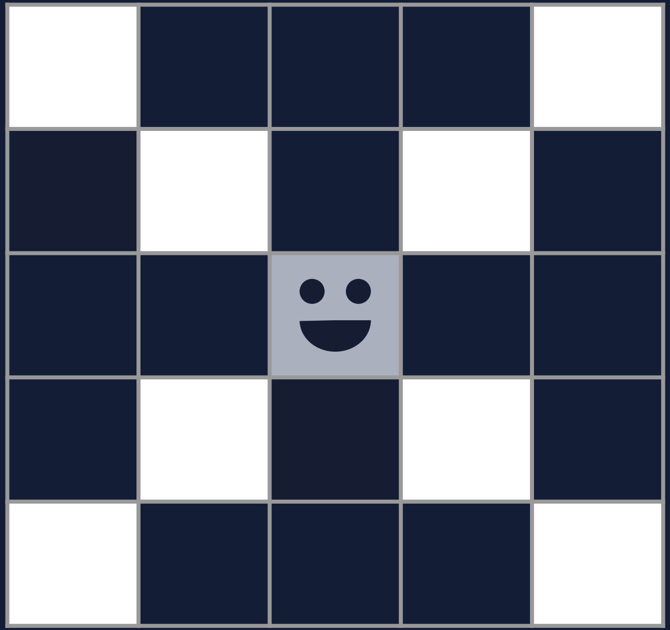
#3
RULE

A living cell with more than three living neighbors dies from overpopulation.

GENERATION | 1

#3 RULE

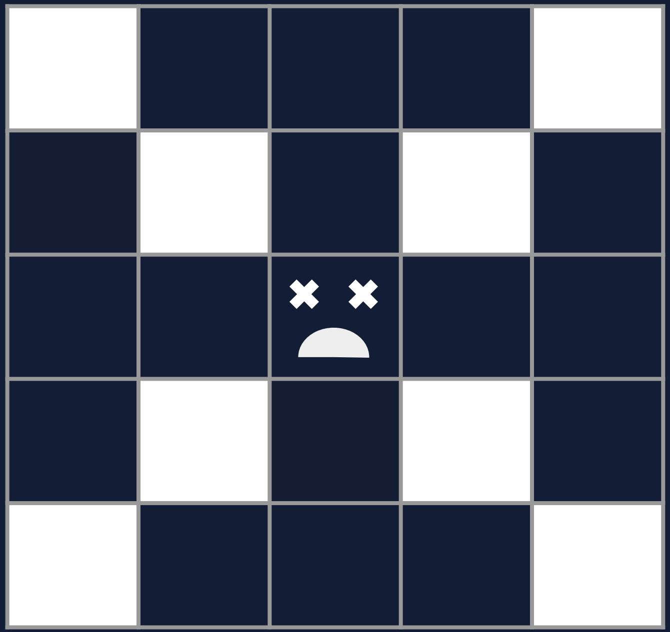
A living cell with more than three living neighbors dies from overpopulation.



GENERATION | 1

#3 RULE

A living cell with more than three living neighbors dies from overpopulation.



GENERATION | 2

#3 RULE

The third rule of Conway's Game of Life states that any living cell with more than three living neighbors dies, as if by overpopulation. This means that if a cell is alive and has more than three living neighbors, it will die in the next generation.

The idea behind this rule is that a living cell that is surrounded by too many other living cells is unlikely to be part of a stable, self-sustaining structure. Instead, it will become overwhelmed and eventually die out.

This rule is important because it **helps to prevent the grid from becoming overcrowded with too many living cells**. By removing these cells, the system is able to focus on the more interesting patterns and structures that emerge from smaller groups of cells.

However, this rule can also lead to interesting patterns and behaviors. For example, a group of cells that is initially arranged in a circular pattern will tend to expand outward until it eventually dies out due to overpopulation. This can lead to the emergence of more complex patterns as the system continues to evolve.

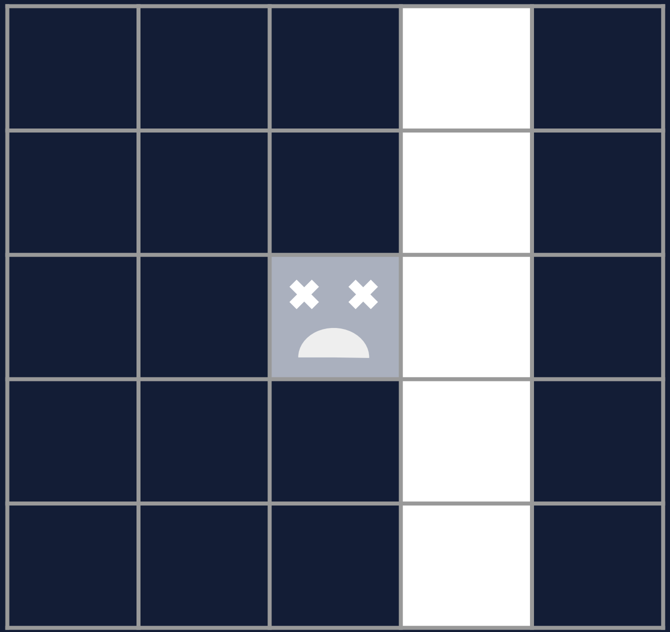
#4 RULE

A dead cell with exactly three living neighbors becomes a living cell by reproduction.

GENERATION | 0

#4 RULE

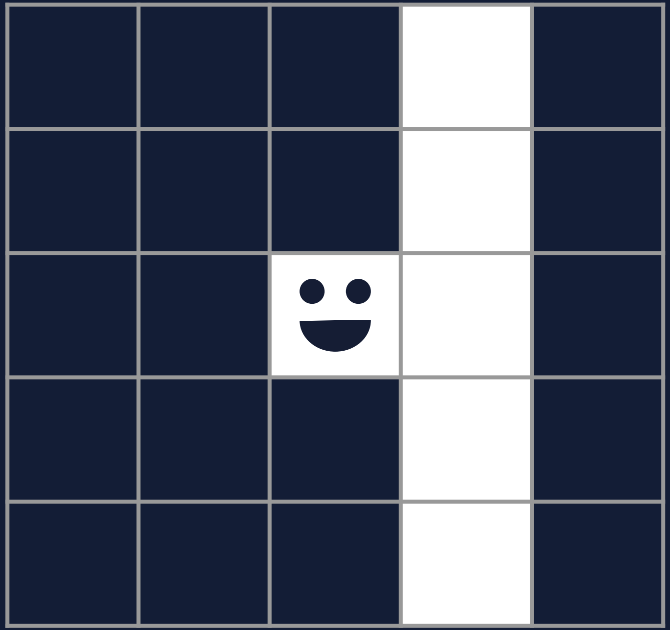
A dead cell with exactly three living neighbors becomes a living cell by reproduction.



GENERATION | 1

#4 RULE

A dead cell with exactly three living neighbors becomes a living cell by reproduction.



GENERATION | 2

#4 RULE

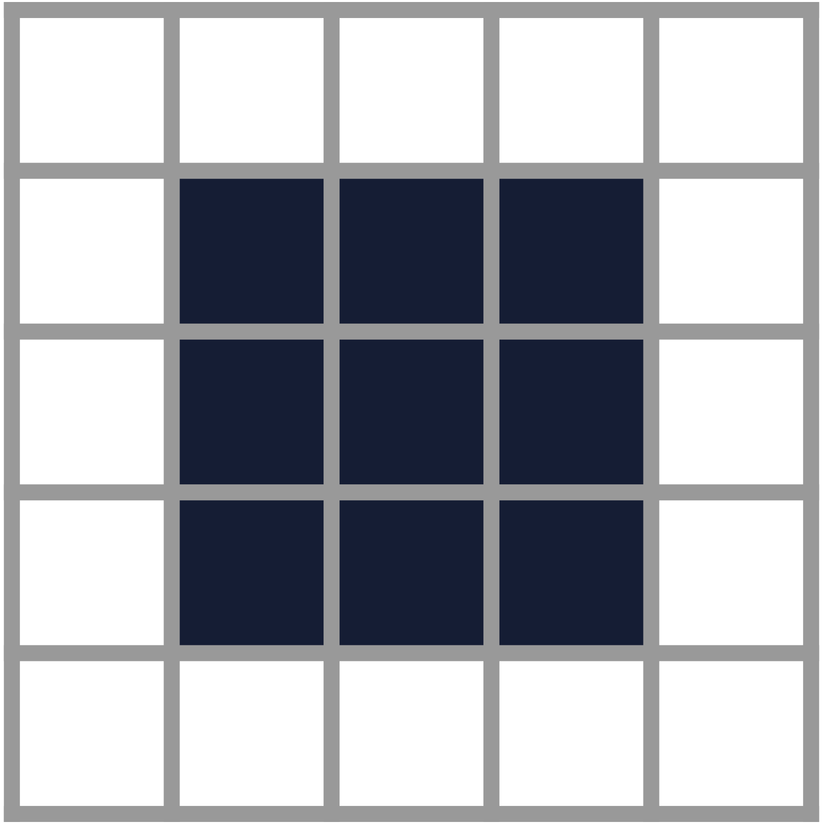
The fourth rule of Conway's Game of Life states that any dead cell with exactly three living neighbors becomes a live cell, as if by reproduction. This means that if a cell is dead and has exactly three living neighbors, it will come to life in the next generation.

The idea behind this rule is that a group of three living cells is the minimum requirement for a stable, self-sustaining structure to emerge. When a dead cell is surrounded by exactly three living cells, it is in the perfect position to become part of this structure and contribute to the overall evolution of the system.

This rule is important because **it allows for new patterns and structures to emerge from the system**. As dead cells are brought to life by their living neighbors, they can join together to form new groups and structures, which can in turn give rise to even more complex patterns and behaviors.

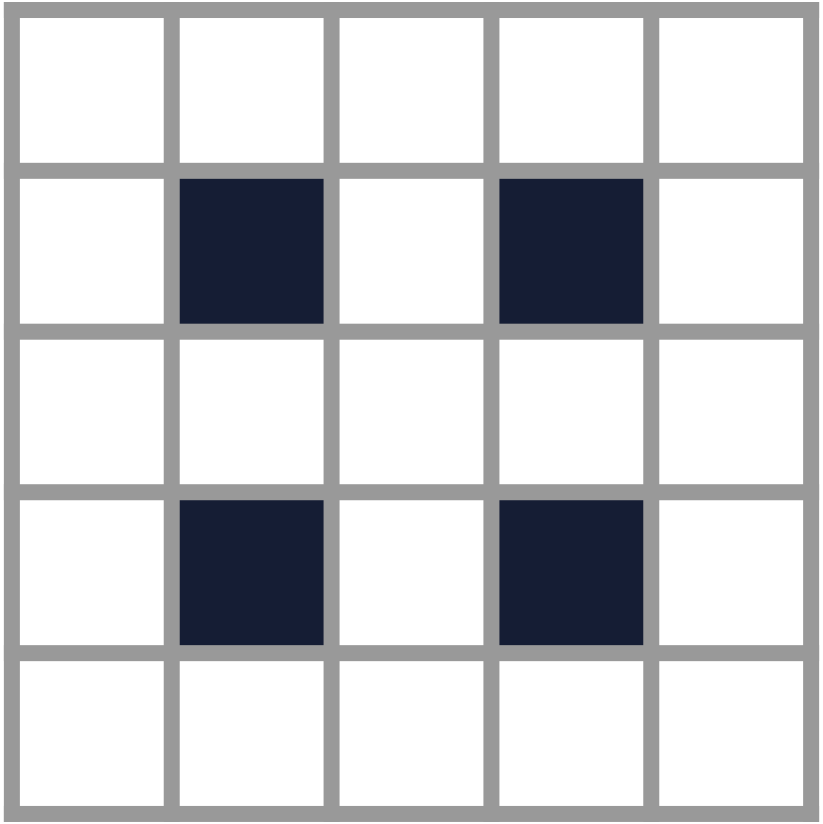
One interesting aspect of this rule is that it can lead to the creation of "glider" patterns, which are groups of cells that move through the grid in a particular direction over time. Gliders are a good example of how simple rules can give rise to complex, emergent behavior in Conway's Game of Life.

GUESS THE RULE | ???



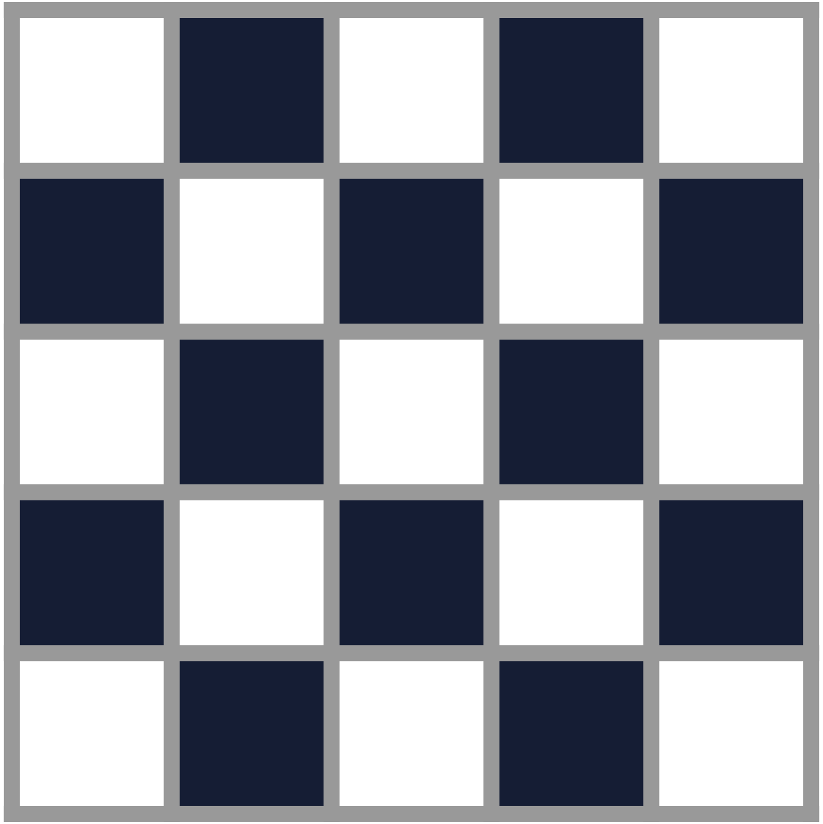
GENERATION | 0

GUESS THE RULE | ???

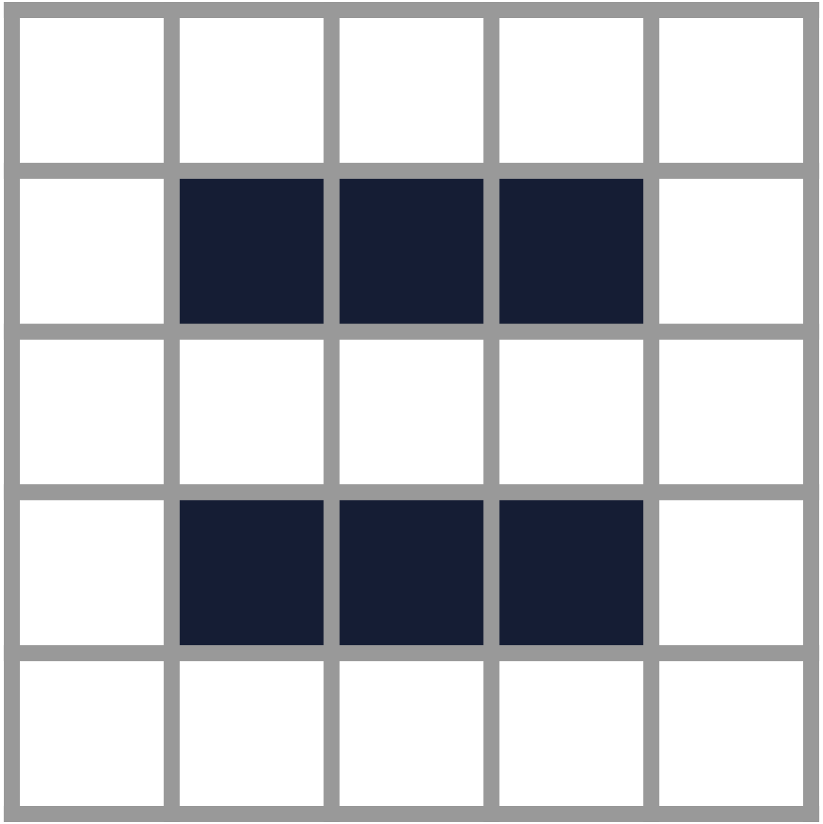


GENERATION | 1

GUESS THE RULE | OVERPOPULATION

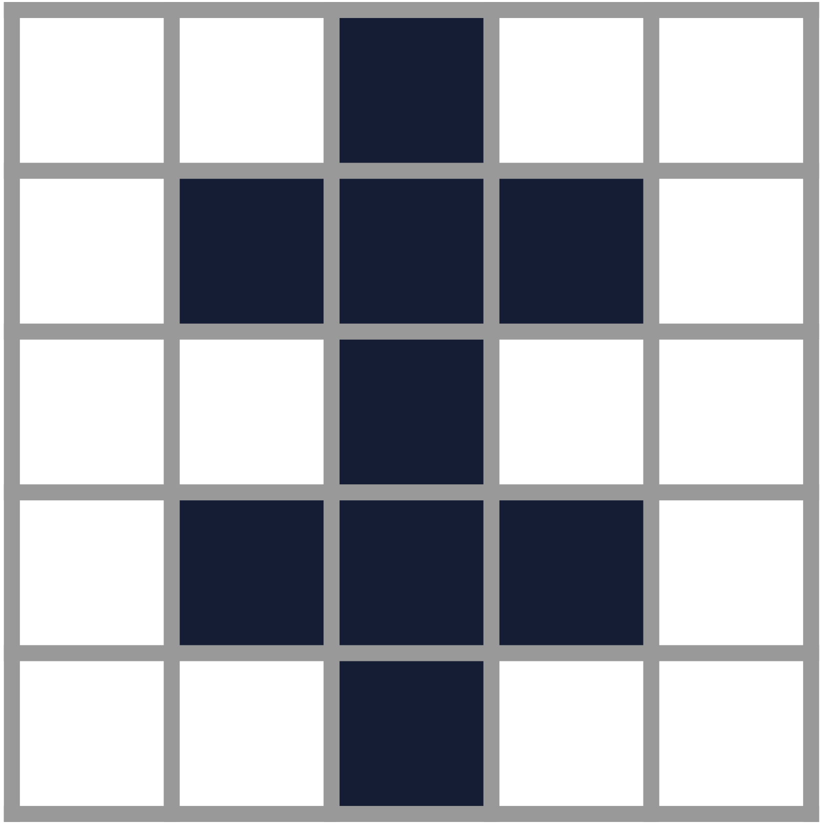


GUESS THE RULE | ???



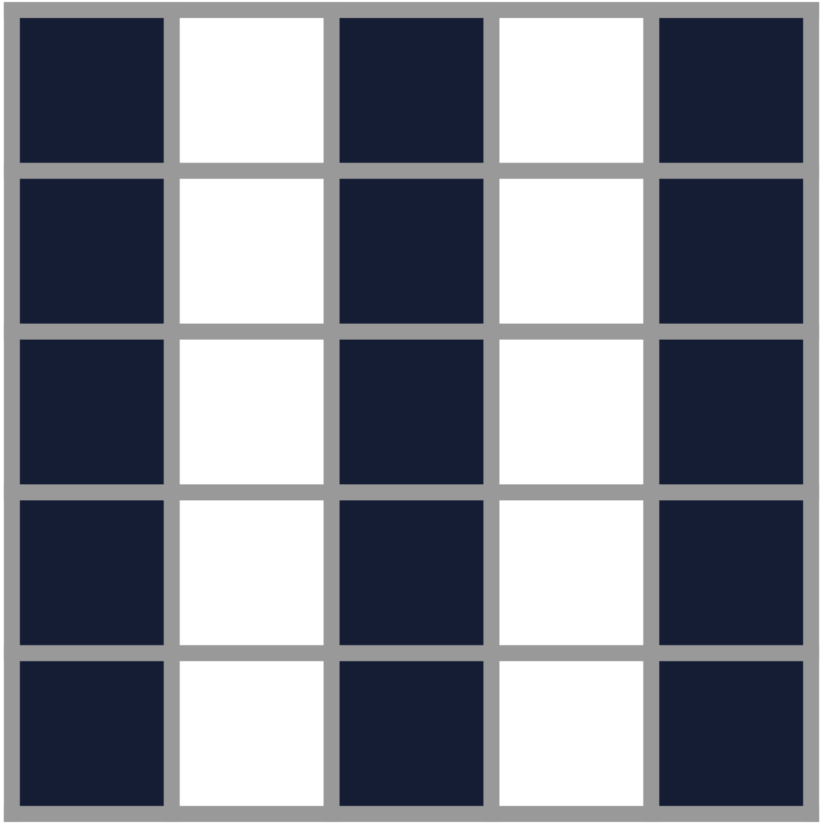
GENERATION | 1

GUESS THE RULE | ???

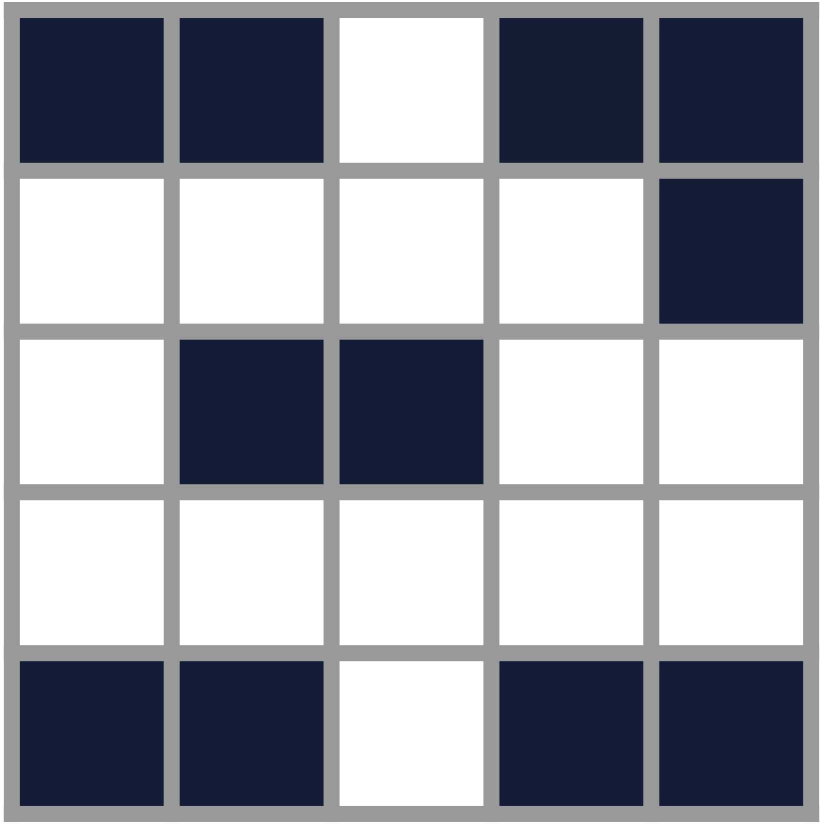


GENERATION | 2

GUESS THE RULE | REPRODUCTION

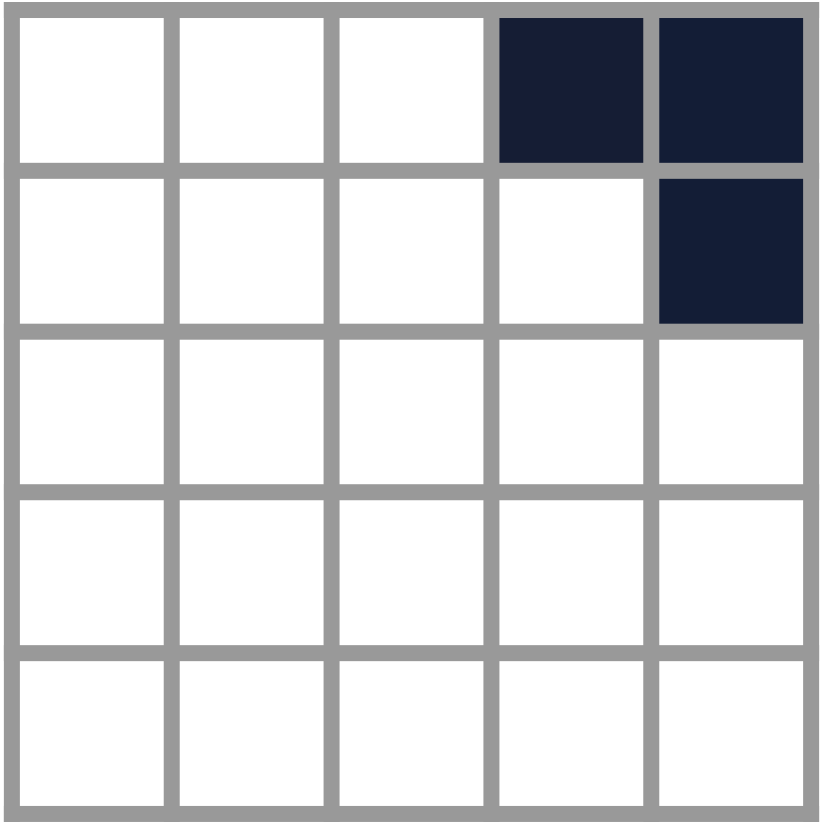


GUESS THE RULE | ???



GENERATION | 1

GUESS THE RULE | ???



GENERATION | 2

GUESS THE RULE | UNDERPOPULATION

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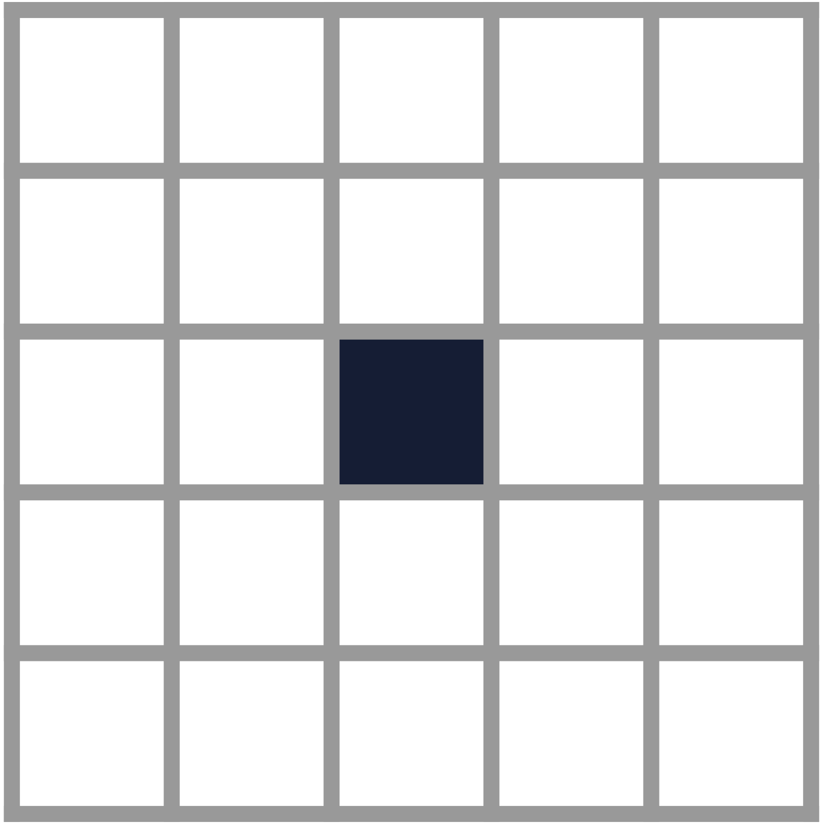
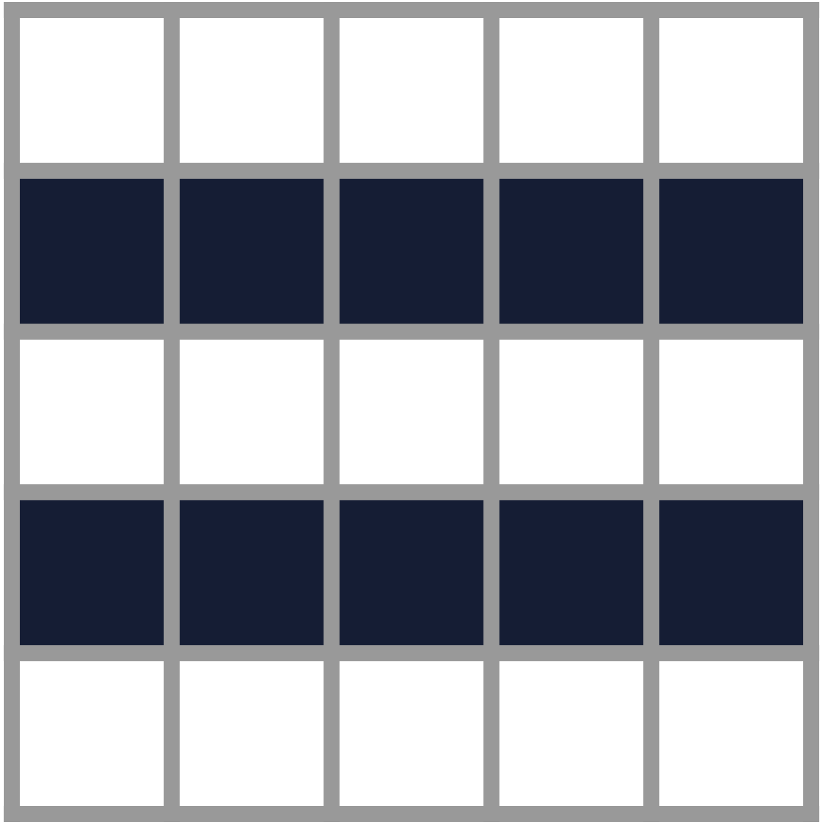


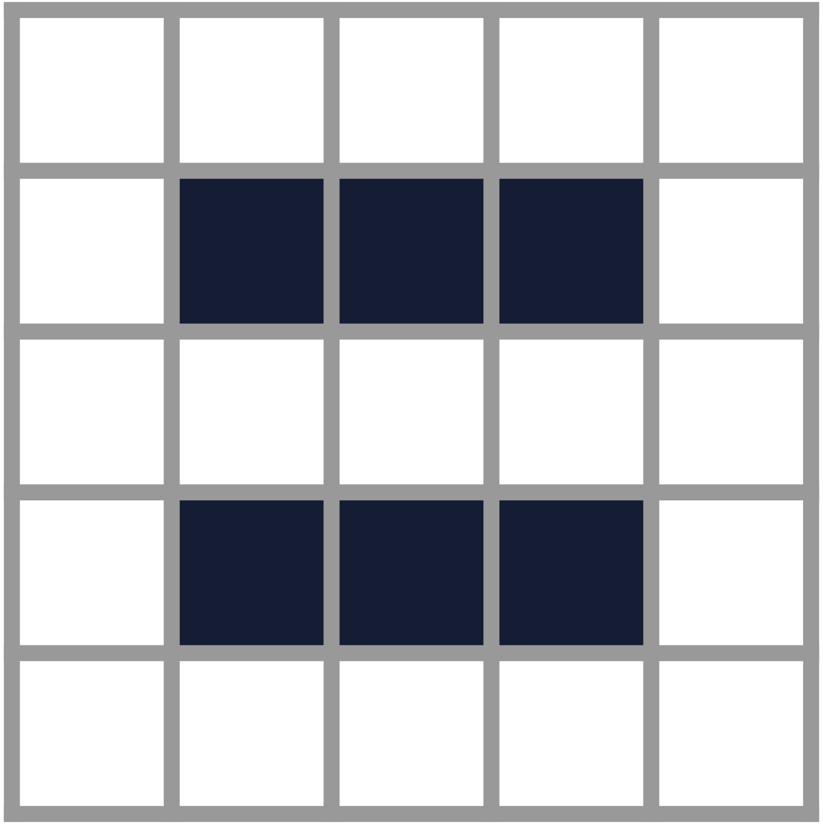
GUESS THE RULE | SURVIVAL

MULTIMEDIA TECHNOLOGIES COURSE



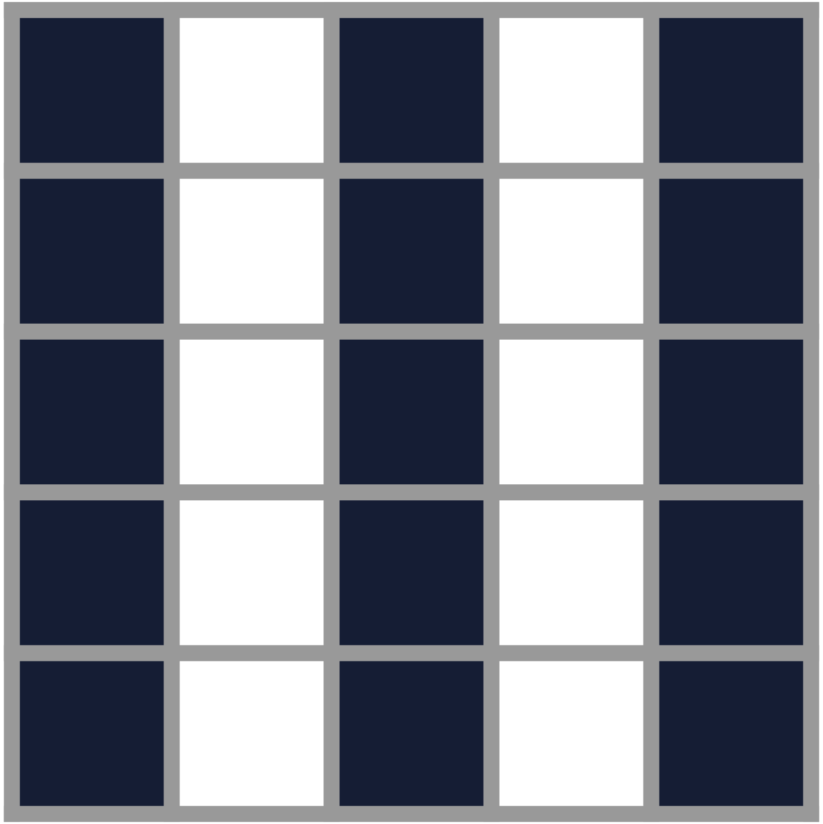
GENERATION | 1

GUESS THE RULE | ???

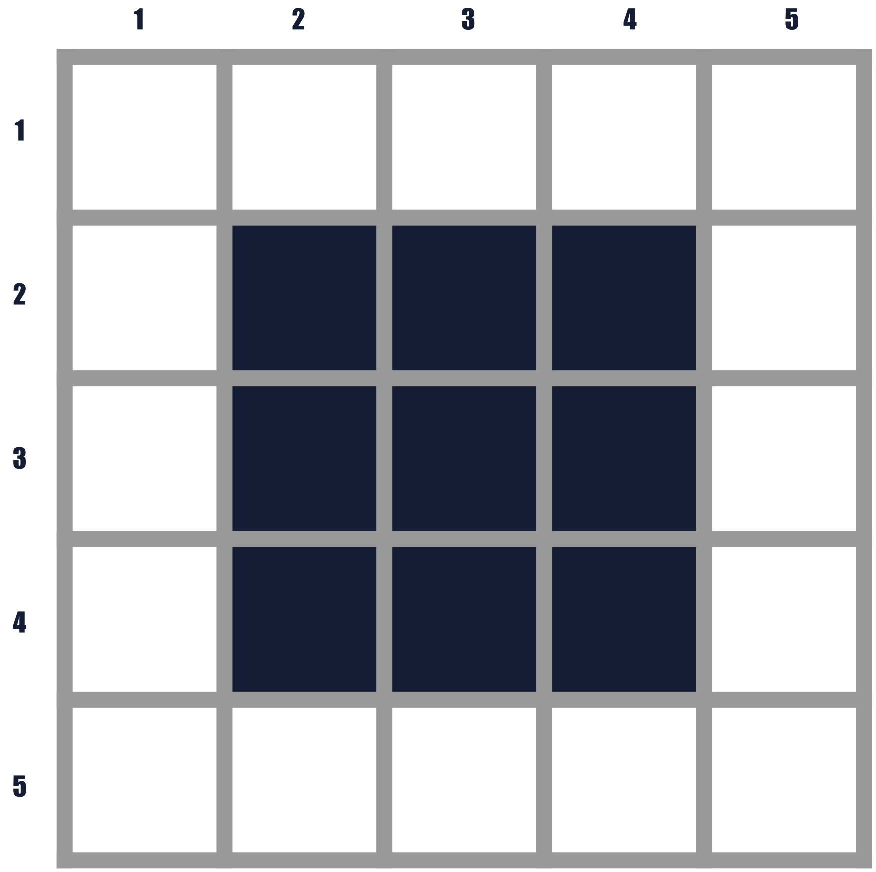


GENERATION | 2

GUESS THE RULE | SURVIVAL

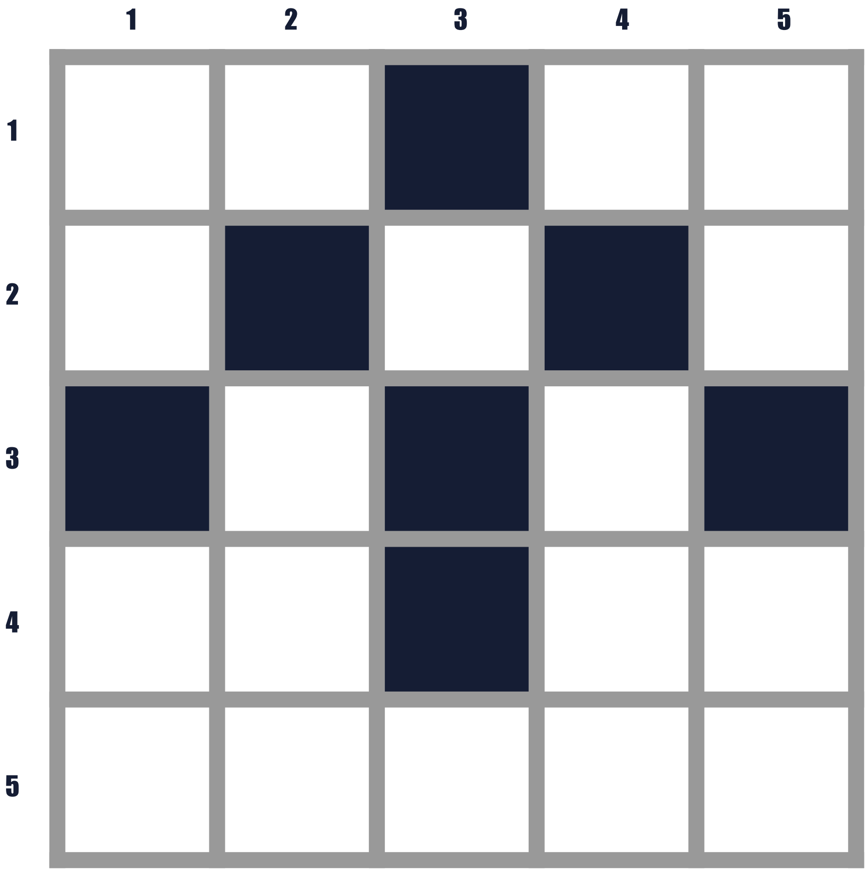


GAME OF LIFE SIMULATION | GUESS THE RULES



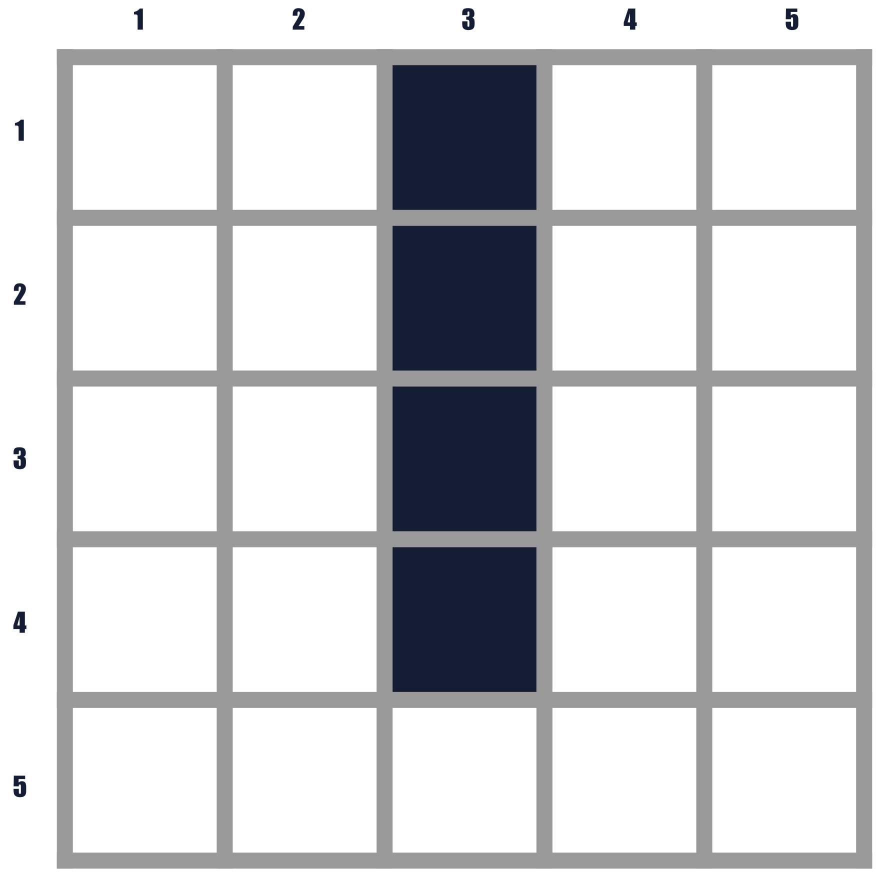
GENERATION | 0

GAME OF LIFE SIMULATION | GUESS THE RULES



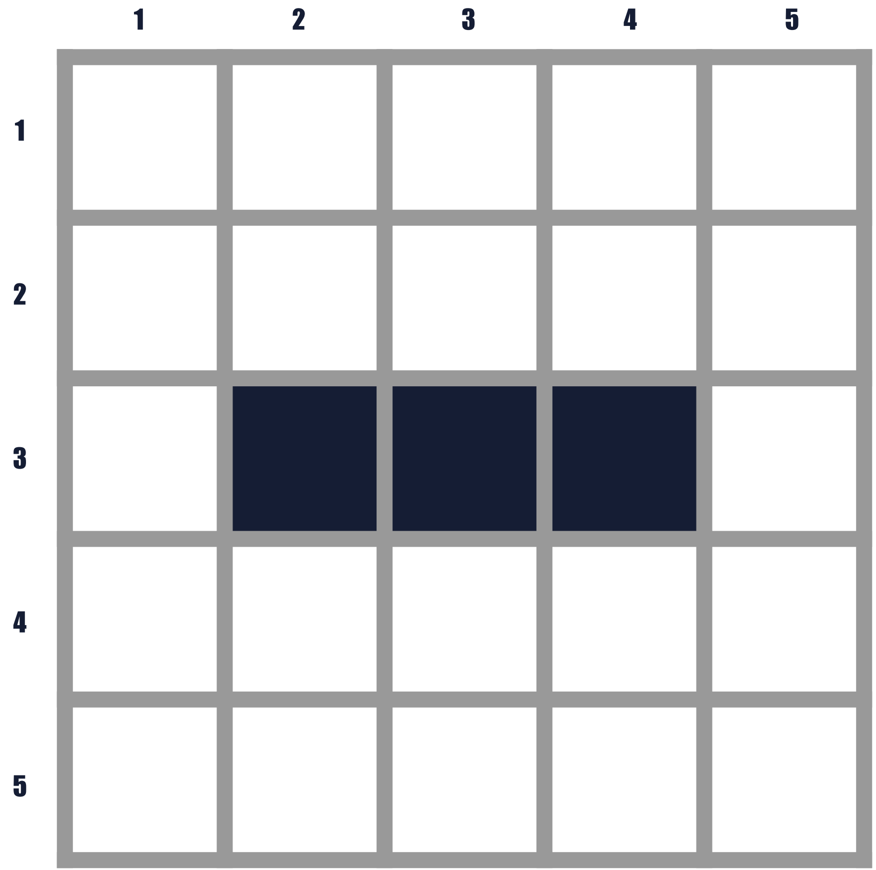
GENERATION | 1

GAME OF LIFE SIMULATION | GUESS THE RULES



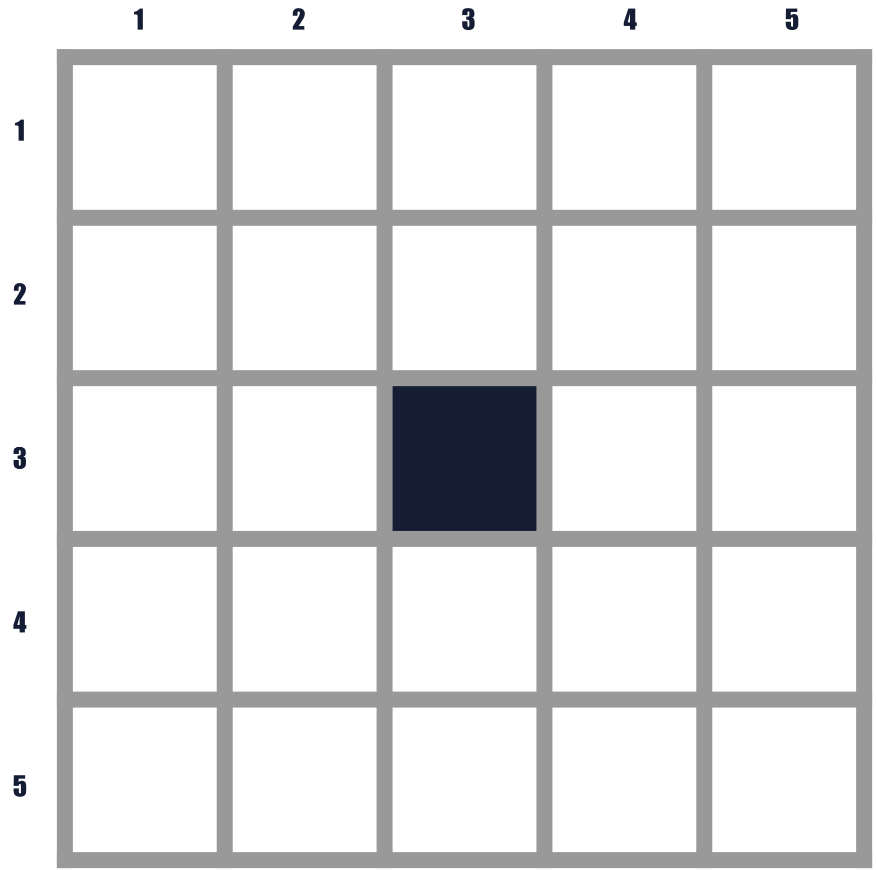
GENERATION | 2

GAME OF LIFE SIMULATION | GUESS THE RULES



GENERATION | 3

GAME OF LIFE SIMULATION | GUESS THE RULES



GENERATION | 4

GAME OF LIFE SIMULATION | GUESS THE RULES

	1	2	3	4	5
1					
2					
3					
4					
5					

GENERATION | 5

PATTERNS
IN GAME OF LIFE

There are many different types of patterns that can arise in Conway's Game of Life, and they are composed of various combinations of the four rules of the game.

Here are some examples:

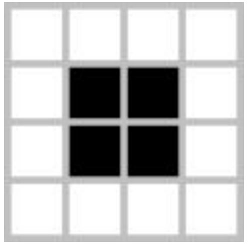
1. STILL LIFE
2. OSCILLATOR
3. SPACESHIP
4. ... many more

PATTERNS
IN GAME OF LIFE

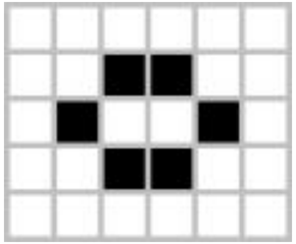
STILL LIFE

A still life is a pattern that remains unchanged from one generation to the next. These patterns are called still lives because they do not move or change shape.

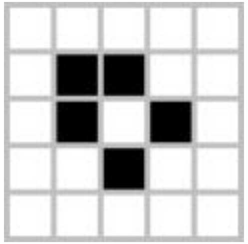
They can occur in any size and shape, but once they are formed, they remain unchanged forever.



BLOCK



BEEHIVE



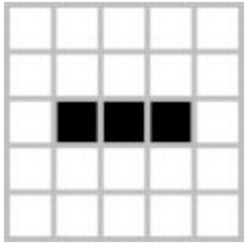
BOAT

PATTERNS
IN GAME OF LIFE

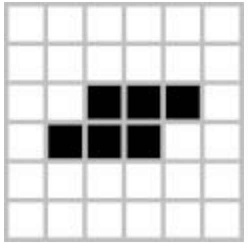
OSCILLATOR

An oscillator is a pattern that returns to its original state after a certain number of generations. T

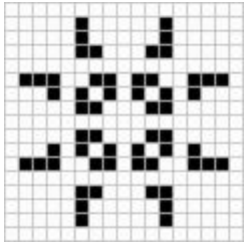
hese patterns move in a periodic way and usually oscillate back and forth between two or more states.



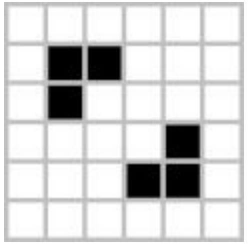
BLINKER



TOAD



PULSAR



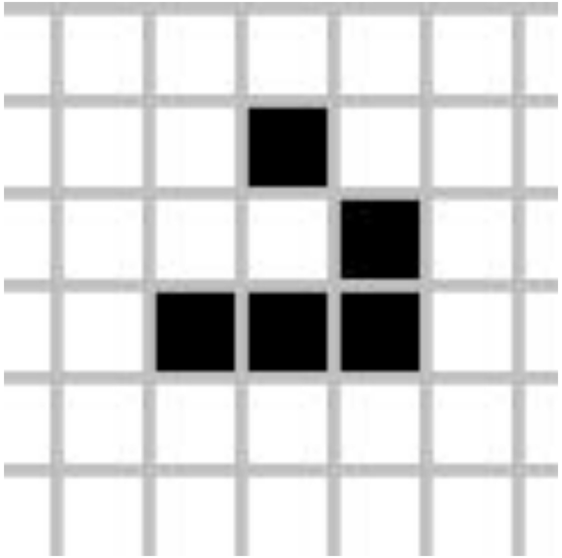
BEACON

PATTERNS
IN GAME OF LIFE

SPACESHIP

A spaceship is a pattern that moves through the game space as it evolves.

These patterns move in a predictable direction and repeat their shape after a certain number of generations.



GLIDER

THE
END

BUT NOT BEFORE YOU’LL HAVE SOME
- FUN -

https://playgameoflife.com/