



POLITECNICO
MILANO 1863

Region Growing Algorithm for Burned Area Mapping for Sentinel-2 Data

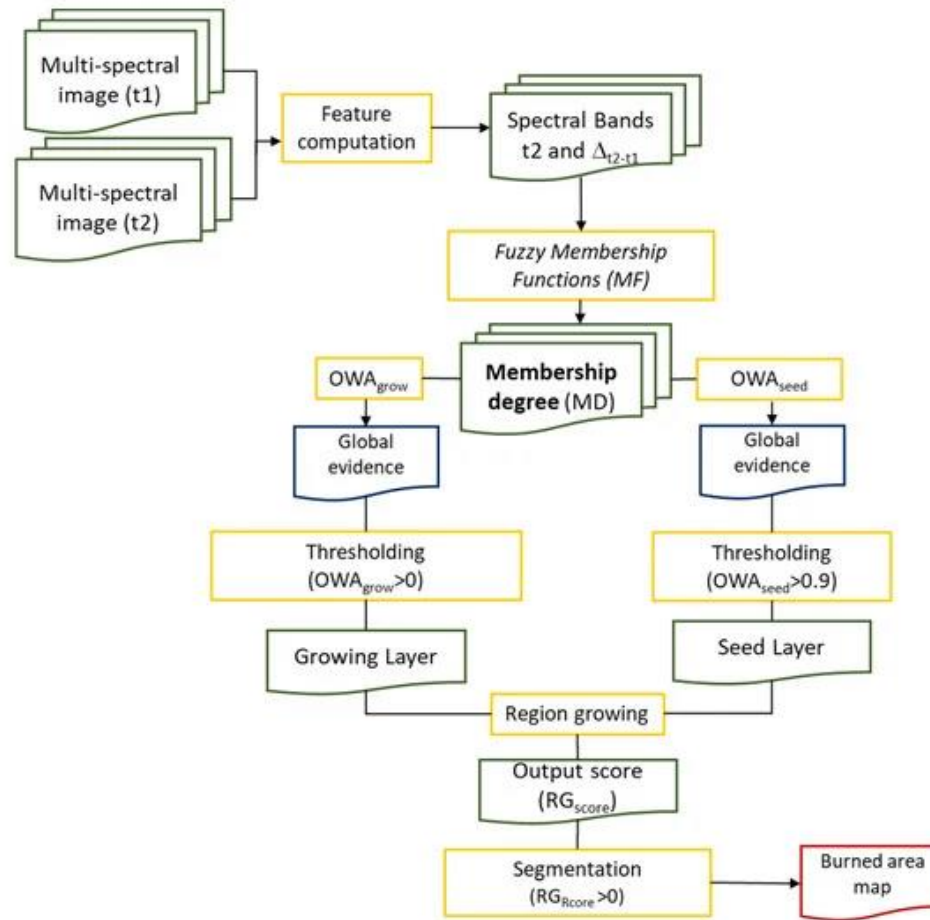


POLITECNICO
MILANO 1863

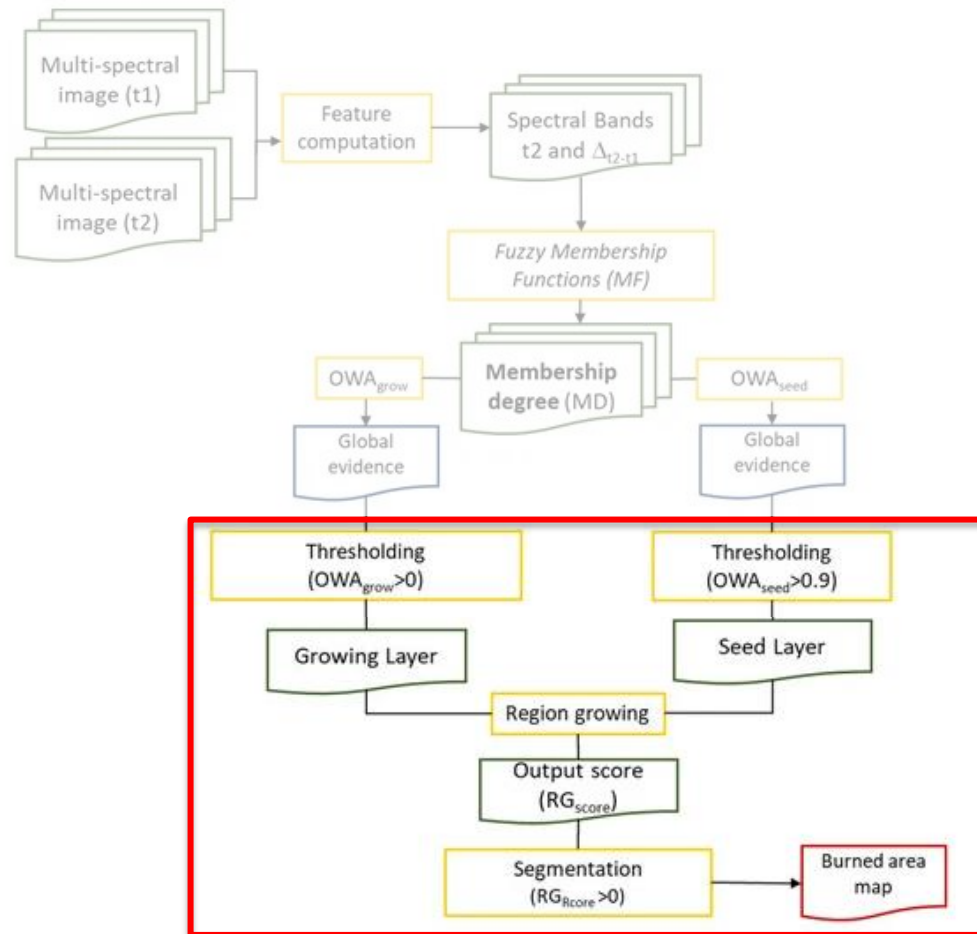
Author: Thomas Martinoli

Proffessors: Giovanna Venuti

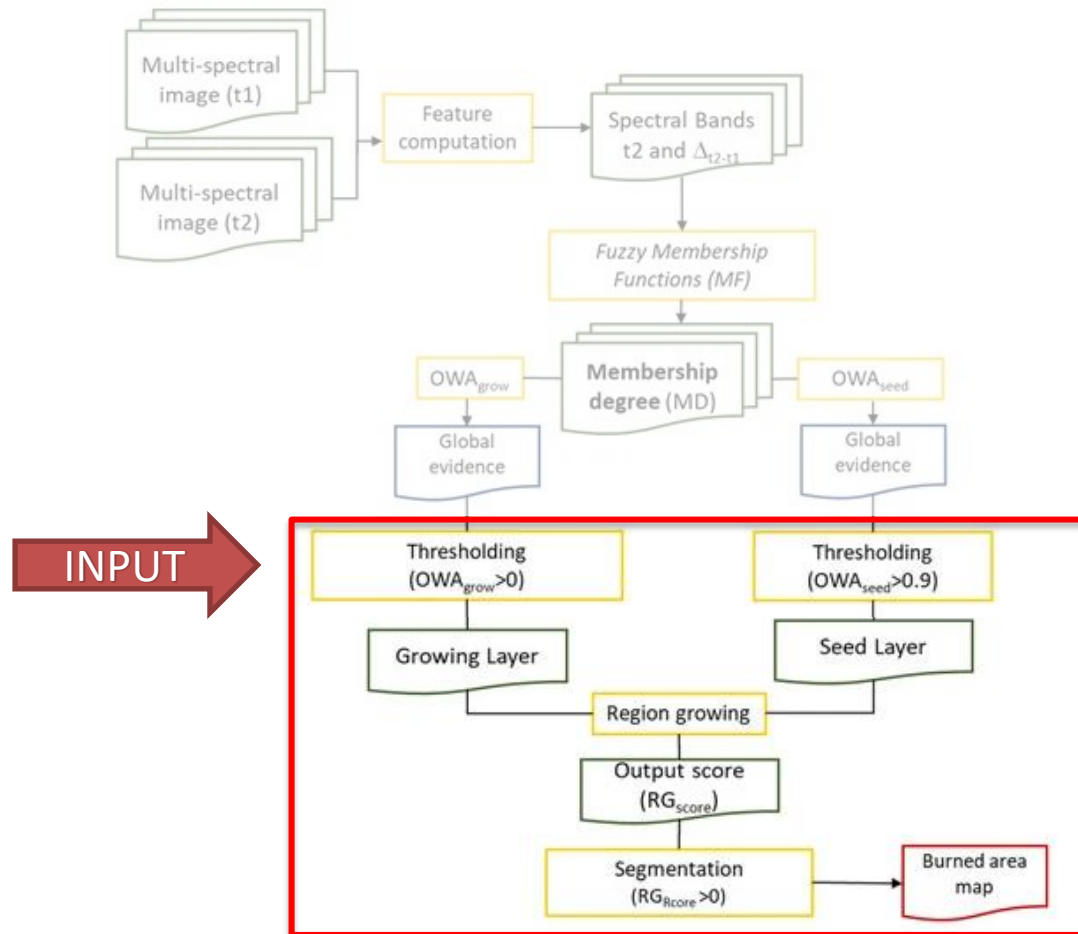
FLOWCHART TO GENERATE BA MAPS



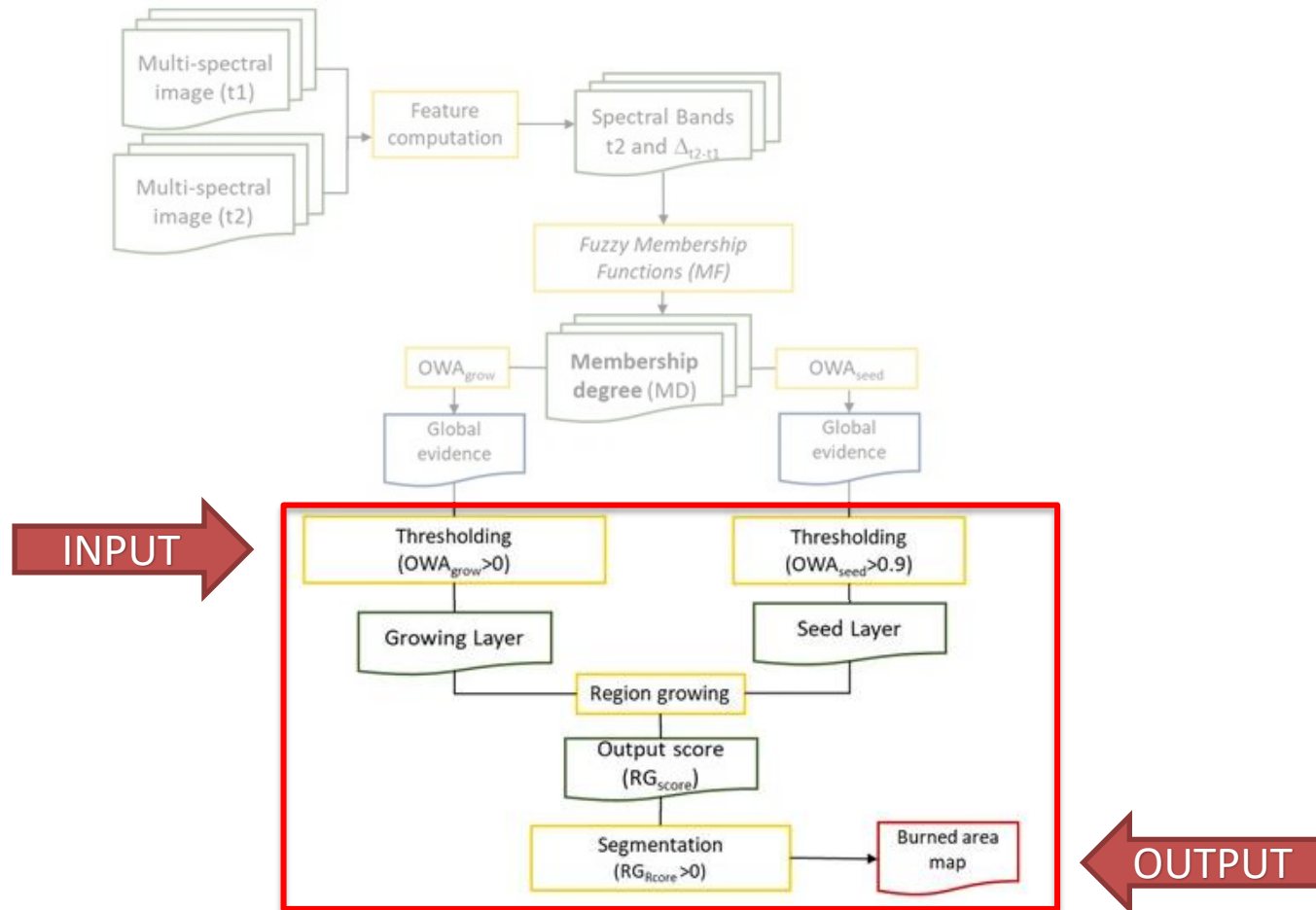
FLOWCHART TO GENERATE BA MAPS



FLOWCHART TO GENERATE BA MAPS



FLOWCHART TO GENERATE BA MAPS





ALGORITHMS



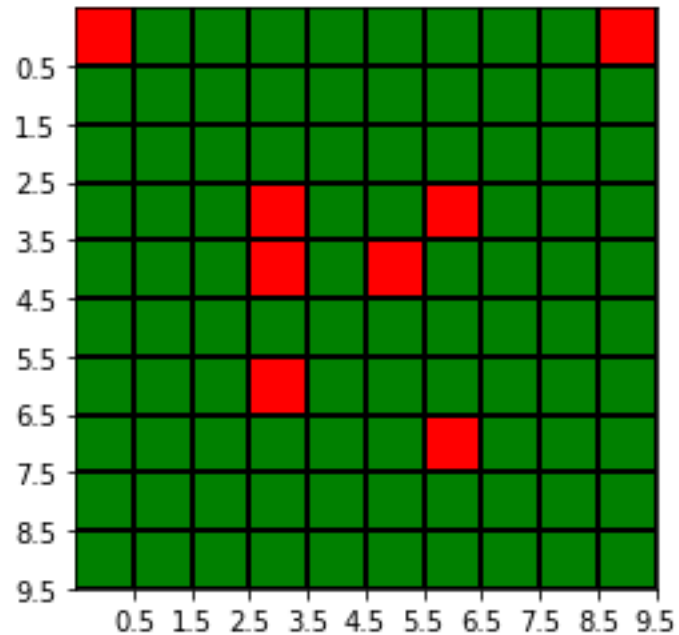
ALGORITHMS

*SCROLLING THE MATRIX
PIXEL BY PIXEL*

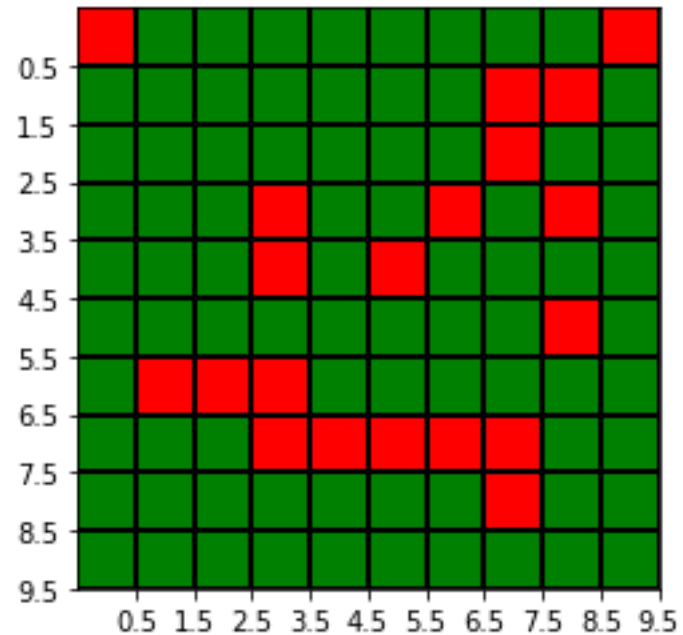
SCROLLING THE MATRIX PIXEL BY PIXEL

Input

Seed Matrix



Grow Matrix

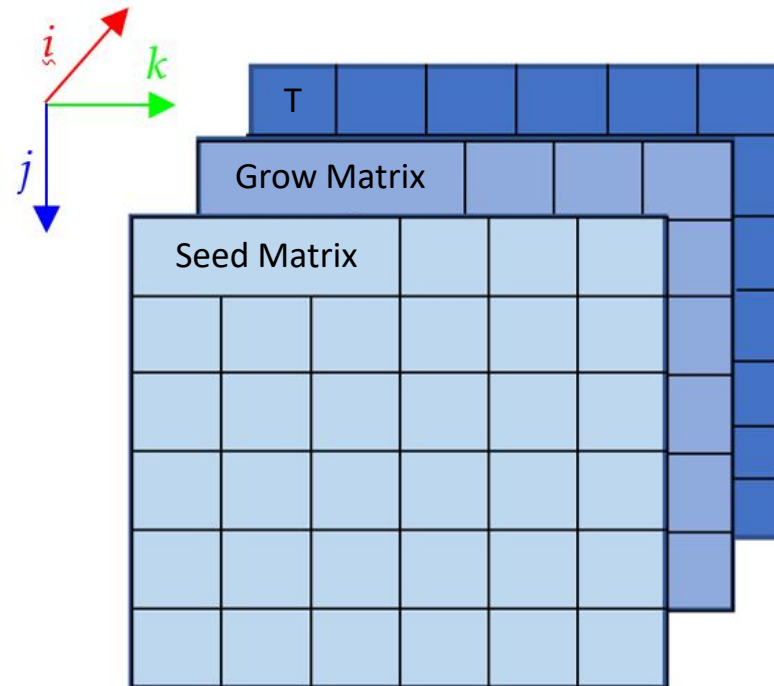


 *UnBurned (0)*

 *Burned (1)*

SCROLLING THE MATRIX PIXEL BY PIXEL

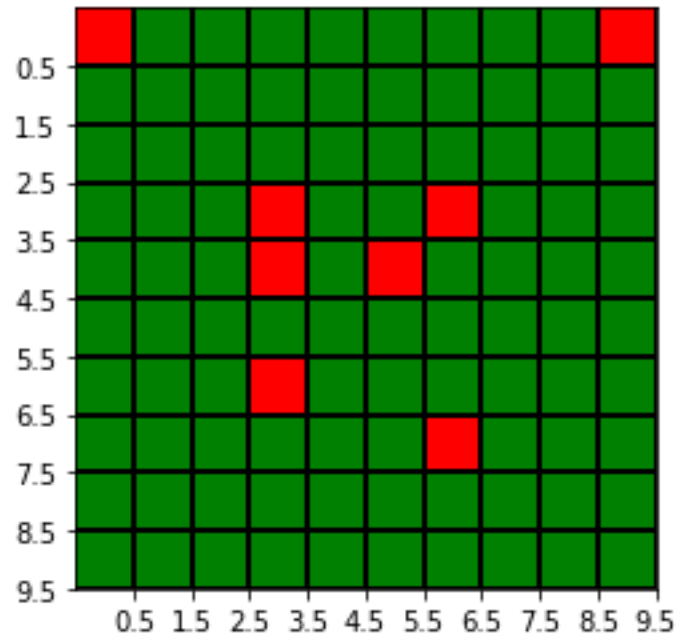
Data structure



SCROLLING THE MATRIX PIXEL BY PIXEL

Ex1 - Cycle 1

Seed Matrix



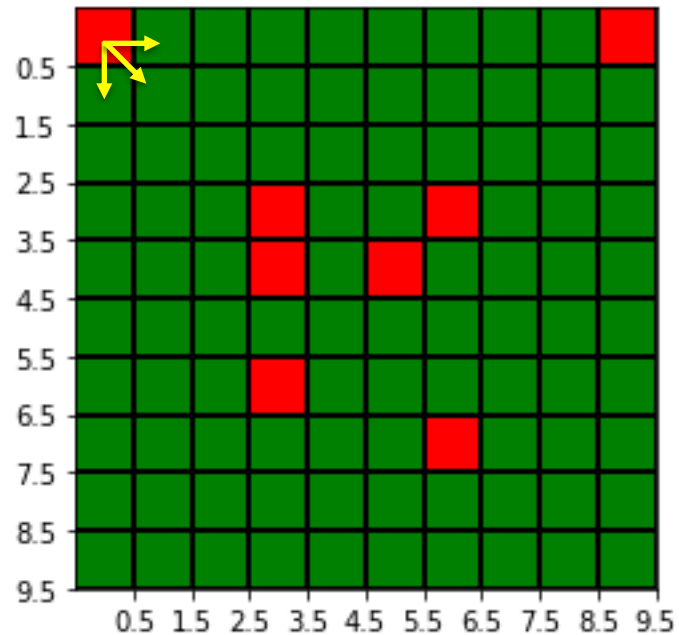
 *UnBurned (0)*

 *Burned (1)*

SCROLLING THE MATRIX PIXEL BY PIXEL

Ex1 - *Cycle 1 - element (0,0)*

Seed Matrix



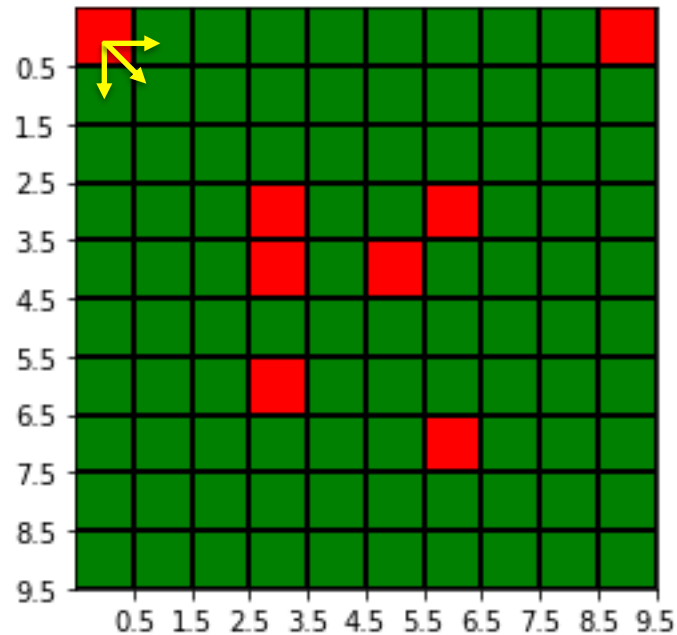
 *UnBurned (0)*

 *Burned (1)*

SCROLLING THE MATRIX PIXEL BY PIXEL

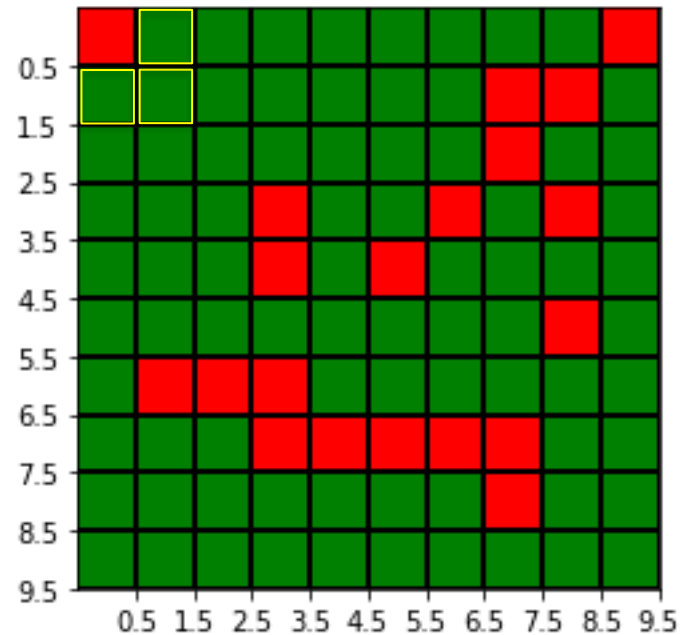
Ex1 - Cycle 1 - element (0,0)

Seed Matrix



 *UnBurned (0)*

Grow Matrix

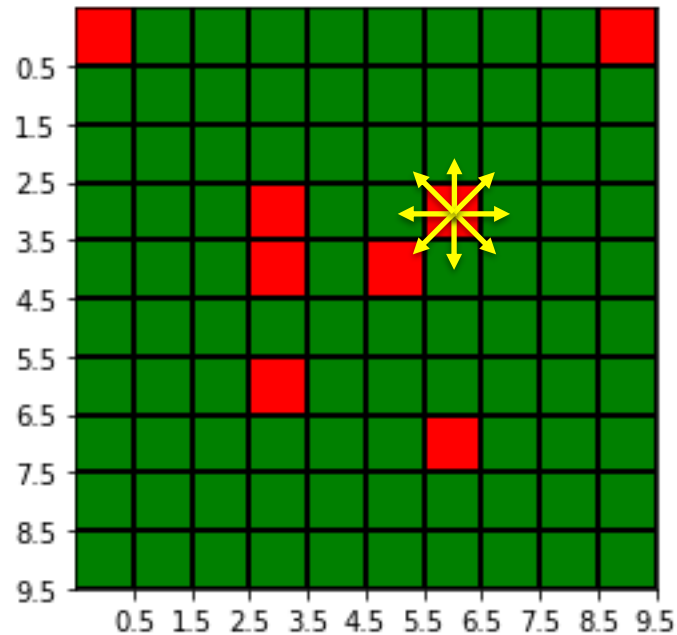


 *Burned (1)*

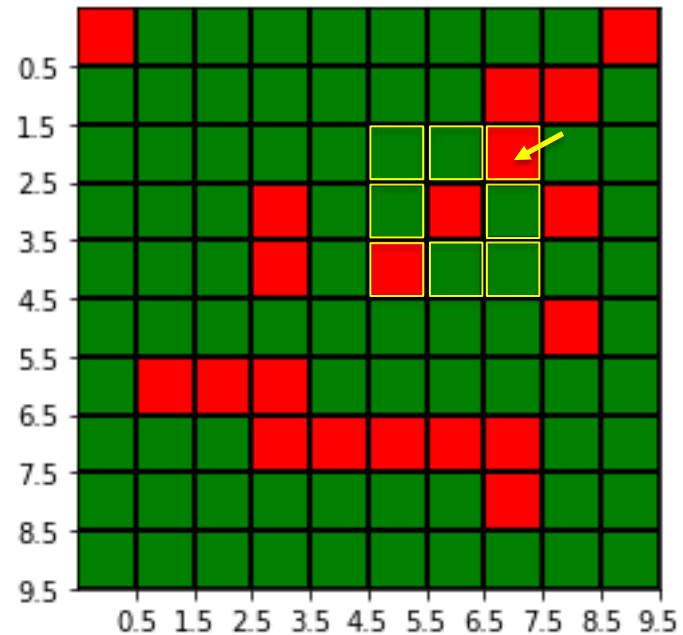
SCROLLING THE MATRIX PIXEL BY PIXEL

Ex2 - Cycle 1 - element (3,6)

Seed Matrix



Grow Matrix



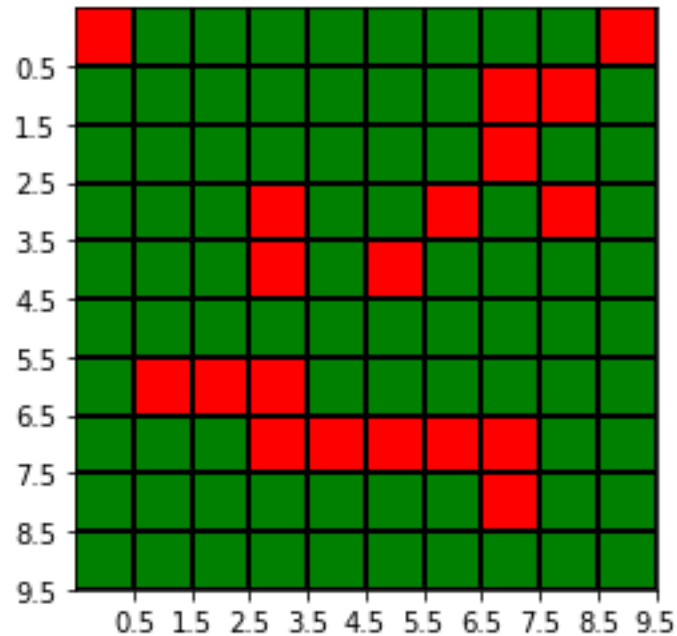
 *UnBurned (0)*

 *Burned (1)*

SCROLLING THE MATRIX PIXEL BY PIXEL

Output

Result Matrix



 *UnBurned (0)*

 *Burned (1)*



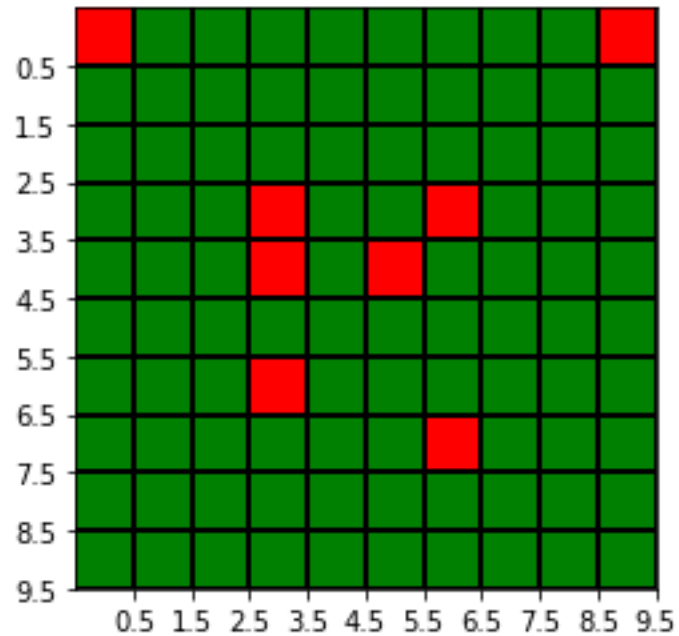
ALGORITHMS

SUMMING THE LAYERS

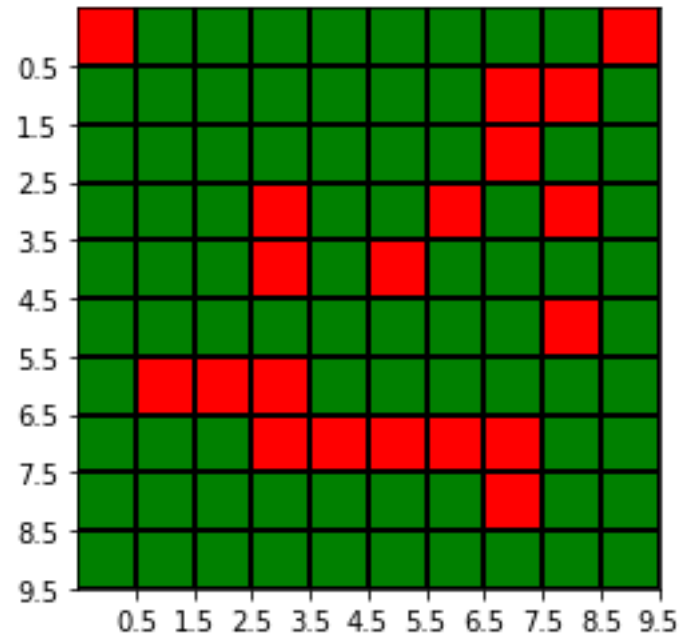
SUMMING THE LAYERS

Input

Seed Matrix



Grow Matrix



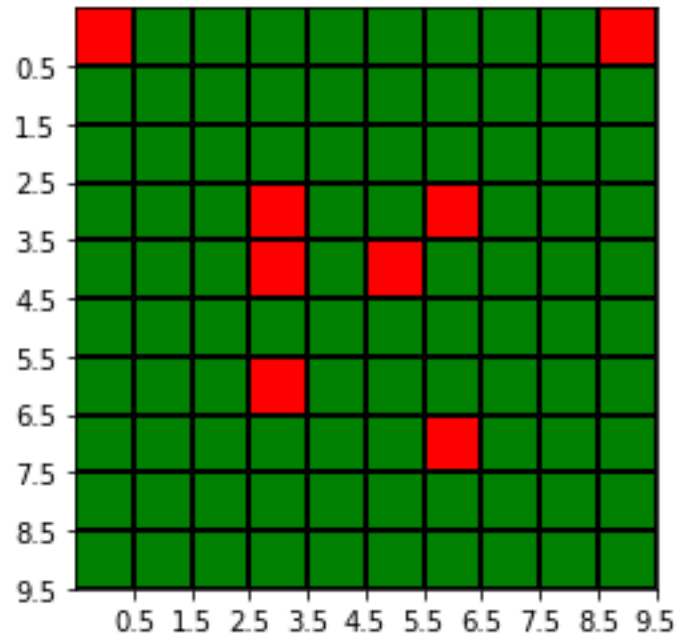
 *UnBurned (0)*

 *Burned (1)*

SUMMING THE LAYERS

Cycle 1 - Neighbors research

Seed Matrix



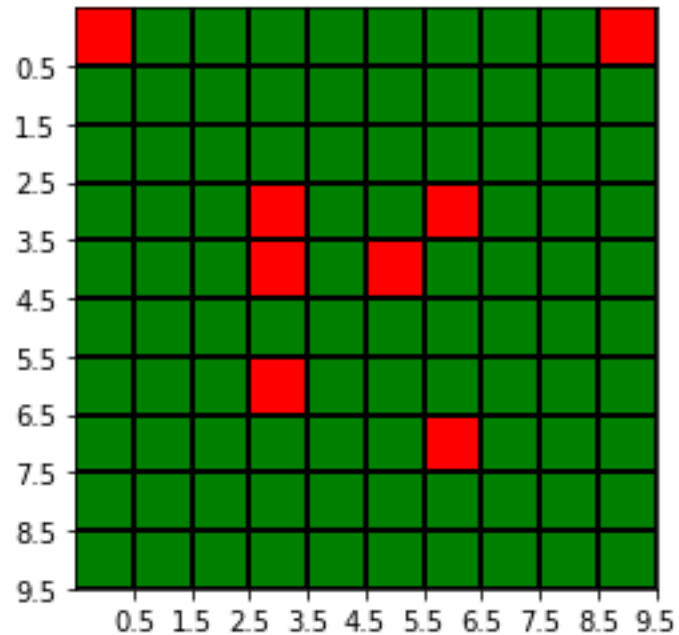
 *UnBurned (0)*

 *Burned (1)*

SUMMING THE LAYERS

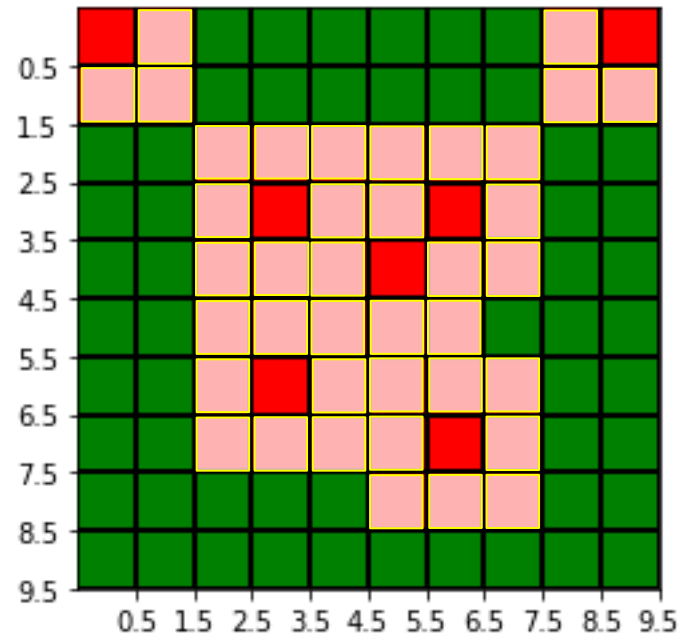
Cycle 1 - Neighbors research

Seed Matrix



 *UnBurned (0)*

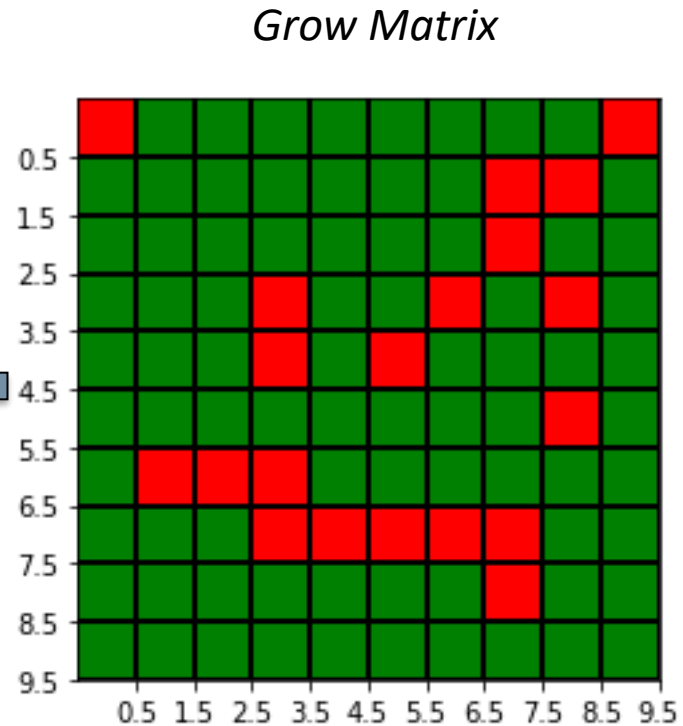
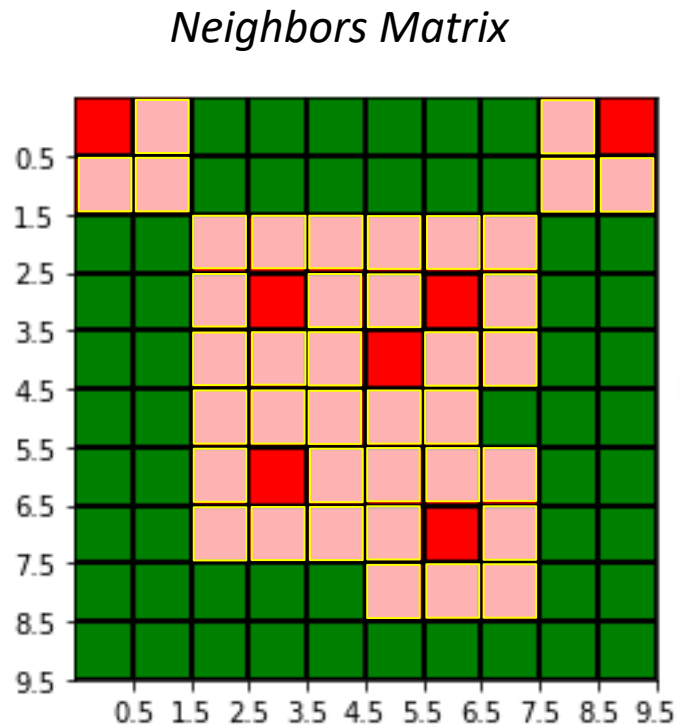
Neighbors Matrix



 *Burned (1)*

SUMMING THE LAYERS

Cycle 1 - Summation



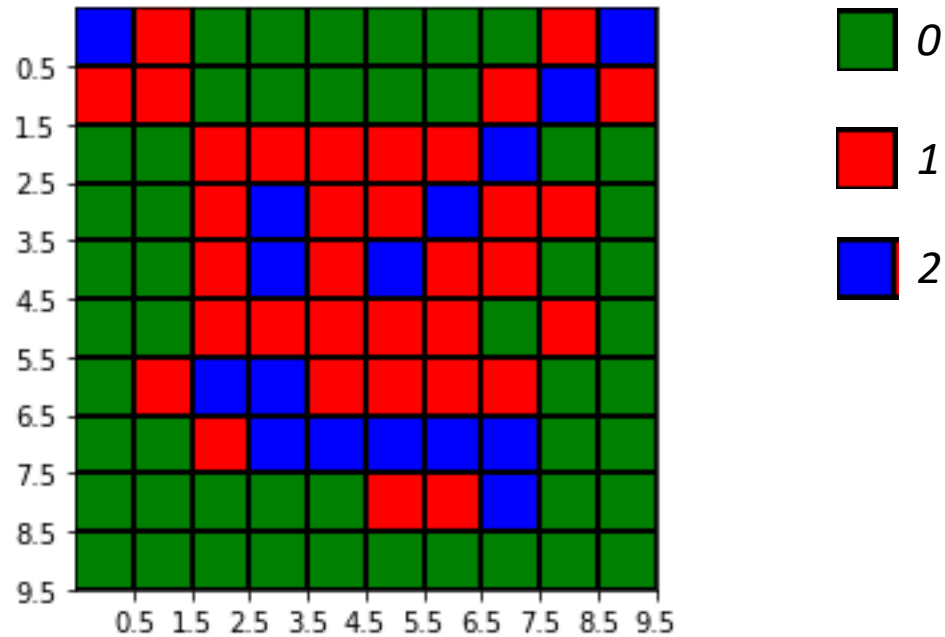
 *UnBurned (0)*

 *Burned (1)*

SUMMING THE LAYERS

Cycle 1 - Sum

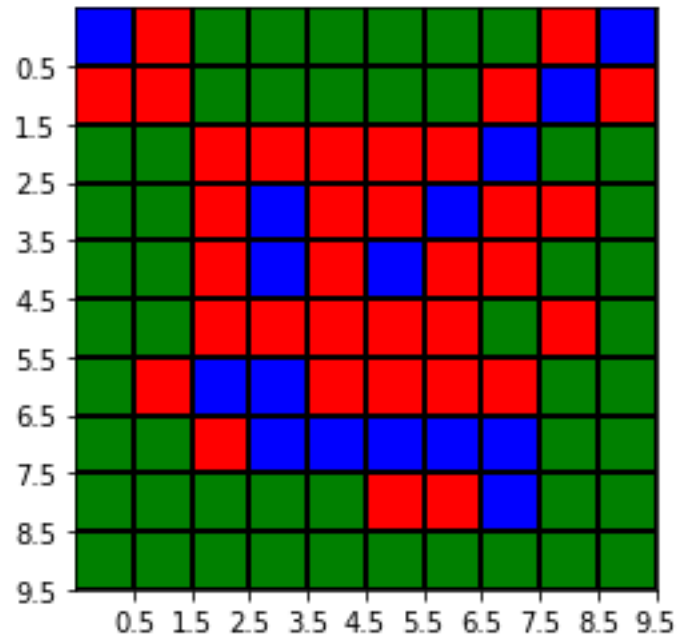
Sum Matrix



SUMMING THE LAYERS

Cycle 1 - Transformation

Sum Matrix

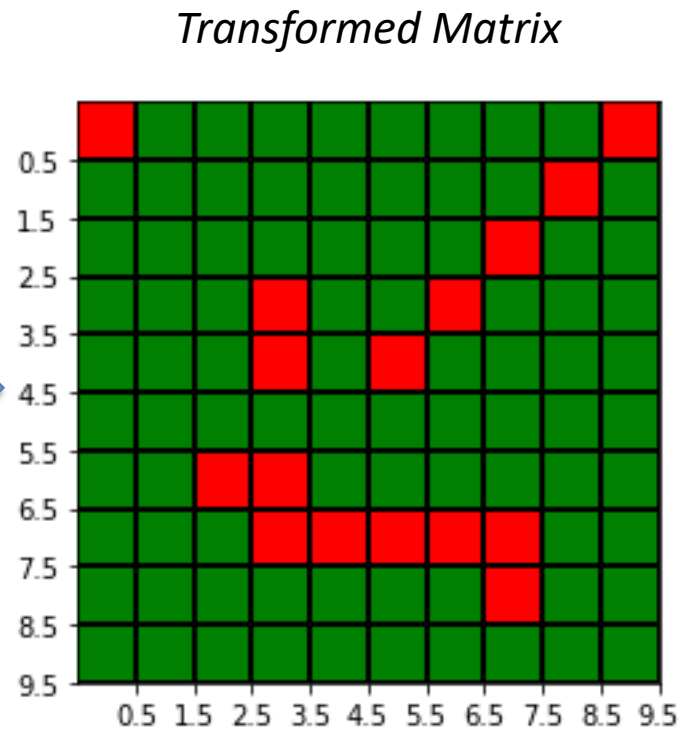
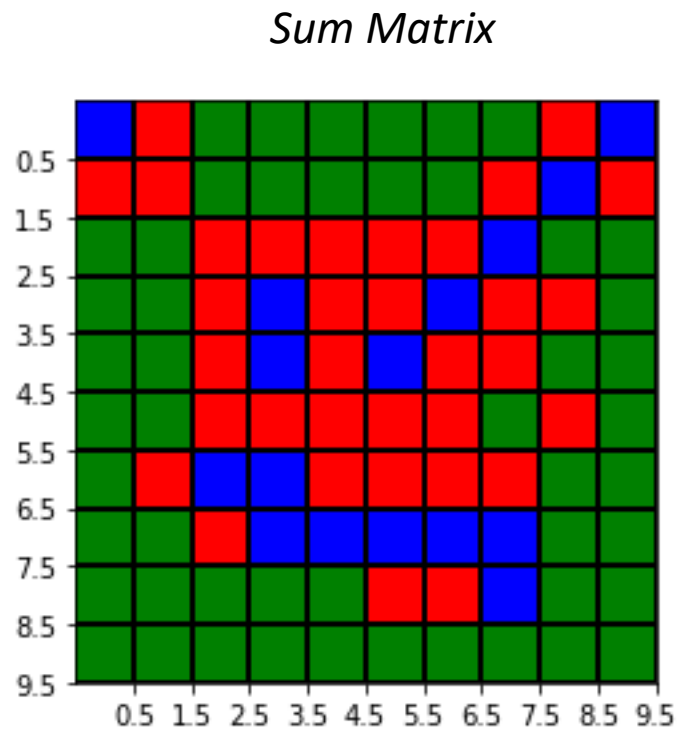


Operation

$\text{floor}(\text{matrix}/2)$

SUMMING THE LAYERS

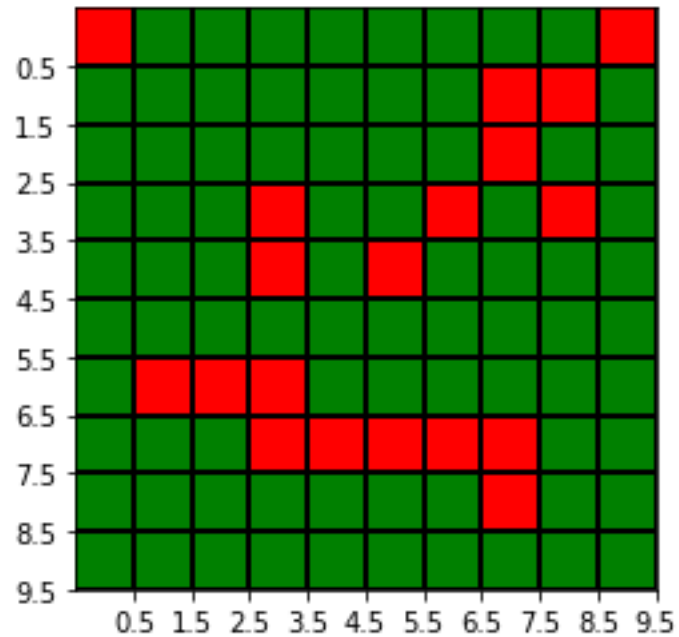
Cycle 1 - Transformation



SUMMING THE LAYERS

Output

Result Matrix



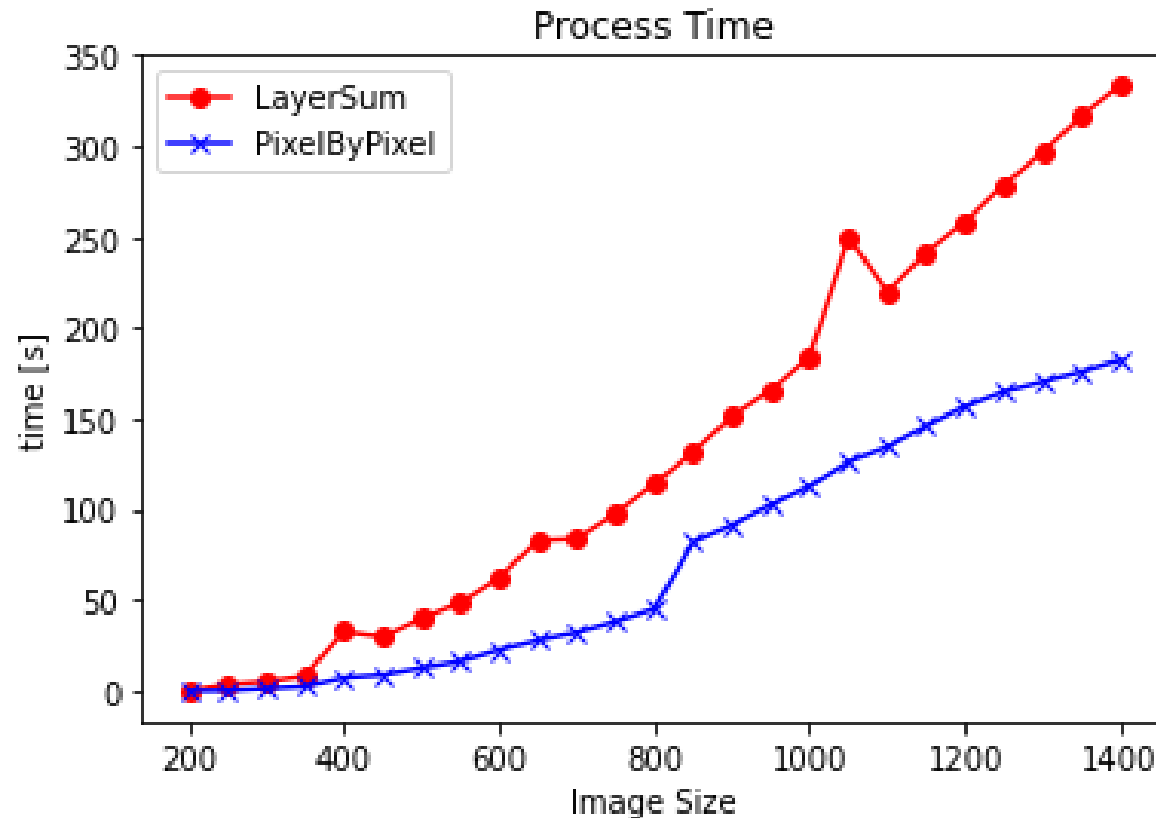
 *UnBurned (0)*

 *Burned (1)*

A decorative horizontal band at the top of the slide, consisting of a series of thin, vertical white lines of varying heights, creating a textured, barcode-like effect.

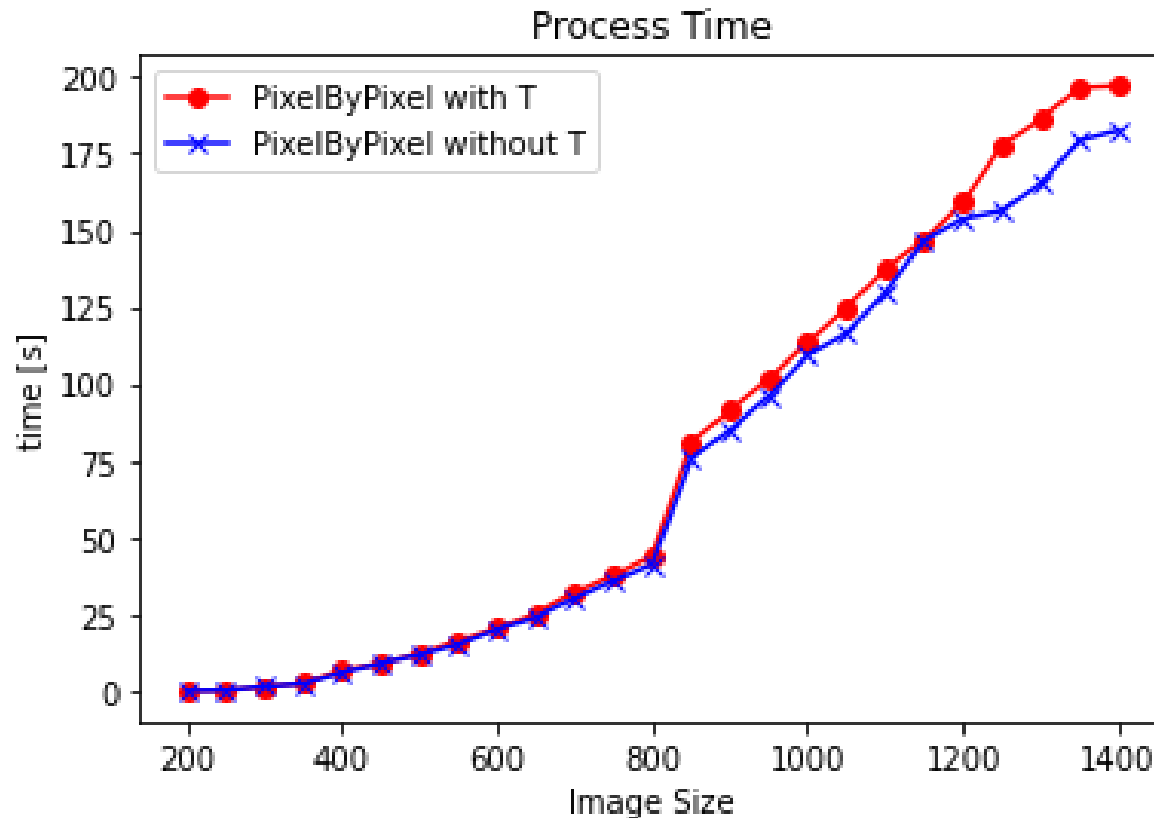
ALGORITHMS COMPARISON

SCROLLING THE MATRIX PIXEL BY PIXEL vs SUMMING THE LAYERS



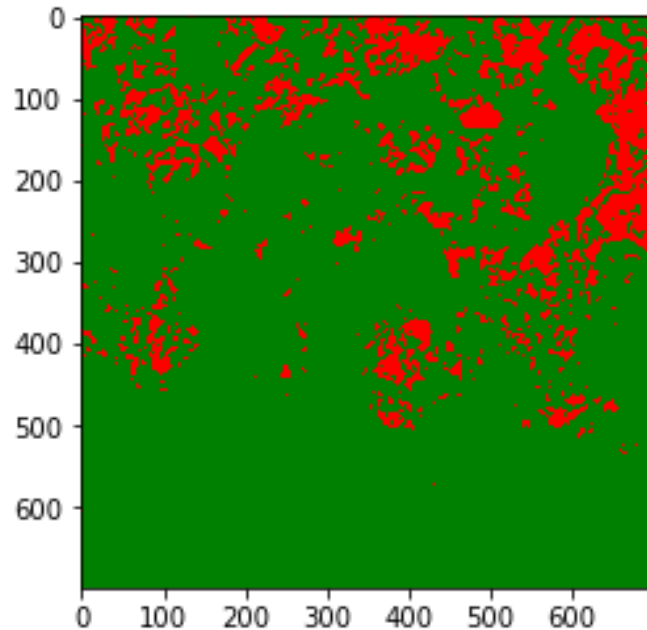
SCROLLING THE MATRIX PIXEL BY PIXEL

With T & Without T



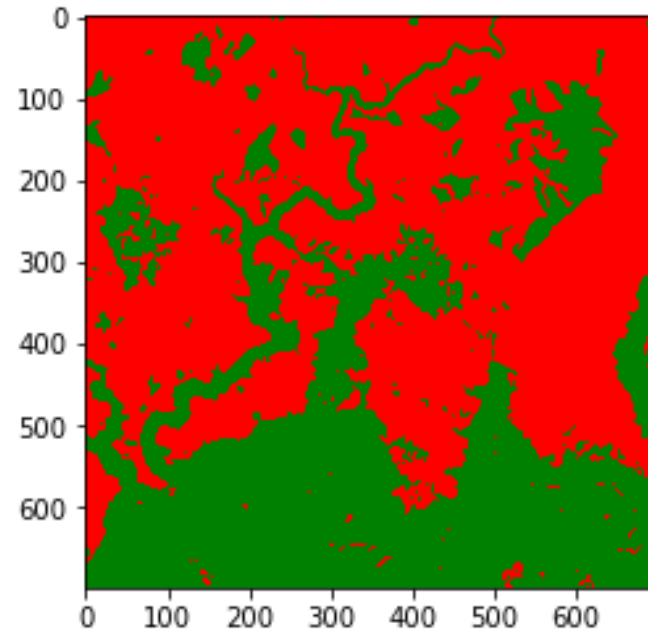
SCROLLING THE MATRIX PIXEL BY PIXEL vs SUMMING THE LAYERS

*Portugal Seed Layer
700x700 pixels*



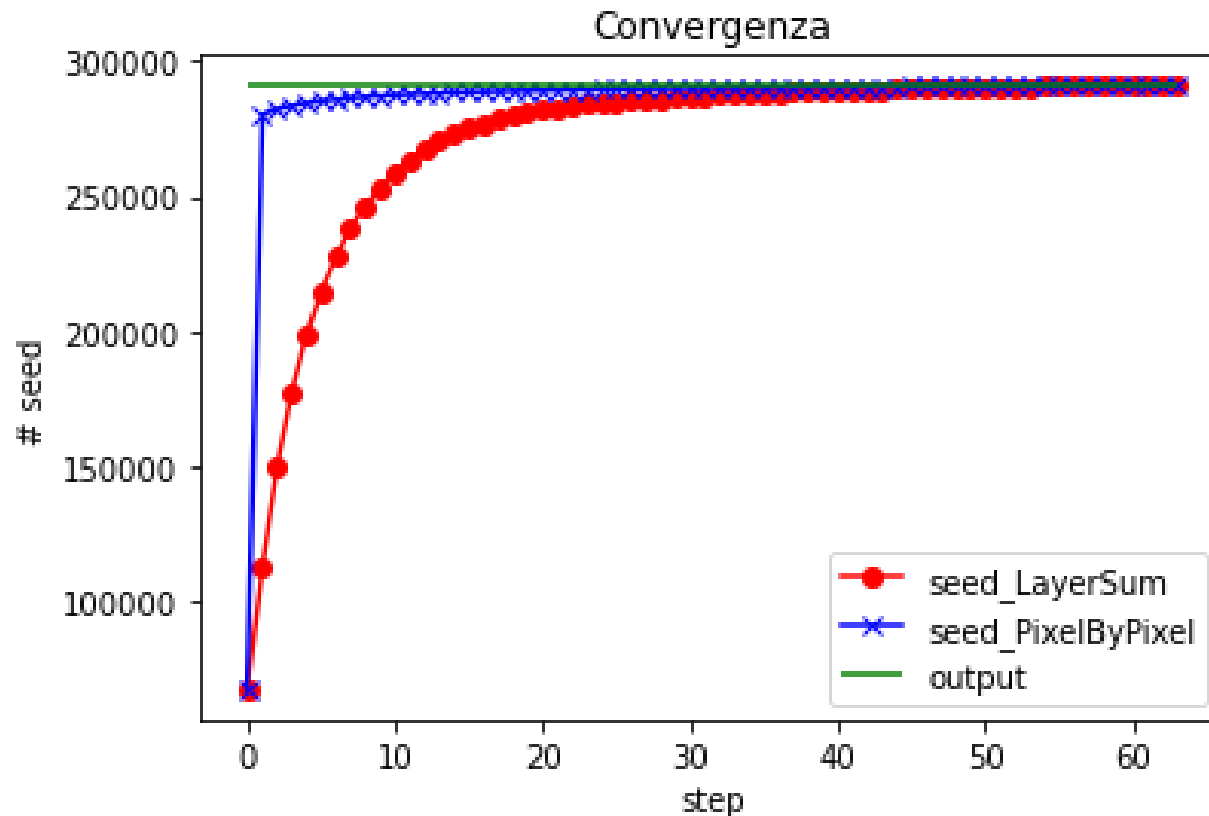
 *UnBurned (0)*

*Portugal Grow Layer
700x700 pixels*



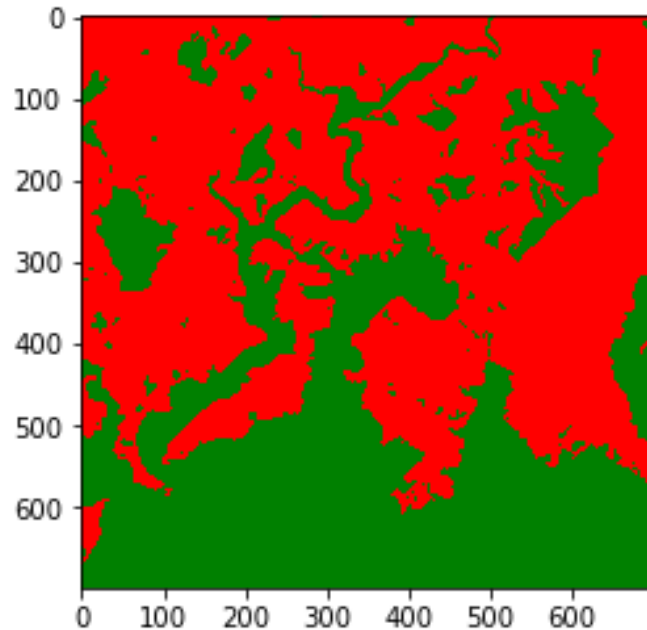
 *Burned (1)*

SCROLLING THE MATRIX PIXEL BY PIXEL vs SUMMING THE LAYERS



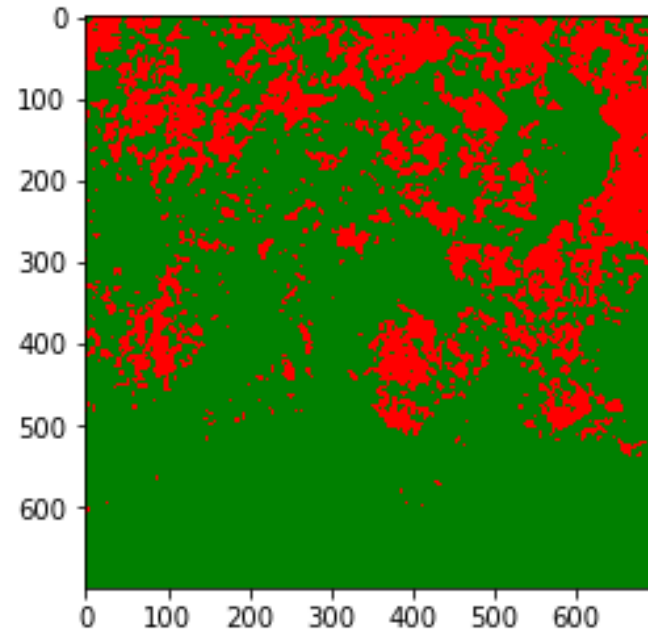
SCROLLING THE MATRIX PIXEL BY PIXEL vs SUMMING THE LAYERS – Cycle 1

*Seed Layer PP
700x700 pixels*



 *UnBurned (0)*

*Seed Layer LS
700x700 pixels*

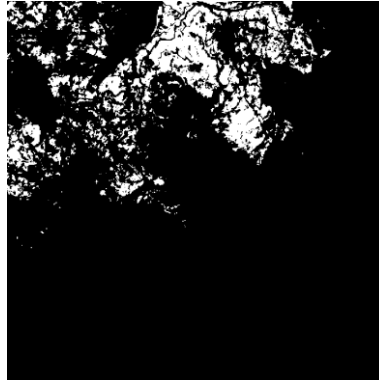


 *Burned (1)*

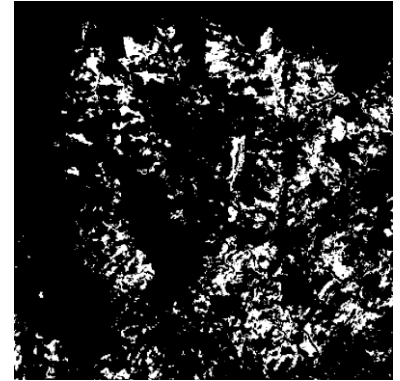
SCROLLING THE MATRIX PIXEL BY PIXEL vs SUMMING THE LAYERS



Clip1



Clip2



Clip3



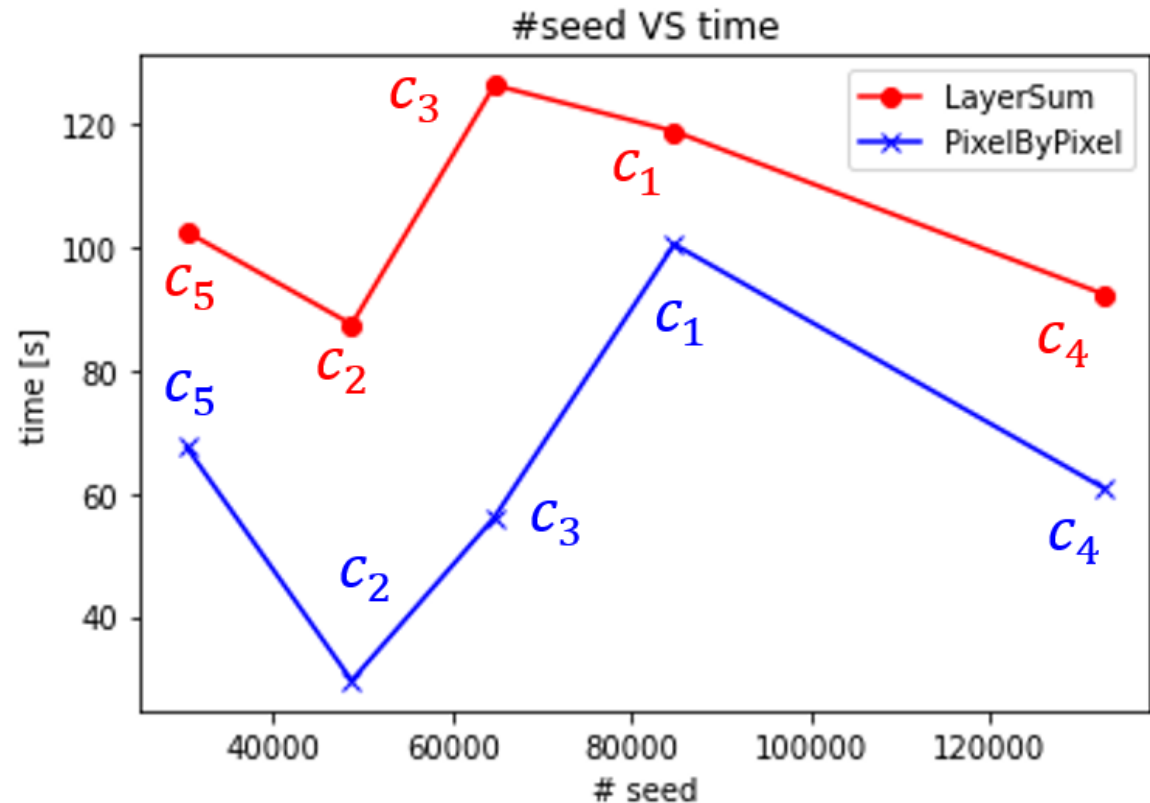
Clip4



Clip5

SCROLLING THE MATRIX PIXEL BY PIXEL vs SUMMING THE LAYERS

Clip	Seeds
1	84764
2	48729
3	64690
4	132715
5	30254

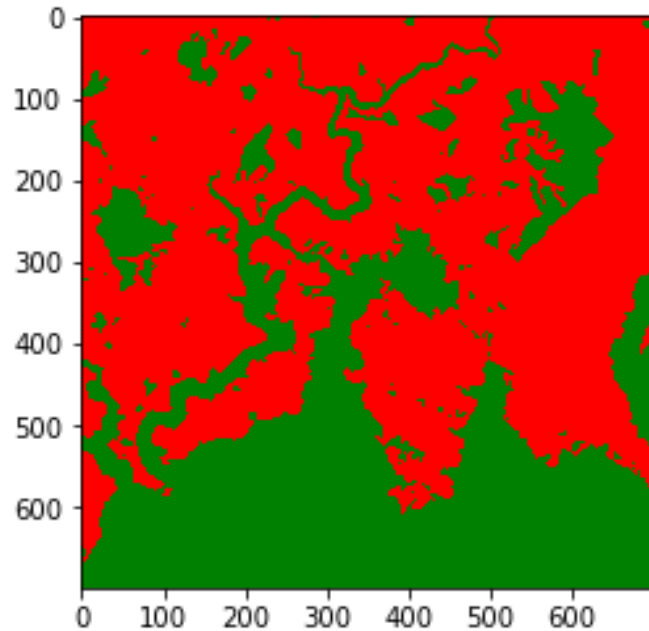




ALGORITHMS VALIDATION

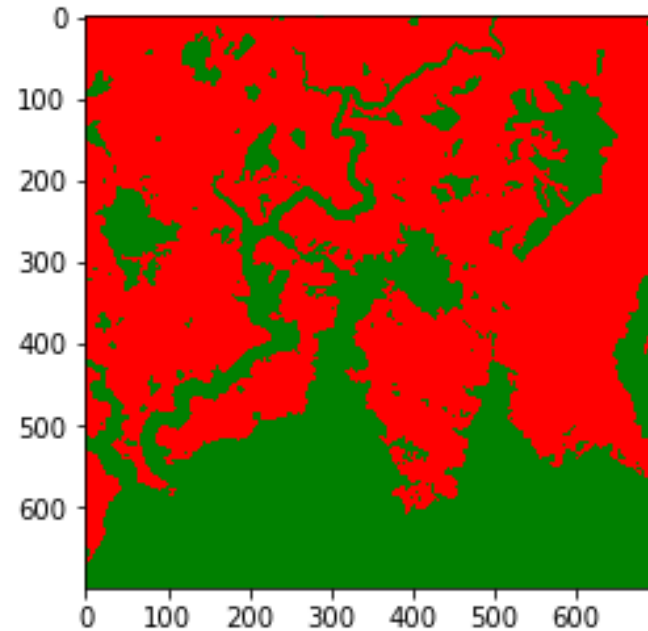
REFERENCE RESULT & ALGORITHM RESULT

Reference Result
700x700 pixels



 *UnBurned (0)*

Algorithm Result
700x700 pixels



 *Burned (1)*

REFERENCE RESULT & ALGORITHM RESULT

Confusion Matrix

		REFERENCE	
		Burned	Unburned
ALGORITHM	Burned	289467	1647
	Unburned	2664	196222

Commission error = 0,57%

Omission error = 0,91%

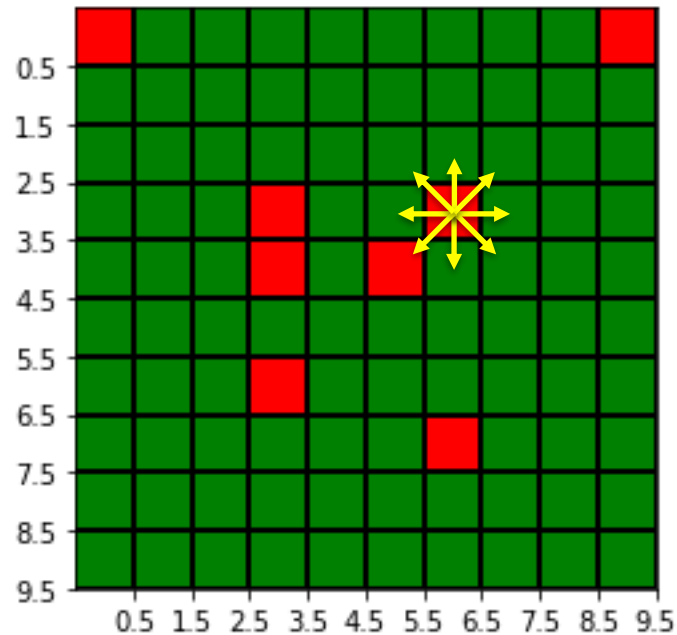
A series of thin, vertical, light blue lines of varying heights, creating a comb-like or barcode-like effect, positioned at the top of the slide.

THANKS FOR THE ATTENTION

SCROLLING THE MATRIX PIXEL BY PIXEL

Ex2 - Cycle 1 - element (3,6)

Seed Matrix



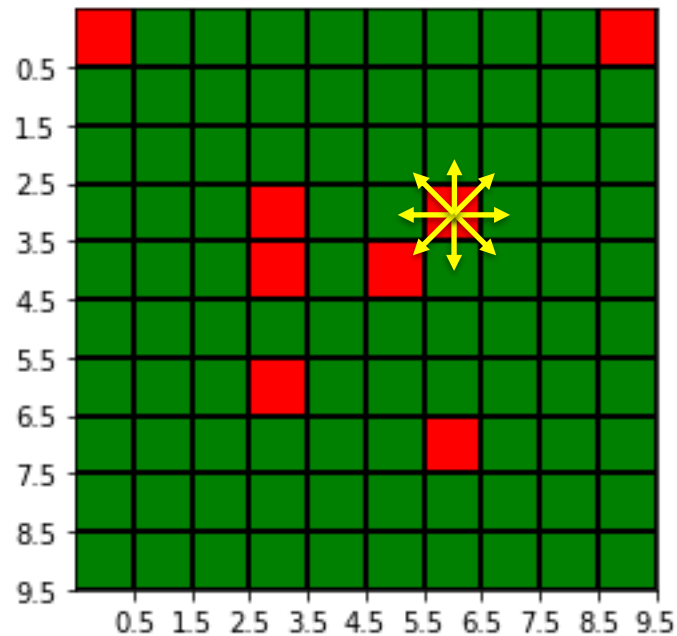
 *UnBurned (0)*

 *Burned (1)*

SCROLLING THE MATRIX PIXEL BY PIXEL

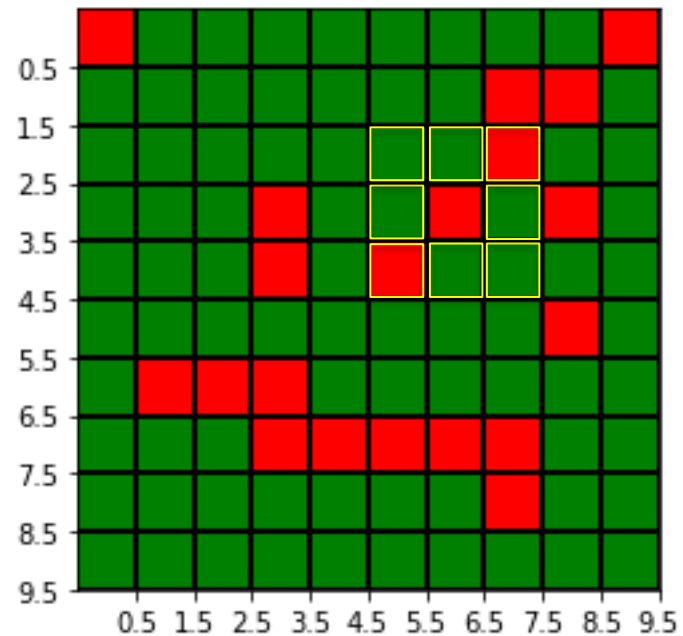
Ex2 - Cycle 1 - element (3,6)

Seed Matrix



 *UnBurned (0)*

Grow Matrix



 *Burned (1)*