# Rust Concurrency - Generating the Mandelbrot Set

lan Channing https://github.com/ianchanning/mandelbrot

March 10, 2021

## Taken from the Rust Book

Based on the Concurrency section of Chapter 2 (A Tour of Rust) from the O'Reilly "Programming Rust" book.

#### Introduction

The Mandelbrot set.

Complex numbers and iterating complex numbers.

Generating the Mandelbrot set with one processor.

The required changes to use multiple processors.

Fearless concurrency.

## The Mandelbrot set

Complex number z

$$z = a + bi$$

Iterate z from 0, square it and add another complex number c

$$\begin{split} z_0 &= 0 \\ z_{n+1} &= z_n^2 + c \end{split}$$

For some values of  $c,\ z$  will stay within a distance of 2 from the origin

Those are 'in' the Mandelbrot Set

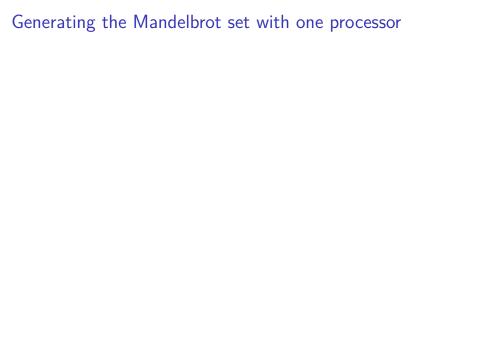
# Complex numbers and iterating complex numbers

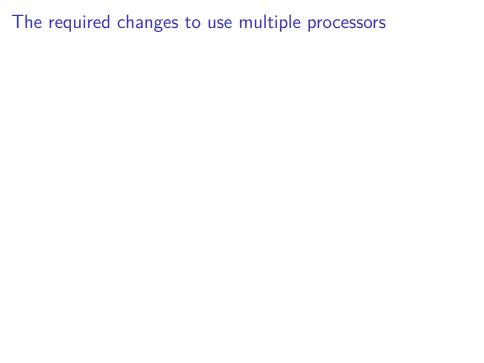
### Addition

$$(a+bi) + (c+di) = (a+c) + (b+d)i$$

#### Multiplication

$$(a+bi) \times (c+di) = ac + (ad+bc)i + bdi^{2}$$
$$= (ac-bd) + (ad+bc)i$$





## Fearless concurrency