Different General Methods in Algorithms Design

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Last Lecture

- Short Presentation
- What is data structure?
  - For today: dictionary, set, nested of all things
- Programming with Python IDLE
- Application of Programming in the Digital Age!

Today

- Short Presentations
- Big picture about methods in algorithms design
- Recursive methods in algorithms
- Application of Programming in the Digital Age!

Together

Send your feedback about the class whenever you want!

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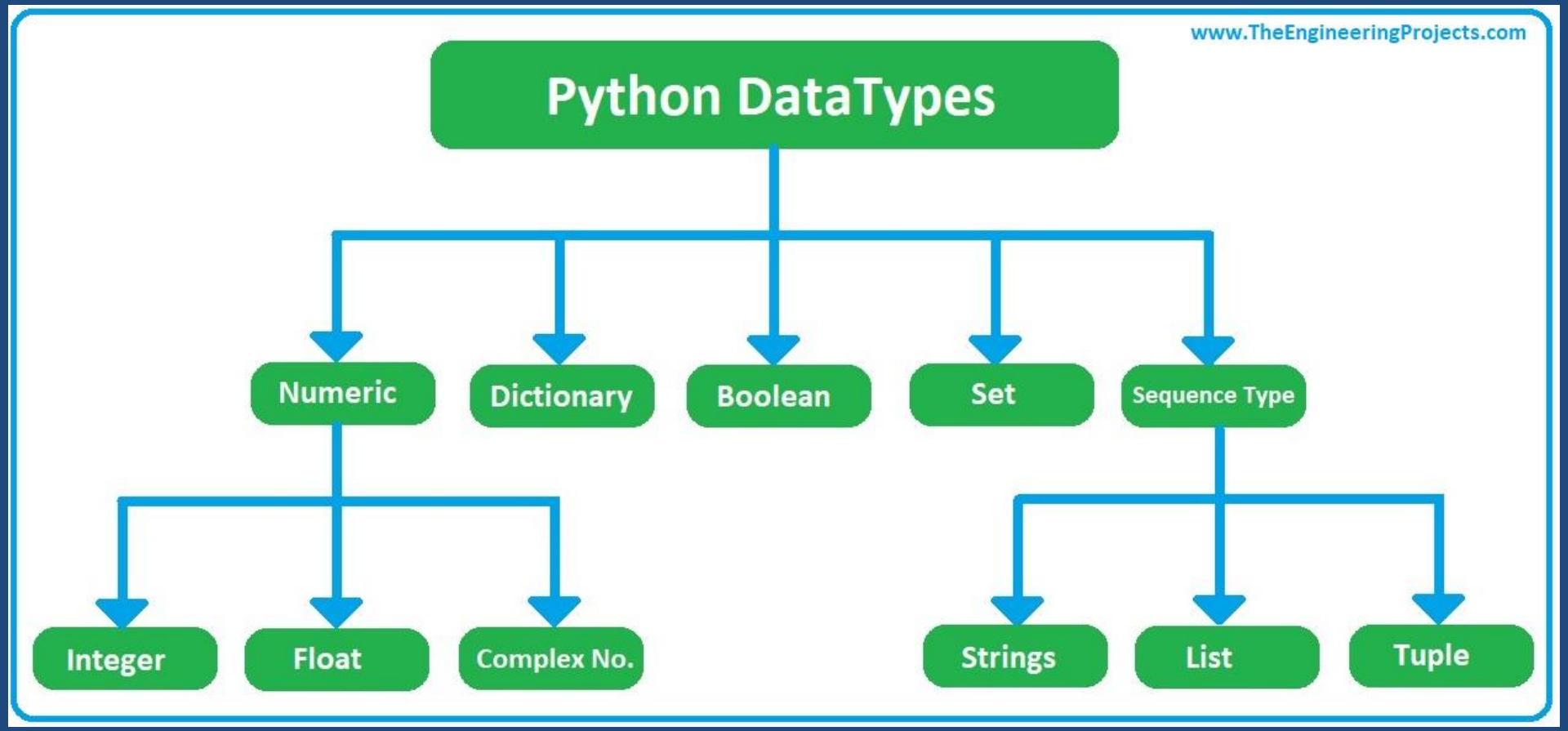
Short Presentations

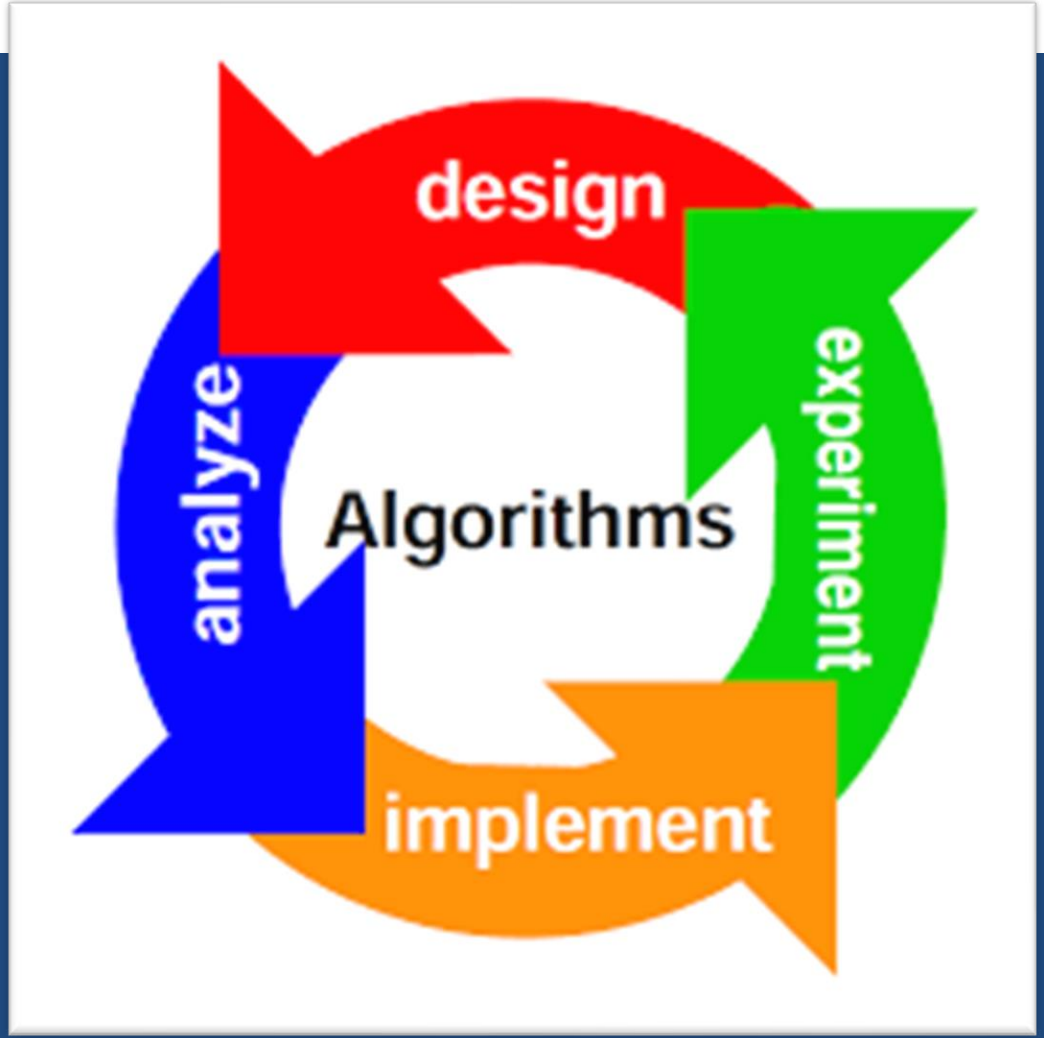
Review the Last Lecture

Python Data Structures

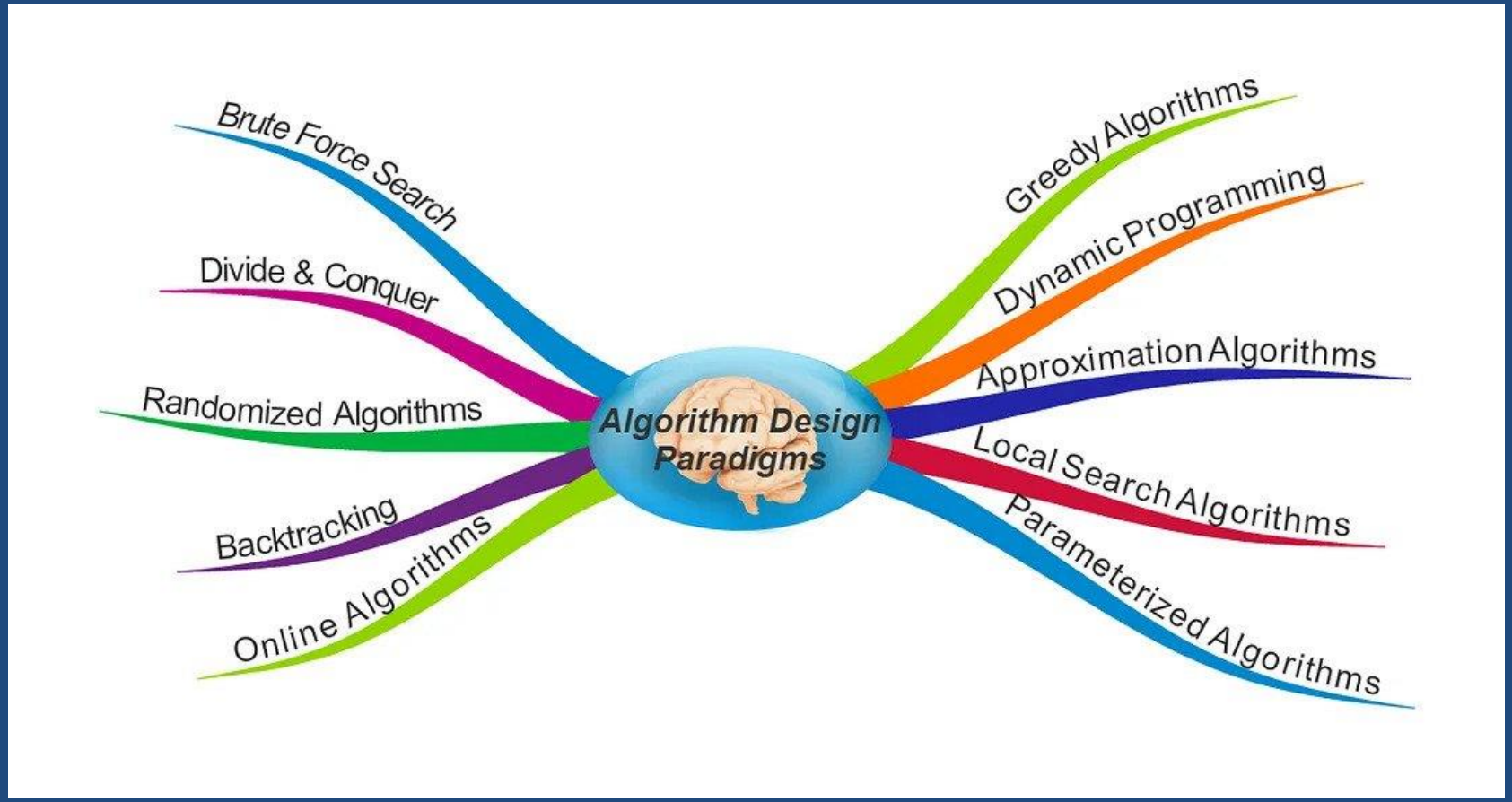


Big Picture about Algorithms

4 steps



Algorithm design paradigms



Recursive methods in algorithms

- # Nested Functions??

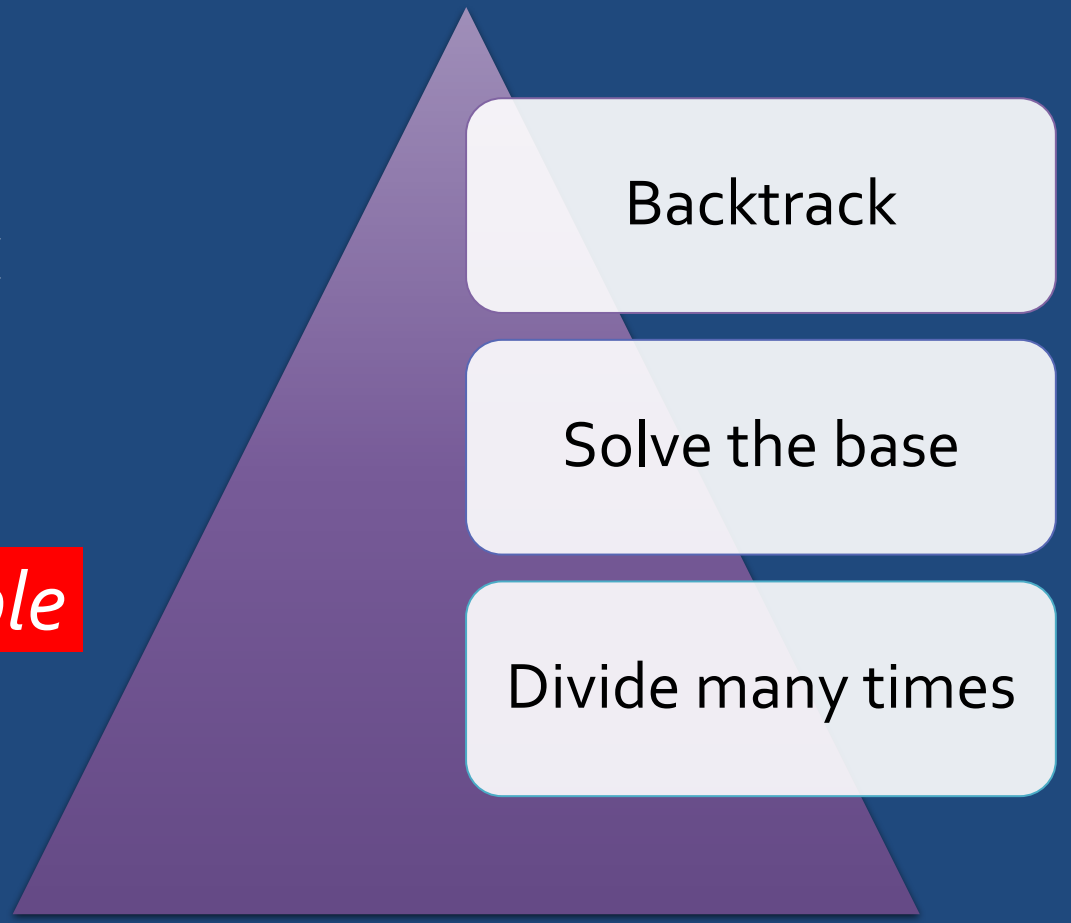
YES! Nested (almost) Every things! Lest's DO it.

Visual Studio Code

Recursive mindset

- We use, as humans, recursive methods in our life. When we want to ready for exam, Think about it…

- *What is your idea about example in real life?*



Bowling game

where is recursion in it?

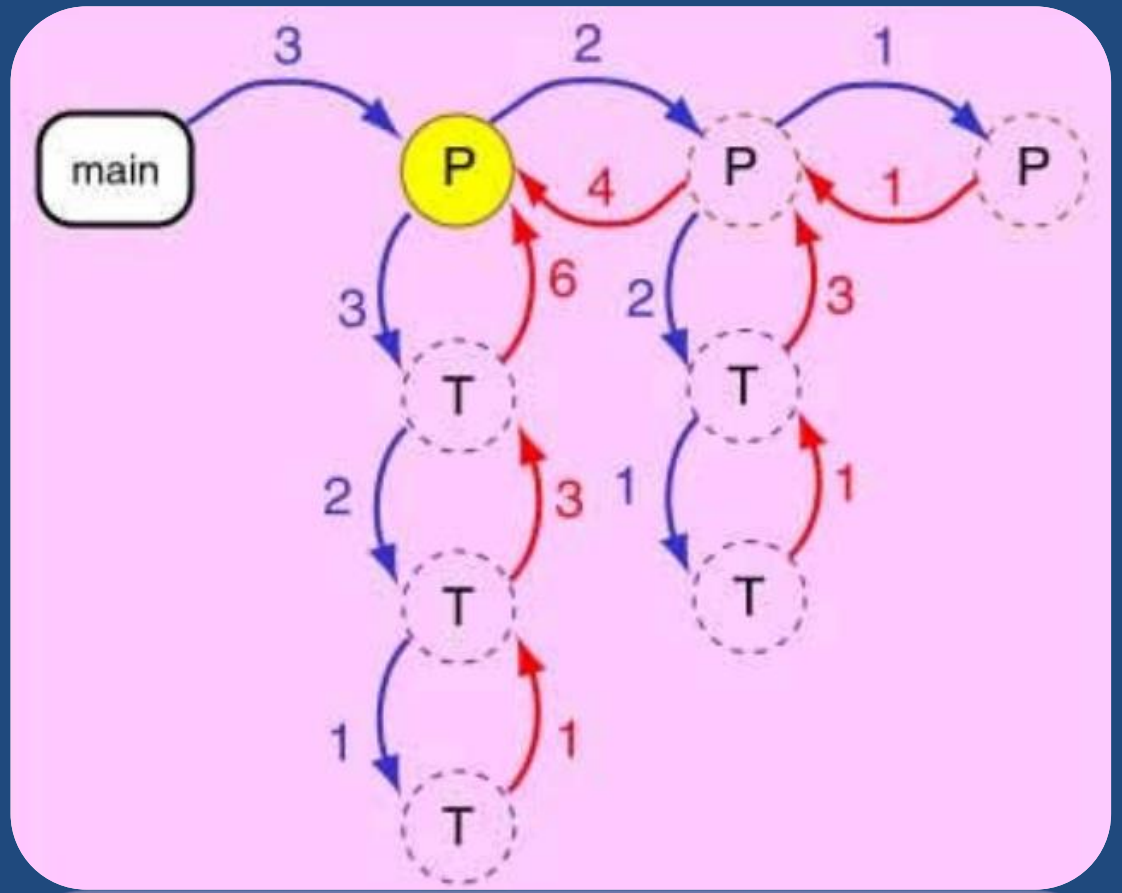
Let’s do it!

Visual Studio Code

Can we solve with iterative approaches?

Can we solve with mathematical formulations?

We can have more complex recursion!



Fractals

8.1 What Is a Fractal?

The term ***fractal*** (from the Latin *fractus*, meaning "broken") was coined by the mathematician Benoit Mandelbrot in 1975. In his seminal work "The Fractal Geometry of Nature," he defines a fractal as "a rough or fragmented geometric shape that can be split into parts, each of which is (at least approximately) a reduced-size copy of the whole."

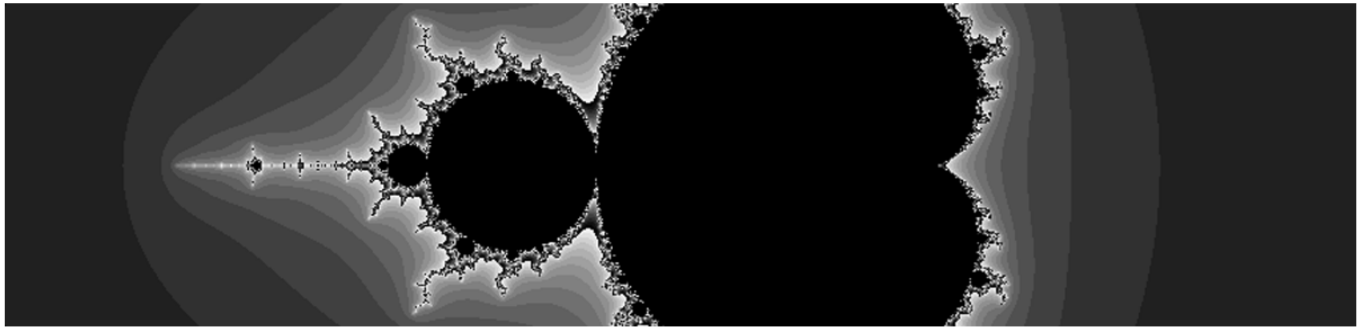
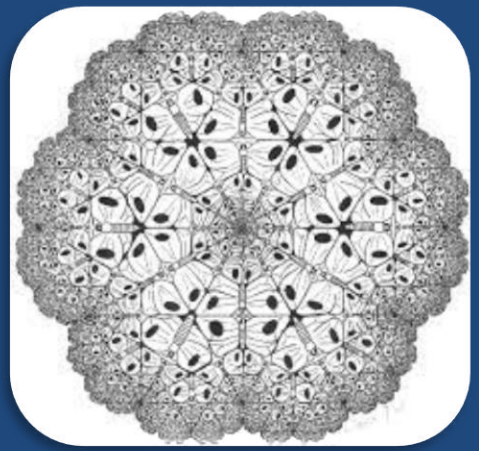


Figure 8.2: One of the most well-known and recognizable fractal patterns is named for Benoit Mandelbrot himself. Generating the Mandelbrot set involves testing the properties of complex numbers after they are passed through an iterative function. Do they tend to infinity? Do they stay bounded? While a fascinating mathematical discussion, this "escape-time" algorithm is a less practical method for generating fractals than the recursive techniques we'll examine in this chapter. However, an example for generating the Mandelbrot set is included in the code examples.

Some Examples in Universe!

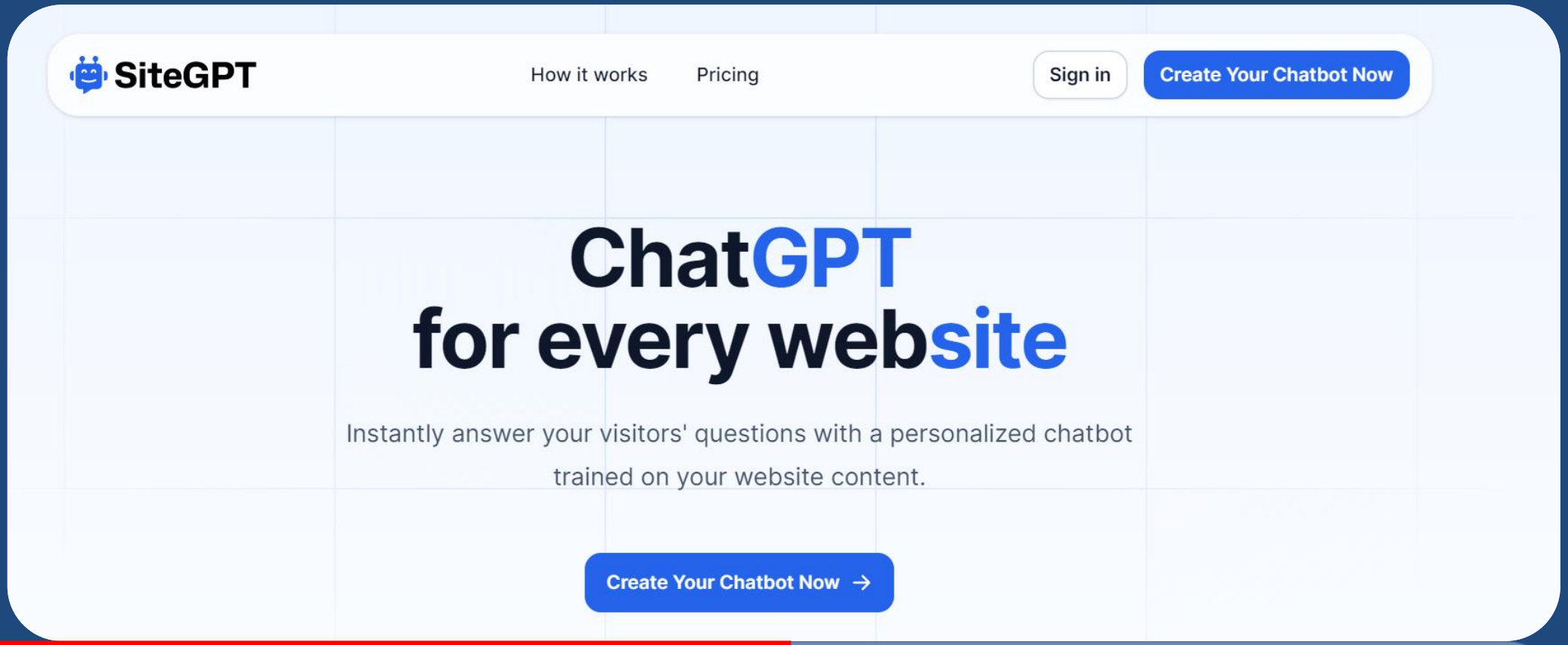


For the next short presentation…

- Explain Fractal application examples
- how can we do it!?
- Code simple one!

Application of Programming in the Digital Age!

SiteGPT



How can it answers our questions?!

Lecture Resources

- https://natureofcode.com/book/chapter-8-fractals/
- https://medium.com/@saiesh.prabhu17/algorithm-design-techniques-406922dd3047