

Basics of Algorithmics with Python

Bioinformatics Summer School
Angers, 30th of June 2015

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Université de Nantes, France

Outlines

- What is an algorithm ? Basic concepts
- What is a program ?
- How can I create my own program with python ?

An algorithm for what ?

- An algorithm is a « normalized and non ambiguous » description of how a problem can be solved.
- Exemple : How can I do pancakes ?



See how to make this recipe!



Good Old Fashioned Pancakes



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Recipe by [dakota kelly](#)

"This is a great recipe that I found in my Grandma's recipe book. Judging from the weathered look of this recipe card, this was a family favorite."

Ingredients [Edit and Save](#)

Original recipe makes 8 servings [Change Servings](#)

- | | |
|--|---|
| <input type="checkbox"/> 1 1/2 cups all-purpose flour | <input type="checkbox"/> 1 1/4 cups milk |
| <input type="checkbox"/> 3 1/2 teaspoons baking powder | <input type="checkbox"/> 1 egg |
| <input type="checkbox"/> 1 teaspoon salt | <input type="checkbox"/> 3 tablespoons butter, melted |
| <input type="checkbox"/> 1 tablespoon white sugar | |

Directions

1. In a large bowl, sift together the flour, baking powder, salt and sugar. Make a well in the center and pour in the milk, egg and melted butter; mix until smooth.
2. Heat a lightly oiled griddle or frying pan over medium high heat. Pour or scoop the batter onto the griddle, using approximately 1/4 cup for each pancake. Brown on both sides and serve hot.



426 Photos

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Actions on variables

Loops

Some alternatives ?



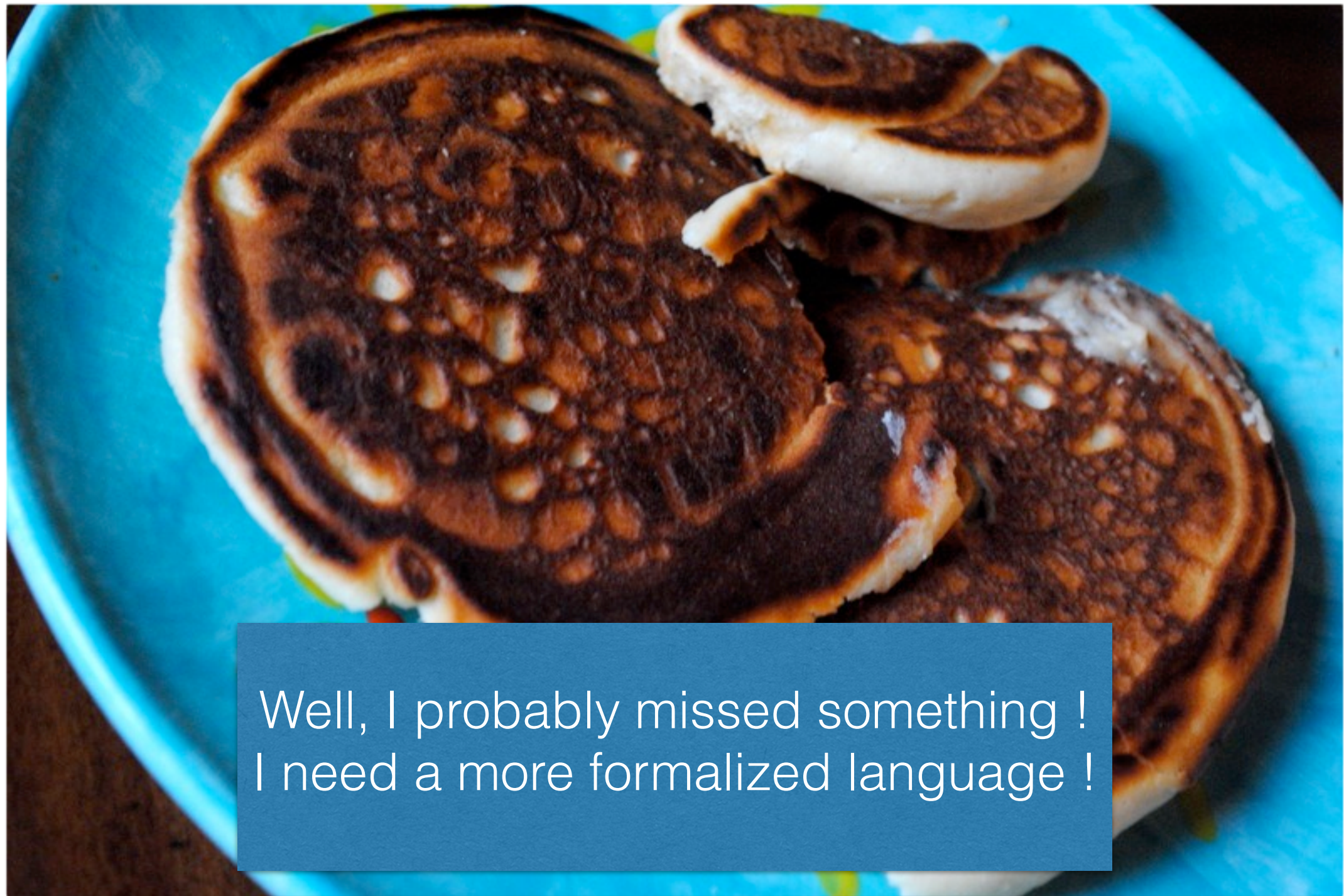
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Well, I probably missed something !
I need a more formalized language !

2. Heat a lightly oiled griddle or frying pan over medium heat. Pour or scoop the batter onto the griddle, using approximately 1/4 cup per pancake. Flip once with a spatula and cook both sides until golden brown. Serve hot.

Loops

Some alternatives ?

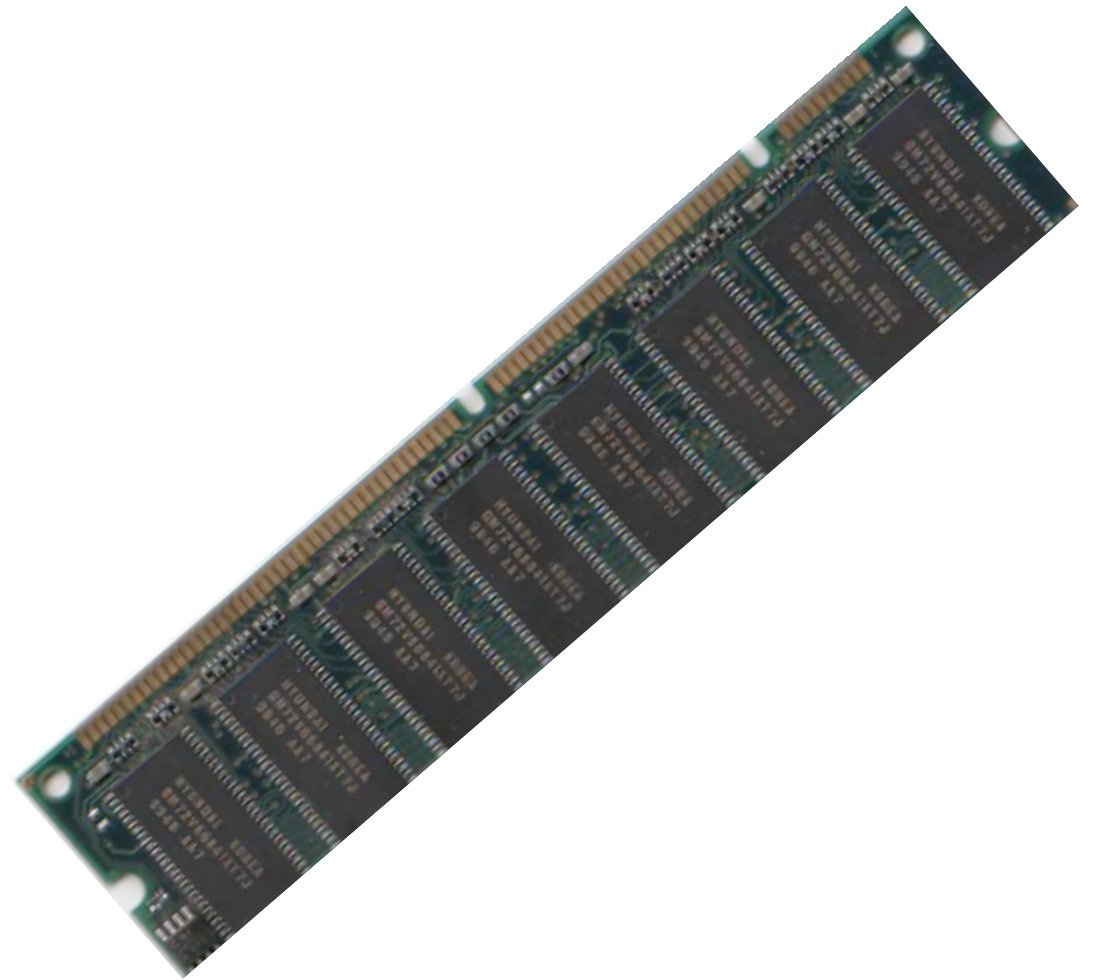
Main ingredient 1

Variables

- Permit a dialog between the physic memory of the and the program (in an abstracted way).

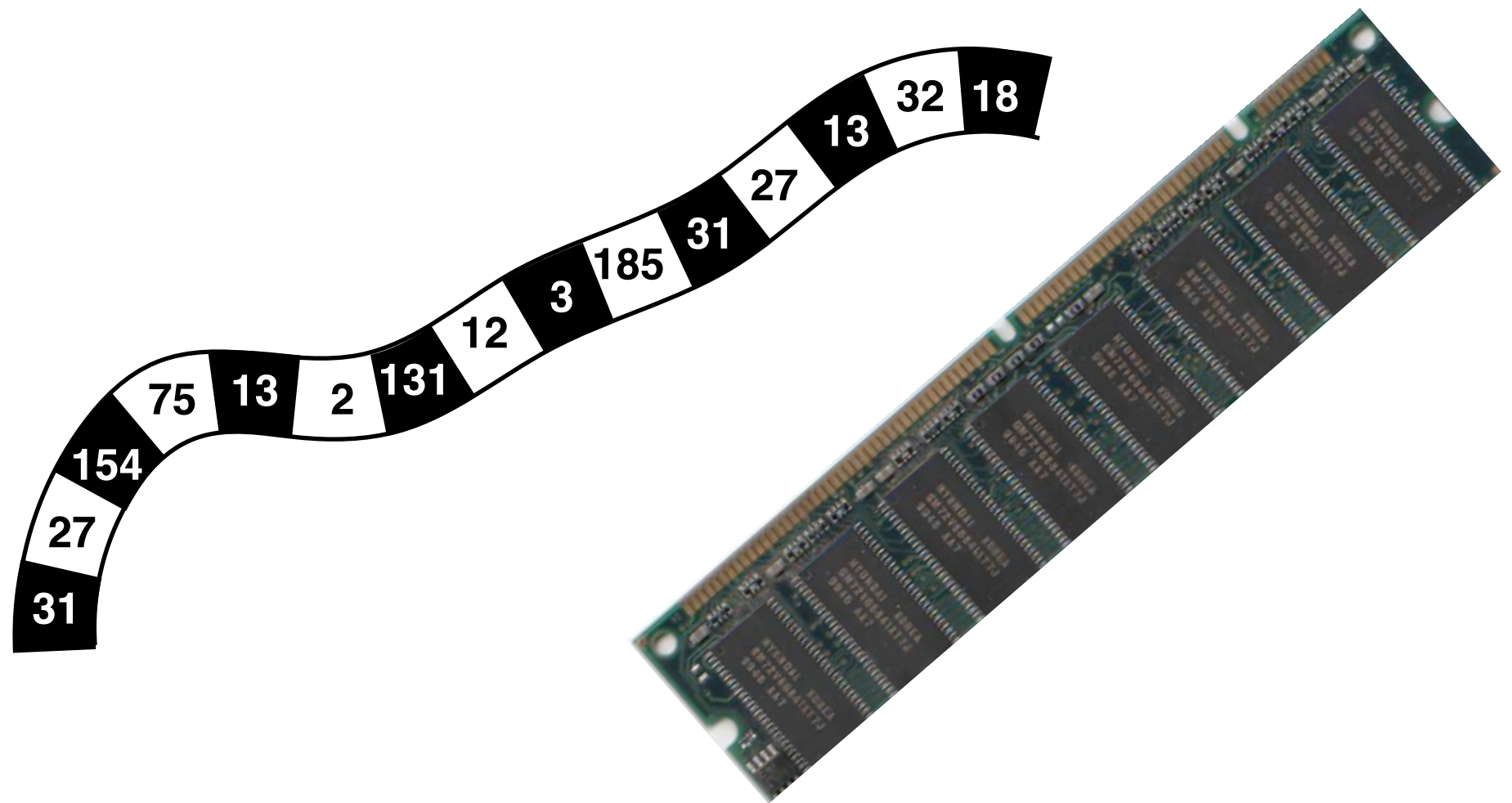
Main ingredient 1

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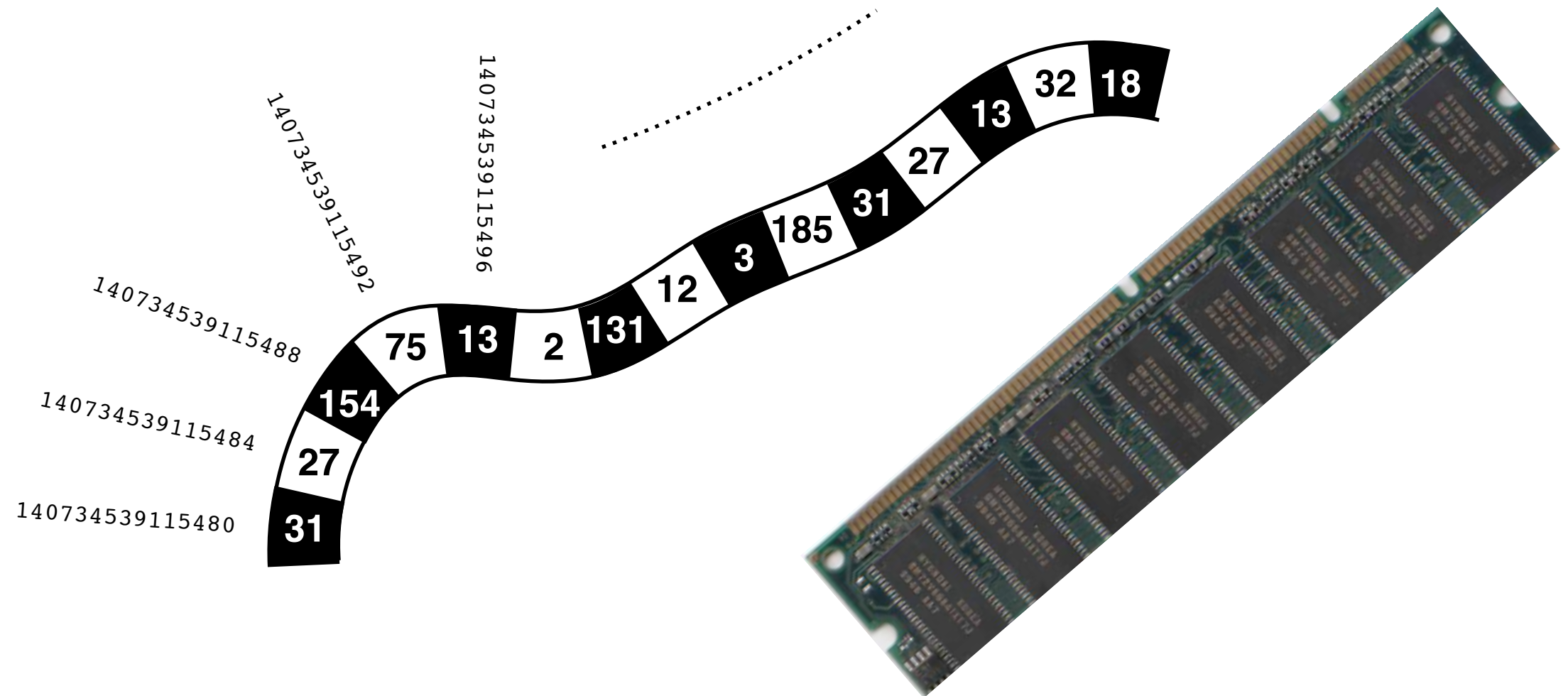
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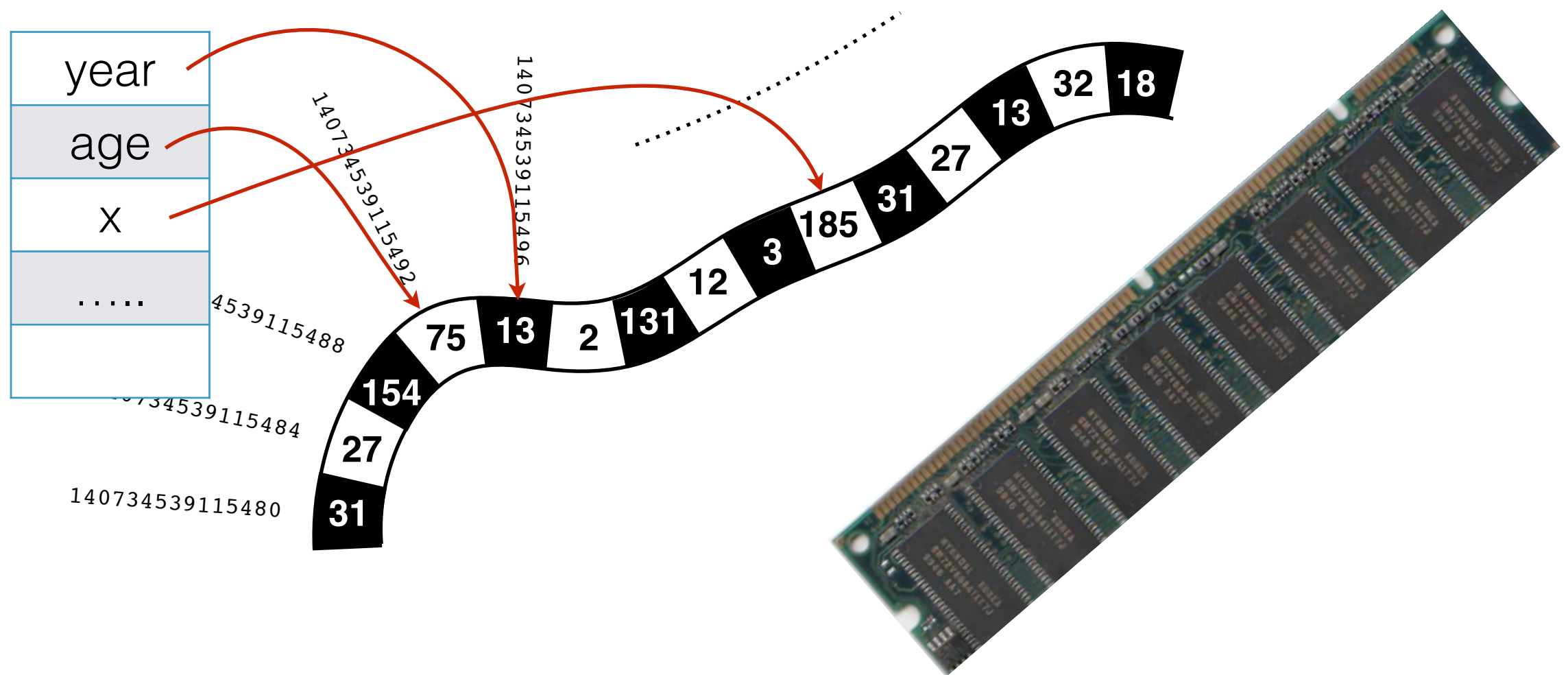
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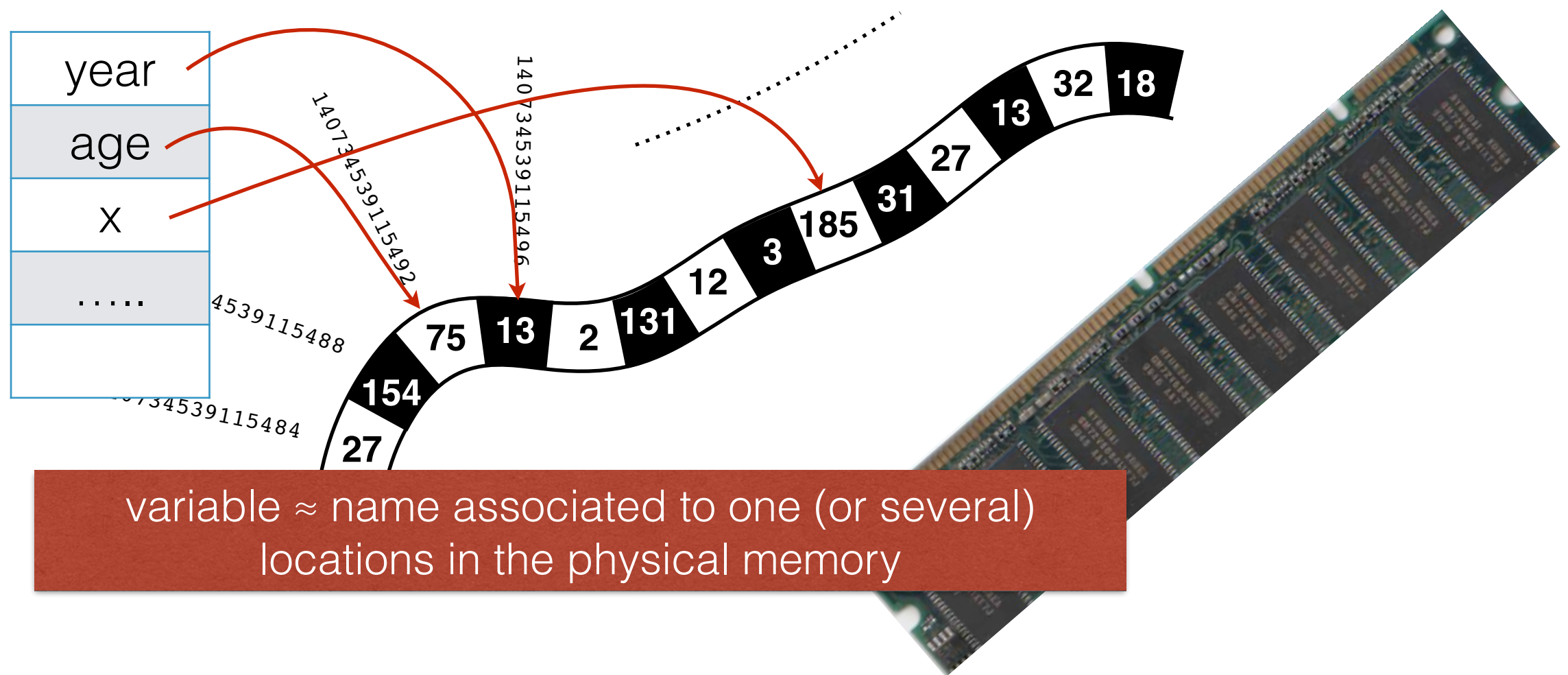
Main ingredient 1

Variables



Main ingredient 1

Variables



Main ingredient 1

Variables

- Variables « stores » a **value** of a given **type**.
- 3 simple types: numbers (int or floats), strings or booleans.
- `x = 5.0`
- `s = "Hello"`
- `b = True`

Main ingredient 2

Instructions

- `x = expression` *Modifies the memory*
- `x = raw_input()` *Ask the user for a value*
- `print x` *Report a value to the user*

What is a program ?

Imperative paradigm

1. Encode an unsolved problem in memory (ask the user for some values)
2. Perform all required computations to solve the problem (the values of variables are changed one by one)
3. Prove the user that the problem is solved by printing the values of some variables

Enhance the programming language I

Conditional statements

- For alternative treatments

if (*test*):

instructions if test is True

else:

instructions if test is False

- else statement is facultative

Enhance the programming language I

Conditional statements

- For alternative treatments

```
if (temp < 0):  
    temp = int(raw_input())  
    if (temp < 0):  
        print "Oh it's freezing !"  
    else:  
        print "what a nice weather !"
```

- else statement is facultative

Enhance the programming language 2

Loops

- « for » loop

for i in range(1,10)

instructions that can use i

- « while » loop

while (test):

instructions that must modify test

Enhance the programming language 3

Arrays

- A special type of variable
- `T = [5,6,8,7]`
- `print T[1]`
- `T[2] = 10`

Enhance the programming language 4

Functions

```
def MyFunctionName(parameters)
    instructions
    return value
```

```
def Pancakes(n)
    flour = 1.5*n/8
    backed_powder = 3.5*n/8
    .....
    pancake_batter = [flour, backed_powder,...]
    while (not smooth(pancake_batter)):
        mix(pancake_batter)
    pancakes = .....
    return pancakes
```

Now its your turn !