# General Computer Science for Engineers CISC 106 Lecture 09

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Computer and Information Sciences

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# Lecture Overview

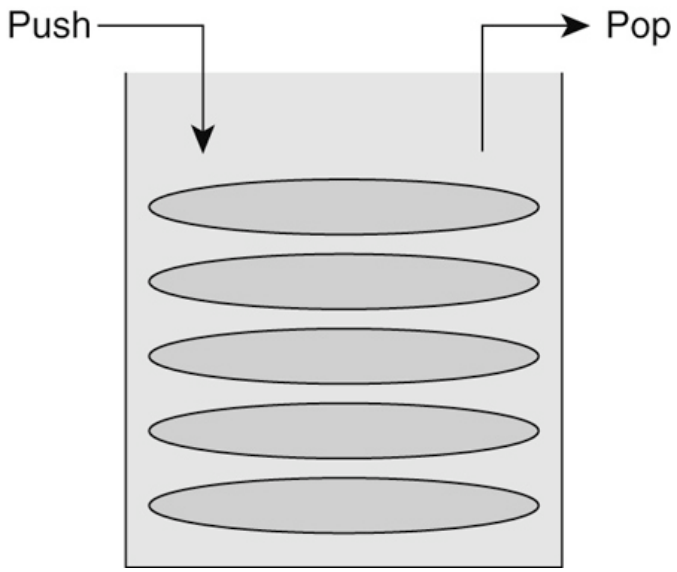
- Recursion
  - - Definition
  - - Characteristics
  - - Details
  - - Examples

# Recursion Definition

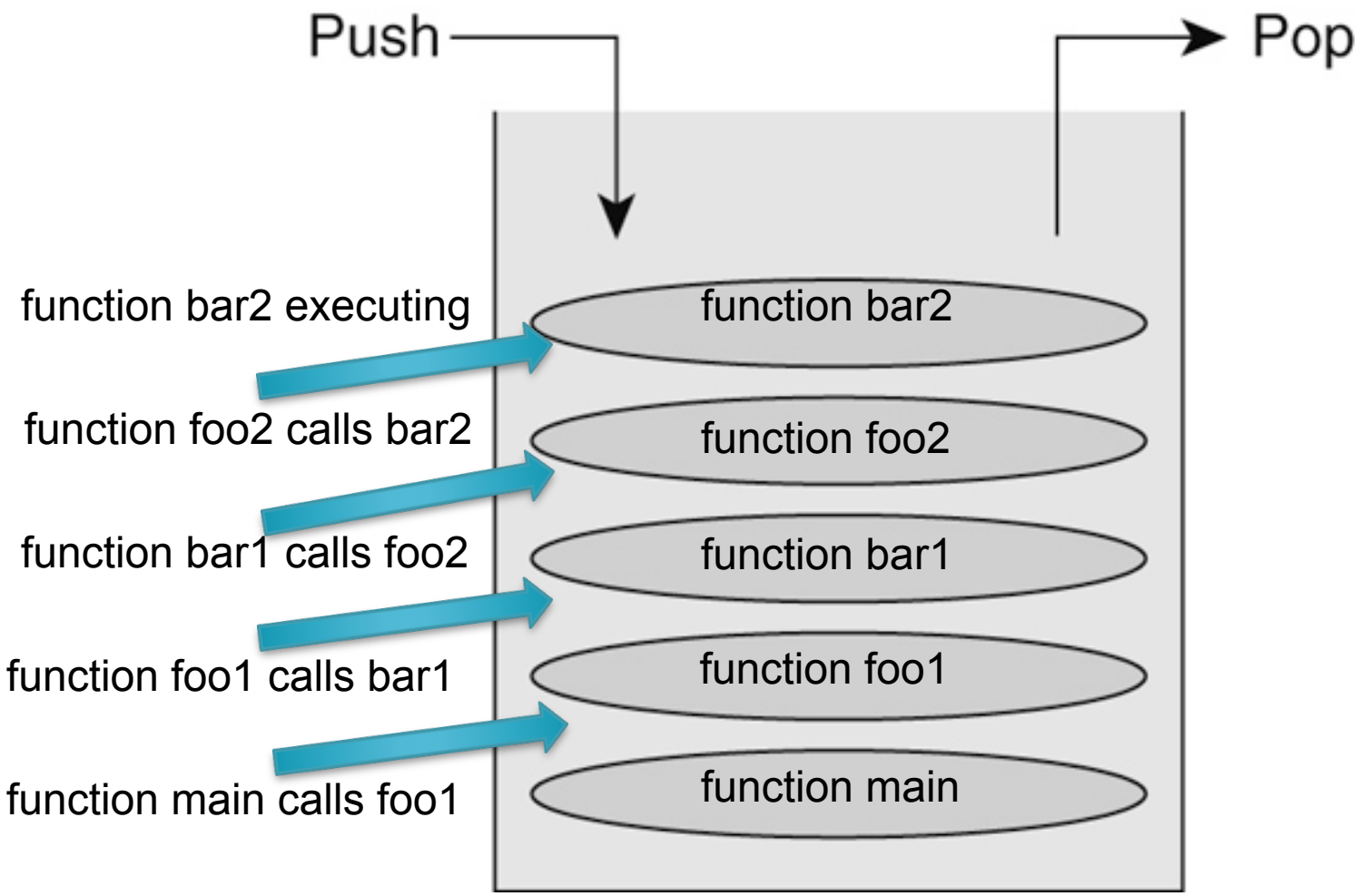
- Definition
  - The process where a function can call itself.
- Characteristics
  - Powerful technique
  - Allows breaking big problems into smaller and smaller problems.
  - One must ensure recursion stops

# When you call a function…

- Matlab creates a 'record' to store the variables from the new function
  - Record is pushed on the "stack"
- When function done, result passed back to calling function
  - Record is popped off stack.



# When you call a function…




In recursion these would all same function!!

# Why Can a Function Call Itself?

- Calling a function creates a an *'instance'* of the function!
- When a function calls itself it creates a new *'instance'* of itself
- Each instance pushed on stack
  - At top of stack is instance of function currently executing

# Recursion requires 3 things

- Terminating condition to stop!
  - Force creation of new instances of a function
- Function must call itself
  - With different inputs!
- Terminating condition must eventually be true

# Example

How many CEO's at this table?

A recursive approach……

Taken from http://cache.daylife.com/imageserve/0dgm32v6aYgv6/610x.jpg

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# Another Recursion Example

- Classic Example
  - Function output = numbersSum(input)

```
if (input == 1)
   output = 1;
else
   output = input+numbersSum(input-1)
end
end
```