Four stories: four models of learning.

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Active learning increases student performance in science, engineering, and mathematics Freeman et al. 2014 (PNAS)
First year undergraduate class
1. Recursion.

   A video describing the concept.

   A video demo.

   It is possible to define functions recursively. This is similar to inductive proofs in mathematics. To do this we need to consider two things:
   
   1. A recursive rule;
   
   2. A base case (that the recursive rule reduces to).

   As an example let us code the following function:

   \[
   f(n) = \sum_{i=0}^{n} i
   \]

   We can see the `recursive rule`:

   \[
   f(n) = f(n - 1) + n
   \]

   We also know that the `base case` is:

   \[
   f(0) = 0
   \]

   Now let us program this function using recursion:

   ```python
   >>> def sum_of_integers(n):
   ...     """Sum of integers from 0 to n""
   ...     if n == 0:  # Base case
   ...         return 0
   ...     return sum_of_integers(n - 1) + n  # Recursive rule
   ```
Masters level 2 day hackathon
You need to build a tournament that creates a round robin of players using different strategies playing Rock Paper Scissors. Each match between 2 players will be 21 rounds of Rock Paper Scissors.

After creating this tournament, create a new strategy that wins the overall tournament.

**Parameters:**

There will be 6 original strategies/players:

- Always play Rock;
- Always play Paper;
- Always play Scissors;
- Alternate: Rock then Paper then Scissors;
- Alternate: Rock then Scissors then Paper;
- Play randomly
- Mirror: Repeats the ‘previous move’ made by the opponent.
PhD level resource practice workshop
We will do this by writing software to find the prime factors of an integer.

Discussion

Before looking any further there will be a class discussion.

Files from discussion

- find_primes_v1.py.
- find_primes_v2.py.
- find_primes_v3.py.
- is_prime.py
- integer_division
- prime_factors.py
- test_is_prime.py
- test_integer_division.py
- test_prime_factors.py
PhD supervision
Learn
Enthusiasm
- Anaconda
- Jupyter notebooks
- `pip install --user <package>`
- gh-pages
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