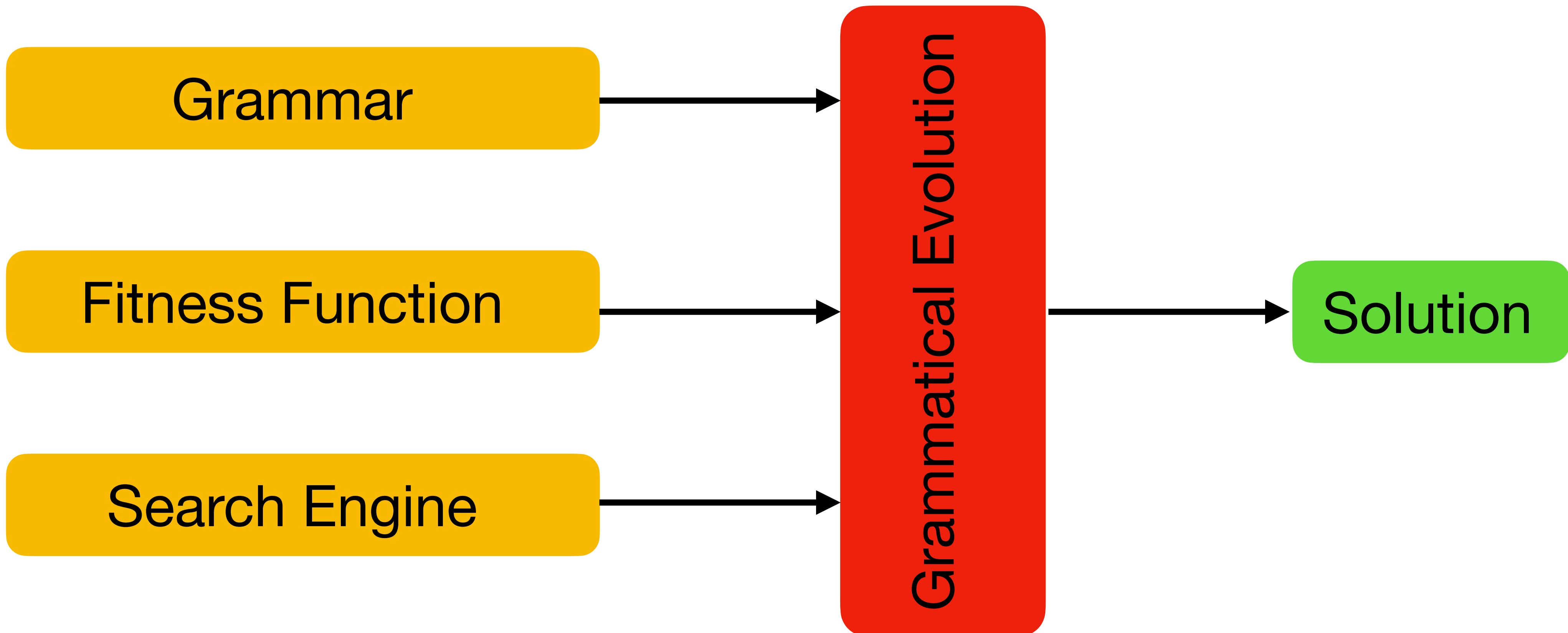


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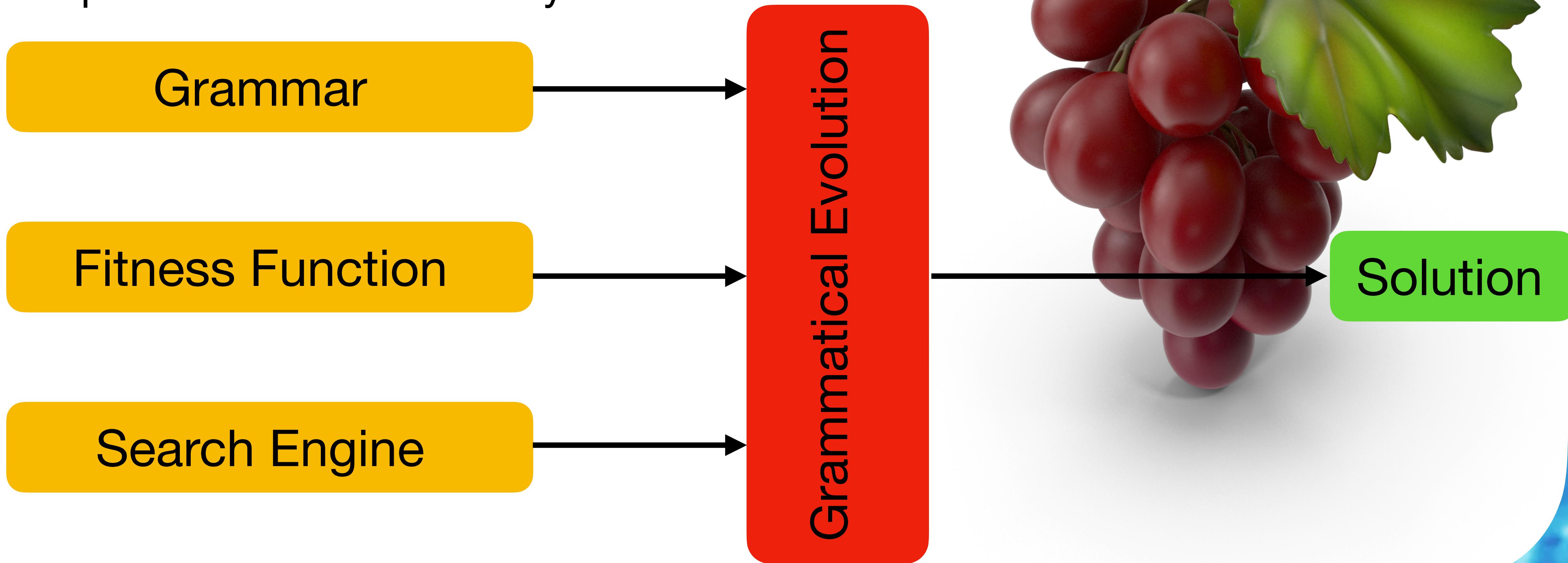
5.3 Grammatical Algorithms in Python for Evolution (GRAPE)

Overview



Overview

- GRammatical Algorithms in Python for Evolution (GRAPE)
- Implementation of GE in Python/DEAP



Overview

- Three application domains
 - Parity, Regression, Classification
- Grammar set up
- Dealing with training and test data

Training vs Testing



- Training Data
 - Gives feedback to algorithm
- Test Data
 - Gives feedback to **user**

GE Parity

- Clone GRAPE
 - This is not a public repository
- Import GE tools
 - Grammar handling, mapping, functions
- Set GE parameters
 - Max wraps, codon size, **elite_size**
- Choose problem
 - Load data and grammar

Grammar (Parity 3)

$\langle e \rangle ::= \text{and}_{-}(\langle e \rangle, \langle e \rangle) |$

$\text{or}_{-}(\langle e \rangle, \langle e \rangle) |$

$\text{nand}_{-}(\langle e \rangle, \langle e \rangle) |$

$\text{nor}_{-}(\langle e \rangle, \langle e \rangle) |$

$x[0] | x[1] | x[2]$

Grammar (Parity 5)

$\langle e \rangle ::= \text{and}_{-}(\langle e \rangle, \langle e \rangle) |$

$\text{or}_{-}(\langle e \rangle, \langle e \rangle) |$

$\text{nand}_{-}(\langle e \rangle, \langle e \rangle) |$

$\text{nor}_{-}(\langle e \rangle, \langle e \rangle) |$

$x[0] | x[1] | x[2] | x[3] | x[4]$

Grammar (Symbolic Regression)

```
<e> ::= <e>+<e>|  
       <e>-<e>|  
       <e>*<e>|  
       div(<e>,<e>)|  
       psqrt(<e>)|  
       np.sin(<e>)|  
       np.tanh(<e>)|  
       exp(<e>)|  
       plog(<e>)|  
       x[0]|x[1]|  
  
<c><c>. <c><c>  
  
<c> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9
```

Grammar (Classification)

x[0]|x[1]|x[2]|x[3]|x[4]|x[5]|x[6]|x[7]|x[8]|x[9]|x[10]|x[11]|x[12]|x[13]|x[14]|x[15]|x[16]|x[17]|x[18]|x[19]|x[20]|x[21]|x[22]|x[23]|x[24]|x[25]|x[26]|x[27]|x[28]|
x[29]|x[30]|x[31]|x[32]|x[33]|x[34]|x[35]|x[36]|x[37]|x[38]|x[39]|x[40]|x[41]|x[42]|x[43]|x[44]|x[45]|x[46]|x[47]|x[48]|x[49]|x[50]|x[51]|x[52]|x[53]|x[54]|x[55]|
x[56]|

`<c> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9`

New notebooks

- Three notebooks available
- GRAPE repository contains
 - Grammars
 - Data files