CSc 120
Introduction to Computer Programming II

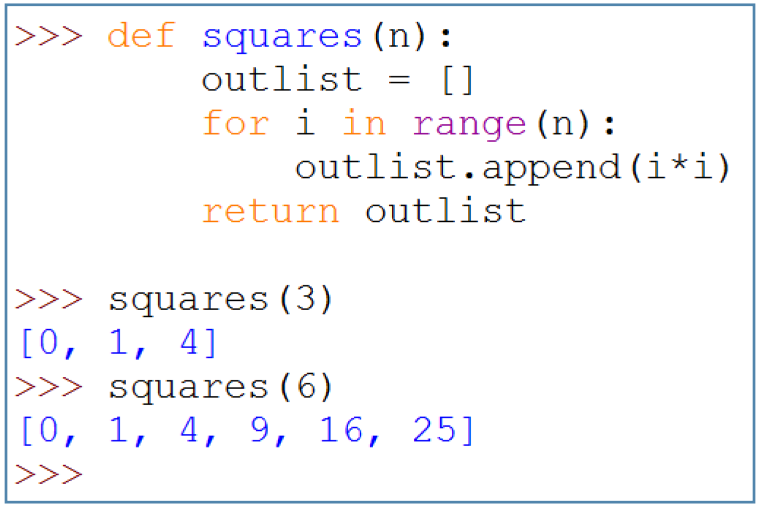
Adapted from slides
by Dr. Saumya Debray

11: List Comprehensions

List comprehensions

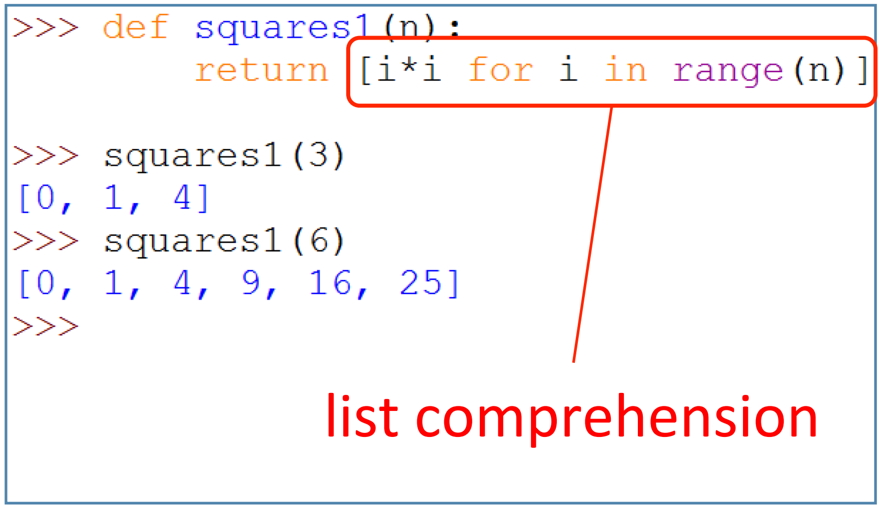
- A *list comprehension* is a simple and concise way to create lists

  Example: compute a list of squares of numbers



```
>>> def squares(n):
        outlist = []
        for i in range(n):
            outlist.append(i*i)
        return outlist

>>> squares(3)
[0, 1, 4]
>>> squares(6)
[0, 1, 4, 9, 16, 25]
>>>
```



```
>>> def squares1(n):
        return [i*i for i in range(n)]

>>> squares1(3)
[0, 1, 4]
>>> squares1(6)
[0, 1, 4, 9, 16, 25]
>>>
```

list comprehension

Basic structure

[*expr* **for** *item* **in** *some_list* **if** *cond* **]**

|||

new_list = []

for *item* **in** *some_list*:

    if *cond*:

        new_list.append(expr)

filter
(optional)

Example 1

```
>>> def odds_and_evens(arglist):
        odds = []
        evens = []
        for i in range(len(arglist)):
            if i % 2 == 0:
                evens.append(arglist[i])
            else:
                odds.append(arglist[i])
        return (odds,evens)

>>> (o,e) = odds_and_evens([0,1,2,3,4,5])
>>> o
[1, 3, 5]
>>> e
[0, 2, 4]
>>>
```

Example 1

```
>>> def odds_and_evens(arglist):
        odds = []
        evens = []
        for i in range(len(arglist)):
            if i % 2 == 0:
                evens.append(arglist[i])
            else:
                odds.append(arglist[i])
        return (odds,evens)
```

using list comprehensions

```
>>> def odds_and_evens(arglist):
        idxs = range(len(arglist))
        odds = [arglist[i] for i in idxs if i % 2 != 0]
        evens = [arglist[i] for i in idxs if i % 2 == 0]
        return (odds,evens)

>>> (o,e) = odds_and_evens([0,1,2,3,4,5])
>>> o
[1, 3, 5]
>>> e
[0, 2, 4]
>>>
```

Example 2

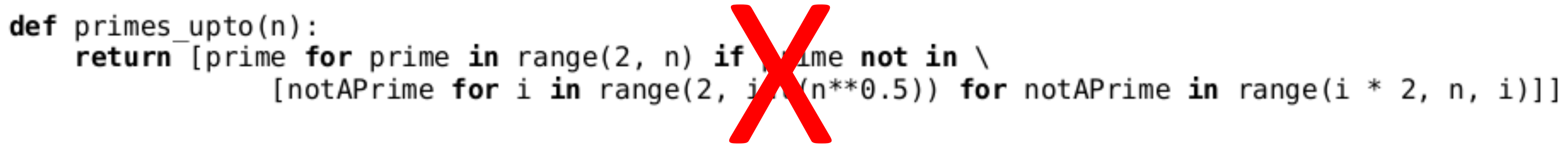
```
>>> import string
>>>
>>> # strip punctuation from around words
>>> def strip_punctuation(wordlist):
        puncts = string.punctuation
        return [wd.strip(puncts) for wd in wordlist]

>>> wordlist = "Look! Here's--> punctuation:!@#$%^&".split()
>>> strip_punctuation(wordlist)
['Look', "Here's", 'punctuation']
>>>
```

style considerations

Style considerations

- Use loops for:
  - code that has side effects, i.e., does I/O or modifies other objects
- Use list comprehensions for:
  - creating lists
    - using code that does not have side effects
- Avoid long or nested list comprehensions
  - these can be hard to read and understand



```
def primes_upto(n):
    return [prime for prime in range(2, n) if prime not in \
                 [notAPrime for i in range(2, int(n**0.5)) for notAPrime in range(i * 2, n, i)]]
```