BNFO 135: Programming For Bioinformatics

Dictionaries

Lecture 9

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What is a dictionary?

- A dictionary is like a list, but more general.
- In a list the indices must be integers, but in a dictionary they can be almost any type.
- A dictionary is a mapping between a set of indices, called keys, and a set of values.
- Each key maps to a value. This is called a key-value pair.
Creating a dictionary

- To create an empty dictionary we can use the empty braces
  \[ \text{d} = \{\} \]
- Or we can use the type name constructor
  \[ \text{d} = \text{dict}() \]
Example dictionary

- Let us create an English to Spanish dictionary
  \[
  \text{eng2sp} = \{} \n  \]

- And now add an item to it
  \[
  \text{eng2sp[}'one'\text{'] } = \text{}'uno'\text{'} \n  \]
Initializing a dictionary

- We can create a dictionary with items all ready in it

    ```python
    eng2sp = {'one': 'uno',
              'two': 'dos',
              'three': 'tres'}
    ```
Using a dictionary

- To access the value, we need only put the key in the square brackets: `[]`

  \[\text{eng2sp} \left[ \text{'two'} \right] \]

- If we print the value of the above expression we get

  \[\text{dos}\]

- The key `two` always maps to the value `dos`
Order of items

- The order of items in a dictionary can change, so you should not rely upon a particular ordering.
- This is okay, because the primary operation on a dictionary is a lookup.
- As long as python can do fast lookups, the order doesn't matter.
Operations on dictionaries

- In addition to the '[]' operator, we can use the 'len' function to determine the number of items in a dictionary
  
  ```python
  print(len(eng2sp))
  ```
- The 'in' operator works also
  
  ```python
  'three' in eng2sp
  ```
Dictionaries and errors

- If you try to access a dictionary using an invalid key you will get a 'KeyError'

  eng2sp['four']

- To avoid this we can determine if the key is valid using the 'in' operator

  'four' in eng2sp
Dictionary usage

• If we want to print out all of the keys and values in our dictionary we could execute the following:

```python
for key in eng2sp:
    print(key, '=>', eng2sp[key])
```

• The above may not always print out in the same order.
Dictionary methods

- Dictionaries have three methods for accessing keys and values
  
  ```python
  D.keys()
  D.values()
  D.items()
  ```

- The above give us all the keys, values, and items (key/value pairs) in a dictionary
Dictionaries and translation

- We will use dictionaries to help us translate a DNA sequence into an amino acid sequence.
- A codon is a sequence of three DNA nucleotides that correspond to a single amino acid.
- We will create a 'codon2aa' dictionary that has every possible 3 nucleotide pattern as a key.