Solution Review: Remove Duplicates

This lesson contains the solution review for the challenge of removing duplicates from a doubly linked list.

WE'LL COVER THE FOLLOWING

- Implementation
- Explanation

In this lesson, we consider how to remove duplicates from a doubly linked list.

Implementation

Check out the code below:

```
def remove_duplicates(self):
  cur = self.head
  seen = dict()
  while cur:
    if cur.data not in seen:
      seen[cur.data] = 1
      cur = cur.next
    else:
      nxt = cur.next
      self.delete_node(cur)
      cur = nxt
```

remove_duplicates(self)

Explanation

In the method `remove_duplicates`, we will keep track of the duplicates using a Python dictionary which we declare on **line 3**. `cur` is set to `self.head` on **line 2** to help us traverse the linked list using the `while` loop on **line 4**.

In the `while` loop, we have to keep track of the number of times we encounter a data element. Therefore, if `cur.data` is not present in `seen`, we set the value of the key `cur.data` to `1` on **line 6** to indicate that we have encountered it

once while traversing the linked list. In the next line, we update `cur` to `cur.next` to iterate to the next node.

On the other hand, if `cur.data` is present in `seen`, we jump to the `else` portion on **line 8**. This implies that `cur` in the current iteration has already been encountered in the previous iterations and is present in `seen`. On **line 9**, we save the next node of `cur` in `nxt` to keep with the traversal after we remove the duplicate node. We call the class method `self.delete_node(cur)` to delete the duplicate node on **line 10** and then set `cur` to `nxt` for the next iteration on **line 11**.

Now let's discuss the `delete_node` method. You can see the modifications through the highlighted lines in the code snippet below. Instead of matching `key` with `cur.data`, we are comparing the entire `node` passed into the method with `cur`.

```
def delete_node(self, node):
  cur = self.head
  while cur:
    if cur == node and cur == self.head:
      # Case 1:
      if not cur.next:
        cur = None
        self.head = None
        return

      # Case 2:
      else:
        nxt = cur.next
        cur.next = None
        nxt.prev = None
        cur = None
        self.head = nxt
        return

    elif cur == node:
      # Case 3:
      if cur.next:
        nxt = cur.next
        prev = cur.prev
        prev.next = nxt
        nxt.prev = prev
        cur.next = None
        cur.prev = None
        cur = None
        return

      # Case 4:
      else:
        prev = cur.prev
        prev.next = None
        cur.prev = None
        cur = None
```

```
        return
    cur = cur.next
```

delete_node(self, node)

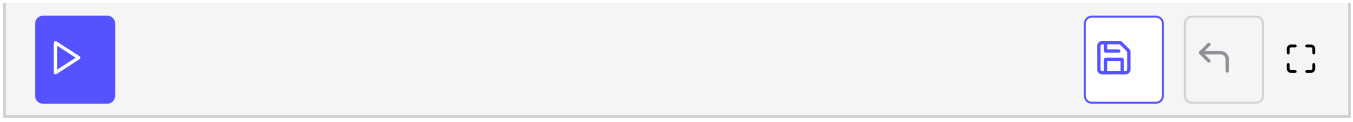
In the code widget below, we have the entire implementation of `DoublyLinkedList` that we have learned so far in this chapter. Go ahead and explore it yourself!

```
class Node:
  def __init__(self, data):
    self.data = data
    self.next = None
    self.prev = None


class DoublyLinkedList:
  def __init__(self):
    self.head = None

  def append(self, data):
    if self.head is None:
      new_node = Node(data)
      new_node.prev = None
      self.head = new_node
    else:
      new_node = Node(data)
      cur = self.head
      while cur.next:
          cur = cur.next
      cur.next = new_node
      new_node.prev = cur
      new_node.next = None

  def prepend(self, data):
    if self.head is None:
      new_node = Node(data)
      new_node.prev = None
      self.head = new_node
    else:
      new_node = Node(data)
      self.head.prev = new_node
      new_node.next = self.head
      self.head = new_node
      new_node.prev = None

  def print_list(self):
    cur = self.head
    while cur:
      print(cur.data)
      cur = cur.next

  def add_after_node(self, key, data):
    cur = self.head
    while cur:
      if cur.next is None and cur.data == key:
        self.append(data)
        return
```

```
    elif cur.data == key:
      new_node = Node(data)
      nxt = cur.next
      cur.next = new_node
      new_node.next = nxt
      new_node.prev = cur
      nxt.prev = new_node
      return
    cur = cur.next

  def add_before_node(self, key, data):
    cur = self.head
    while cur:
      if cur.prev is None and cur.data == key:
        self.prepend(data)
        return
      elif cur.data == key:
        new_node = Node(data)
        prev = cur.prev
        prev.next = new_node
        cur.prev = new_node
        new_node.next = cur
        new_node.prev = prev
        return
      cur = cur.next

  def delete(self, key):
    cur = self.head
    while cur:
      if cur.data == key and cur == self.head:
        # Case 1:
        if not cur.next:
          cur = None
          self.head = None
          return

        # Case 2:
        else:
          nxt = cur.next
          cur.next = None
          nxt.prev = None
          cur = None
          self.head = nxt
          return

      elif cur.data == key:
          # Case 3:
        if cur.next:
            nxt = cur.next
            prev = cur.prev
            prev.next = nxt
            nxt.prev = prev
            cur.next = None
            cur.prev = None
            cur = None
            return

          # Case 4:
        else:
            prev = cur.prev
            prev.next = None
            cur.prev = None
```

```
            cur = None
            return
        cur = cur.next

    def delete_node(self, node):
      cur = self.head
      while cur:
        if cur == node and cur == self.head:
          # Case 1:
          if not cur.next:
            cur = None
            self.head = None
            return

          # Case 2:
          else:
            nxt = cur.next
            cur.next = None
            nxt.prev = None
            cur = None
            self.head = nxt
            return

        elif cur == node:
          # Case 3:
          if cur.next:
            nxt = cur.next
            prev = cur.prev
            prev.next = nxt
            nxt.prev = prev
            cur.next = None
            cur.prev = None
            cur = None
            return

          # Case 4:
          else:
            prev = cur.prev
            prev.next = None
            cur.prev = None
            cur = None
            return
        cur = cur.next

    def reverse(self):
        tmp = None
        cur = self.head
        while cur:
            tmp = cur.prev
            cur.prev = cur.next
            cur.next = tmp
            cur = cur.prev
        if tmp:
            self.head = tmp.prev

    def remove_duplicates(self):
        cur = self.head
        seen = dict()
        while cur:
            if cur.data not in seen:
                seen[cur.data] = 1
                cur = cur.next
```

```
            else:
                nxt = cur.next
                self.delete_node(cur)
                cur = nxt


dllist = DoublyLinkedList()
dllist.append(8)
dllist.append(4)
dllist.append(4)
dllist.append(6)
dllist.append(4)
dllist.append(8)
dllist.append(4)
dllist.append(10)
dllist.append(12)
dllist.append(12)


dllist.remove_duplicates()
dllist.print_list()
```



Hope you had fun with this lesson! Now brace yourself for another challenge in the next lesson. All the best!