Project 1
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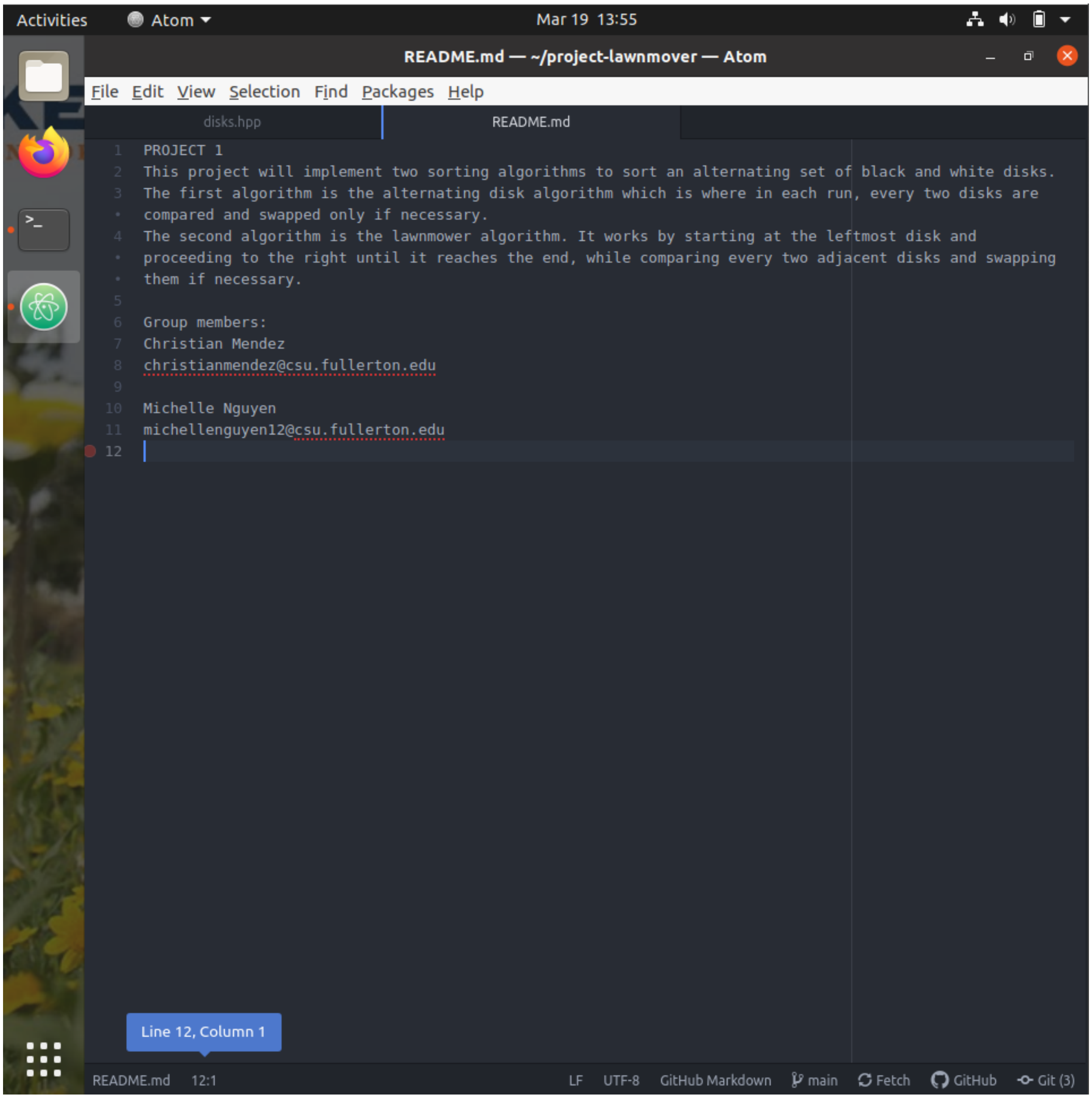

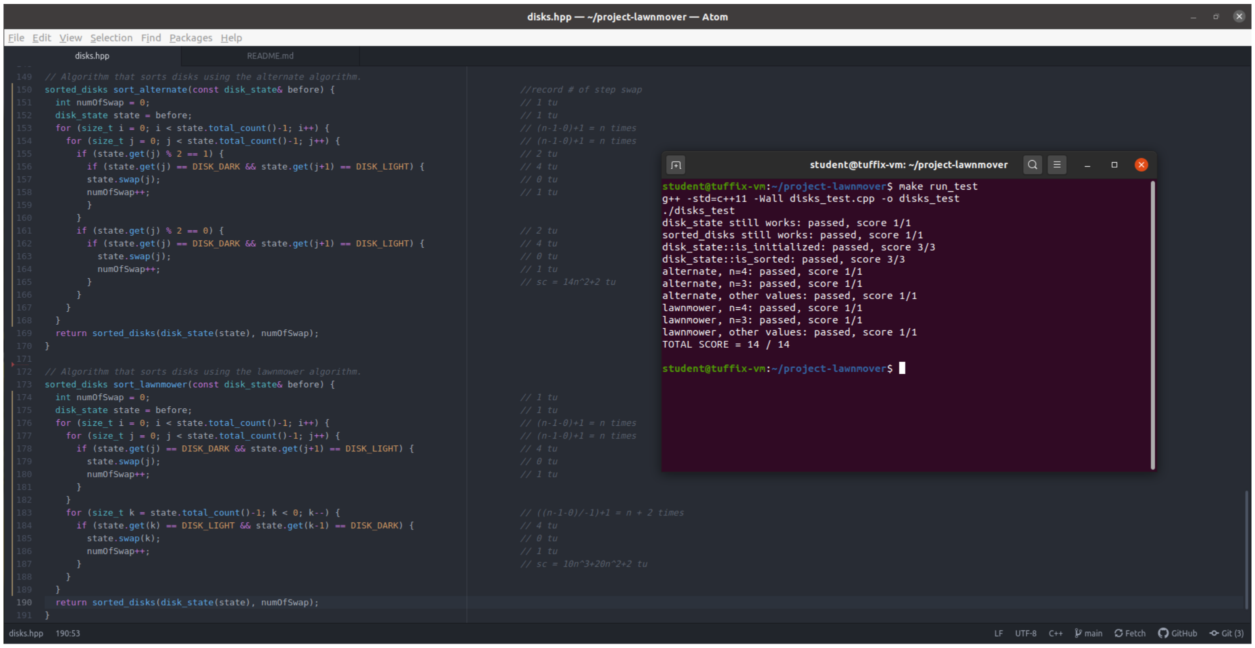

Step Count for Pseudocode sort_alternate

```
numOfSwap = 0                       // 1 tu
state = before                      // 1 tu
for i = 0 to n - 1 do               // (n-1-0)+1 = n times
  for j = 0 to n - 1 do             // (n-1-0)+1 = n times
    if (j % 2 == 1)                 // 2 tu
      if (j == dark && j+1 == light)  // 4 tu
        swap(j)                     // 0 tu
        numOfSwap++                 // 1 tu
      end if
    end if
    if (j % 2 == 0)                 // 2 tu
      if (j == dark && j+1 == light)  // 4 tu
        swap(j)                     // 0 tu
        numOfSwap++                 // 1 tu
      end if
    end if
  end for
end for
```

SCa = 4 + max(1,0) = 5 tu
SC = 2 + max(0,0) = 2 tu
SCb = 4 + max(1,0) = 5 tu
SC = 2 + max(0,0) = 2 tu
SC = n * n * 14 + 1 + 1 = 14n^2 + 2 tu

Proof for Pseudocode sort_alternate

Show that 14n^2+2 belongs to O(n^2)

F(n) = 14n^2 + 2
G(n) = n^2
Using def. f(n) <= c*g(n), n>=n0
By def, 14n^2 + 2 <= c*n^2, n > n0
Let c = 40 and n0=1
14n^2+2 <= 40n^2, n > 1
14(1)^2 +2 <= 40(1)^2
16 <= 40
This is true, hence 14n^2 + 2 belongs to the O(n^2) time complexity

Step Count for Pseudocode sort_lawnmower

```
numOfSwap = 0                          // 1 tu
state = before                         // 1 tu
for i = 0 to n - 1 do                  // (n-1-0)+1 = n times
  for j = 0 to n - 1 do                // (n-1-0)+1 = n times
    if (j == dark && j+1 == light)     // 4 tu
      swap(j)                          // 0 tu
      numOfSwap++                      // 1 tu
    end if
  end for
  for k = n-1 to 0 do                  // (0-(n-1))+1 = n times
    if (k == light && k-1 == dark)     // 4 tu
      swap(k)                          // 0 tu
      numOfSwap++                      // 1 tu
     end if
  end for
end for
```

SC = 4 + max(1,0) = 5 tu
SC = 4 + max(1,0) = 5 tu
SC = (n * n + n) * (5 + 5) + 1 + 1
SC = 10n^2 + 10n + 2

Proof for Pseudocode sort_lawnmower

Show that 10n^2+10n+2 belongs to O(n^2)

F(n) = 10n^2 +10n+2
G(n) = n^2
Using def. f(n) <= c*g(n), n>=n0
By def, 10n^2+10n+2 <= c*n^2, n > n0

Let $c = 40$ and $n0=1$
$10n^2+10n+2 <= 40n^2, n > 1$
$10(1)^2 +10(1)+2 <= 40(1)^2$
$22 <= 40$
This is true, hence $10n^2+10n+2$ belongs to the $O(n^2)$ time complexity