

Algorithm performance



Big-O: nested loops



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by Christine Alvarado, Mia Minnes, and Leo Porter, 2015.

By the end of this video you will be able to...

- Compute the big-O class of code with nested loops

```
public static int maxDifference (int[] vals) {  
    int max = 0;  
    for (int i=0; i < vals.length; i++) {  
        for (int j=0; j < vals.length; j++) {  
            if (vals[i] - vals[j] > max) {  
                max = vals[i] - vals[j];  
            }  
        }  
    }  
    return max;  
}
```

```
public static int maxDifference (int[] vals) {  
    int max = 0;  
    for (int i=0; i < vals.length; i++) {  
        for (int j=0; j < vals.length; j++) {  
            if (vals[i] - vals[j] > max) {  
                max = vals[i] - vals[j];  
            }  
        }  
    }  
    return max;  
}
```

IVQ: sample run

```
public static int maxDifference (int[] vals) {  
    int max = 0;  
    for (int i=0; i < vals.length; i++) {  
        for (int j=0; j < vals.length; j++) {  
            if (vals[i] - vals[j] > max) {  
                max = vals[i] - vals[j];  
            }  
        }  
    }  
    return max;  
}
```

```
public static int maxDifference (int[] vals) {  
    int max = 0;  
    for (int i=0; i < vals.length; i++) {  
        for (int j=0; j < vals.length; j++) {  
            if (vals[i] - vals[j] > max) {  
                max = vals[i] - vals[j];  
            }  
        }  
    }  
    return max;  
}
```


```
public static int maxDifference (int[] vals) {  
    int max = 0;  
    for (int i=0; i < vals.length; i++) {  
        for (int j=0; j < vals.length; j++) {  
            if (vals[i] - vals[j] > max) {  
                max = vals[i] - vals[j];  
            }  
        }  
    }  
    return max;  
}
```


Count from the inside out

```
public static int maxDifference (int[] vals) {  
    int max = 0;  
    for (int i=0; i < vals.length; i++) {  
        for (int j=0; j < vals.length; j++) {  
            if (vals[i] - vals[j] > max) {  
                max = vals[i] - vals[j];  
            }  
        }  
    }  
    return max;  
}
```

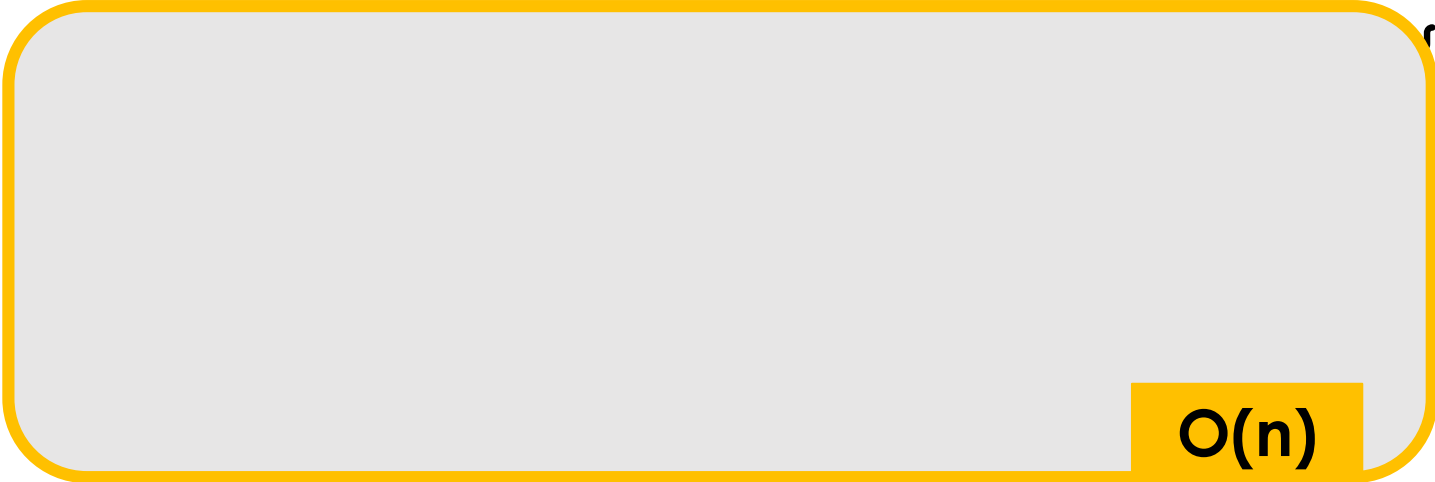


```
public static int maxDifference (int[] vals) {  
    int max = 0;  
    for (int i=0; i < vals.length; i++) {  
        for (int j=0; j < vals.length; j++) {  
            if (vals[i] - vals[j] > max) {  
                max = vals[i] - vals[j];  
            } O(1)  
        }  
    }  
    return max;  
}
```

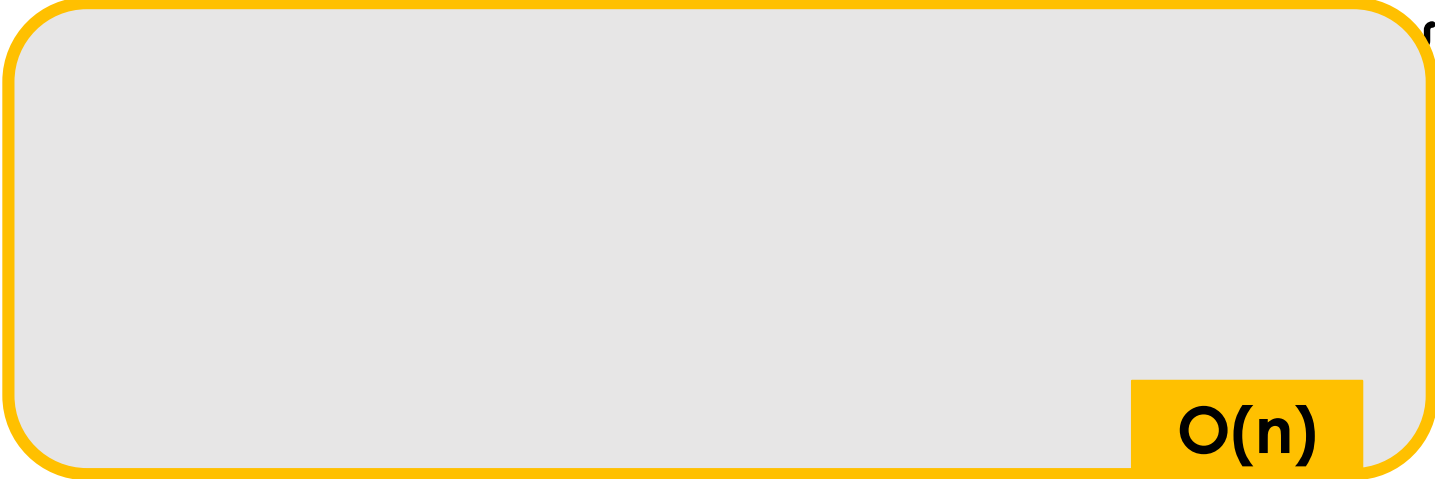
```
public static int maxDifference (int[] vals) {  
    int max = 0;  
    for (int i=0; i < vals.length; i++) {  
        for (int j=0; j < vals.length; j++) {  
              
            O(1)  
        }  
    }  
    return max;  
}
```

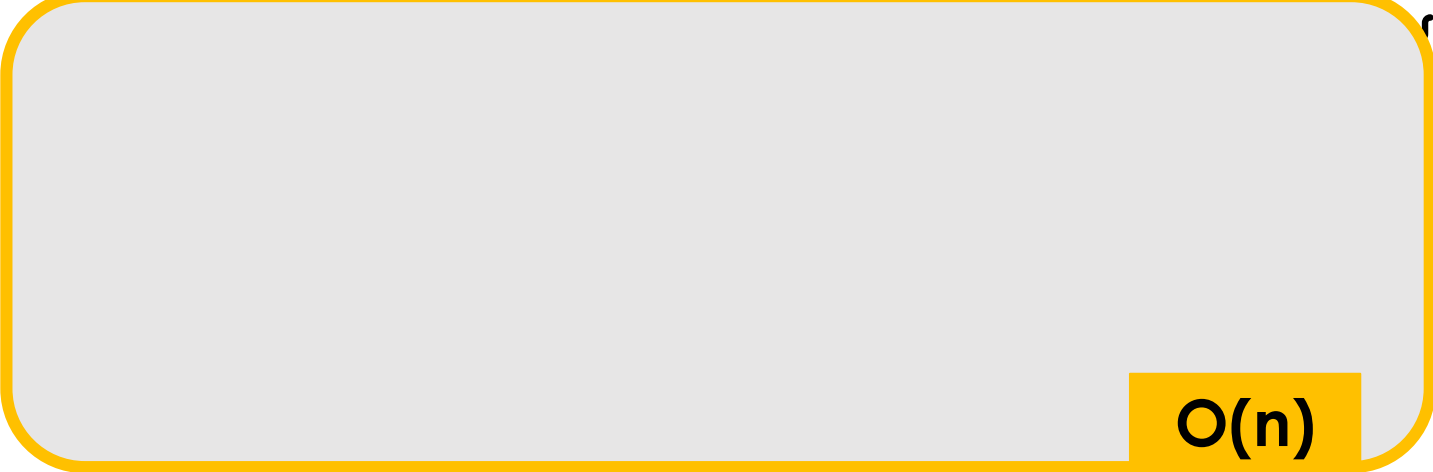
```
public static int maxDifference (int[] vals) {  
    int max = 0;  
    for (int i=0; i < vals.length; i++) {  
        for (int j=0; j < vals.length; j++) {  
              
        }  
    }  
    return max;  
}
```

O(n)

```
public static int maxDifference (int[] vals) {  
    int max = 0;  
    for (int i=0; i < vals.length; i++) {  
          
    }  
    return max;  
}
```

$O(n)$

```
public static int maxDifference (int[] vals) {  
    int max = 0;  
    for (int i=0; i < vals.length; i++) {  
          
    }  
    return max;  
}
```

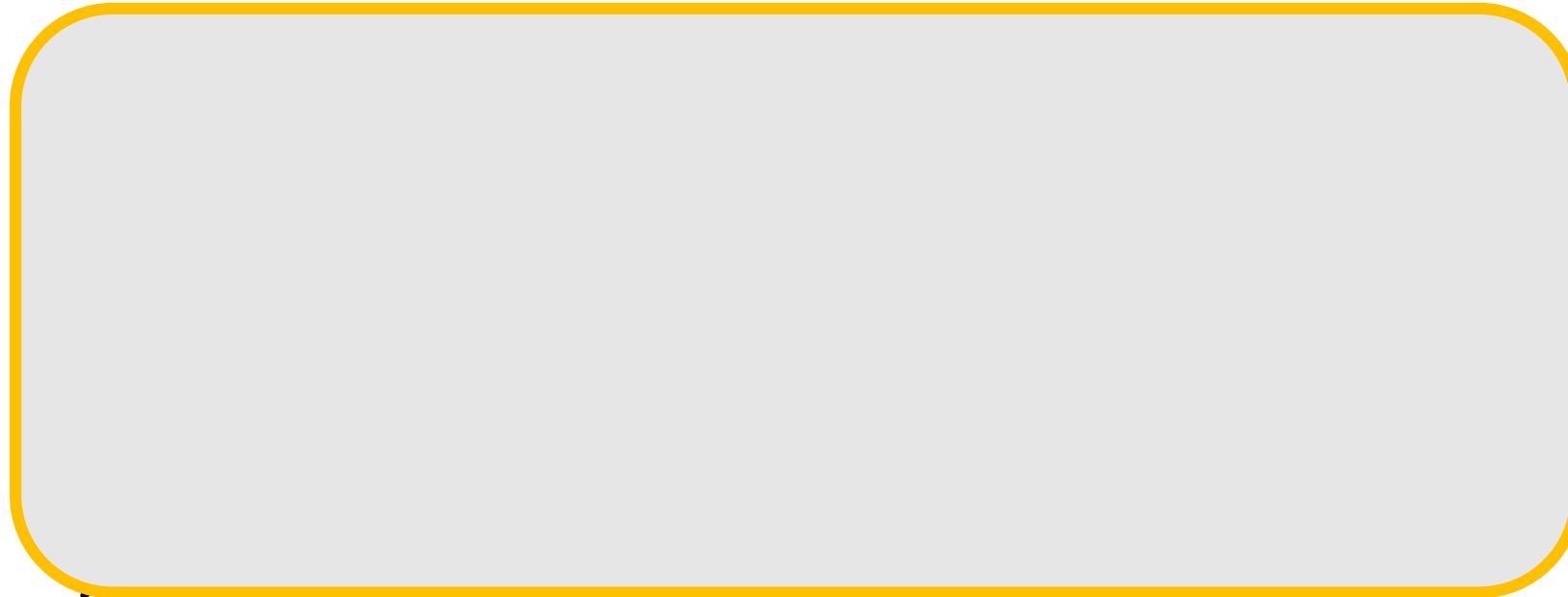
```
public static int maxDifference (int[] vals) {  
    int max = 0;  
    for (int i=0; i < vals.length; i++) {  
          
    }  
    return max;  
}
```

$O(n)$

$O(n^2)$

```
public static int maxDifference (int[] vals) {
```


```
    int max = 0; O(1)
```



O(n²)

```
    return max; O(1)
```

```
}
```

```
public static int maxDifference (int[] vals) {  
    int max = 0; O(1)  
  
     O(n2)  
  
    return max; O(1)  
}
```

Total: $O(n^2)$