

Announcements

- HW 6 due tomorrow
- HW 7 due next Tues 4/2
- Midterm #2: Tues 4/2 to Tues 4/9
- Office hours: today 4-5pm

Today

- Dynamic Programming
 - Segmented Least Squares
 - Subset Sum

Segmented Least Squares: Algorithm

```
Segmented-Least-Squares() {
```

Cost

```
  for all pairs  $i < j$ 
```

```
    compute the least square error  $e_{ij}$  for  
    the segment  $p_i, \dots, p_j$ 
```

$O(n^3)$

```
  end
```

```
   $M[0] = 0$ 
```

```
  for  $j = 1$  to  $n$ 
```

```
     $M[j] = \min_{1 \leq i \leq j} (e_{ij} + C + M[i-1])$ 
```

$O(n^2)$

```
  end
```

```
  return  $M[n]$ 
```

```
}
```

Total = $O(n^3)$

Comparison

Weighted Interval scheduling

- n subproblems
- Two cases: include j or don't include j

Segmented Least Squares

- n subproblems
- Up to n cases (select starting point p_i of final segment, $i \leq j$)

Subset-Sum Algorithm

```
Subset-Sum (n, W) {  
  initialize  $M[0, w] = 0$  for  $w = 0, 1, \dots, W$   
  for  $i = 1..n$  {  
    for  $w = 0..W$  {  
      if  $w_i > w$  {  
         $M[i, w] = M[i-1, w]$   
      }  
      else {  
         $M[i, w] = \max(M[i-1, w], w_i + M[i-1, w-w_i])$   
      }  
    }  
  }  
}
```

Running time. $O(n W)$.

Not polynomial in input size!
"Pseudo-polynomial."

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Segmented Least Squares

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Subset Sum

- nW subproblems
- Two cases: include j or don't include j