**Goals:**

- Finish Knapsack DP Algorithm
- Motivate NP definition

**Announcements/Questions:**

- Monday @7 pm on Zoom: Tapia Panel
- Last week with these groups :-(
- Other base cases?
- "0" cols and rows, pros/cons?
- Why work backwards? Decrement C?

**Recurrence Relation for Knapsack Problem**

\[
V(i,j) = \begin{cases} 
0 & \text{if } i = 0 \\
\text{max} \{ V(i-1,j) , V(i-1,j-w_i) + v_i \} & \text{if } j \geq w_i \\
v_i & \text{if } j = w_i \\
\text{undefined} & \text{otherwise} 
\end{cases}
\]

- **Base Case:**
  - \( V(i,0) = 0 \)
  - \( V(0,j) = 0 \) if \( j < w_i \)
  - \( V(0,j) = v_i \) if \( j = w_i \)
  - \( V(i,j) = V(i-1,j) \) if \( i < 0 \) or \( j < 0 \)

**Knapsack: Brute Force \( O(n^2) \)**

- \( V(i) \)
  - \( V(i) = \text{max} \{ 0, V(i-1) \} \)
  - \( V(i) = \text{max} \{ 0, V(i-1) + v_i \} \)

Do we really need to do all these things?