

## 1 | Notes from Within the Lecture

$$CM = \frac{\sum m_i \vec{r}_i}{\sum m_i} = \frac{1}{M} \sum m_i \vec{r}_i \quad (1)$$

i.e.: the centre of mass is the weighted average of the centers. "First moment."

$$I = M \frac{\sum m_i r_i^2}{M} = \sum m_i r_i^2 \quad (2)$$

i.e.: the rotational inertia is  $M$  times the weighted average, squared. "Second moment."

- 1st moment: Mean
- 2nd moment: Standard Deviation
- 3rd moment: Skew
- 4th moment: Kurtosis

If I take an axis, and shift the direction of the axis, we can compute the rotational inertia about the center of mass and then move it

## 2 | Proving the Parallel Axis Theorem

We will begin with the definition of rotational inertia about an origin:

$$I = \sum_i m_i l_i^2 \quad (3)$$