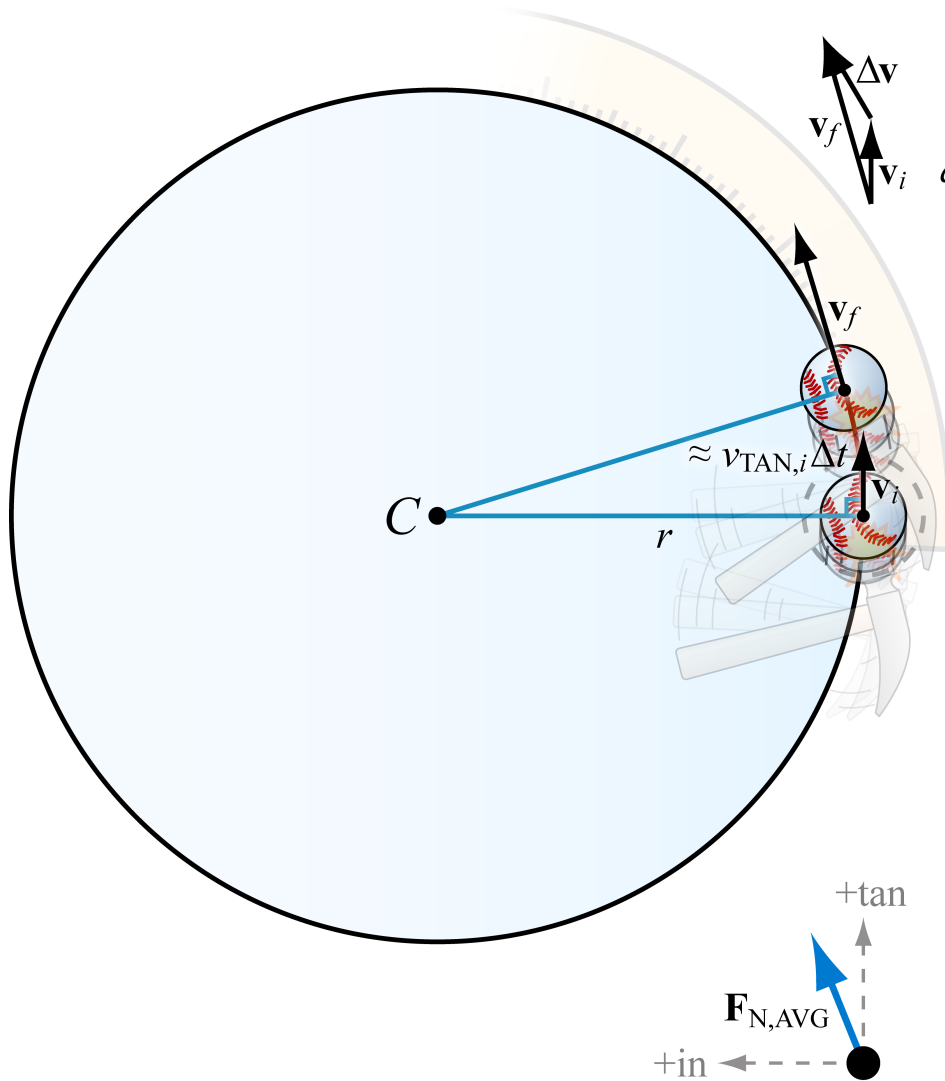


# Uniform and non-uniform circular motion



## U/CM Kinematics

- $r$  radius
- $c = 2\pi r$  circumference
- $T$  period (lap time)
- $f := \frac{1}{T}$  frequency  $[f] = \frac{1}{s} = \text{Hz}$
- $\omega = 2\pi f$  angular frequency
- $v_{TAN} = \frac{c}{T} = \frac{2\pi r}{T}$  tangential speed
- $a_{IN} = \frac{v_{TAN}^2}{r}$  inward (centripetal) acceleration
- $a_{TAN} = \frac{dv_{TAN}}{dt}$  tangential acceleration
- $\vec{\mathbf{a}} = a_{IN}(-\hat{\mathbf{r}}) + a_{TAN}\hat{\mathbf{t}}$

## U/CM Dynamics

- $a_{IN} = \frac{\Sigma F_{IN}}{m}$  net of inward (centripetal) force components
- $a_{IN}(-\hat{\mathbf{r}}) + a_{TAN}\hat{\mathbf{t}} = \frac{\Sigma F_{IN}(-\hat{\mathbf{r}}) + \Sigma F_{TAN}\hat{\mathbf{t}}}{m}$