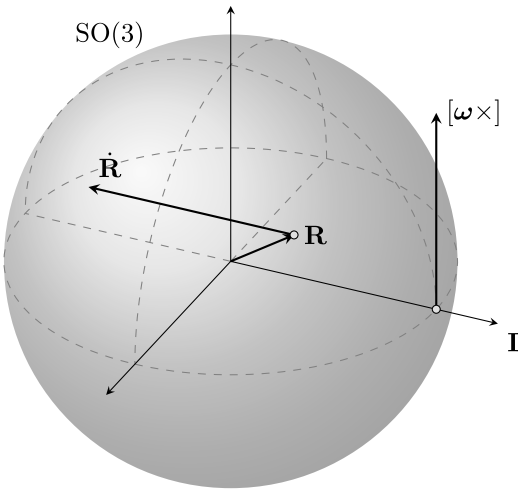
The tangent space of SO(3)
Lie algebra vs. Cartesian representation



* Lie algebra $\mathfrak{so}(3)$:

$$
\begin{aligned}
[\boldsymbol{\omega}\times] &= \begin{bmatrix} 0 & -\omega_z & \omega_y \\ \omega_z & 0 & -\omega_x \\ -\omega_y & \omega_x & 0 \end{bmatrix} \in \mathfrak{so}(3) \\
&= \omega_x \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & -1 \\ 0 & 1 & 0 \end{bmatrix} + \omega_y \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 0 \\ -1 & 0 & 0 \end{bmatrix} + \omega_z \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}
\end{aligned}
$$

* Cartesian $\mathbb{R}^3$

$$
\begin{aligned}
\boldsymbol{\omega} &= [\omega_x, \omega_y, \omega_z]^\mathrm{T} \quad \in \mathbb{R}^3 \\
&= \omega_x\, [1,0,0]^\mathrm{T} + \omega_y\, [0,1,0]^\mathrm{T} + \omega_z\, [0,0,1]^\mathrm{T}
\end{aligned}
$$

* Isomorphism: $\mathfrak{so}(3) \simeq \mathbb{R}^3$
  – Hat: $\boldsymbol{\omega}^\wedge = [\boldsymbol{\omega}\times]$
  – Vee: $\boldsymbol{\omega} = [\boldsymbol{\omega}\times]^\vee$