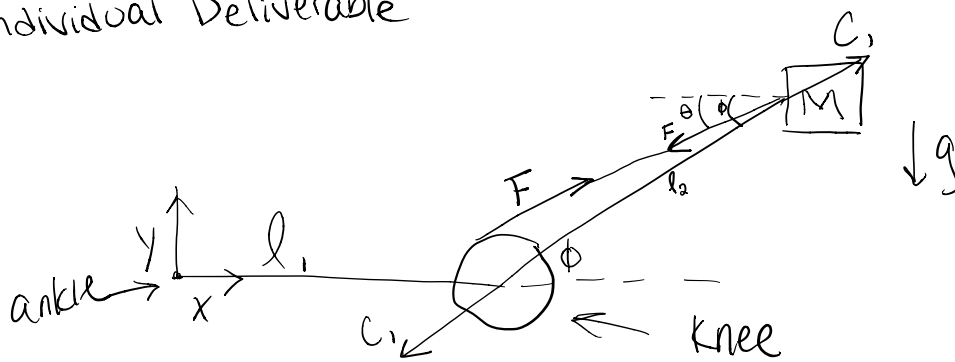


Individual Deliverable

Riley Ennis



$$M\ddot{x}_a = C_1 \cos \phi - F \cos \theta$$

$$M\ddot{y}_a = C_1 \sin \phi - F \sin \theta - Mg$$

$$C_1 \cos \phi = F \cos \theta - M\ddot{x}_a \longrightarrow C_1 = \frac{F \cos \theta}{\cos \phi} - \frac{M\ddot{x}_a}{\cos \phi}$$

$$M\ddot{y}_a = \left(\frac{F \cos \theta}{\cos \phi} - \frac{M\ddot{x}_a}{\cos \phi} \right) \sin \phi - F \sin \theta - Mg$$

$$M\ddot{y}_a = \frac{F \cos \theta \sin \phi}{\cos \phi} - \frac{M\ddot{x}_a \sin \phi}{\cos \phi} - F \sin \theta - Mg$$

$$y_a = l_2 \sin \phi$$

$$x_a = l_1 + l_2 \cos \phi$$

$$\dot{y}_a = (l_2 \cos \phi) \dot{\phi}$$

$$\dot{x}_a = (-l_2 \sin \phi) \dot{\phi}$$

$$\ddot{y}_a = (-l_2 \sin \phi) \dot{\phi}^2$$

$$\ddot{x}_a = (-l_2 \cos \phi) \dot{\phi}^2$$

$$-M l_2 \sin \phi \dot{\phi}^2 = F \cos \theta \tan \phi + M l_2 \sin \phi \dot{\phi}^2 - F \sin \theta - Mg$$

F is force exerted by hamstring

This is a highly simplified model assuming hip angle is 180°.