Problem

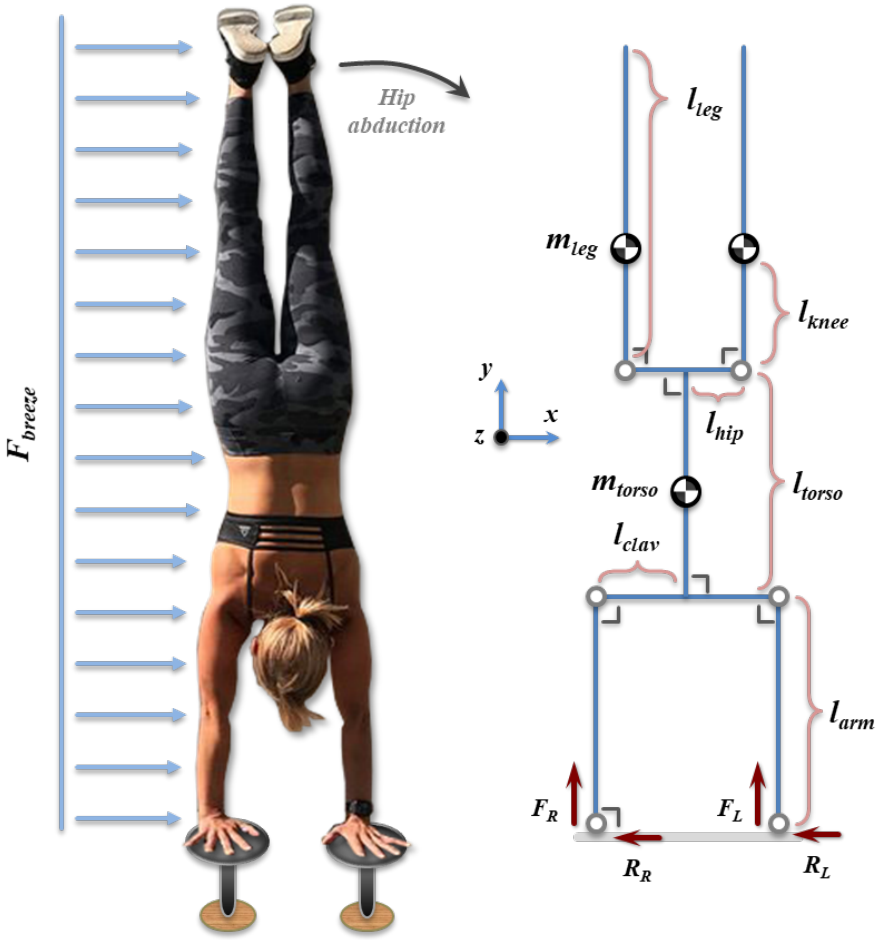
A gymnast practices a handstand outside on two exercise platforms. A breeze is blowing in the positive x-direction and creates a distributed force $\boldsymbol{F}_{breeze}$ along the length of her body. She abducts her left hip by 45 degrees while maintaining the handstand.

In the model below, the total mass of torso and arms are treated as a point mass $\boldsymbol{m}_{torso}$ centered along the length of the torso, and the legs are treated as point masses $\boldsymbol{m}_{leg}$ centered at the knees. The exercise platforms are assumed to be located directly below the shoulder joints, vertically aligned. Assume that the gymnast does not apply a moment on the platforms.

$\boldsymbol{l}_{knee}$ = 0.40 m
$\boldsymbol{l}_{torso}$ = 0.60 m
$\boldsymbol{l}_{arm}$ = 0.60 m
$\boldsymbol{l}_{hip}$ = 0.15 m
$\boldsymbol{l}_{clav}$ = 0.15 m
$\boldsymbol{l}_{leg}$ = 0.80 m

$\boldsymbol{m}_{leg}$ = 12.5 kg
$\boldsymbol{m}_{torso}$ = 35.0 kg

$\boldsymbol{F}_{breeze}$ = 2.0 N/m



a) Given the anatomical dimensions and masses, determine forces $\mathbf{F_L}$ and $\mathbf{F_R}$ at the gymnast's hands. Solve the problem symbolically first, then numerically, and show your work for each part.

c) How strong would the breeze have to be knock to gymnast of balance, causing her right hand to lift off the ground?