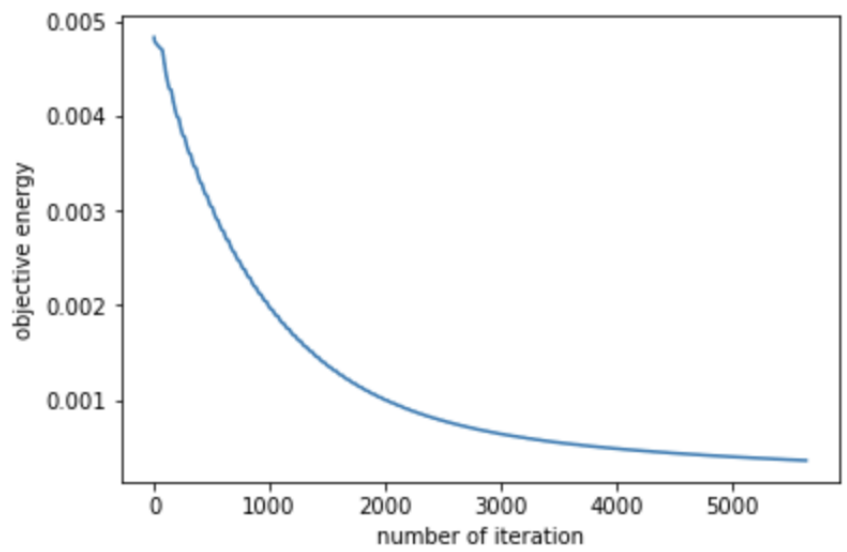
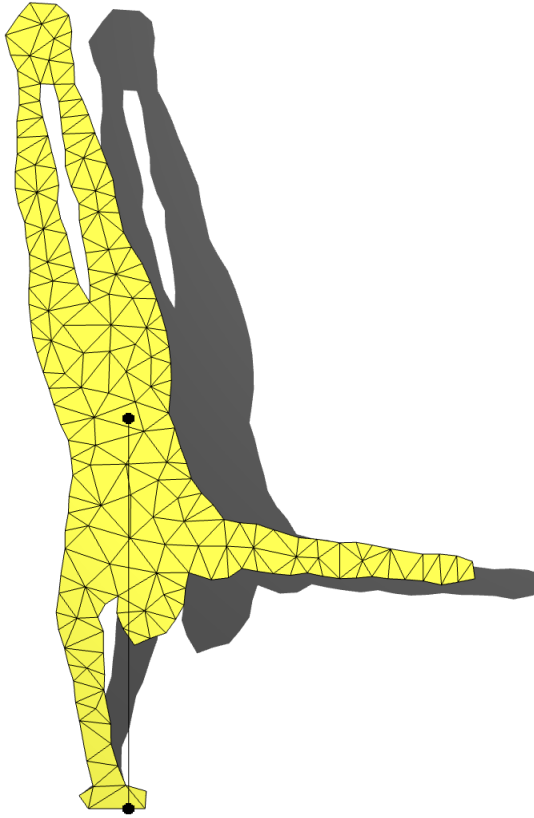
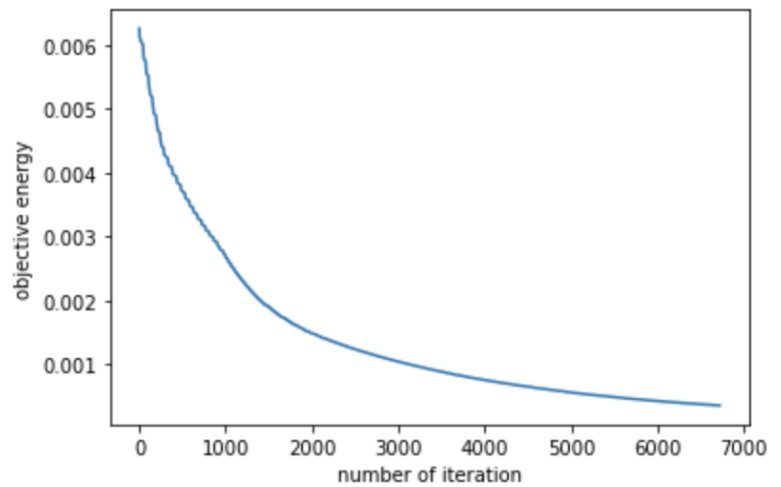
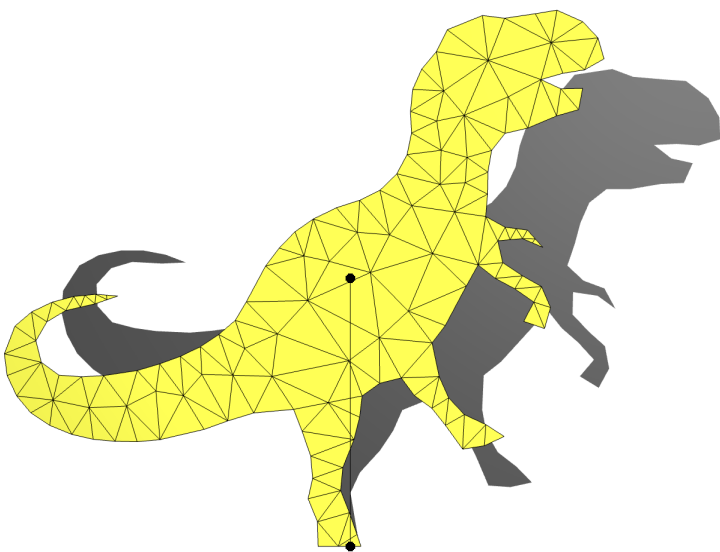


## Gradient Descent with backtrack line search

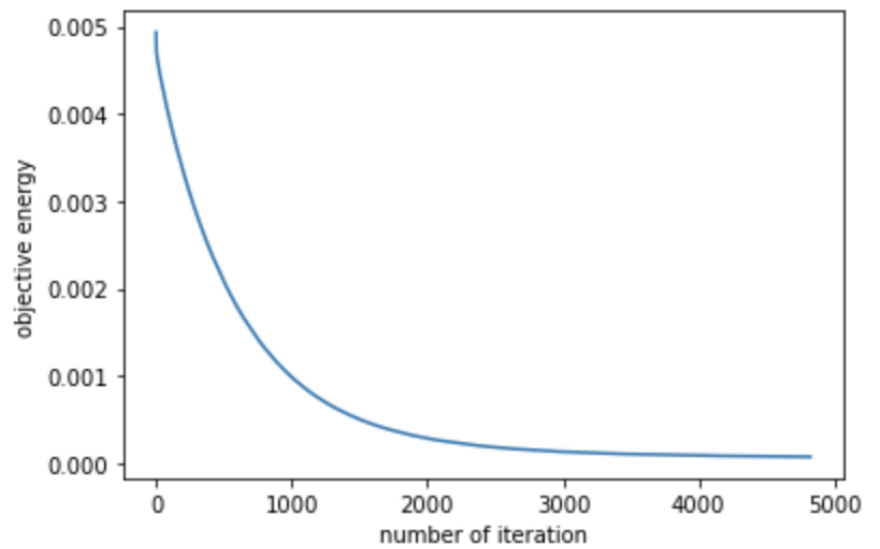
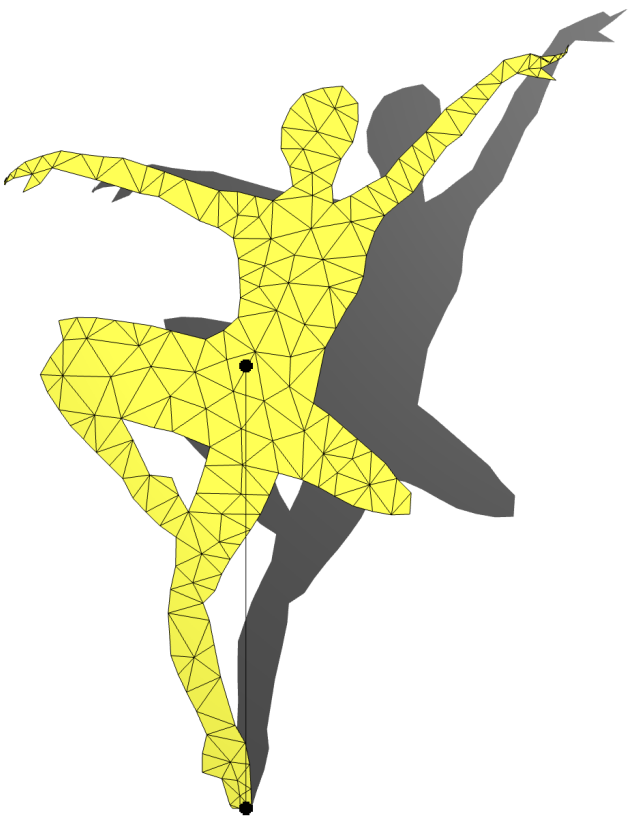
Parameters:  $w=2$ ,  $\text{obj\_tol} = 1\text{E-}8$ ,  $\theta = 1.0$ ,  $\beta = 0.5$ ,  $c = 0.01$ ,  $\text{iter} = 10000$



Parameters:  $w=2$ ,  $\text{obj\_tol} = 1\text{E-}8$ ,  $\theta = 1.0$ ,  $\beta = 0.5$ ,  $c = 0.01$ ,  $\text{iter} = 10000$

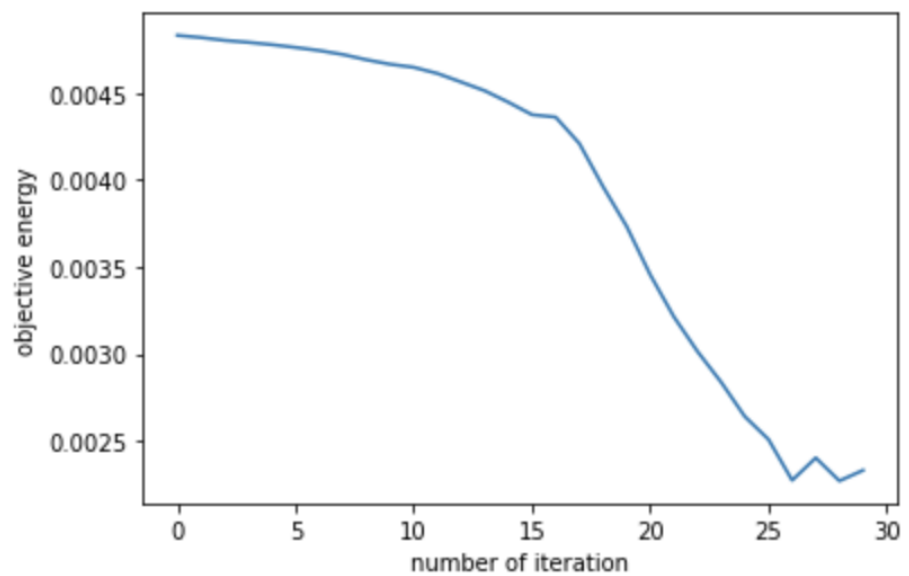
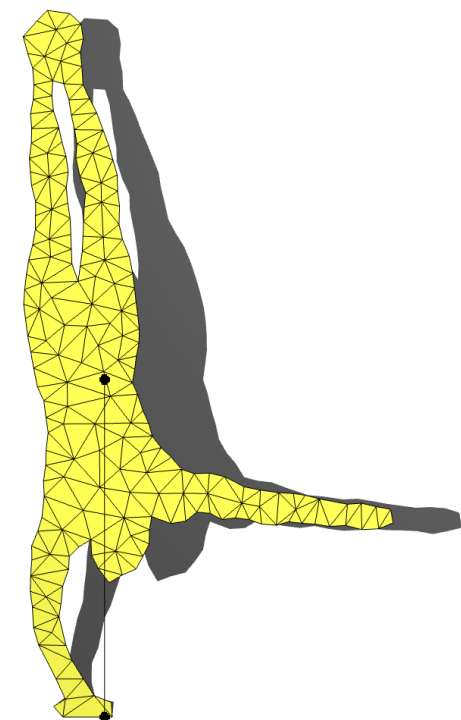


Parameters:  $w=2$ ,  $\text{obj\_tol} = 1\text{E-}8$ ,  $\theta = 1.0$ ,  $\beta = 0.5$ ,  $c = 0.3$ ,  $\text{iter} = 10000$

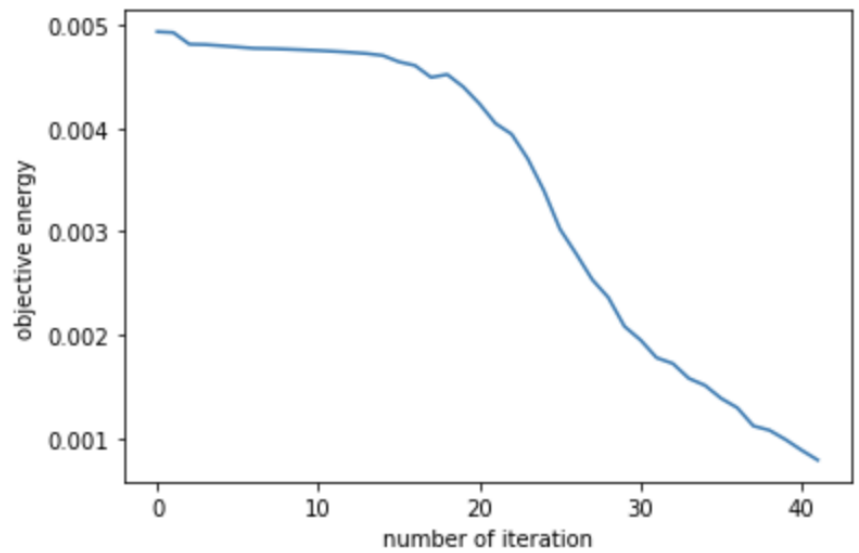
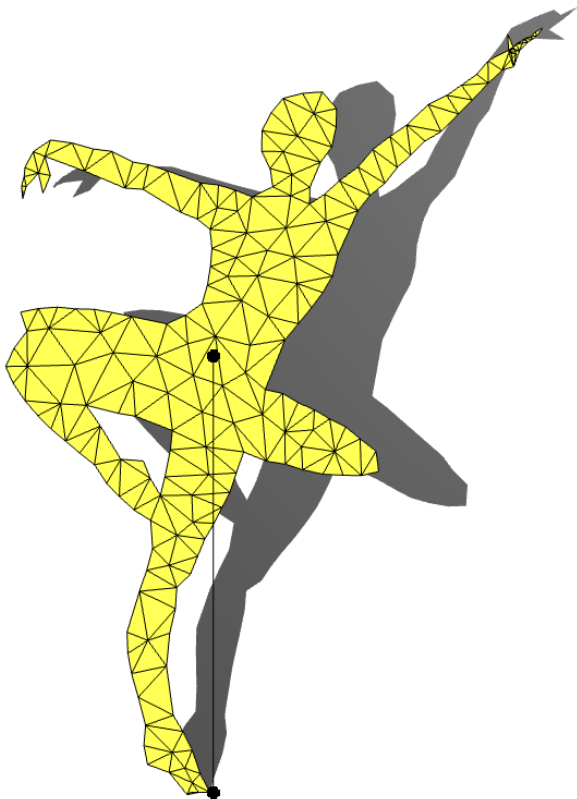


## BFGS with backtrack line search

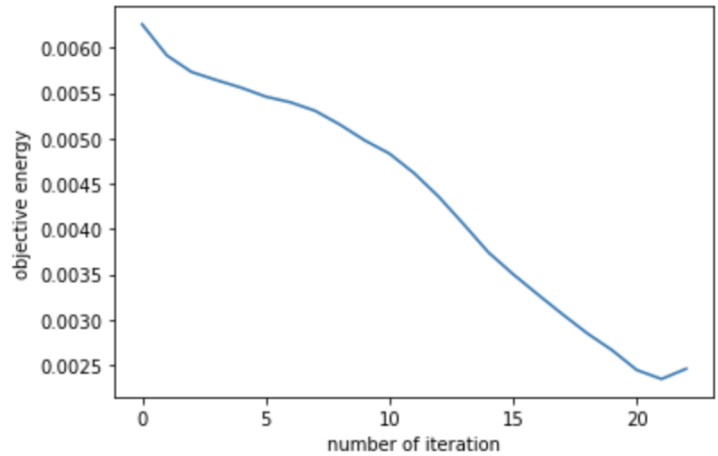
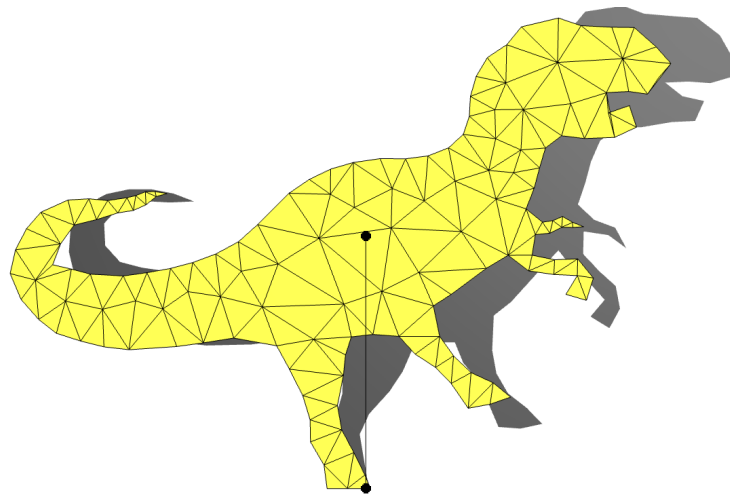
$w=8$ ,  $\text{obj\_tol} = 1\text{E-}8$ ,  $\theta = 1.0$ ,  $\beta = 0.8$ ,  $c = 0.01$ ,  $\text{iter} = 10000$



$w = 2$ ,  $\text{obj\_tol} = 1\text{E-}8$ ,  $\theta = 0.5$ ,  $\beta = 0.9$ ,  $c = 0.001$ ,  $\text{iter} = 10000$

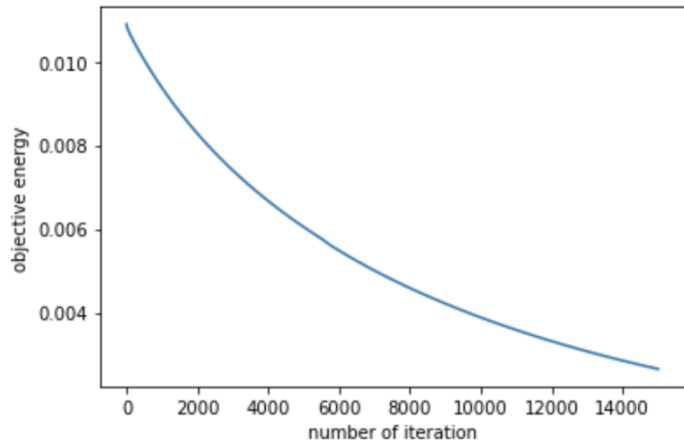
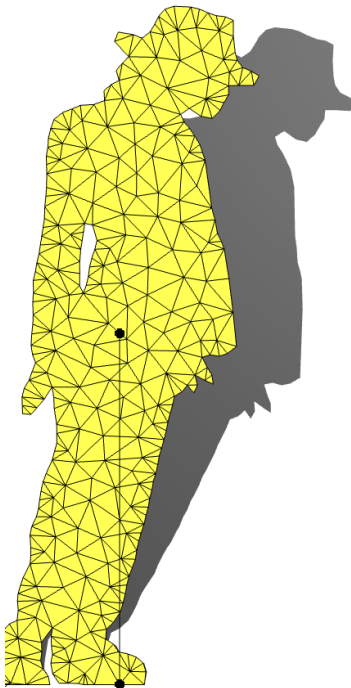


$w = 2$ ,  $\text{obj\_tol} = 1\text{E-}10$ ,  $\theta = 1000$ ,  $\beta = 0.855$ ,  $c = 0.6$ ,  $\text{iter} = 10000$

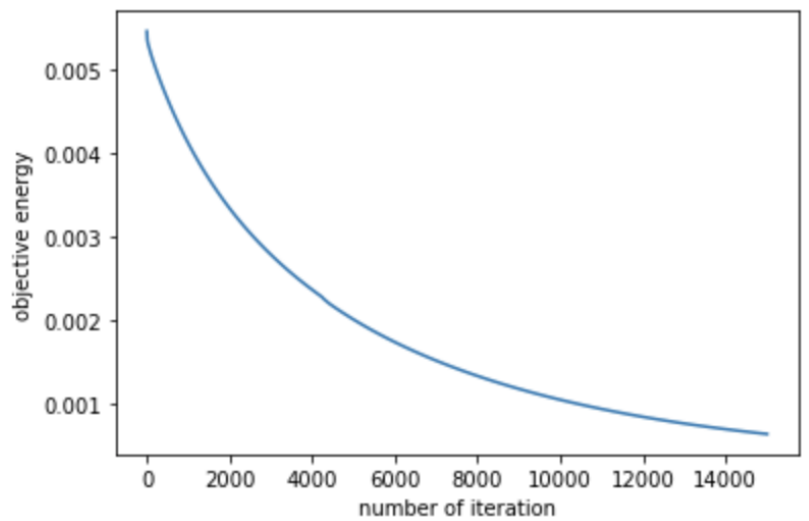
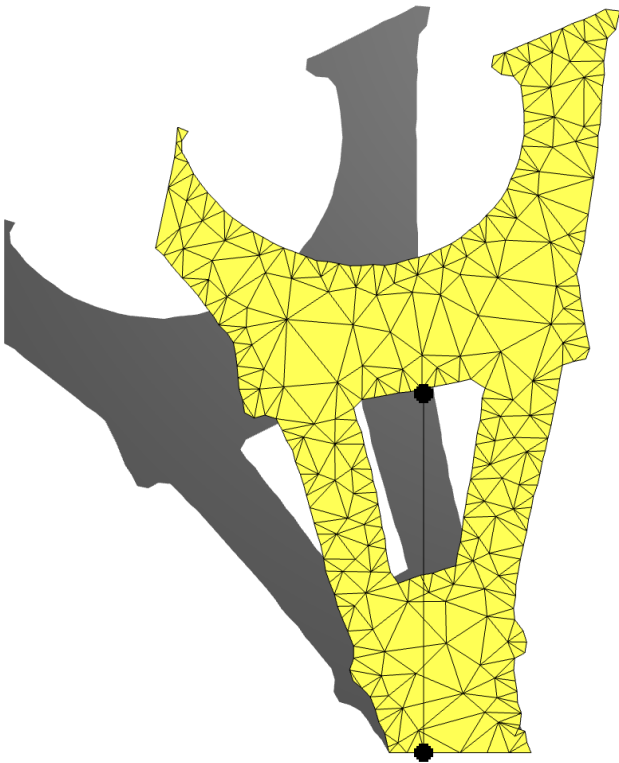


# My shapes

gradient\_descent\_with\_line\_search w = 10, obj\_tol = 1E-9, theta = 1.0, beta = 0.9, c = 0.1, iter = 15000)



gradient\_descent\_with\_line\_search w = 10, obj\_tol = 1E-9, theta = 1.0, beta = 0.9, c = 0.1, iter = 15000)



gradient\_descent\_with\_line\_search  $w = 8$ ,  $\text{obj\_tol} = 1\text{E-}8$ ,  $\theta = 1.0$ ,  $\beta = 0.8$ ,  $c = 0.8$ ,  $\text{iter} = 10000$

