

**Bootstrap and Unsupervised Learning**

1. What is the runtime of bootstrapping, in terms of the number of trials  $T$  and the number of examples  $n$ ? Does the number of features  $p$  factor into the runtime?
2. With  $n = 2$  training examples, how many unique datasets can I generate with bagging? What about  $n = 3$ ?
3. Say I want to run PCA on a matrix of  $n$  examples with  $p$  features, and reduce the dimension from  $p$  to  $r$  (usually  $r = 2$ ). What are the dimensions of the weight matrix  $W$ ? What are the dimensions of the transformed matrix?
4. In terms of  $n$ ,  $p$ , and  $r$ , what is the runtime of each step of PCA? (you can skip the step related to computing eigenvalues and eigenvectors)