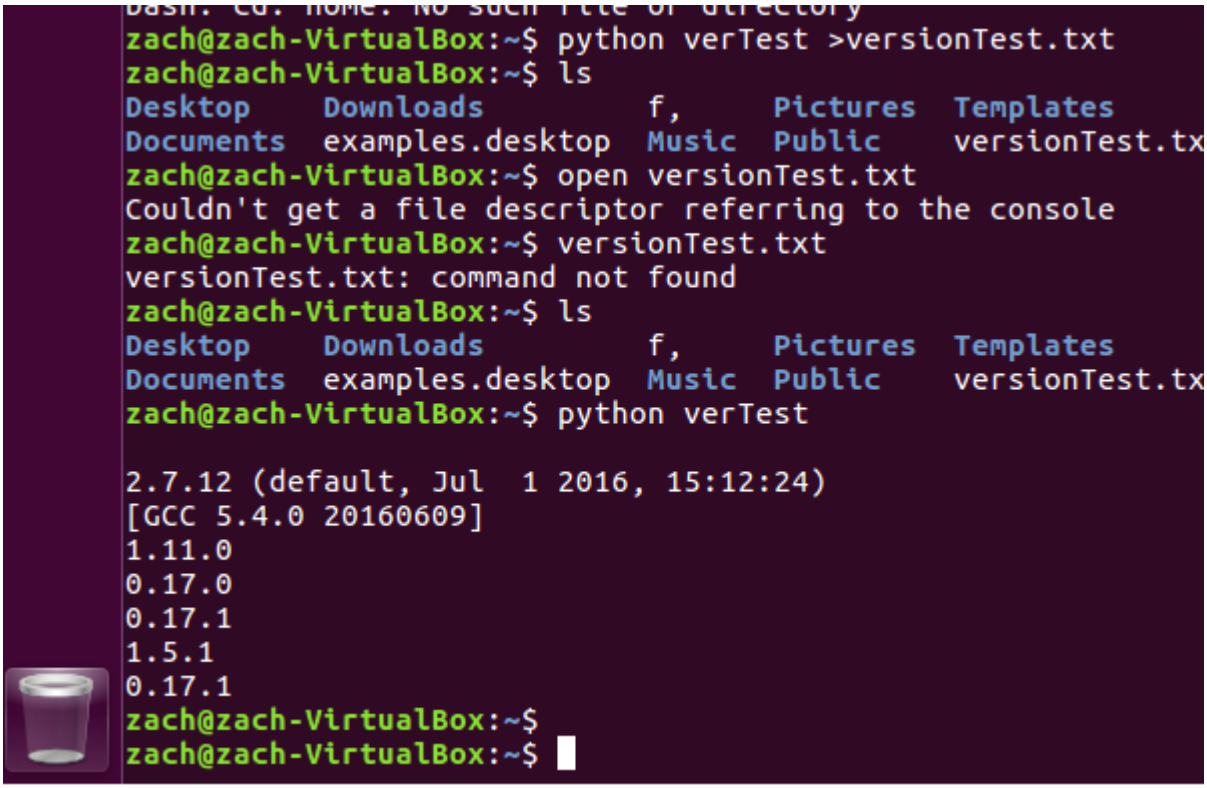
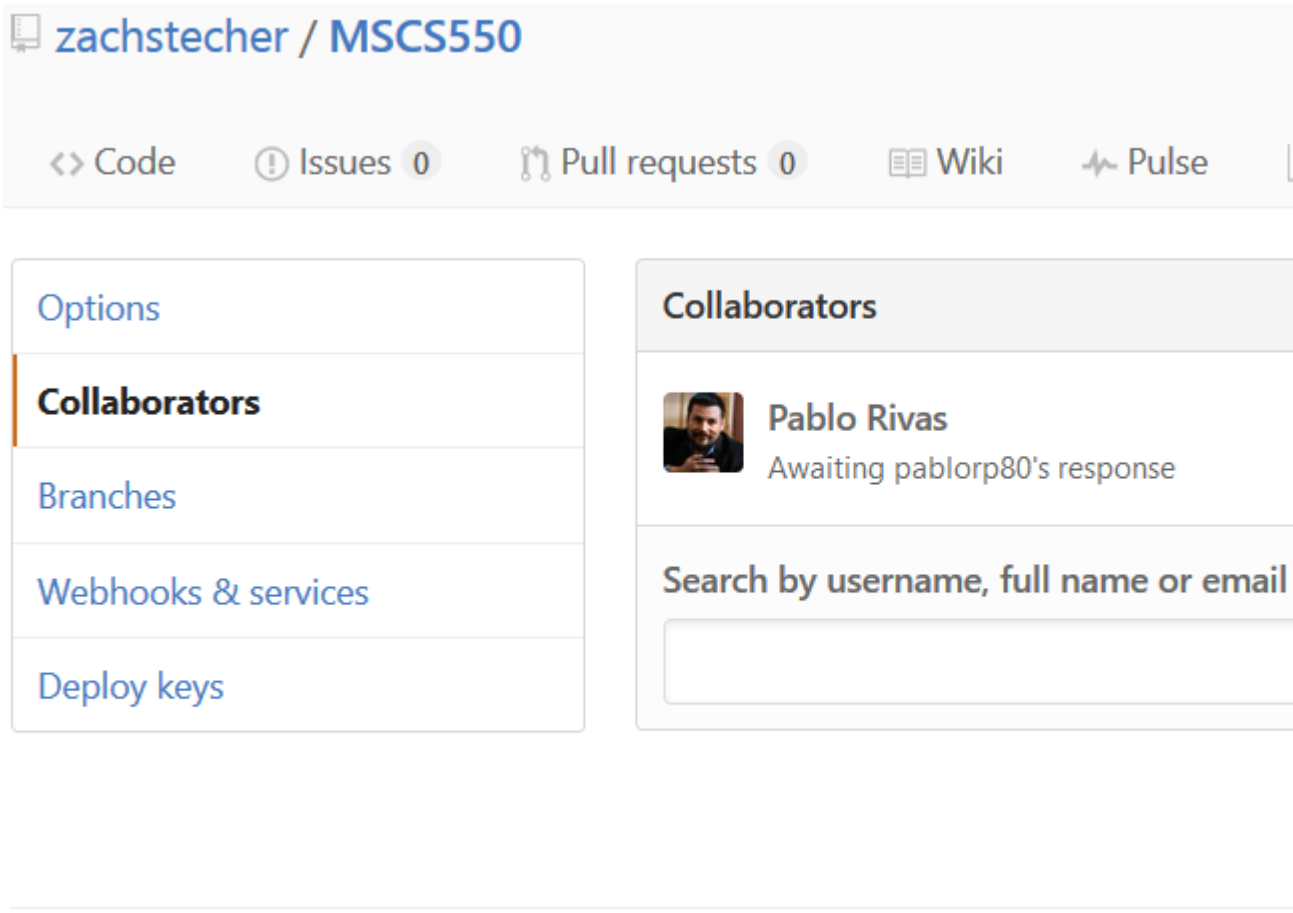
Homework 0

Zach Stecher

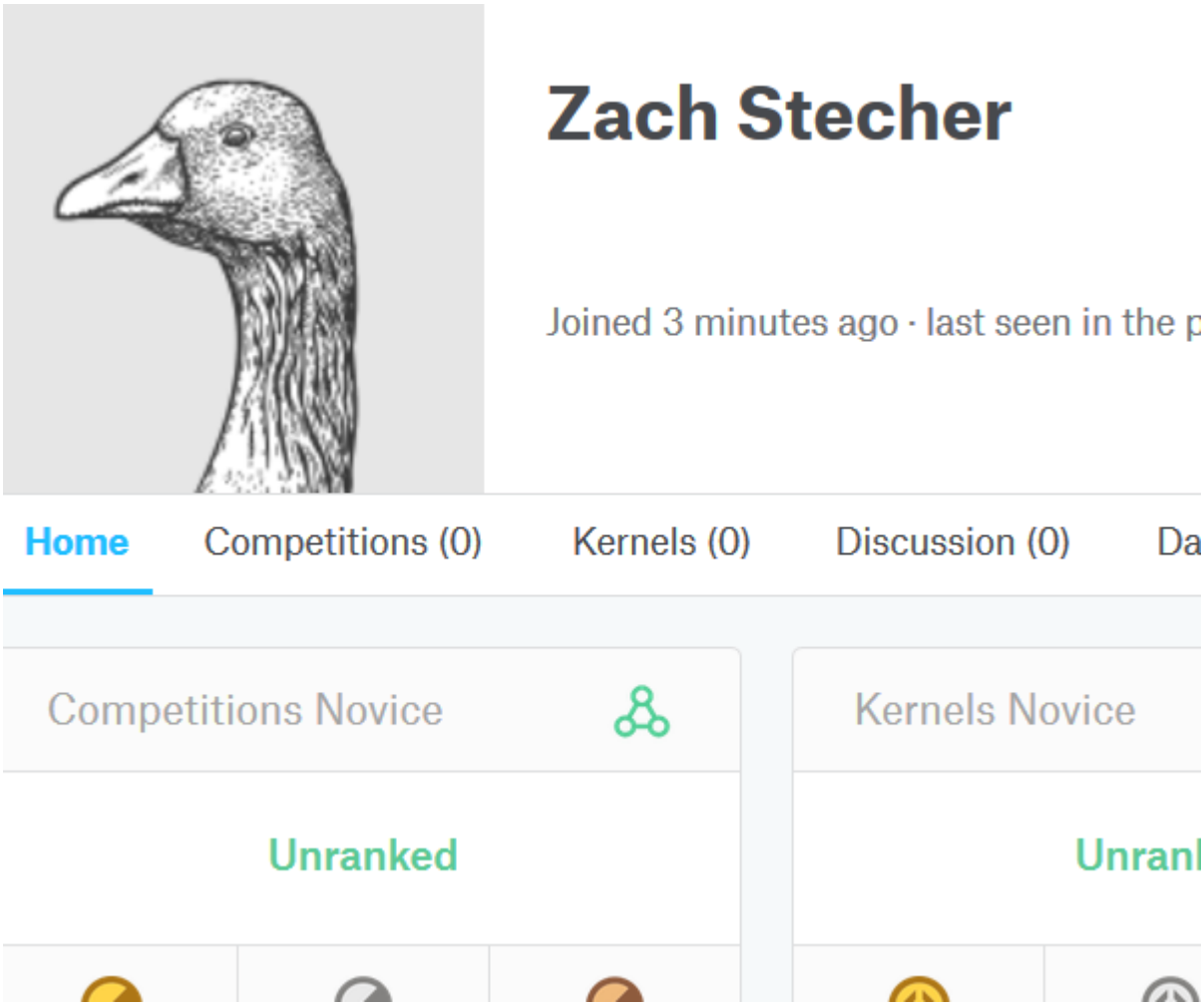
Due: 9/6/16



Screenshot of Python package verion test. The output is also hosted on GitHub.



Screenshot of Professor Rivas added as GitHub Collaborator.
Username: zachstecher
Link: https://github.com/zachstecher/MSCS550



Screenshot of kaggle account created with marist e-mail address.
Username: zstecher
Link: https://www.kaggle.com/zstecher

Problems:

1) Find the value for x that maximizes g(x).
Using $\frac{-b}{2a}$ we compute that $x = 4$ will maximize g(x).
$x = 4$

2) What are the partial derivatives of f(x) with respect to x_0 and x_1?
With respect to x_0: $9x_0^2$ - $2x_1^2$
With respect to x_1: -$4x_0x_1$ + 4

3) Questions about given matrices:
a) Can you multiply the two matrices?
No. The number of rows from martix A do not match the number of rows from matrix B.

b)Multiply A^T x B and give its Rank:

$$C = \begin{bmatrix} -2 & -2 & 13 \\ -8 & 1 & 16 \\ 6 & -3 & -3 \end{bmatrix}$$

Matrix C has a Rank of 2.

c) $AB^T + C^{-}1 =$

$$\begin{bmatrix} -16 & -16 \\ 11 & 13.5 \end{bmatrix}$$

4) Give the mathematical definitions of the simple Gaussian, multivariate Gaussian, Bernoulli, binomial, and exponential distribution.

simple Gaussian: $$f(x) = ae^{-\frac{(x-b)^2}{2c^2}}$$

multivariate Gaussian:

$$p(x;\mu,\Sigma) = \frac{1}{(2\pi)^{n/2}|\Sigma|^{1/2}} \exp\left(-\frac{1}{2}(x-\mu)^T\Sigma^{-1}(x-\mu)\right)$$

Bernoulli: $P(n) = P^n(1 - p)^{1-n}$

binomial:

$$f(k;n,p) = \Pr(X = k) = \binom{n}{k} p^k (1-p)^{n-k}$$

exponential:

$$f(x;\lambda) = \begin{cases} \lambda e^{-\lambda x} & x \geq 0, \\ 0 & x < 0. \end{cases}$$

5) What is the relationship between the Bernoulli and binomial distributions?

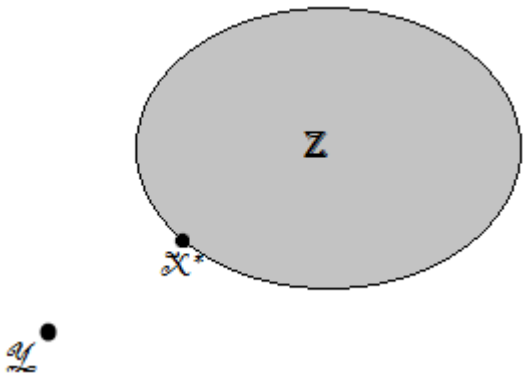
A Bernoulli distribution is a when a random variable X has two possible outcomes: 0 and 1. A binomial distribution is when we take the sum of n independant Bernoulli random variables.

6) The expected value is 2.5.

7)Answer a) and b) for the given optimization problem.

a) $x^* = 1$

b) Locate x^* in the picture (added location):



8) Couldn't figure out these problems in time...