ASSIGNMENT #4

EPsy 8252

This assignment covers vector geometry and matrix algebra. Please submit your responses to each of the questions below in a printed document. Please adhere to the following guidelines for formatting your assignment:

- All graphics should be resized so that they do not take up more room than necessary and all should have an appropriate caption.
- Any typed mathematics (equations, matrices, vectors, etc.) should be appropriately typeset within the document using Equation Editor, Markdown, or LaTeX.
- All syntax included should be typeset in a monospaced font, appropriately commented and follow the Data Camp Style Guide (`https://teach.datacamp.com/style-guide`).

There are 17 points possible for the assignment. Each question is worth one point, unless otherwise noted.

Effects Coding...Redux

Using the data, *Sex-Discrimination.csv*, create two effects-coded vector for the sex variable, `sexF` and `sexM`, by weighting each of the variables by the *inverse of their conditional sample sizes*. In this variable `sexF` will be coded $\frac{1}{n_{\text{female}}}$ and male is coded $\frac{1}{n_{\text{male}}}$. Fit the linear model: `salary ~ 1 + sexF`.

1. Write out the **b** vector.
2. Interpret the intercept coefficient.
3. Interpret the slope coefficient.
4. Using matrices, compute the fitted values for a male and a female. Show your work. **(2pts)**
5. How do the marginal and conditional means of salary relate to the linear models fitted? Explain.

Fit the linear model: `salary ~ 1 + sexM`

6. Write out the **b** vector.
7. Interpret the intercept coefficient.
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Regression through the Origin

Consider a regression through the origin carried out on four observations (X_i, Y_i), where $i = 1, \ldots, 4$.

11. Write out the **X** and **Y** matrices.
12. Write out the **b** vector.
13. Express the elements from **b** as linear combinations of **X** and **Y**.
14. Write the expectation vector for $\boldsymbol{\epsilon}$

Final Exercise

15. Obtain an expression for the variance–covariance matrix of the fitted values, $\hat{Y}_i$, (where $i = 1, \ldots, n$) in terms of the hat matrix **H**.