POLS 6481. Research Design and Quantitative Methods II
Lecture 1. Course Introduction

1. Example: *The Pyramids of Giza and Dashur*

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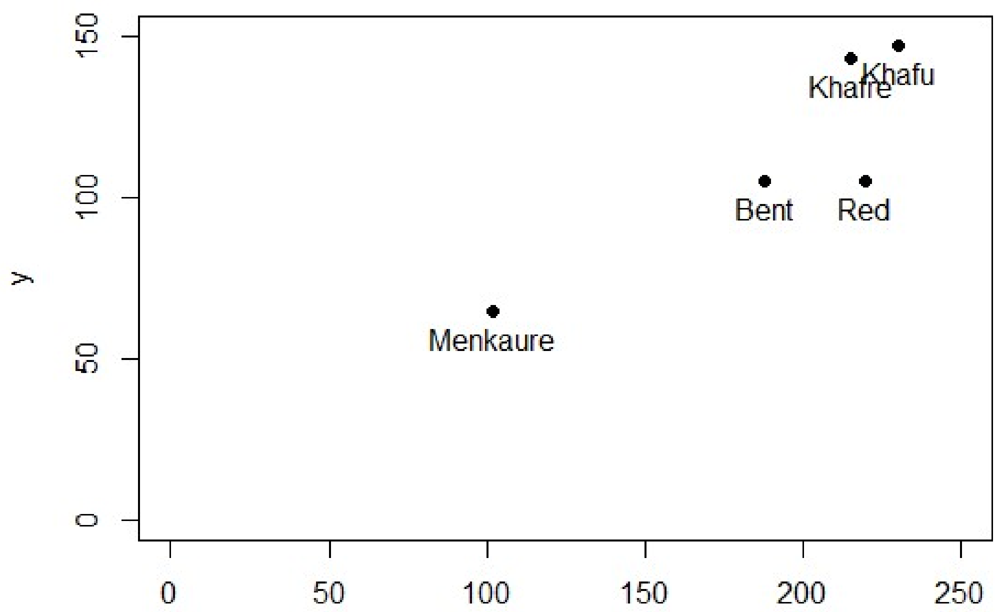
1. Example: *The Pyramids of Giza and Dashur*

```
width <- c(230,220,215,188,102)
height <- c(147,105,143,105,65)
pyramids <- c("Khafu", "Red", "Khafre", "Bent", "Menkaure")
horiz <- c(0,250)
vert <- c(0,150)
plot(width, height, pch=16, xlim = horiz, ylim = vert)
text(width, height, labels=pyramids, pos=1, xpd=TRUE)
```



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i	x_i	y_i	$(x_i-\mu_x)$	$(x_i-\mu_x)^2$	$(y_i-\mu_y)$	$(y_i-\mu_y)^2$	$(x_i-\bar{x})(y_i-\bar{y})$
Khufu	230	147	39	1,521	34	1,156	1,326
Khafre	215	143	24	576	30	900	720
Menkaure	102	65	–89	7,921	–48	2,304	4,272
"Bent"	188	105	–3	9	–8	64	24
"Red"	220	105	29	841	–8	64	–232
Σ	955	565	SST_x =	10,868	SST_y =	4,488	6,110
Σ/n	μ_x = 191	μ_y = 113	σ_x^2 =	2,173.6	σ_y^2 =	897.6	σ_{xy}^2 = 1,222

```
data = cbind.data.frame(pyramids,width,height)
covxy = cov(data[2:3], use = "pairwise.complete.obs"); covxy
bhat = covxy[1,2]/covxy[1,1]; bhat
ahat = mean(data$height) - bhat*mean(data$width); ahat
```

Slope: $\widehat{\beta_1} = \frac{cov(x,y)}{var(x)} = \frac{1222}{2173.6} = 0.562$ Intercept: $\widehat{\beta_0} = \bar{y} - \widehat{\beta_1}\bar{x}$ = 113 – (0.562)·191 = 5.62

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R script: Lecture 1 Pyramids.R

Data frame: data
Explained variable: data$height
Explanatory variable: data$width

```
myModel = lm(data$height ~ data$width)
summary(myModel)

cor(myModel$residuals, width)          # check assumption of zero correlation…
sum(myModel$residuals)                 # check assumption of zero mean residual
```

Question: *"What determines the height of a pyramid?"*
Answer: *"The width of the base."*

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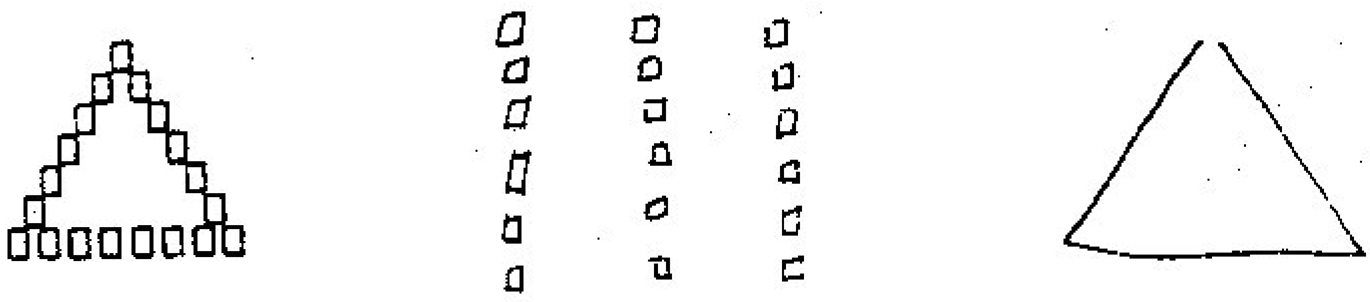
Reading: Daniel Pink, *A Whole New Mind*

2. Left Brain, Right Brain

Stimulus | Right-Hemisphere Injury | Left-Hemisphere Injury



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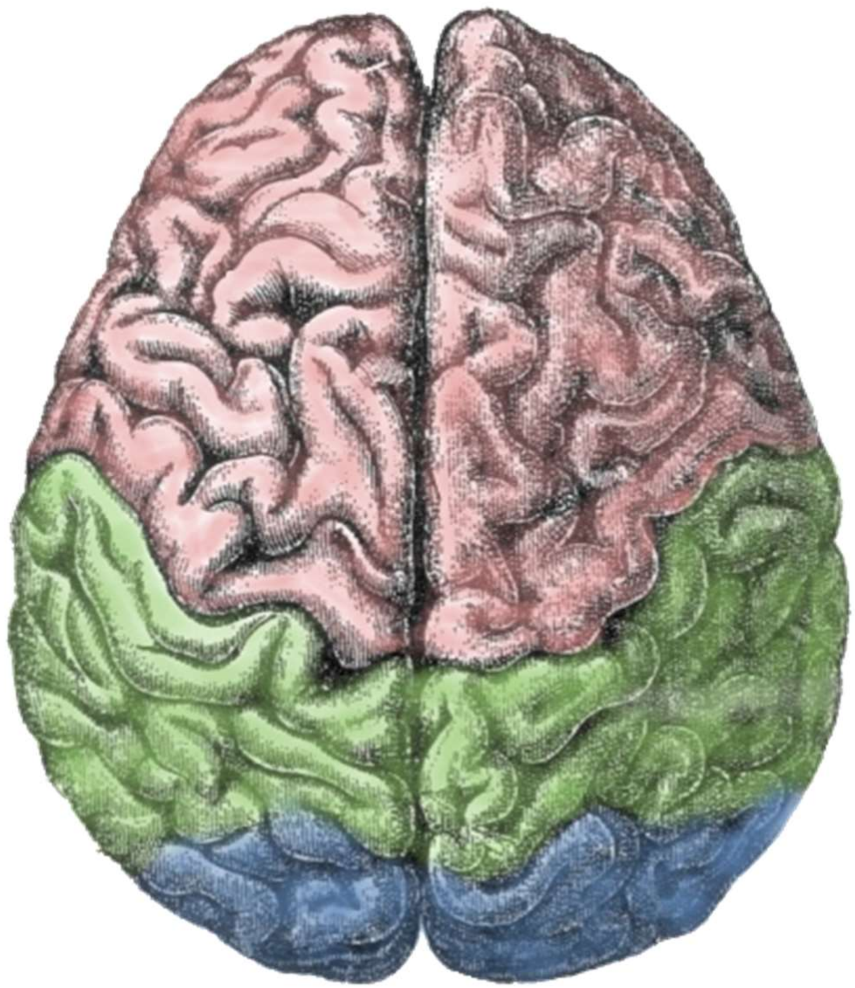
2. Left Brain, Right Brain

Left Hemisphere	**Right Hemisphere**
Right vision field	Left vision field
Right motor skills	Left motor skills
Details	Holistic
Numbers	Patterns
Verbal	Nonverbal
Grammar, Vocab.	Facial Expressions
Text	Context (Emotions)
Literal	Figurative
Sequential/Serial	Simultaneous
Logical	Intuitive
Analytical	Imaginative
Cautious	Impulsive
Systematic	Empathetic



2. Left Brain, Right Brain

However, there are some important caveats:

The idea that people use entirely (or predominantly) the right or left brain is a myth;
you enlist both hemispheres all the time (as long as your corpus collosum is intact).
Names are stored in the left hemisphere while faces are stored in the right hemisphere.

This is an active field of neuroscience; almost any claim is controversial. For example, Simon Baron-Cohen (*The Essential Difference*) claims that there are gender differences along the empathizing-systemizing dimension — and that autism occurs at one extreme.

Nevertheless, this is a useful metaphor:

Daniel Pink (*A Whole New Mind*) argues that the Information Age prioritized left-brain aptitudes, but these are becoming less important in what he calls the Conceptual Age.

Iain McGilchrist (*The Master and His Emissary*) also makes the provocative claim that the evolution of Western culture increasingly has been dominated by the left-brain.

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2. Left Brain, Right Brain

My "challenge" is to teach left-brain material (equations, calculations, computations) without sacrificing the right-brain.

I will frequently emphasize the following:

Design (Appearance)

Story

Meaning

Connections between concepts

The 'big picture'

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Readings: Ray Fair, *Predicting Presidential Elections and Other Things*, ch. 2

3. Regression in Seven (or More?) Steps

1. Begin with a theory
2. Collect data
3. Fit the data to a line
6. Interpret the results
7. Predict *y* given a set value of *x*
4. Test a hypothesis about the slope of the line
5. Think about pitfalls
8. Add more variables