

Math 327, Fall 2019, Chapter 2, Data from Appendix B, Table B.2

Data was collected during a solar energy project at Georgia Tech. The following output is from fitting a linear regression model that relates total heat flux (y, kilowatts) to radial deflection of the deflected rays (x4, milliradians). Where applicable, answers are rounded using 2 significant digits in the standard error with the estimate reported to the same decimal place; otherwise, three significant figures are used.

```
lm(formula = y ~ x4, data = mydata)
```

Residuals:

	Min	1Q	Median	3Q	Max
	-26.2487	-4.5029	0.5202	7.9093	24.5080

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	607.103	42.906	14.150	5.24e-14 ***
x4	-21.402	2.565	-8.343	5.94e-09 ***

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 12.33 on 27 degrees of freedom  
Multiple R-squared: 0.7205, Adjusted R-squared: 0.7102  
F-statistic: 69.61 on 1 and 27 DF, p-value: 5.935e-09

```
> anova(myfit)
```

Analysis of Variance Table

Response: y

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
x4	1	10578.7	10579	69.609	5.935e-09 ***
Residuals	27	4103.2	152		

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> confint(myfit)
```

	2.5 %	97.5 %
(Intercept)	519.06725	695.1393
x4	-26.66592	-16.1390

$$\hat{\beta}_0 = 608 \text{ kw}, se(\hat{\beta}_0) = 43 \text{ kw}, \frac{\hat{\beta}_0}{se(\hat{\beta}_0)} = 14.2$$

$$\hat{\beta}_0 \text{ units: kilowatts or kw}$$

$$\hat{\beta}_1 = -21.4, se(\hat{\beta}_1) = 2.5, \frac{\hat{\beta}_1}{se(\hat{\beta}_1)} = -8.3$$

$$\hat{\beta}_1 \text{ units: kw / mrad ("kilowatts per milliradian")}$$

$$\hat{\sigma} = 12.3 \text{ kw}, R^2 = 0.721 \text{ or } 72.1\%$$

$$F\text{-statistic and p-value} = 69.6, <0.0001$$

$$\text{Model degrees of freedom} = 1$$

$$\text{Residual degrees of freedom} = 27$$

$$\text{Regression sum of squares, } \hat{\beta}_1 SS_{xy} = 10578$$

$$\text{Residual sum of squares, } SS_{res} = 4103$$

$$\text{Mean Square Error, } MS_{res} = 152$$

$$\hat{\beta}_0 \text{ 95\% confidence limits: LCL}=519 \text{ kw, UCL}=695 \text{ kw}$$

$$\hat{\beta}_1 \text{ 95\% confidence limits: LCL}= -26.7 \text{ kw/mrad, UCL}= -16.1 \text{ kw/mrad}$$

