

DATA 556 Homework 6 Lab

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```
library(kableExtra)
library(dplyr)
```

Problem 6

Let X and Y be i.i.d. $\text{Unif}(0,1)$. a) Use simulations in R to numerically estimate the covariance of $X + Y$ and $X - Y$.

```
set.seed(0)
n <- 10000
X <- runif(n)
Y <- runif(n)
X_plus_Y <- X + Y
X_minus_Y <- X - Y
cov(X_plus_Y, X_minus_Y)
```

```
## [1] 0.001322378
```

Problem 8 Setup

```
y=matrix(c(0.018, 0.035, 0.031, 0.008, 0.018,
           0.002, 0.112, 0.064, 0.032, 0.069,
           0.001, 0.066, 0.094, 0.032, 0.084,
           0.001, 0.018, 0.019, 0.010, 0.051,
           0.001, 0.029, 0.032, 0.043, 0.130) , nrow =5 , byrow=TRUE)
colnames(y) =c("farm", "operatives", "craftsmen", "sales", "professional")
rownames(y) =colnames(y)
```

Problem 8a

Using this joint distribution, calculate the marginal probability distribution of a father's occupation

```
kable(margin.table(y,1)) %>% kable_styling()
```

	x
farm	0.110
operatives	0.279
craftsmen	0.277
sales	0.099
professional	0.235

Problem 8b

Using this joint distribution, calculate the marginal probability distribution of a son's occupation

```
kable(margin.table(y,2)) %>% kable_styling()
```

	x
farm	0.023
operatives	0.260
craftsmen	0.240
sales	0.125
professional	0.352

Problem 8c

Using this joint distribution, calculate the conditional distribution of a son's occupation, given that the father is a farmer

```
kable(y[1,]/sum(y[1,])) %>% kable_styling()
```

	x
farm	0.1636364
operatives	0.3181818
craftsmen	0.2818182
sales	0.0727273
professional	0.1636364

Problem 8d

Using this joint distribution, calculate the conditional distribution of a father's occupation, given that the son is a farmer

```
kable(y[,1]/sum(y[,1])) %>% kable_styling()
```

	x
farm	0.7826087
operatives	0.0869565
craftsmen	0.0434783
sales	0.0434783
professional	0.0434783