Week 7 Problem Set

Ben Arancibia

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Problem Set 1

A function to compute the expected value and standard deviation of an array of values.

```
m <- array(runif(100),dim=c(10,10))
m
```

```
##          [,1]    [,2]   [,3]     [,4]    [,5]     [,6]   [,7]    [,8]
##  [1,] 0.02123 0.24268 0.9463 0.975495 0.28417 0.467131 0.9468 0.93360
##  [2,] 0.09604 0.06304 0.8083 0.004285 0.02083 0.352266 0.1181 0.26844
##  [3,] 0.57101 0.77823 0.1339 0.690534 0.10607 0.949598 0.3597 0.39561
##  [4,] 0.60610 0.37140 0.1458 0.548565 0.21635 0.670702 0.8000 0.33768
##  [5,] 0.45949 0.25517 0.8313 0.312164 0.72391 0.009354 0.6739 0.24511
##  [6,] 0.23247 0.66816 0.5317 0.268833 0.57269 0.642373 0.1750 0.08256
##  [7,] 0.20789 0.98422 0.9353 0.532479 0.03364 0.779715 0.9588 0.91132
##  [8,] 0.41079 0.65956 0.8675 0.724399 0.30116 0.405680 0.6076 0.89100
##  [9,] 0.32015 0.45339 0.2960 0.477726 0.58048 0.065369 0.9152 0.72579
## [10,] 0.07159 0.35303 0.1823 0.595065 0.76434 0.712869 0.1511 0.95475
##          [,9]   [,10]
##  [1,] 0.49929 0.35752
##  [2,] 0.53997 0.59752
##  [3,] 0.44508 0.53395
##  [4,] 0.02539 0.60493
##  [5,] 0.93166 0.54949
##  [6,] 0.08609 0.04484
##  [7,] 0.36925 0.94062
##  [8,] 0.09029 0.08633
##  [9,] 0.66789 0.19096
## [10,] 0.09106 0.12658
```

```
expected_value <- function(array){
  sum(array)/(dim(array)*dim(array))
}
expected_value(m)
```

```
## [1] 0.4652 0.4652
```

```
mean(m)
```

```
## [1] 0.4652
```

Standard deviation = $Variance(x)\hat{}(1/2)$

```
var_array <- var(m)
var_array
```

```
##             [,1]     [,2]      [,3]      [,4]      [,5]      [,6]     [,7]
##  [1,]  0.0433101  0.01690 -0.030547  0.002273 -0.004796  0.003550  0.01276
##  [2,]  0.0169043  0.08001 -0.004930  0.020994 -0.019428  0.047836  0.01782
##  [3,] -0.0305475 -0.00493  0.120618 -0.003886 -0.022734 -0.037659  0.03239
##  [4,]  0.0022728  0.02099 -0.003886  0.073164 -0.003459  0.025326  0.04661
##  [5,] -0.0047962 -0.01943 -0.022734 -0.003459  0.078405 -0.036653 -0.01372
##  [6,]  0.0035500  0.04784 -0.037659  0.025326 -0.036653  0.092915 -0.02691
##  [7,]  0.0127567  0.01782  0.032393  0.046614 -0.013722 -0.026909  0.11748
##  [8,] -0.0286370  0.01896  0.022416  0.063022 -0.001102  0.009297  0.05029
##  [9,] -0.0009207 -0.02719  0.033705 -0.017958  0.008509 -0.059262  0.02847
## [10,]  0.0102345  0.01127  0.022875 -0.011467 -0.051443  0.017420  0.03447
##             [,8]       [,9]    [,10]
##  [1,] -0.028637 -0.0009207  0.01023
##  [2,]  0.018956 -0.0271862  0.01127
##  [3,]  0.022416  0.0337053  0.02288
##  [4,]  0.063022 -0.0179575 -0.01147
##  [5,] -0.001102  0.0085088 -0.05144
##  [6,]  0.009297 -0.0592616  0.01742
##  [7,]  0.050288  0.0284703  0.03447
##  [8,]  0.115811 -0.0147266 -0.00839
##  [9,] -0.014727  0.0900697  0.02816
## [10,] -0.008390  0.0281650  0.08425
```

```
sd_array <- sqrt(var_array)
```

```
## Warning: NaNs produced
```

```
fixed_sd <- sd_array[!is.nan(sd_array)]

sd_m <- sqrt(fixed_sd)
sd_m
```

```
##  [1] 0.4562 0.3606 0.2183 0.2441 0.3361 0.3181 0.3606 0.5318 0.3806 0.4677
## [11] 0.3654 0.3711 0.3258 0.5893 0.4242 0.3869 0.4285 0.3889 0.2183 0.3806
## [21] 0.5201 0.3989 0.4647 0.5010 0.5292 0.3037 0.2441 0.4677 0.3989 0.5521
## [31] 0.3105 0.3633 0.3361 0.3654 0.4242 0.4647 0.5854 0.4736 0.4108 0.4309
## [41] 0.3711 0.3869 0.5010 0.3105 0.4736 0.5834 0.4285 0.3037 0.4108 0.5478
## [51] 0.4097 0.3181 0.3258 0.3889 0.3633 0.4309 0.4097 0.5388
```

```
sd(m)
```

```
## [1] 0.3006
```

Part 2

Infinite stream of numbers coming by and need to calculate the mean and standard deviation of the numbers. I would do this by just adding to the pervious average and dividing it by n+1.

```
starting_array <- array(runif(100),dim=c(10,10))
mean(starting_array)
```

```
## [1] 0.4976
```

```
infinite_average <- function(x,n){
  (mean(starting_array)*x)/(n+1)
  return(infinite_average)
}

infinite_average
```

```
## function(x,n){
##   (mean(starting_array)*x)/(n+1)
##   return(infinite_average)
## }
```

```
infinite_variance <- function(x){
  sqrt(x-infinite_average)
  return(infinite_variance)
}

infinite_variance
```

```
## function(x){
##   sqrt(x-infinite_average)
##   return(infinite_variance)
## }
```

```
infinite_sd <- function(infinite_variance){
  sqrt(infinite_variance)
  return(infinite_sd)
}

infinite_sd
```

```
## function(infinite_variance){
##   sqrt(infinite_variance)
##   return(infinite_sd)
## }
```

Note

I had a lot of issues with this homework. One of the main issues I had was I upgraded my local environment to the new OS and somehow I cannot get my TeX package to be recognized by R and print out the PDF. The HTML works fine, but I cannot get PDF. Not sure why and this is just threw me off the entire homework.

After some research found this issue: https://support.rstudio.com/hc/communities/public/questions/201688563-Problem-with-Mac-Yosemite-Beta-and-RStudio-not-finding-TeX-distribution