Salary Analysis

March 22, 2018

```
In [106]: import pandas as pd
          import matplotlib.pyplot as plt
          import scipy.stats as st
          from math import sqrt, log10, log
```

```
In [99]: def parse_dollar(an_amount):
             return int(an_amount.replace("$", "").replace(",",""))
         def make_k(an_amount):
             return "${}k".format(round(an_amount/1000))
         def make_percent(an_amount):
             return "{}%".format(round(100 * an_amount))
         def split_groups(dataframe):
             values_per_group = {col_name:col for col_name, col in dataframe.groupby(1)[2]}
             return values_per_group.values()
         def analyze_pvalue(pvalue):
             if pvalue < .05:
                 print("Significantly different")
```

```
In [31]: salaries = pd.read_csv('VTsalaries.csv')
         salaries.columns = ['Name', 'Title', 'Pay']
         salaries['Pay'] = salaries['Pay'].map(parse_dollar)

         print(salaries.groupby("Title")["Pay"].median().sort_values().map(make_k)) #.to_strin
```

```
Title
Food Service Technician I          $22k
Hsekeep &/or Apparel Worker I      $22k
Trades Technician I                $23k
Food Service Technician II         $24k
Agricultural Specialist I          $25k
Admin and Office Spec II           $27k
Trainer and Instructor I           $28k
Security Officer II                $28k
Printing Technician II             $28k
Trades Technician II               $28k
Hsekeep &/or Apparel Worker II     $29k
Emergency Coordinator I            $29k
Laboratory and Research Tech       $29k
```

Licensed Practical Nurse	$29k
Store & Warehouse Spec II	$30k
Security Officer III	$30k
Education Support Spec I	$30k
Direct Service Associate III	$30k
Utility Plant Specialist I	$31k
Transportation Operator II	$31k
Food Service Technician III	$31k
Compliance/Safety Officer II	$32k
Natural Resource Spec II	$33k
Direct Service Associate II	$33k
Agricultural Specialist II	$33k
Natural Resource Spec I	$34k
Electronic Technician I	$34k
Laboratory & Research Spec I	$35k
Transportation Operator III	$35k
Computer Operations Techn II	$35k
	...
Utility Plant Manager II	$86k
Prog Admin Manager II	$87k
Compliance Manager II	$87k
Pilot II	$91k
Scientist Manager I	$92k
Gen Admin Manager II	$92k
Info Technology Specialist III	$92k
Info Technology Specialist IV	$94k
Research Professor AY	$96k
Associate Professor	$96k
Trades Manager II	$99k
Professional - Professor	$103k
Research Assoc Professor AY	$104k
Senior Research Scientist	$104k
Info Technology Manager II	$108k
Pharmacist II	$110k
Research Associate Professor	$111k
Admin - Associate Professor	$123k
Professor	$128k
Assoc Prof and Eminent Scholar	$131k
Gen Admin Manager III	$131k
Administrative - Instructor	$139k
Administrative - Lecturer	$153k
Admin - Assistant Professor	$167k
Associate Professor ES CY	$175k
Professor and Eminent Scholar	$194k
Research Professor	$209k
Admin - Professor and ES	$246k
Administrative - Professor	$267k
President VPI and SU	$771k

```
Name: Pay, Length: 167, dtype: object
```

```
In [68]: import gender_guesser.detector as gender

         GENDER_VALUES = {
             'unknown': 0,
             'andy': 0,
             'male': -1,
             'female': 1,
             'mostly_male': -.5,
             'mostly_female': .5
         }

         gd = gender.Detector()
         def estimate_gender(names):
             name_parts = names.strip().split()
             genders = [gd.get_gender(name.strip()) for name in name_parts[:-1]]
             gender_values = [GENDER_VALUES[gender] for gender in genders]
             estimated_gender = sum(gender_values)
             if estimated_gender < 0:
                 return 'Male'
             elif estimated_gender > 0:
                 return 'Female'
             else:
                 return 'Unknown'
         salaries['Gender'] = salaries['Name'].apply(estimate_gender)
         named_salaries = salaries[salaries.Name != '(Name withheld)']
         gendered = named_salaries.groupby("Gender")
```

```
In [78]: # Counts
         gendered_count= pd.DataFrame()

         gendered_count['Count'] = gendered["Pay"].count()

         gendered_count['Percentage'] = (gendered["Pay"].count()/len(named_salaries)).map(make_

         print(gendered_count)
```

```
         Count Percentage
Gender
Female    1491        36%
Male      2250        54%
Unknown    416        10%
```

```
In [81]: # Mean Pay
         gendered_stats = pd.DataFrame()
```

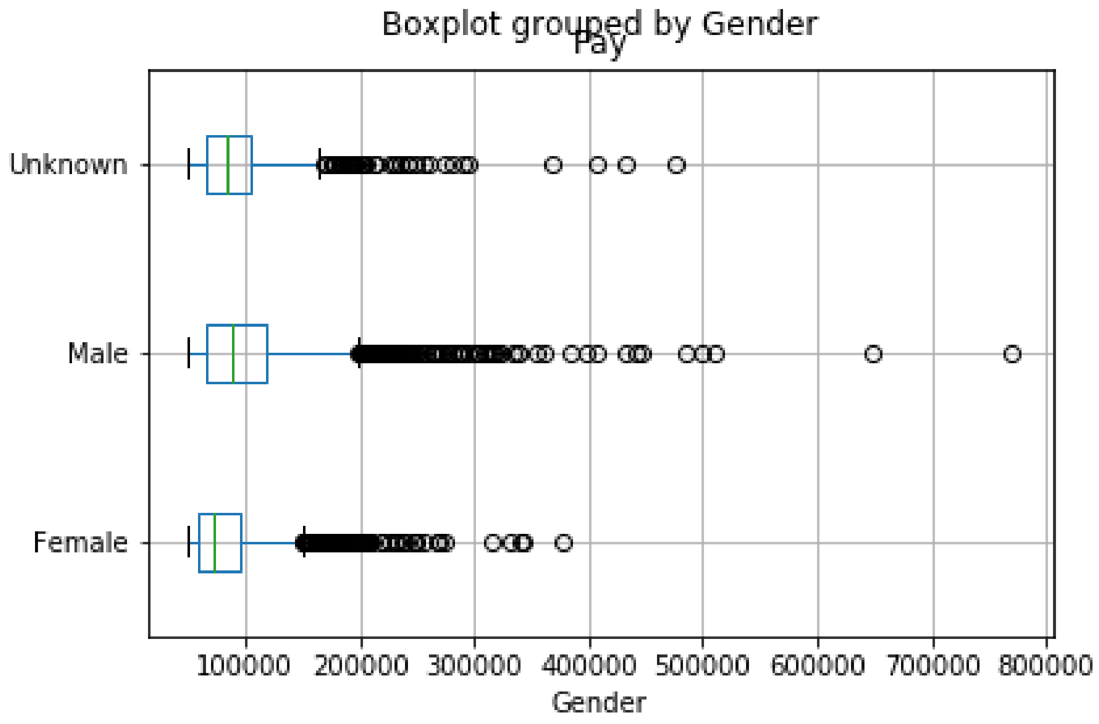
```
gendered_stats['Mean'] = gendered["Pay"].mean().sort_values().map(make_k)
gendered_stats['Median'] = gendered["Pay"].median().sort_values().map(make_k)
gendered_stats['Std'] = gendered["Pay"].std().sort_values().map(make_k)
print(gendered_stats)

#.to_string(header=False)
```

```
          Mean Median   Std
Gender
Female    $84k   $71k  $38k
Unknown   $99k   $83k  $56k
Male     $102k   $87k  $56k
```

```
In [121]: # Anova
          female_pay = gendered.get_group('Female').Pay.map(log10).values
          male_pay = gendered.get_group('Male').Pay.map(log10).values
          statistic, pvalue = st.mannwhitneyu(female_pay,male_pay)
          analyze_pvalue(pvalue)
          named_salaries.boxplot(column='Pay', by='Gender', vert=False)
          plt.show()
```

```
Significantly different
```


Boxplot grouped by Gender
Pay
Unknown
Male
Female
Gender