Assignment 03

Taylor Luckenbill

September 22, 2025

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| ID|LAST\_UPDATED\_DATE|LAST\_UPDATED\_TIMESTAMP|DUPLICATES| POSTED| EXPIRED|DURATION| SOURCE\_TYPES| SOURCES| URL|ACTIVE\_URLS|ACTIVE\_SOURCES\_INFO| TITLE\_RAW| BODY|MODELED\_EXPIRED|MODELED\_DURATION| COMPANY| COMPANY\_NAME|COMPANY\_RAW|COMPANY\_IS\_STAFFING|EDUCATION\_LEVELS|EDUCATION\_LEVELS\_NAME|MIN\_EDULEVELS| MIN\_EDULEVELS\_NAME|MAX\_EDULEVELS|MAX\_EDULEVELS\_NAME|EMPLOYMENT\_TYPE|EMPLOYMENT\_TYPE\_NAME|MIN\_YEARS\_EXPERIENCE|MAX\_YEARS\_EXPERIENCE|IS\_INTERNSHIP|SALARY|REMOTE\_TYPE|REMOTE\_TYPE\_NAME|ORIGINAL\_PAY\_PERIOD|SALARY\_TO|SALARY\_FROM| LOCATION| CITY| CITY\_NAME|COUNTY| COUNTY\_NAME| MSA| MSA\_NAME|STATE|STATE\_NAME|COUNTY\_OUTGOING|COUNTY\_NAME\_OUTGOING|COUNTY\_INCOMING|COUNTY\_NAME\_INCOMING|MSA\_OUTGOING| MSA\_NAME\_OUTGOING|MSA\_INCOMING| MSA\_NAME\_INCOMING|NAICS2| NAICS2\_NAME|NAICS3| NAICS3\_NAME|NAICS4| NAICS4\_NAME|NAICS5| NAICS5\_NAME|NAICS6| NAICS6\_NAME| TITLE| TITLE\_NAME| TITLE\_CLEAN| SKILLS| SKILLS\_NAME| SPECIALIZED\_SKILLS|SPECIALIZED\_SKILLS\_NAME| CERTIFICATIONS| CERTIFICATIONS\_NAME| COMMON\_SKILLS| COMMON\_SKILLS\_NAME| SOFTWARE\_SKILLS|SOFTWARE\_SKILLS\_NAME| ONET| ONET\_NAME| ONET\_2019| ONET\_2019\_NAME| CIP6| CIP6\_NAME| CIP4| CIP4\_NAME| CIP2| CIP2\_NAME|SOC\_2021\_2| SOC\_2021\_2\_NAME|SOC\_2021\_3| SOC\_2021\_3\_NAME|SOC\_2021\_4|SOC\_2021\_4\_NAME|SOC\_2021\_5|SOC\_2021\_5\_NAME|LOT\_CAREER\_AREA|LOT\_CAREER\_AREA\_NAME|LOT\_OCCUPATION| LOT\_OCCUPATION\_NAME|LOT\_SPECIALIZED\_OCCUPATION|LOT\_SPECIALIZED\_OCCUPATION\_NAME|LOT\_OCCUPATION\_GROUP|LOT\_OCCUPATION\_GROUP\_NAME|LOT\_V6\_SPECIALIZED\_OCCUPATION|LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME|LOT\_V6\_OCCUPATION|LOT\_V6\_OCCUPATION\_NAME|LOT\_V6\_OCCUPATION\_GROUP|LOT\_V6\_OCCUPATION\_GROUP\_NAME|LOT\_V6\_CAREER\_AREA|LOT\_V6\_CAREER\_AREA\_NAME| SOC\_2| SOC\_2\_NAME| SOC\_3| SOC\_3\_NAME| SOC\_4| SOC\_4\_NAME| SOC\_5| SOC\_5\_NAME|LIGHTCAST\_SECTORS|LIGHTCAST\_SECTORS\_NAME|NAICS\_2022\_2| NAICS\_2022\_2\_NAME|NAICS\_2022\_3| NAICS\_2022\_3\_NAME|NAICS\_2022\_4| NAICS\_2022\_4\_NAME|NAICS\_2022\_5| NAICS\_2022\_5\_NAME|NAICS\_2022\_6| NAICS\_2022\_6\_NAME|  
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|1f57d95acf4dc67ed...| 9/6/2024| 2024-09-06 20:32:...| 0|6/2/2024| 6/8/2024| 6| [\n "Company"\n]|[\n "brassring.c...|[\n "https://sjo...| []| NULL|Enterprise Analys...|31-May-2024\n\nEn...| 6/8/2024| 6| 894731| Murphy USA| Murphy USA| false| [\n 2\n]| [\n "Bachelor's ...| 2| Bachelor's degree| NULL| NULL| 1|Full-time (> 32 h...| 2| 2| false| NULL| 0| [None]| NULL| NULL| NULL|{\n "lat": 33.20...|RWwgRG9yYWRvLCBBUg==|El Dorado, AR| 5139| Union, AR|20980| El Dorado, AR| 5| Arkansas| 5139| Union, AR| 5139| Union, AR| 20980| El Dorado, AR| 20980| El Dorado, AR| 44| Retail Trade| 441|Motor Vehicle and...| 4413|Automotive Parts,...| 44133|Automotive Parts ...|441330|Automotive Parts ...|ET29C073C03D1F86B4|Enterprise Analysts|enterprise analys...|[\n "KS126DB6T06...|[\n "Merchandisi...|[\n "KS126DB6T06...| [\n "Merchandisi...| []| []|[\n "KS126706DPF...|[\n "Mathematics...|[\n "KS440W865GC...|[\n "SQL (Progra...|15-2051.01|Business Intellig...|15-2051.01|Business Intellig...|[\n "45.0601",\n...|[\n "Economics, ...|[\n "45.06",\n ...|[\n "Economics",...|[\n "45",\n "27...|[\n "Social Scie...| 15-0000|Computer and Math...| 15-2000|Mathematical Scie...| 15-2050|Data Scientists| 15-2051|Data Scientists| 23|Information Techn...| 231010|Business Intellig...| 23101011| General ERP Analy...| 2310| Business Intellig...| 23101011| General ERP Analy...| 231010| Business Intellig...| 2310| Business Intellig...| 23| Information Techn...|15-0000|Computer and Math...|15-2000|Mathematical Scie...|15-2050|Data Scientists|15-2051|Data Scientists| [\n 7\n]| [\n "Artificial ...| 44| Retail Trade| 441|Motor Vehicle and...| 4413|Automotive Parts,...| 44133|Automotive Parts ...| 441330|Automotive Parts ...|  
|0cb072af26757b6c4...| 8/2/2024| 2024-08-02 17:08:...| 0|6/2/2024| 8/1/2024| NULL| [\n "Job Board"\n]| [\n "maine.gov"\n]|[\n "https://job...| []| NULL|Oracle Consultant...|Oracle Consultant...| 8/1/2024| NULL| 133098|Smx Corporation L...| SMX| true| [\n 99\n]| [\n "No Educatio...| 99|No Education Listed| NULL| NULL| 1|Full-time (> 32 h...| 3| 3| false| NULL| 1| Remote| NULL| NULL| NULL|{\n "lat": 44.31...| QXVndXN0YSwgTUU=| Augusta, ME| 23011| Kennebec, ME|12300|Augusta-Watervill...| 23| Maine| 23011| Kennebec, ME| 23011| Kennebec, ME| 12300|Augusta-Watervill...| 12300|Augusta-Watervill...| 56|Administrative an...| 561|Administrative an...| 5613| Employment Services| 56132|Temporary Help Se...|561320|Temporary Help Se...|ET21DDA63780A7DC09| Oracle Consultants|oracle consultant...|[\n "KS122626T55...|[\n "Procurement...|[\n "KS122626T55...| [\n "Procurement...| []| []| []| []|[\n "BGSBF3F508F...|[\n "Oracle Busi...|15-2051.01|Business Intellig...|15-2051.01|Business Intellig...| []| []| []| []| []| []| 15-0000|Computer and Math...| 15-2000|Mathematical Scie...| 15-2050|Data Scientists| 15-2051|Data Scientists| 23|Information Techn...| 231010|Business Intellig...| 23101012| Oracle Consultant...| 2310| Business Intellig...| 23101012| Oracle Consultant...| 231010| Business Intellig...| 2310| Business Intellig...| 23| Information Techn...|15-0000|Computer and Math...|15-2000|Mathematical Scie...|15-2050|Data Scientists|15-2051|Data Scientists| NULL| NULL| 56|Administrative an...| 561|Administrative an...| 5613| Employment Services| 56132|Temporary Help Se...| 561320|Temporary Help Se...|  
|85318b12b3331fa49...| 9/6/2024| 2024-09-06 20:32:...| 1|6/2/2024| 7/7/2024| 35| [\n "Job Board"\n]|[\n "dejobs.org"\n]|[\n "https://dej...| []| NULL| Data Analyst|Taking care of pe...| 6/10/2024| 8|39063746| Sedgwick| Sedgwick| false| [\n 2\n]| [\n "Bachelor's ...| 2| Bachelor's degree| NULL| NULL| 1|Full-time (> 32 h...| 5| NULL| false| NULL| 0| [None]| NULL| NULL| NULL|{\n "lat": 32.77...| RGFsbGFzLCBUWA==| Dallas, TX| 48113| Dallas, TX|19100|Dallas-Fort Worth...| 48| Texas| 48113| Dallas, TX| 48113| Dallas, TX| 19100|Dallas-Fort Worth...| 19100|Dallas-Fort Worth...| 52|Finance and Insur...| 524|Insurance Carrier...| 5242|Agencies, Brokera...| 52429|Other Insurance R...|524291| Claims Adjusting|ET3037E0C947A02404| Data Analysts| data analyst|[\n "KS1218W78FG...|[\n "Management"...|[\n "ESF3939CE1F...| [\n "Exception R...|[\n "KS683TN76T7...|[\n "Security Cl...|[\n "KS1218W78FG...|[\n "Management"...|[\n "KS126HY6YLT...|[\n "Microsoft O...|15-2051.01|Business Intellig...|15-2051.01|Business Intellig...| []| []| []| []| []| []| 15-0000|Computer and Math...| 15-2000|Mathematical Scie...| 15-2050|Data Scientists| 15-2051|Data Scientists| 23|Information Techn...| 231113|Data / Data Minin...| 23111310| Data Analyst| 2311| Data Analysis and...| 23111310| Data Analyst| 231113| Data / Data Minin...| 2311| Data Analysis and...| 23| Information Techn...|15-0000|Computer and Math...|15-2000|Mathematical Scie...|15-2050|Data Scientists|15-2051|Data Scientists| NULL| NULL| 52|Finance and Insur...| 524|Insurance Carrier...| 5242|Agencies, Brokera...| 52429|Other Insurance R...| 524291| Claims Adjusting|  
|1b5c3941e54a1889e...| 9/6/2024| 2024-09-06 20:32:...| 1|6/2/2024|7/20/2024| 48| [\n "Job Board"\n]|[\n "disabledper...|[\n "https://www...| []| NULL|Sr. Lead Data Mgm...|About this role:\...| 6/12/2024| 10|37615159| Wells Fargo|Wells Fargo| false| [\n 99\n]| [\n "No Educatio...| 99|No Education Listed| NULL| NULL| 1|Full-time (> 32 h...| 3| NULL| false| NULL| 0| [None]| NULL| NULL| NULL|{\n "lat": 33.44...| UGhvZW5peCwgQVo=| Phoenix, AZ| 4013| Maricopa, AZ|38060|Phoenix-Mesa-Chan...| 4| Arizona| 4013| Maricopa, AZ| 4013| Maricopa, AZ| 38060|Phoenix-Mesa-Chan...| 38060|Phoenix-Mesa-Chan...| 52|Finance and Insur...| 522|Credit Intermedia...| 5221|Depository Credit...| 52211| Commercial Banking|522110| Commercial Banking|ET2114E0404BA30075|Management Analysts|sr lead data mgmt...|[\n "KS123QX62QY...|[\n "Exit Strate...|[\n "KS123QX62QY...| [\n "Exit Strate...| []| []|[\n "KS7G6NP6R6L...|[\n "Reliability...|[\n "KS4409D76NW...|[\n "SAS (Softwa...|15-2051.01|Business Intellig...|15-2051.01|Business Intellig...| []| []| []| []| []| []| 15-0000|Computer and Math...| 15-2000|Mathematical Scie...| 15-2050|Data Scientists| 15-2051|Data Scientists| 23|Information Techn...| 231113|Data / Data Minin...| 23111310| Data Analyst| 2311| Data Analysis and...| 23111310| Data Analyst| 231113| Data / Data Minin...| 2311| Data Analysis and...| 23| Information Techn...|15-0000|Computer and Math...|15-2000|Mathematical Scie...|15-2050|Data Scientists|15-2051|Data Scientists| [\n 6\n]| [\n "Data Privac...| 52|Finance and Insur...| 522|Credit Intermedia...| 5221|Depository Credit...| 52211| Commercial Banking| 522110| Commercial Banking|  
|cb5ca25f02bdf25c1...| 6/19/2024| 2024-06-19 07:00:00| 0|6/2/2024|6/17/2024| 15|[\n "FreeJobBoar...|[\n "craigslist....|[\n "https://mod...| []| NULL|Comisiones de $10...|Comisiones de $10...| 6/17/2024| 15| 0| Unclassified| LH/GM| false| [\n 99\n]| [\n "No Educatio...| 99|No Education Listed| NULL| NULL| 3|Part-time / full-...| NULL| NULL| false| 92500| 0| [None]| year| 150000| 35000|{\n "lat": 37.63...| TW9kZXN0bywgQ0E=| Modesto, CA| 6099|Stanislaus, CA|33700| Modesto, CA| 6|California| 6099| Stanislaus, CA| 6099| Stanislaus, CA| 33700| Modesto, CA| 33700| Modesto, CA| 99|Unclassified Indu...| 999|Unclassified Indu...| 9999|Unclassified Indu...| 99999|Unclassified Indu...|999999|Unclassified Indu...|ET0000000000000000| Unclassified|comisiones de por...| []| []| []| []| []| []| []| []| []| []|15-2051.01|Business Intellig...|15-2051.01|Business Intellig...| []| []| []| []| []| []| 15-0000|Computer and Math...| 15-2000|Mathematical Scie...| 15-2050|Data Scientists| 15-2051|Data Scientists| 23|Information Techn...| 231010|Business Intellig...| 23101012| Oracle Consultant...| 2310| Business Intellig...| 23101012| Oracle Consultant...| 231010| Business Intellig...| 2310| Business Intellig...| 23| Information Techn...|15-0000|Computer and Math...|15-2000|Mathematical Scie...|15-2050|Data Scientists|15-2051|Data Scientists| NULL| NULL| 99|Unclassified Indu...| 999|Unclassified Indu...| 9999|Unclassified Indu...| 99999|Unclassified Indu...| 999999|Unclassified Indu...|  
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# 1. Analysis Objective

## 1.1 Data Preparation Activities

In order to complete the analysis the first step is to load and prepare the data. For this analysis I will update data types, calculate average salary, remove extraneous characters from relevant data text, and replace null values.

For the data set job\_postings save as df and change the columns SALARY\_FROM, SALARY\_TO, SALARY, MIN\_YEARS\_EXPERIENCE, and MAX\_YEARS\_EXPERIENCE to type float.

df = (  
 df.withColumn("SALARY\_FROM", col("SALARY\_FROM").cast("float"))  
 .withColumn("SALARY\_TO", col("SALARY\_TO").cast("float"))  
 .withColumn("SALARY", col("SALARY").cast("float"))  
 .withColumn("MIN\_YEARS\_EXPERIENCE", col("MIN\_YEARS\_EXPERIENCE").cast("float"))  
 .withColumn("MAX\_YEARS\_EXPERIENCE", col("MAX\_YEARS\_EXPERIENCE").cast("float"))  
)

Next the median needs to be calculated as it will be used to fill na values. Create a new method called compute\_median.

def compute\_median(sdf,col\_name):  
 q = sdf.approxQuantile(col\_name,[0.5],0.01)  
 return q[0] if q else None  
  
median\_from = compute\_median(df,"SALARY\_FROM")  
median\_to = compute\_median(df, "SALARY\_TO")  
median\_salary = compute\_median(df, "SALARY")

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medians: 87295.0 130042.0 115024.0

Next fill the missing values in the SALARY\_FROM, SALARY\_TO, SALARY with the median values.

df = df.fillna({  
 "SALARY\_FROM": median\_from,  
 "SALARY\_TO": median\_to,  
 "SALARY": median\_salary})

Calculate average salary by adding the min and max salaries and dividing by 2.

df = df.withColumn("Average Salary",(col("SALARY\_FROM")+col("SALARY\_TO"))/2)

['ID', 'LAST\_UPDATED\_DATE', 'LAST\_UPDATED\_TIMESTAMP', 'DUPLICATES', 'POSTED', 'EXPIRED', 'DURATION', 'SOURCE\_TYPES', 'SOURCES', 'URL', 'ACTIVE\_URLS', 'ACTIVE\_SOURCES\_INFO', 'TITLE\_RAW', 'BODY', 'MODELED\_EXPIRED', 'MODELED\_DURATION', 'COMPANY', 'COMPANY\_NAME', 'COMPANY\_RAW', 'COMPANY\_IS\_STAFFING', 'EDUCATION\_LEVELS', 'EDUCATION\_LEVELS\_NAME', 'MIN\_EDULEVELS', 'MIN\_EDULEVELS\_NAME', 'MAX\_EDULEVELS', 'MAX\_EDULEVELS\_NAME', 'EMPLOYMENT\_TYPE', 'EMPLOYMENT\_TYPE\_NAME', 'MIN\_YEARS\_EXPERIENCE', 'MAX\_YEARS\_EXPERIENCE', 'IS\_INTERNSHIP', 'SALARY', 'REMOTE\_TYPE', 'REMOTE\_TYPE\_NAME', 'ORIGINAL\_PAY\_PERIOD', 'SALARY\_TO', 'SALARY\_FROM', 'LOCATION', 'CITY', 'CITY\_NAME', 'COUNTY', 'COUNTY\_NAME', 'MSA', 'MSA\_NAME', 'STATE', 'STATE\_NAME', 'COUNTY\_OUTGOING', 'COUNTY\_NAME\_OUTGOING', 'COUNTY\_INCOMING', 'COUNTY\_NAME\_INCOMING', 'MSA\_OUTGOING', 'MSA\_NAME\_OUTGOING', 'MSA\_INCOMING', 'MSA\_NAME\_INCOMING', 'NAICS2', 'NAICS2\_NAME', 'NAICS3', 'NAICS3\_NAME', 'NAICS4', 'NAICS4\_NAME', 'NAICS5', 'NAICS5\_NAME', 'NAICS6', 'NAICS6\_NAME', 'TITLE', 'TITLE\_NAME', 'TITLE\_CLEAN', 'SKILLS', 'SKILLS\_NAME', 'SPECIALIZED\_SKILLS', 'SPECIALIZED\_SKILLS\_NAME', 'CERTIFICATIONS', 'CERTIFICATIONS\_NAME', 'COMMON\_SKILLS', 'COMMON\_SKILLS\_NAME', 'SOFTWARE\_SKILLS', 'SOFTWARE\_SKILLS\_NAME', 'ONET', 'ONET\_NAME', 'ONET\_2019', 'ONET\_2019\_NAME', 'CIP6', 'CIP6\_NAME', 'CIP4', 'CIP4\_NAME', 'CIP2', 'CIP2\_NAME', 'SOC\_2021\_2', 'SOC\_2021\_2\_NAME', 'SOC\_2021\_3', 'SOC\_2021\_3\_NAME', 'SOC\_2021\_4', 'SOC\_2021\_4\_NAME', 'SOC\_2021\_5', 'SOC\_2021\_5\_NAME', 'LOT\_CAREER\_AREA', 'LOT\_CAREER\_AREA\_NAME', 'LOT\_OCCUPATION', 'LOT\_OCCUPATION\_NAME', 'LOT\_SPECIALIZED\_OCCUPATION', 'LOT\_SPECIALIZED\_OCCUPATION\_NAME', 'LOT\_OCCUPATION\_GROUP', 'LOT\_OCCUPATION\_GROUP\_NAME', 'LOT\_V6\_SPECIALIZED\_OCCUPATION', 'LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME', 'LOT\_V6\_OCCUPATION', 'LOT\_V6\_OCCUPATION\_NAME', 'LOT\_V6\_OCCUPATION\_GROUP', 'LOT\_V6\_OCCUPATION\_GROUP\_NAME', 'LOT\_V6\_CAREER\_AREA', 'LOT\_V6\_CAREER\_AREA\_NAME', 'SOC\_2', 'SOC\_2\_NAME', 'SOC\_3', 'SOC\_3\_NAME', 'SOC\_4', 'SOC\_4\_NAME', 'SOC\_5', 'SOC\_5\_NAME', 'LIGHTCAST\_SECTORS', 'LIGHTCAST\_SECTORS\_NAME', 'NAICS\_2022\_2', 'NAICS\_2022\_2\_NAME', 'NAICS\_2022\_3', 'NAICS\_2022\_3\_NAME', 'NAICS\_2022\_4', 'NAICS\_2022\_4\_NAME', 'NAICS\_2022\_5', 'NAICS\_2022\_5\_NAME', 'NAICS\_2022\_6', 'NAICS\_2022\_6\_NAME', 'Average Salary']

Next remove extraneous characters from education level names.

from pyspark.sql.functions import regexp\_replace, col  
  
df = df.withColumn(  
 "EDUCATION\_LEVELS\_NAME",  
 regexp\_replace(col("EDUCATION\_LEVELS\_NAME"), "[\n\r]", "")   
)

## 1.2 Create a box and whisker plot to analyze variation across occupations.

### 1.2.1 Begin with more data prep

Select the columns to maintain in the analysis

export\_cols = [  
 "EDUCATION\_LEVELS\_NAME",  
 "REMOTE\_TYPE\_NAME",  
 "MAX\_YEARS\_EXPERIENCE",  
 "Average Salary",  
 "LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME"  
]

confirmed selected columns

df\_selected = df.select(export\_cols)  
df\_selected.show(3)

+---------------------+----------------+--------------------+--------------+----------------------------------+  
|EDUCATION\_LEVELS\_NAME|REMOTE\_TYPE\_NAME|MAX\_YEARS\_EXPERIENCE|Average Salary|LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME|  
+---------------------+----------------+--------------------+--------------+----------------------------------+  
| [ "Bachelor's de...| [None]| 2.0| 108668.5| General ERP Analy...|  
| [ "No Education ...| Remote| 3.0| 108668.5| Oracle Consultant...|  
| [ "Bachelor's de...| [None]| NULL| 108668.5| Data Analyst|  
+---------------------+----------------+--------------------+--------------+----------------------------------+  
only showing top 3 rows

Transform pyspark data into pandas dataframe from visualization.

pdf = df\_selected.toPandas()  
pdf.to\_csv("./data/lighthouse\_cleaned.csv", index=False)

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Compute median salaries by group and sort the groups decending on median salaries.

median\_salaries = pdf.groupby("LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME")["Average Salary"].median()

sorted\_employment\_types = median\_salaries.sort\_values(ascending=False).index

Make occupation a category and maintain group sorting.

pdf["LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME"] = pd.Categorical(  
 pdf["LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME"],  
 categories=sorted\_employment\_types,  
 ordered=True  
)

### 1.2.2 Variations in average salary by occupation name

The occupations with the most variance look to include SAP Analyst/Admin, Data Analyst, and Oracle consultant/analyst.I think a general but not definitive trend is that the occupations with higher variance seem to be those that are more generalized. For example SAP Analyst/Admin covers a broad spectrum of skills related to SAP from analyst to admin whereas healthcare analyst has less observable variance and is specific in both its role analyst only and the sector of work healthcare.

fig = px.box(  
 pdf,  
 x="LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME",  
 y="Average Salary"  
)

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['ID', 'LAST\_UPDATED\_DATE', 'LAST\_UPDATED\_TIMESTAMP', 'DUPLICATES', 'POSTED', 'EXPIRED', 'DURATION', 'SOURCE\_TYPES', 'SOURCES', 'URL', 'ACTIVE\_URLS', 'ACTIVE\_SOURCES\_INFO', 'TITLE\_RAW', 'BODY', 'MODELED\_EXPIRED', 'MODELED\_DURATION', 'COMPANY', 'COMPANY\_NAME', 'COMPANY\_RAW', 'COMPANY\_IS\_STAFFING', 'EDUCATION\_LEVELS', 'EDUCATION\_LEVELS\_NAME', 'MIN\_EDULEVELS', 'MIN\_EDULEVELS\_NAME', 'MAX\_EDULEVELS', 'MAX\_EDULEVELS\_NAME', 'EMPLOYMENT\_TYPE', 'EMPLOYMENT\_TYPE\_NAME', 'MIN\_YEARS\_EXPERIENCE', 'MAX\_YEARS\_EXPERIENCE', 'IS\_INTERNSHIP', 'SALARY', 'REMOTE\_TYPE', 'REMOTE\_TYPE\_NAME', 'ORIGINAL\_PAY\_PERIOD', 'SALARY\_TO', 'SALARY\_FROM', 'LOCATION', 'CITY', 'CITY\_NAME', 'COUNTY', 'COUNTY\_NAME', 'MSA', 'MSA\_NAME', 'STATE', 'STATE\_NAME', 'COUNTY\_OUTGOING', 'COUNTY\_NAME\_OUTGOING', 'COUNTY\_INCOMING', 'COUNTY\_NAME\_INCOMING', 'MSA\_OUTGOING', 'MSA\_NAME\_OUTGOING', 'MSA\_INCOMING', 'MSA\_NAME\_INCOMING', 'NAICS2', 'NAICS2\_NAME', 'NAICS3', 'NAICS3\_NAME', 'NAICS4', 'NAICS4\_NAME', 'NAICS5', 'NAICS5\_NAME', 'NAICS6', 'NAICS6\_NAME', 'TITLE', 'TITLE\_NAME', 'TITLE\_CLEAN', 'SKILLS', 'SKILLS\_NAME', 'SPECIALIZED\_SKILLS', 'SPECIALIZED\_SKILLS\_NAME', 'CERTIFICATIONS', 'CERTIFICATIONS\_NAME', 'COMMON\_SKILLS', 'COMMON\_SKILLS\_NAME', 'SOFTWARE\_SKILLS', 'SOFTWARE\_SKILLS\_NAME', 'ONET', 'ONET\_NAME', 'ONET\_2019', 'ONET\_2019\_NAME', 'CIP6', 'CIP6\_NAME', 'CIP4', 'CIP4\_NAME', 'CIP2', 'CIP2\_NAME', 'SOC\_2021\_2', 'SOC\_2021\_2\_NAME', 'SOC\_2021\_3', 'SOC\_2021\_3\_NAME', 'SOC\_2021\_4', 'SOC\_2021\_4\_NAME', 'SOC\_2021\_5', 'SOC\_2021\_5\_NAME', 'LOT\_CAREER\_AREA', 'LOT\_CAREER\_AREA\_NAME', 'LOT\_OCCUPATION', 'LOT\_OCCUPATION\_NAME', 'LOT\_SPECIALIZED\_OCCUPATION', 'LOT\_SPECIALIZED\_OCCUPATION\_NAME', 'LOT\_OCCUPATION\_GROUP', 'LOT\_OCCUPATION\_GROUP\_NAME', 'LOT\_V6\_SPECIALIZED\_OCCUPATION', 'LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME', 'LOT\_V6\_OCCUPATION', 'LOT\_V6\_OCCUPATION\_NAME', 'LOT\_V6\_OCCUPATION\_GROUP', 'LOT\_V6\_OCCUPATION\_GROUP\_NAME', 'LOT\_V6\_CAREER\_AREA', 'LOT\_V6\_CAREER\_AREA\_NAME', 'SOC\_2', 'SOC\_2\_NAME', 'SOC\_3', 'SOC\_3\_NAME', 'SOC\_4', 'SOC\_4\_NAME', 'SOC\_5', 'SOC\_5\_NAME', 'LIGHTCAST\_SECTORS', 'LIGHTCAST\_SECTORS\_NAME', 'NAICS\_2022\_2', 'NAICS\_2022\_2\_NAME', 'NAICS\_2022\_3', 'NAICS\_2022\_3\_NAME', 'NAICS\_2022\_4', 'NAICS\_2022\_4\_NAME', 'NAICS\_2022\_5', 'NAICS\_2022\_5\_NAME', 'NAICS\_2022\_6', 'NAICS\_2022\_6\_NAME', 'Average Salary']

## Differences in salary by occupation  
#|echo: false  
from pyspark.sql.functions import lit

## 1.3 Create a scatterplot to review salary differences across occupation

### 1.3.1 begin with data prep

Create new column and assign 1 to each row so that it can be use for a record count by occupation later.

df = df.withColumn("counter", lit(1))

Select the fields needed for the analysis.

#parse  
export\_cols2 = [  
 "LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME",  
 "Average Salary",  
 "counter"  
]

Trannsform pyspark data to pandas dataframe for visualization.

pdf2 = df\_selected2.toPandas()  
#pdf2.to\_csv("./data/lighthouse\_cleaned.csv", index=False)  
#print(len(pdf2))  
#pdf2.head(30)

[Stage 19:> (0 + 1) / 1]

Group the median average salaries by occupation and sum the counts of each occupation.

median\_salaries2 = pdf2.groupby("LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME").agg({  
 "Average Salary": "median",  
 "counter": "sum"  
}).reset\_index()

|  | LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME | Average Salary | counter |
| --- | --- | --- | --- |
| 0 | Business Analyst (General) | 108668.5 | 4326 |
| 1 | Business Intelligence Analyst | 108668.5 | 3639 |
| 2 | Data Analyst | 108668.5 | 27832 |

### 1.3.2 Median average salaries by occupation with number of job postings as the size parameter

The visual reveals the relative size differences of the job market. It is clear that data analyst is the biggest job pool and niche postings like marketing and healthcare analyst. The visual does not reveal differences in the salary ranges. This is due to the way missinf values using the median.

fig2 = px.scatter(  
 median\_salaries2,  
 x="LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME",  
 y="Average Salary",  
 size="counter",  
 hover\_name="LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME",   
 size\_max=60   
)  
  
fig2.update\_layout(  
 xaxis\_title="Occupation",  
 yaxis\_title="Median Salary",  
 title="Bubble Chart of Jobs: Median Salary vs. Occupation (Bubble = # Postings)",  
 xaxis\_tickangle=90 # rotate labels if long  
)

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## 1.4 visualizing salary by education

### 1.4.1 begin with data prep

Group the data in MIN\_EDULEVELS\_NAME into five groups: Associates or Lower, Bachelors, Masters, Professional, Other.

df = df.withColumn(  
 "education\_group",  
 F.when(F.col("MIN\_EDULEVELS\_NAME").isin("GED", "Associate", "No Education Listed"), "Associate's or lower")  
 .when(F.col("MIN\_EDULEVELS\_NAME") == "Bachelor's degree", "Bachelor's")  
 .when(F.col("MIN\_EDULEVELS\_NAME").isin("Master's degree"), "Master's")  
 .when(F.col("MIN\_EDULEVELS\_NAME").isin("PhD", "Doctorate", "professional degree"), "PhD")  
 .otherwise("Other") # optional catch-all for unexpected values  
)

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| ID|LAST\_UPDATED\_DATE|LAST\_UPDATED\_TIMESTAMP|DUPLICATES| POSTED| EXPIRED|DURATION| SOURCE\_TYPES| SOURCES| URL|ACTIVE\_URLS|ACTIVE\_SOURCES\_INFO| TITLE\_RAW| BODY|MODELED\_EXPIRED|MODELED\_DURATION| COMPANY| COMPANY\_NAME|COMPANY\_RAW|COMPANY\_IS\_STAFFING|EDUCATION\_LEVELS|EDUCATION\_LEVELS\_NAME|MIN\_EDULEVELS| MIN\_EDULEVELS\_NAME|MAX\_EDULEVELS|MAX\_EDULEVELS\_NAME|EMPLOYMENT\_TYPE|EMPLOYMENT\_TYPE\_NAME|MIN\_YEARS\_EXPERIENCE|MAX\_YEARS\_EXPERIENCE|IS\_INTERNSHIP| SALARY|REMOTE\_TYPE|REMOTE\_TYPE\_NAME|ORIGINAL\_PAY\_PERIOD|SALARY\_TO|SALARY\_FROM| LOCATION| CITY| CITY\_NAME|COUNTY| COUNTY\_NAME| MSA| MSA\_NAME|STATE|STATE\_NAME|COUNTY\_OUTGOING|COUNTY\_NAME\_OUTGOING|COUNTY\_INCOMING|COUNTY\_NAME\_INCOMING|MSA\_OUTGOING| MSA\_NAME\_OUTGOING|MSA\_INCOMING| MSA\_NAME\_INCOMING|NAICS2| NAICS2\_NAME|NAICS3| NAICS3\_NAME|NAICS4| NAICS4\_NAME|NAICS5| NAICS5\_NAME|NAICS6| NAICS6\_NAME| TITLE| TITLE\_NAME| TITLE\_CLEAN| SKILLS| SKILLS\_NAME| SPECIALIZED\_SKILLS|SPECIALIZED\_SKILLS\_NAME| CERTIFICATIONS| CERTIFICATIONS\_NAME| COMMON\_SKILLS| COMMON\_SKILLS\_NAME| SOFTWARE\_SKILLS|SOFTWARE\_SKILLS\_NAME| ONET| ONET\_NAME| ONET\_2019| ONET\_2019\_NAME| CIP6| CIP6\_NAME| CIP4| CIP4\_NAME| CIP2| CIP2\_NAME|SOC\_2021\_2| SOC\_2021\_2\_NAME|SOC\_2021\_3| SOC\_2021\_3\_NAME|SOC\_2021\_4|SOC\_2021\_4\_NAME|SOC\_2021\_5|SOC\_2021\_5\_NAME|LOT\_CAREER\_AREA|LOT\_CAREER\_AREA\_NAME|LOT\_OCCUPATION| LOT\_OCCUPATION\_NAME|LOT\_SPECIALIZED\_OCCUPATION|LOT\_SPECIALIZED\_OCCUPATION\_NAME|LOT\_OCCUPATION\_GROUP|LOT\_OCCUPATION\_GROUP\_NAME|LOT\_V6\_SPECIALIZED\_OCCUPATION|LOT\_V6\_SPECIALIZED\_OCCUPATION\_NAME|LOT\_V6\_OCCUPATION|LOT\_V6\_OCCUPATION\_NAME|LOT\_V6\_OCCUPATION\_GROUP|LOT\_V6\_OCCUPATION\_GROUP\_NAME|LOT\_V6\_CAREER\_AREA|LOT\_V6\_CAREER\_AREA\_NAME| SOC\_2| SOC\_2\_NAME| SOC\_3| SOC\_3\_NAME| SOC\_4| SOC\_4\_NAME| SOC\_5| SOC\_5\_NAME|LIGHTCAST\_SECTORS|LIGHTCAST\_SECTORS\_NAME|NAICS\_2022\_2| NAICS\_2022\_2\_NAME|NAICS\_2022\_3| NAICS\_2022\_3\_NAME|NAICS\_2022\_4| NAICS\_2022\_4\_NAME|NAICS\_2022\_5| NAICS\_2022\_5\_NAME|NAICS\_2022\_6| NAICS\_2022\_6\_NAME|Average Salary|counter| education\_group|  
+--------------------+-----------------+----------------------+----------+--------+--------+--------+-------------------+--------------------+--------------------+-----------+-------------------+--------------------+--------------------+---------------+----------------+--------+--------------------+-----------+-------------------+----------------+---------------------+-------------+-------------------+-------------+------------------+---------------+--------------------+--------------------+--------------------+-------------+--------+-----------+----------------+-------------------+---------+-----------+--------------------+--------------------+-------------+------+------------+-----+--------------------+-----+----------+---------------+--------------------+---------------+--------------------+------------+--------------------+------------+--------------------+------+--------------------+------+--------------------+------+--------------------+------+--------------------+------+--------------------+------------------+-------------------+--------------------+--------------------+--------------------+--------------------+-----------------------+--------------------+--------------------+--------------------+--------------------+--------------------+--------------------+----------+--------------------+----------+--------------------+--------------------+--------------------+--------------------+--------------------+--------------------+--------------------+----------+--------------------+----------+--------------------+----------+---------------+----------+---------------+---------------+--------------------+--------------+--------------------+--------------------------+-------------------------------+--------------------+-------------------------+-----------------------------+----------------------------------+-----------------+----------------------+-----------------------+----------------------------+------------------+-----------------------+-------+--------------------+-------+--------------------+-------+---------------+-------+---------------+-----------------+----------------------+------------+--------------------+------------+--------------------+------------+--------------------+------------+--------------------+------------+--------------------+--------------+-------+--------------------+  
|1f57d95acf4dc67ed...| 9/6/2024| 2024-09-06 20:32:...| 0|6/2/2024|6/8/2024| 6| [\n "Company"\n]|[\n "brassring.c...|[\n "https://sjo...| []| NULL|Enterprise Analys...|31-May-2024\n\nEn...| 6/8/2024| 6| 894731| Murphy USA| Murphy USA| false| [\n 2\n]| [ "Bachelor's de...| 2| Bachelor's degree| NULL| NULL| 1|Full-time (> 32 h...| 2.0| 2.0| false|115024.0| 0| [None]| NULL| 130042.0| 87295.0|{\n "lat": 33.20...|RWwgRG9yYWRvLCBBUg==|El Dorado, AR| 5139| Union, AR|20980| El Dorado, AR| 5| Arkansas| 5139| Union, AR| 5139| Union, AR| 20980| El Dorado, AR| 20980| El Dorado, AR| 44| Retail Trade| 441|Motor Vehicle and...| 4413|Automotive Parts,...| 44133|Automotive Parts ...|441330|Automotive Parts ...|ET29C073C03D1F86B4|Enterprise Analysts|enterprise analys...|[\n "KS126DB6T06...|[\n "Merchandisi...|[\n "KS126DB6T06...| [\n "Merchandisi...| []| []|[\n "KS126706DPF...|[\n "Mathematics...|[\n "KS440W865GC...|[\n "SQL (Progra...|15-2051.01|Business Intellig...|15-2051.01|Business Intellig...|[\n "45.0601",\n...|[\n "Economics, ...|[\n "45.06",\n ...|[\n "Economics",...|[\n "45",\n "27...|[\n "Social Scie...| 15-0000|Computer and Math...| 15-2000|Mathematical Scie...| 15-2050|Data Scientists| 15-2051|Data Scientists| 23|Information Techn...| 231010|Business Intellig...| 23101011| General ERP Analy...| 2310| Business Intellig...| 23101011| General ERP Analy...| 231010| Business Intellig...| 2310| Business Intellig...| 23| Information Techn...|15-0000|Computer and Math...|15-2000|Mathematical Scie...|15-2050|Data Scientists|15-2051|Data Scientists| [\n 7\n]| [\n "Artificial ...| 44| Retail Trade| 441|Motor Vehicle and...| 4413|Automotive Parts,...| 44133|Automotive Parts ...| 441330|Automotive Parts ...| 108668.5| 1| Bachelor's|  
|0cb072af26757b6c4...| 8/2/2024| 2024-08-02 17:08:...| 0|6/2/2024|8/1/2024| NULL|[\n "Job Board"\n]| [\n "maine.gov"\n]|[\n "https://job...| []| NULL|Oracle Consultant...|Oracle Consultant...| 8/1/2024| NULL| 133098|Smx Corporation L...| SMX| true| [\n 99\n]| [ "No Education ...| 99|No Education Listed| NULL| NULL| 1|Full-time (> 32 h...| 3.0| 3.0| false|115024.0| 1| Remote| NULL| 130042.0| 87295.0|{\n "lat": 44.31...| QXVndXN0YSwgTUU=| Augusta, ME| 23011|Kennebec, ME|12300|Augusta-Watervill...| 23| Maine| 23011| Kennebec, ME| 23011| Kennebec, ME| 12300|Augusta-Watervill...| 12300|Augusta-Watervill...| 56|Administrative an...| 561|Administrative an...| 5613| Employment Services| 56132|Temporary Help Se...|561320|Temporary Help Se...|ET21DDA63780A7DC09| Oracle Consultants|oracle consultant...|[\n "KS122626T55...|[\n "Procurement...|[\n "KS122626T55...| [\n "Procurement...| []| []| []| []|[\n "BGSBF3F508F...|[\n "Oracle Busi...|15-2051.01|Business Intellig...|15-2051.01|Business Intellig...| []| []| []| []| []| []| 15-0000|Computer and Math...| 15-2000|Mathematical Scie...| 15-2050|Data Scientists| 15-2051|Data Scientists| 23|Information Techn...| 231010|Business Intellig...| 23101012| Oracle Consultant...| 2310| Business Intellig...| 23101012| Oracle Consultant...| 231010| Business Intellig...| 2310| Business Intellig...| 23| Information Techn...|15-0000|Computer and Math...|15-2000|Mathematical Scie...|15-2050|Data Scientists|15-2051|Data Scientists| NULL| NULL| 56|Administrative an...| 561|Administrative an...| 5613| Employment Services| 56132|Temporary Help Se...| 561320|Temporary Help Se...| 108668.5| 1|Associate's or lower|  
|85318b12b3331fa49...| 9/6/2024| 2024-09-06 20:32:...| 1|6/2/2024|7/7/2024| 35|[\n "Job Board"\n]|[\n "dejobs.org"\n]|[\n "https://dej...| []| NULL| Data Analyst|Taking care of pe...| 6/10/2024| 8|39063746| Sedgwick| Sedgwick| false| [\n 2\n]| [ "Bachelor's de...| 2| Bachelor's degree| NULL| NULL| 1|Full-time (> 32 h...| 5.0| NULL| false|115024.0| 0| [None]| NULL| 130042.0| 87295.0|{\n "lat": 32.77...| RGFsbGFzLCBUWA==| Dallas, TX| 48113| Dallas, TX|19100|Dallas-Fort Worth...| 48| Texas| 48113| Dallas, TX| 48113| Dallas, TX| 19100|Dallas-Fort Worth...| 19100|Dallas-Fort Worth...| 52|Finance and Insur...| 524|Insurance Carrier...| 5242|Agencies, Brokera...| 52429|Other Insurance R...|524291| Claims Adjusting|ET3037E0C947A02404| Data Analysts| data analyst|[\n "KS1218W78FG...|[\n "Management"...|[\n "ESF3939CE1F...| [\n "Exception R...|[\n "KS683TN76T7...|[\n "Security Cl...|[\n "KS1218W78FG...|[\n "Management"...|[\n "KS126HY6YLT...|[\n "Microsoft O...|15-2051.01|Business Intellig...|15-2051.01|Business Intellig...| []| []| []| []| []| []| 15-0000|Computer and Math...| 15-2000|Mathematical Scie...| 15-2050|Data Scientists| 15-2051|Data Scientists| 23|Information Techn...| 231113|Data / Data Minin...| 23111310| Data Analyst| 2311| Data Analysis and...| 23111310| Data Analyst| 231113| Data / Data Minin...| 2311| Data Analysis and...| 23| Information Techn...|15-0000|Computer and Math...|15-2000|Mathematical Scie...|15-2050|Data Scientists|15-2051|Data Scientists| NULL| NULL| 52|Finance and Insur...| 524|Insurance Carrier...| 5242|Agencies, Brokera...| 52429|Other Insurance R...| 524291| Claims Adjusting| 108668.5| 1| Bachelor's|  
+--------------------+-----------------+----------------------+----------+--------+--------+--------+-------------------+--------------------+--------------------+-----------+-------------------+--------------------+--------------------+---------------+----------------+--------+--------------------+-----------+-------------------+----------------+---------------------+-------------+-------------------+-------------+------------------+---------------+--------------------+--------------------+--------------------+-------------+--------+-----------+----------------+-------------------+---------+-----------+--------------------+--------------------+-------------+------+------------+-----+--------------------+-----+----------+---------------+--------------------+---------------+--------------------+------------+--------------------+------------+--------------------+------+--------------------+------+--------------------+------+--------------------+------+--------------------+------+--------------------+------------------+-------------------+--------------------+--------------------+--------------------+--------------------+-----------------------+--------------------+--------------------+--------------------+--------------------+--------------------+--------------------+----------+--------------------+----------+--------------------+--------------------+--------------------+--------------------+--------------------+--------------------+--------------------+----------+--------------------+----------+--------------------+----------+---------------+----------+---------------+---------------+--------------------+--------------+--------------------+--------------------------+-------------------------------+--------------------+-------------------------+-----------------------------+----------------------------------+-----------------+----------------------+-----------------------+----------------------------+------------------+-----------------------+-------+--------------------+-------+--------------------+-------+---------------+-------+---------------+-----------------+----------------------+------------+--------------------+------------+--------------------+------------+--------------------+------------+--------------------+------------+--------------------+--------------+-------+--------------------+  
only showing top 3 rows

Extract columns needed for the analysis.

#parse  
export\_cols3 = [  
 "education\_group",  
 "Average Salary",  
 "MAX\_YEARS\_EXPERIENCE"  
]

[Stage 21:> (0 + 1) / 1]

|  | education\_group | Average Salary | MAX\_YEARS\_EXPERIENCE |
| --- | --- | --- | --- |
| 0 | Bachelor's | 108668.5 | 2.0 |
| 1 | Associate's or lower | 108668.5 | 3.0 |
| 2 | Bachelor's | 108668.5 | NaN |
| 3 | Associate's or lower | 108668.5 | NaN |
| 4 | Associate's or lower | 92500.0 | NaN |
| 5 | Bachelor's | 110155.0 | NaN |
| 6 | Bachelor's | 108668.5 | NaN |
| 7 | Bachelor's | 108668.5 | NaN |
| 8 | Associate's or lower | 108668.5 | 7.0 |
| 9 | Bachelor's | 92962.0 | 2.0 |

Fill missing values with 0 if max years experience is empty.

pdf3["MAX\_YEARS\_EXPERIENCE"] = pdf3["MAX\_YEARS\_EXPERIENCE"].fillna(0)

|  | education\_group | Average Salary | MAX\_YEARS\_EXPERIENCE |
| --- | --- | --- | --- |
| 0 | Bachelor's | 108668.5 | 2.0 |
| 1 | Associate's or lower | 108668.5 | 3.0 |
| 2 | Bachelor's | 108668.5 | 0.0 |
| 3 | Associate's or lower | 108668.5 | 0.0 |
| 4 | Associate's or lower | 92500.0 | 0.0 |
| 5 | Bachelor's | 110155.0 | 0.0 |
| 6 | Bachelor's | 108668.5 | 0.0 |
| 7 | Bachelor's | 108668.5 | 0.0 |
| 8 | Associate's or lower | 108668.5 | 7.0 |
| 9 | Bachelor's | 92962.0 | 2.0 |

groups = pdf3["MAX\_YEARS\_EXPERIENCE"].unique()  
  
plt.figure(figsize=(10,6))  
  
for g in groups:  
 subset = pdf3[pdf3["MAX\_YEARS\_EXPERIENCE"] == g]  
   
 # Add jitter to avoid overlapping points  
 x\_jitter = subset["MAX\_YEARS\_EXPERIENCE"] + np.random.normal(0, 0.2, size=len(subset))  
 y\_jitter = subset["Average Salary"] + np.random.normal(0, 0.2, size=len(subset))  
   
 plt.scatter(x\_jitter, y\_jitter, alpha=0.6, label=g)  
  
plt.xlabel("X-axis (with jitter)")  
plt.ylabel("Y-axis (with jitter)")  
plt.title("Scatter Plots per Group with Jitter")  
plt.legend()  
plt.show()

