

Assignment 03

Bhargavi Manyala

September 24, 2025

1 Import Dataset

```
import pandas as pd
import plotly.express as px
import plotly.io as pio
from pyspark.sql import SparkSession
import re
import numpy as np
import plotly.graph_objects as go
from pyspark.sql.functions import col, split, explode, regexp_replace, transform, when
from pyspark.sql import functions as F
from pyspark.sql.functions import col, monotonically_increasing_id

np.random.seed(42)
#pio.renderers.default = "vscode+notebook+svg"

spark = SparkSession.builder.appName("LightcastData").getOrCreate()
df = (
    spark.read
        .option("header", "true")
        .option("inferSchema", "true")
        .option("multiLine", "true")
        .option("escape", "\\")
        .csv("lightcast_job_postings.csv")
)
```

```
#df.show(5)
```

[Stage 8:>

(0 + 1) / 1]

2 Casting salary and experience columns

2.1 Computing medians and Imputing missing salaries

```
from pyspark.sql.functions import col

df = df.withColumn("SALARY", col("SALARY").cast("float")) \
        .withColumn("SALARY_FROM", col("SALARY_FROM").cast("float")) \
        .withColumn("SALARY_TO", col("SALARY_TO").cast("float")) \
        .withColumn("MIN_YEARS_EXPERIENCE", col("MIN_YEARS_EXPERIENCE").cast("float")) \
        .withColumn("MAX_YEARS_EXPERIENCE", col("MAX_YEARS_EXPERIENCE").cast("float"))

# Computing medians for salary columns
def compute_median(sdf, col_name):
    return sdf.approxQuantile(col_name, [0.5], 0.01)[0]

median_from = compute_median(df, "SALARY_FROM")
median_to   = compute_median(df, "SALARY_TO")
median_salary = compute_median(df, "SALARY")

print("Medians:", median_from, median_to, median_salary)

# Imputing missing salaries, but not experience
df = df.fillna({
    "SALARY_FROM": median_from,
    "SALARY_TO": median_to
})

# Computing average salary
df = df.withColumn(
    "Average_Salary", (col("SALARY_FROM") + col("SALARY_TO")) / 2
)
```

```
# Selecting required columns
export_cols = [
    "Average_Salary",
    "SALARY",
    "EDUCATION_LEVELS_NAME",
    "REMOTE_TYPE_NAME",
    "MAX_YEARS_EXPERIENCE",
    "LOT_V6_SPECIALIZED_OCCUPATION_NAME"
]

df_selected = df.select(*export_cols)

pdf_selected = df_selected.toPandas()
pdf_selected.head()
```

[Stage 9:> (0 + 1) / 1]

Medians: 87295.0 130042.0 115024.0

[Stage 12:> (0 + 1) / 1]

	Average_Salary	SALARY	EDUCATION_LEVELS_NAME	REMOTE_TYPE_NAME	MAX_YEARS_EXPERIENCE	LOT_V6_SPECIALIZED_OCCUPATION_NAME
0	108668.5	NaN	[\n "Bachelor's degree"\n]	[None]	2.0	General ERP Analyst /
1	108668.5	NaN	[\n "No Education Listed"\n]	Remote	3.0	Oracle Consultant / An
2	108668.5	NaN	[\n "Bachelor's degree"\n]	[None]	NaN	Data Analyst
3	108668.5	NaN	[\n "No Education Listed"\n]	[None]	NaN	Data Analyst
4	92500.0	92500.0	[\n "No Education Listed"\n]	[None]	NaN	Oracle Consultant / An

2.2 Cleaning Education column and Exporting Cleaned Data

*I referred to Claude Sonnet 4 for prompts and sample code ideas, but I wrote and adapted the final implementation myself

```
# To remove \n and \r
pdf_selected["EDUCATION_LEVELS_NAME"] = (
    pdf_selected["EDUCATION_LEVELS_NAME"]
    .astype(str)
    .str.replace(r"[\n\r]", "", regex=True)
    .str.strip()
)
pdf_selected.to_csv("data/lightcast_cleaned.csv", index=False)
pdf_selected.head()
```

	Average_Salary	SALARY	EDUCATION_LEVELS_NAME	REMOTE_TYPE_NAME	MAX_YEARS_EXPERIENCE	LOT_V6_SPECIALIZ
0	108668.5	NaN	["Bachelor's degree"]	[None]	2.0	General ERP Analyst /
1	108668.5	NaN	["No Education Listed"]	Remote	3.0	Oracle Consultant / An
2	108668.5	NaN	["Bachelor's degree"]	[None]	NaN	Data Analyst
3	108668.5	NaN	["No Education Listed"]	[None]	NaN	Data Analyst
4	92500.0	92500.0	["No Education Listed"]	[None]	NaN	Oracle Consultant / An

2.3 Exporting Cleaned Data

```
print("Data cleaning complete. Rows retained:", len(pdf_selected))
```

Data cleaning complete. Rows retained: 72498

3 Query 1: Salary Distribution by Industry and Employment Type

3.1 Salary Distribution by Employment Type

```
df_query1 = df.select(
    "EMPLOYMENT_TYPE_NAME",
    "NAICS2_NAME",
    "SALARY"
)
```

```

pdf_query1 = df_query1.toPandas()

pdf_query1 = pdf_query1[pdf_query1["SALARY"] > 0]

pdf_query1["EMPLOYMENT_TYPE_NAME"] = (
    pdf_query1["EMPLOYMENT_TYPE_NAME"]
        .astype(str)
        .apply(lambda x: re.sub(r"^\x00-\x7F+", "", x))
        .str.strip()
)
pdf_query1 = pdf_query1[pdf_query1["EMPLOYMENT_TYPE_NAME"] != "None"]

median_salaries = pdf_query1.groupby("EMPLOYMENT_TYPE_NAME")["SALARY"].median()

sorted_employment_types = median_salaries.sort_values(ascending=False).index

pdf_query1["EMPLOYMENT_TYPE_NAME"] = pd.Categorical(
    pdf_query1["EMPLOYMENT_TYPE_NAME"],
    categories=sorted_employment_types,
    ordered=True
)

```

[Stage 13:>

(0 + 1) / 1]

```

fig = px.box(
    pdf_query1,
    x="EMPLOYMENT_TYPE_NAME",
    y="SALARY",
    title="Salary Distribution by Employment Type",
    color_discrete_sequence=["#CC0000"],
    boxmode="group",
    points="outliers"
)

fig.update_layout(
    title=dict(
        text="Salary Distribution by Employment Type",

```

```

    font=dict(size=20, family="Arial Black", color="black"),
    x=0.5
),
xaxis=dict(
    title=dict(
        text="Employment Type",
        font=dict(size=14, family="Arial Black", color="black")
    ),
    tickangle=-45,
    tickfont=dict(size=12, family="Arial Black", color="black"),
    showline=True,
    linecolor="black",
    linewidth=2,
    mirror=True,
    showgrid=False,
    categoryorder="array",
    categoryarray=sorted_employment_types.tolist()
),
yaxis=dict(
    title=dict(
        text="Salary (1000 $)",
        font=dict(size=14, family="Arial Black", color="black")
    ),
    tickvals=[0, 50000, 100000, 150000, 200000, 250000, 300000, 350000, 400000, 450000, 500000],
    ticktext=["0", "50k", "100k", "150k", "200k", "250k", "300k", "350k", "400k", "450k", "500k"],
    tickfont=dict(size=12, family="Arial Black", color="black"),
    showline=True,
    linecolor="black",
    linewidth=2,
    mirror=True,
    showgrid=True,
    gridcolor="lightgray",
    gridwidth=0.5
),
font=dict(family="Arial", size=16, color="black"),
boxgap=0.7,
plot_bgcolor="white",
paper_bgcolor="white",
showlegend=False,

```

```
    height=500,  
    width=850,  
)  
  
# Show the figure  
  
fig.write_html("./output/Q1.html")  
fig.write_image("./output/Q1.png", width = 850, height = 500, scale=1)
```

Salary Distribution by Employment Type

