Artificial Intelligence and Machine Learning Job Analysis

Business Problem

As artificial intelligence (AI) and machine learning (ML) technologies continue to evolve and disrupt traditional business models, the global demand for AI talent has surged dramatically. However, this rapid expansion has introduced critical challenges for both job seekers and employers:

- **For Employers**: There is limited visibility into where the best AI talent resides, what qualifications and skills yield the best results, and how to competitively structure salaries and benefits. Companies struggle to identify which industries, job roles, and geographies are leading in AI hiring trends, making it difficult to benchmark their recruitment strategies and compensation packages.
- **For Job Seekers**: Professionals face uncertainty about which roles are in demand, what experience or education is needed to access high-paying opportunities, and how to strategically position themselves in a crowded, competitive market. Additionally, the rise of remote work and flexible employment models adds complexity to career planning.
- **For Educators and Policymakers**: There is a need for data to guide curriculum design, workforce training programs, and national strategies that align with the evolving AI labor market.

Core Problem Statement

How can stakeholders in the AI job ecosystem—employers, professionals, educators, and policymakers—leverage data-driven insights to align recruitment, career planning, and skill development with the current and future demands of the global AI and ML job market?

Dataset

Datasource-Kaggle

Dataset description-

work_year
The year the salary was reported. Covers salaries from 2020 through 2025.

experience_level
The seniority level of the employee at the time of reporting. Common values include:

- **EN**: Entry-level / Junior
- **MI**: Mid-level / Intermediate
- **SE**: Senior-level
- **EX**: Executive / Director

employment_type
The type of employment contract:

- **FT**: Full-time
- **PT**: Part-time
- **CT**: Contract
- **FL**: Freelance

job_title
The employee's specific job title (e.g., Data Scientist, ML Engineer, AI Specialist, Research Scientist).

remote_ratio
Indicates the percentage of remote work:

- **0**: No remote work (On-site)
- **50**: Hybrid (partially remote)
- **100**: Fully remote

company_location
The country where the company or employer is headquartered.

company_size
The size of the employing organization:

- **S**: Small (1–50 employees)
- **M**: Medium (51–500 employees)
- **L**: Large (501+ employees)

Data Analysis using MySQL

- **Name top 5 industry which are offering maximum salary?**

```
5   -- 1.Name top 5 industry which are offering maximum salary?
6   select industry, round(max(salary_usd),2) Max_Salary from job
7   group by industry order by Max_Salary desc limit 5;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch

industry	Max_Salary
Retail	399095
Automotive	398084
Real Estate	394917
Transportation	388754
Technology	383142

The top five industries offering the highest maximum salaries are Retail, Automotive, Real Estate, Transportation, and Technology. Retail leads with a peak salary of $399,095, followed closely by Automotive and Real Estate.

- **Which education level is associated with the highest average salary?**

```
9   -- 2. Which education level is associated with the highest average salary?
10  select education_required,round(avg(salary_usd),2) Avg_Salary from job
11  group by education_required order by Avg_Salary desc limit 1;
12
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

education_required	Avg_Salary
Master	117171.82

AI job roles requiring a **Master's degree** offer the highest average salary, approximately **$117,171.82**.

- **Which size of company have most number of employee having education of 'Master'?**

```
13      -- 3.Which size of company have most number of employee having education of 'Master'?
14 •    select company_size, count(*) Count from job where education_required='Master'
15      group by company_size order by Count desc limit 1;
16
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

company_size	Count
M	1268

Medium-sized companies (M) employ the highest number of individuals with a **Master's degree**, totaling **1,268 employees**.

- **What's the average years of experience required per job title?**

```
21      -- 5.What's the average years of experience required per job title?
22 •    select job_title,round(avg(years_experience),2) Avg_Years_Experience from job
23      group by job_title;
24
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

job_title	Avg_Years_Experience
AI Research Scientist	6.40
AI Software Engineer	6.23
AI Specialist	6.56
NLP Engineer	5.98
AI Consultant	6.10
AI Architect	6.50
Principal Data Scientist	6.13
Data Analyst	5.96
Autonomous Systems Engineer	6.09
AI Product Manager	6.09
Machine Learning Engineer	6.72
Data Engineer	6.29
Research Scientist	6.26
ML Ops Engineer	6.29
Robotics Engineer	6.48
Head of AI	6.51
Deep Learning Engineer	6.08
Data Scientist	6.34
Machine Learning Researcher	6.09
Computer Vision Engineer	5.95

Average experience by AI job title shows that most roles demand **6 to 6.5 years** of professional experience. Positions like **Machine Learning Engineer (6.72 years)** and **AI Specialist (6.56 years)** require the most experience, reflecting their technical complexity and strategic importance. Entry-level roles like **Data Analyst (5.96 years)** and **NLP Engineer (5.98 years)** require slightly less.

- **Top 5 countries offering remote work.**

```
36      -- 9.Top 5 countries offering remote work.
37 •    select company_location,count(*) Number_of_remote_jobs from job
38      where remote_ratio=100 group by company_location order by Number_of_remote_jobs desc limit 5;
39
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

company_location	Number_of_remote_jobs
China	271
Ireland	269
Austria	266
Sweden	262
India	261

The data reveals that **China, Ireland, Austria, Sweden, and India** are the top five countries offering the highest number of fully remote AI jobs, with China leading at **271 positions**.

- **What is the average salary by company size?**

```
40      -- 10.What is the average salary by company size?
41 •    select company_size,round(avg(salary_usd),2) Avg_Salary from job
42      group by company_size order by Avg_Salary desc;
43
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

company_size	Avg_Salary
L	130322.45
M	113600.24
S	102146.93

The data shows a clear correlation between **company size and average salary** in the AI sector. **Large companies (L)** offer the highest average salary at **$130,322.45**, followed by **medium-sized companies (M)** at **$113,600.24**, and **small companies (S)** at **$102,146.93**.

- **Which industry is providing most number of remote jobs?**

```
48      -- 12.Which industry is providing most number of remote jobs?
49 •    select industry,count(*) No_of_remote_jobs from job
50      where remote_ratio=100 group by industry order by No_of_remote_jobs desc limit 1;
51
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

industry	No_of_remote_jobs
Media	353

The **Media industry** leads in offering remote opportunities in the AI job market, with **353 fully remote positions**.

- **Top 10 companies with most job postings.**

```
52      -- 13.Top 10 companies with the most job postings.
53 •    select company_name,count(*) job_postings from job
54      group by company_name order by job_postings desc limit 10;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

company_name	job_postings
TechCorp Inc	980
Cognitive Computing	972
AI Innovations	964
Digital Transformation LLC	961
Future Systems	960
Quantum Computing Inc	960
Cloud AI Solutions	951
Predictive Systems	947
Smart Analytics	927
Advanced Robotics	925

The analysis reveals that **TechCorp Inc** leads with **980 AI job postings**, followed closely by **Cognitive Computing (972)** and **AI Innovations (964)**. These companies are at the forefront of AI hiring, indicating robust investment in AI talent and technology.

- **How many jobs list ‘Python’ as a required skill?**

```
56      -- 14.How many jobs list “Python” as a required skill?
57 •    select count(*) Python_jobs from job where required_skills like '%Python%';
58
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

Python_jobs
4450

The data shows that **4,450 AI-related jobs** list **Python** as a required skill, confirming its critical role in the AI and data science landscape. Python's simplicity, strong libraries (like TensorFlow, Pandas, and Scikit-learn), and widespread community support make it the preferred language for AI development.

- **What are the most frequent combinations of job title & location?**

```
59      -- 15.What are the most frequent combinations of job title and location?
60 •    select job_title,company_location, count(*) count from job
61      group by job_title,company_location order by count desc limit 10;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

job_title	company_location	count
Head of AI	Germany	58
Machine Learning Researcher	Japan	58
AI Product Manager	United Kingdom	58
AI Research Scientist	Denmark	57
Autonomous Systems Engineer	China	57
Head of AI	Ireland	54
Research Scientist	Denmark	53
Data Scientist	Austria	52
Machine Learning Researcher	Norway	51
AI Product Manager	Singapore	51

By analyzing job title and location combinations, we found that roles such as *Head of AI* in Germany and *Machine Learning Researcher* in Japan are the most frequent, each with 58 occurrences.

Exploratory Data Analysis by Python

- **Provide the information of datasets.**

```
#Checking information of datasets.
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 15000 entries, 0 to 14999
Data columns (total 18 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   job_id                 15000 non-null  object
 1   job_title              15000 non-null  object
 2   salary_usd             15000 non-null  int64
 3   experience_level       15000 non-null  object
 4   employment_type        15000 non-null  object
 5   company_location       15000 non-null  object
 6   company_size           15000 non-null  object
 7   employee_residence     15000 non-null  object
 8   remote_ratio           15000 non-null  int64
 9   required_skills        15000 non-null  object
 10  education_required     15000 non-null  object
 11  years_experience       15000 non-null  int64
 12  industry               15000 non-null  object
 13  posting_date           15000 non-null  object
 14  application_deadline   15000 non-null  object
 15  job_description_length 15000 non-null  int64
 16  benefits_score         15000 non-null  float64
 17  company_name           15000 non-null  object
dtypes: float64(1), int64(4), object(13)
memory usage: 2.1+ MB
```

- **Provide the statistical info of the data.**

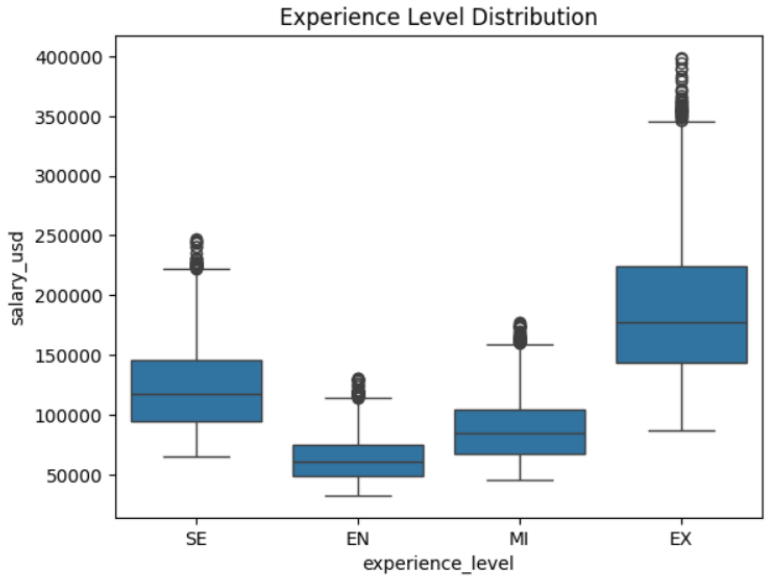
```
#Provide statistical information of datasets.
df.describe()
```

	salary_usd	remote_ratio	years_experience	job_description_length	benefits_score
count	15000.000000	15000.000000	15000.000000	15000.000000	15000.000000
mean	115348.965133	49.483333	6.253200	1503.314733	7.504273
std	60260.940438	40.812712	5.545768	576.127083	1.450870
min	32519.000000	0.000000	0.000000	500.000000	5.000000
25%	70179.750000	0.000000	2.000000	1003.750000	6.200000
50%	99705.000000	50.000000	5.000000	1512.000000	7.500000
75%	146408.500000	100.000000	10.000000	2000.000000	8.800000
max	399095.000000	100.000000	19.000000	2499.000000	10.000000

- **Distribution of salaries.**

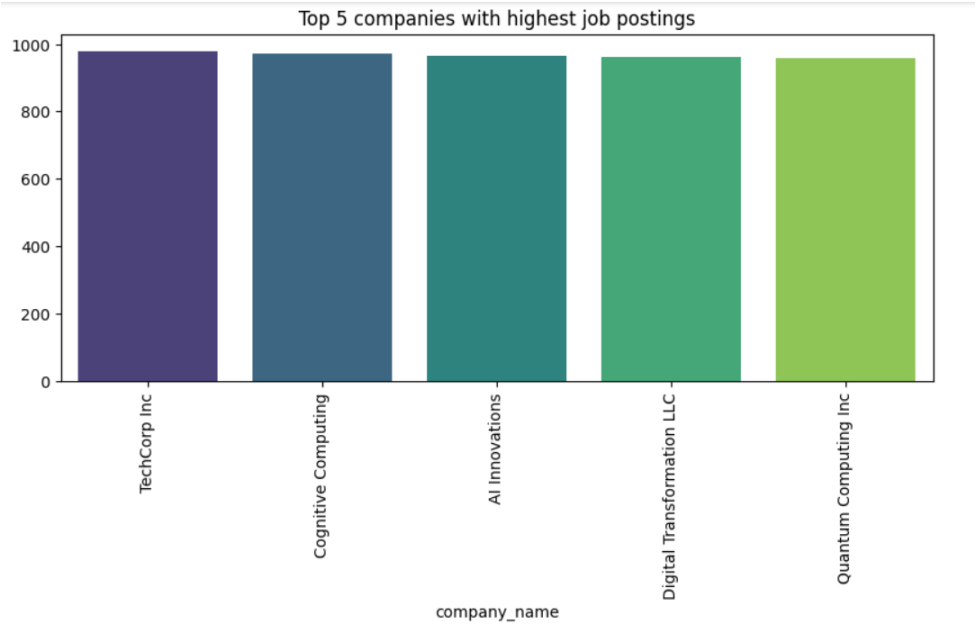
Analysis-The histogram reveals that most AI professionals earn between **$50,000 and $150,000 USD**, with the peak around **$75,000 to $100,000**. The distribution is **right-skewed**, indicating a smaller group earning very high salaries (up to $400,000). This skewness suggests that while lucrative opportunities exist, high compensation is concentrated in fewer roles or regions.

- **Experience wise salary.**



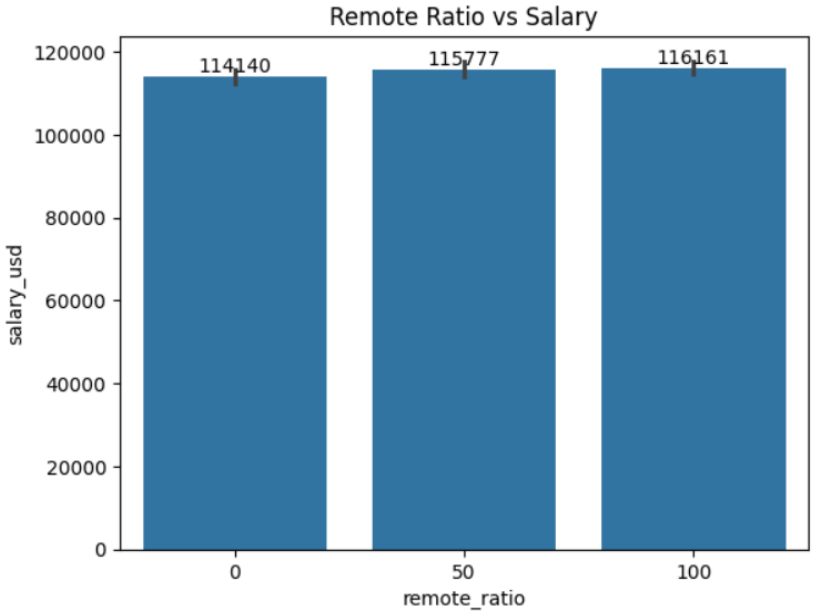
The boxplot reveals a clear positive correlation: as experience increases, so do salaries. Entry-level (EN) professionals earn the lowest, while Executive-level (EX) professionals earn the highest, with many earning above **$300,000 USD**. Senior-level (SE) and Mid-level (MI) roles show moderate compensation, with some overlap.

- **Select the top 5 companies with highest job postings.**



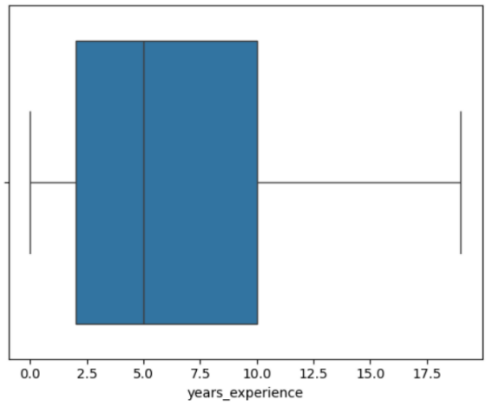
These are the top five companies with the highest number of job postings. These include **TechCorp Inc**, **Cognitive Computing**, and **AI Innovations**, each posting nearly 980–990 jobs.

- **What is the average salary according to remote ratio?**



Analysis-Salary comparisons across remote work ratios revealed a positive correlation between remote flexibility and compensation. Employees with a **100% remote ratio** earn the highest average salary ($115,777), and **on-site roles** (~$114,140).

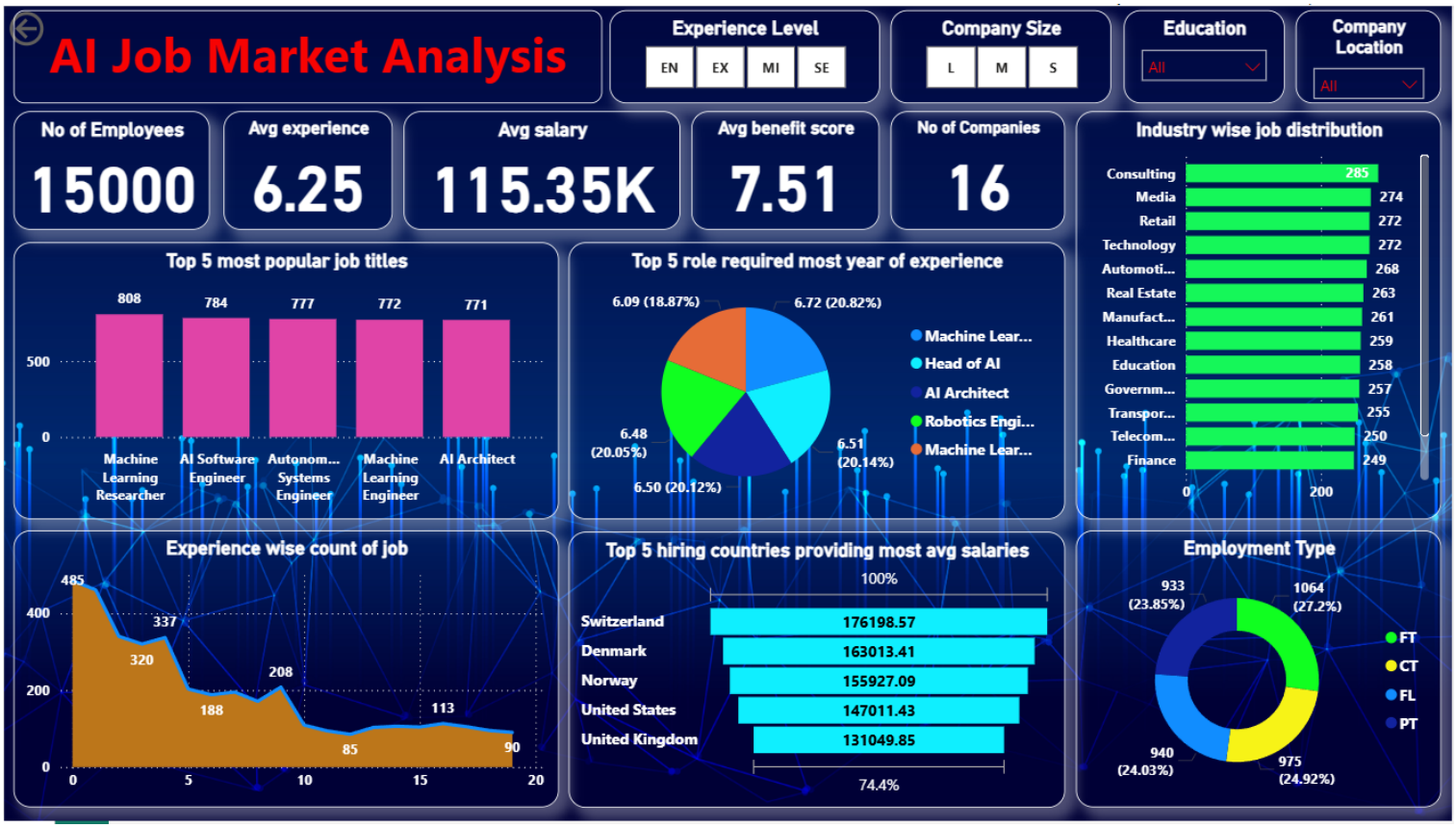
- **What is the average year of experience?**



Box plot of **years of experience** shows that most AI professionals have between **2 and 10 years** of experience, with a median around **6 years**. The distribution is moderately spread, indicating a balanced mix of mid-level and senior professionals in the market.

Power Bi

Created an interactive dashboard for highlighting visual representation of analysis.



Business Recommendation

Recommendation for job seekers-

- **Prioritize Advanced Education:** Pursue a Master's degree, as roles requiring this level of education offer the highest average salaries in the AI industry (approximately $117,171.82).
- **Focus on Python Proficiency:** Ensure strong proficiency in Python, as it is a critical skill listed in 4,450 AI-related job postings.
- **Consider Diverse Industries for High Salaries:** Don't limit your search to just the technology sector. Industries such as Retail, Automotive, Real Estate, and Transportation are emerging as top employers offering competitive salaries, with Retail leading at a peak salary of $399,095.
- **Target Mid-to-Senior Level Experience:** Most AI roles demand 6 to 6.5 years of experience. Plan for graduate education combined with relevant industry exposure to meet these expectations.

Recommendation for Employer & Recruiter-

- **Leverage Remote Work for Talent Acquisition:** Embrace and promote remote work options to access a broader talent pool, as countries across Asia and Europe are leading in remote AI job postings.
- **Prioritize Candidates with Advanced Degrees:** Master's degree holders command the highest average salaries and are heavily recruited by medium-sized companies. Tailor recruitment strategies to attract this talent pool.
- **Focus on Key Skills like Python:** Given that Python is a required skill in 4,450 AI-related jobs, prioritize candidates with strong Python proficiency.

Recommendations for Educators and Policymakers

- **Encourage AI Adoption Across Diverse Industries:** The analysis shows AI integration across various sectors like Retail, Automotive, Real Estate, and Media, indicating a need for broad AI education and training programs beyond just the tech industry.
- **Support Remote Work Infrastructure:** Policymakers should consider initiatives that support and facilitate remote work, as it is a growing trend in the AI sector globally.
- **Promote Advanced Degree Programs:** Highlight the value of Master's degrees in AI, as they correlate with higher earning potential and are in demand by companies.