

Final Report

Haoyu Yu

Introduction

As the AI and tech industry continues to grow, understanding salary distribution and the factors that influence it is crucial for both employers and employees. Several variables can impact salary, such as experience level, remote work, job title, company size, and geographical location. For organizations, knowing these factors can help in offering competitive salaries, while for professionals, it assists in career planning and salary negotiations. The dataset used in this analysis contains salary information for individuals working in the global AI and tech industry, spanning different roles, experience levels, employment types, and locations. The dataset includes data points such as salary (in both local currency and converted to USD), remote work ratios, company sizes, and the employee's country of residence. The following is an explanation of the important variables in the dataset to better understand the results.

Variable	Description
Work_year	The year the salary was paid
Experience_level	The experience level in the job during the year: <ul style="list-style-type: none">- EN: Entry-level / Junior- MI: Mid-level / Intermediate- SE: Senior-level / Expert- EX: Executive-level / Director
Employment_type	The type of employment for the role: <ul style="list-style-type: none">- PT: Part-time- FT: Full-time- CT: Contract- FL: Freelance
Remote_ratio	The amount of work done remotely: <ul style="list-style-type: none">- 0: No remote work (<20%)- 50: Partially remote/hybrid- 100: Fully remote (>80%)
Company_size	The number of people working in the company: <ul style="list-style-type: none">- S: Small (<50 employees)

Variable	Description
	- M: Medium (50-250 employees)
	- L: Large (>250 employees)

Based on this dataset, two questions worth exploring are proposed 1. What are the key factors that influence salary levels in the global AI and tech industry, and how do these factors interact to shape salary 2. Whether there are more interactions between different factors related to salary.

method

Data Acquisition

The dataset used in this analysis was obtained from the website [AI Jobs Salaries](#), which provides detailed salary data for various roles in the AI and tech industry. The dataset includes variables such as work year, experience level, job titles, salaries in local currencies and converted to USD, remote work ratios, company size, and employee location.

Data Cleaning and Wrangling

Using `dim(salaries_data)` function to determine the dimensions of the dataset. The dataset contains 53,841 pieces of salary data and 11 variables. Using `str(salaries_data)` to determine the data type of each variable. Using `head(salaries_data)` and `tail(salaries_data)` to observe the first few rows and last few rows of data. And then, using `colSums()` and `is.na(salaries_data)` functions to view missing data in the dataset. There are no missing data in this dataset. Using `summary(salaries_data)` to check the statistical results of the dataset and look for any unreasonable data.

By observing the dataset, I found that the `job_title` variable is not convenient for statistical analysis because the title of each job is different. The `salary` variable and `salary_currency` variable can be replaced by `salary_in_usd` variable. Therefore, delete `job_title`, `salary` and `salary_currency` variables, making the data set more concise.

Since variables `experience_level`, `remote_ratio`, `company_size` and `employee_residence` are categorical variables, these variables are created as factors to facilitate subsequent calls.

Results

Factors that affect salary

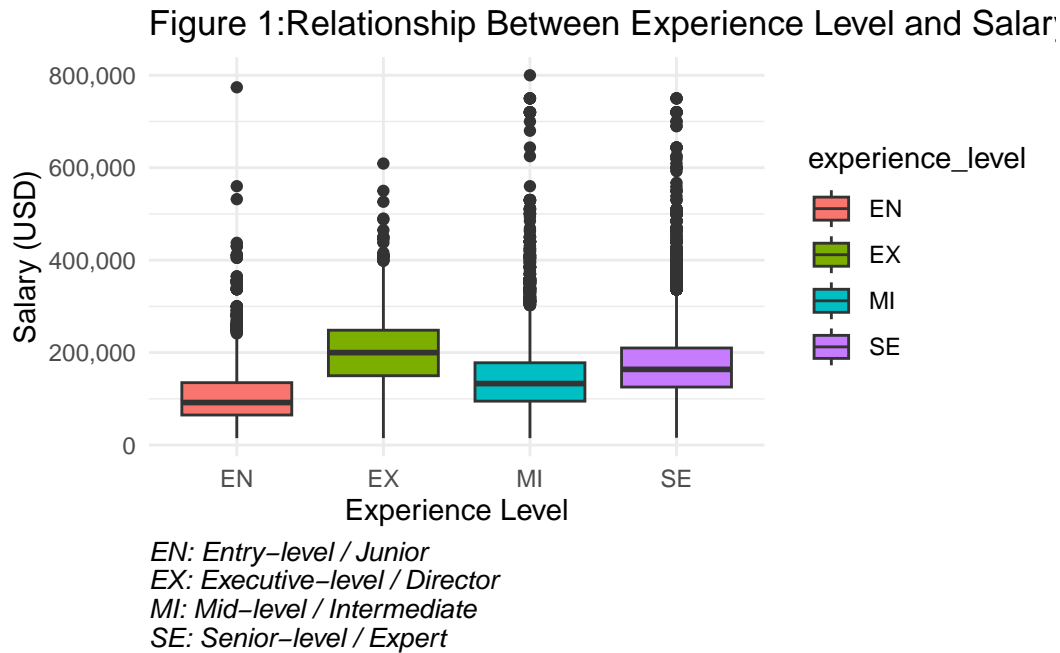


Figure 1: The box plot illustrates the relationship between experience levels and salary in the global AI and tech industry. Entry-level (EN) employees have the lowest median salary and the narrowest range, indicating a lower variation in earnings for junior positions. Executive-level (EX) employees exhibit the highest median salary and the largest salary range, reflecting a significant premium for leadership roles and strategic expertise. Mid-level (MI) salaries are slightly lower than Senior-level (SE) salaries but demonstrate a narrower range. Senior-level (SE) employees earn significantly more than entry-level (EN) positions and represent a bridge between managerial and technical expertise. The salary data aligns with industry norms where experience strongly correlates with potential salaries

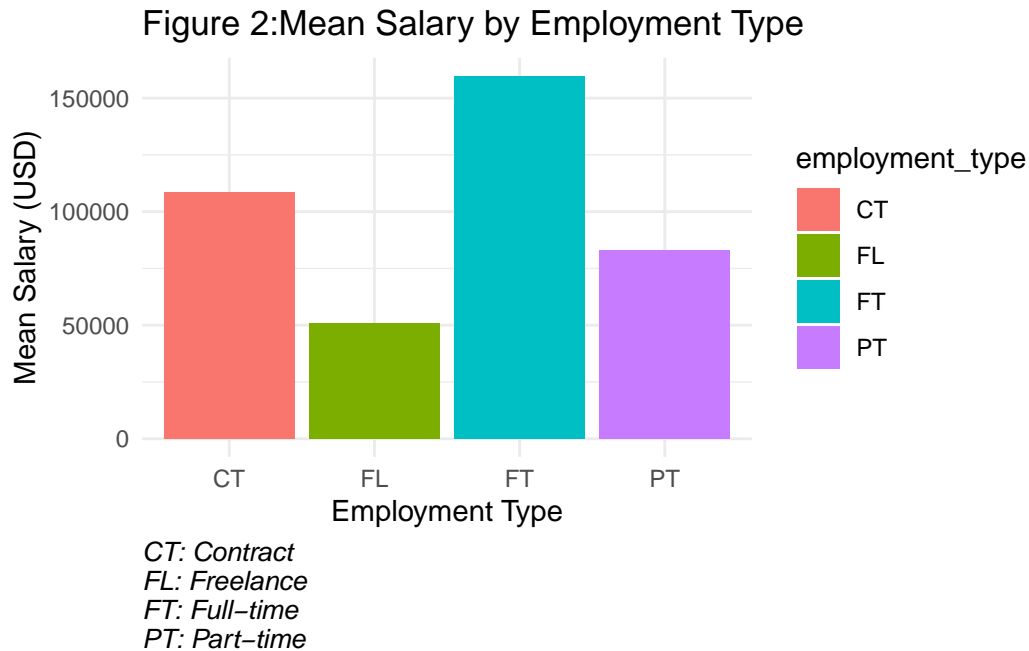


Figure 2: Full-time employees earn the highest mean salary among all employment types. This is likely due to the stability and benefits associated with full-time roles. Contract workers have the second-highest mean salary. This reflects the premium often paid for specialized or short-term expertise. Freelancers earn the lowest mean salary, while part-time workers earn slightly more than freelancers but significantly less than full-time or contract workers. This could be due to fewer hours worked or the lack of long-term stability. The data suggests that the type of employment significantly impacts salary levels, with more stable employment types commanding higher pay.

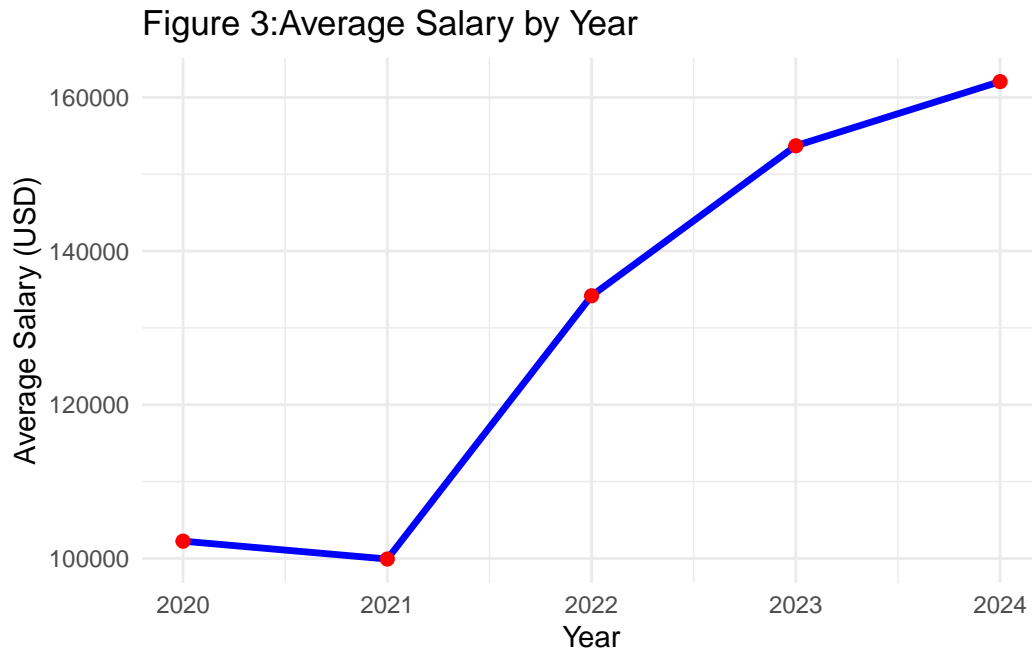


Figure 3: The average salary shows a steady increase from 2021 to 2024, with a particularly sharp rise between 2021 and 2022. The slower growth from 2023 to 2024 indicates a potential stabilization in salary increments. However, the slight decrease in 2021 compared to 2020 reflects the changing dynamics of the industry, which may be the impact of covid 19. The continuous increase in average salaries reflects the growing demand for skilled professionals in the AI and tech industry.



Table 2: Salary Statistics by Company Size (Mean, Median, SD, Min, Max, Count)

company_size	M	L	S
mean_salary	160086.66	152341.53	87671.74
median_salary	150000	136000	74500
salary_sd	72267.93	68403.63	57443.24
min_salary	15000	15000	15809
max_salary	800000	423000	416000
count	51719	1918	204

Figure 4: Medium-sized companies have the highest average salary (\$160,086.66) among all company sizes, followed by large companies with an average salary of \$152,341.53. Small companies pay significantly less, with an average salary of \$87,671.74. Medium-sized companies exhibit the widest salary range, with a minimum of \$15,000 and a maximum of \$800,000. Large companies have a narrower salary range, with a maximum salary of \$423,000. Small companies show the most limited salary range and lower variability, as evidenced by their lower standard deviation.

interactions between different factors

Figure 5: Mean Salary by Employment Type and Company S

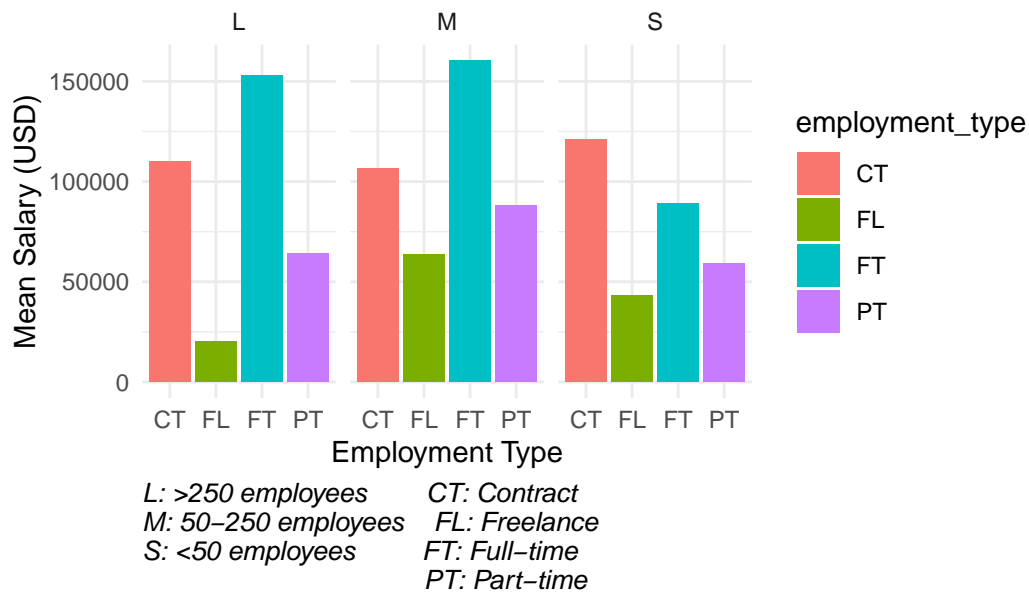


Figure 5: The average salary of FT and CT is much higher than the other two, especially in large companies. In both large and medium-sized companies, FT wages are higher than CT wages, but in small companies, CT salaries are higher than FT salaries. This may be because small companies will offer short-term, high-paying contracts to attract employees when there are projects, while long-term employees are paid less than these contract workers.

Figure 6: Mean Salary by Work Year and Employment Type

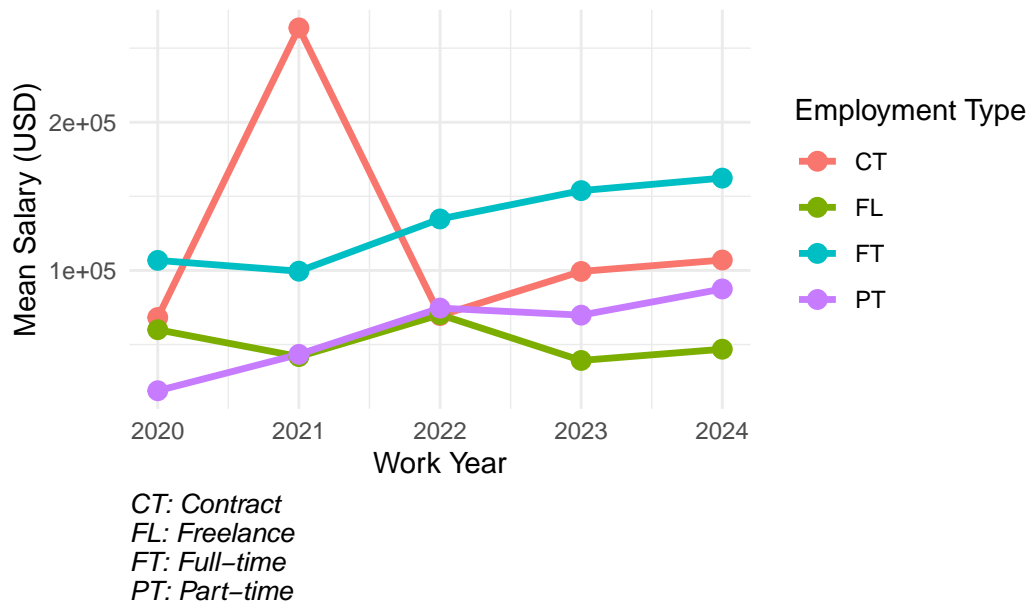
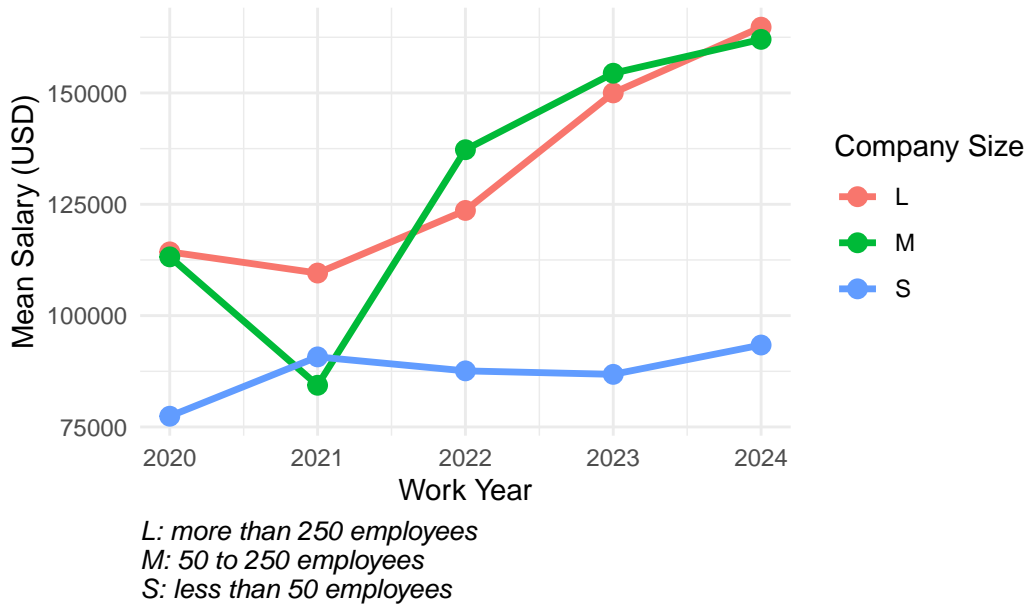


Figure 6: The average salary of FT shows a steady growth trend, rising year by year from 2020 to 2024. In 2021, the average salary of CT shows a clear peak, which is much higher than other years. The salary levels of the two employment types of FL and PT remain relatively low throughout the period. The salary peak of CT in 2021 may reflect a temporary surge in demand in certain specific industries or economic environments, such as an increase in project-based work.

Figure7: Mean Salary by Work Year and Company Size



From 2021 to 2024, the average salary of small companies is much lower than that of medium and large companies. The salary curve of medium and large companies is basically the same over time, and the growth trend is also greater than that of small companies. This shows that in the field of artificial intelligence, medium and large companies are better than small companies in terms of salary level and development prospects.

Conclusion and Summary

Conclusion

According to in-depth analysis, there are three main factors that affect salaries in the AI field: years of work experience, experience level, and employee type. As the field matures over time, salaries gradually increase, and as experience levels increase, from novice to department head, salaries also increase. Compared with part-time and freelance jobs, full-time jobs and contract workers are more professional and have higher barriers to entry, so salaries are relatively high.

When studying the interaction between different factors that affect salary, I found something interesting. First, when analyzing the relationship between company size and experience level, small companies' overall income level is not as good as that of medium and large companies. However, the average salary of their contract workers is higher than that of full-time employees, which is the opposite of medium and large companies. After research, I think there are two main reasons for this difference. On the one hand, contract workers' positions usually lack

stability, have no long-term employment security, and face higher career risks. In order to attract talents, small companies will offer higher salaries to compensate for this uncertainty. In addition, small companies may need contract workers to quickly fill technical vacancies for specific projects, so they are more willing to pay a premium. On the other hand, medium and large companies often offer attractive salaries in full-time positions to attract top talents, and increase total compensation through benefits, bonuses, and equity incentives. Contract workers usually cannot enjoy these additional benefits and their total income is lower than that of full-time employees.

Second, the interaction between years of work experience and company size is also worth noting. From 2021 to 2024, the average salary of all companies has increased, and the growth rate of medium and large companies is greater. However, in 2021, the salaries of medium and large companies have all declined, while small companies have grown rapidly in this year. This may be because in 2021, due to the epidemic, economic growth was slow, and medium and large companies took measures to cut salaries, while small companies, due to their small size, had a steady increase in average salaries.

Summary

This report mainly discusses the factors that affect wages in the field of artificial intelligence and the relationship between these factors. After analysis, interesting results were obtained, which also provides better data guidance for those who are about to work in the field of artificial intelligence. However, in order to obtain more accurate results and predict future salary trends in the field of artificial intelligence, more data and more accurate models are needed in the future.

Reference

1. The Global AI, ML, Data Science Salary Index for 2024. (n.d.). [aijobs.net.
https://aijobs.net/salaries/](https://aijobs.net/salaries/)