

The Global Impact of Artificial Intelligence: Trends, Data Insights, and Future Outlook

The main objectives of this study are to:

1. **Measure how AI tool adoption rates are growing globally** and how they differ by **country, industry, and firm size**.
2. **Identify countries and industries leading AI investment and readiness**, based on indicators such as talent, infrastructure, research, and governance.
3. **Examine the impact of AI on the labor market**, focusing on automation risk, skill demand, salary distribution, and work flexibility.
4. **Assess the role of GDP, R&D investment, and government AI policies** in accelerating AI adoption and national AI readiness.
5. **Apply clustering techniques to group countries and job roles** based on AI adoption, investment levels, and workforce characteristics, in order to identify distinct AI development and employment patterns.
6. **Provide data-driven insights** to support future AI workforce planning, business strategy, and public policy decision-making.

Data Collection

Data Collection

This study relies exclusively on secondary data obtained from internationally recognized, open-access sources to ensure reliability, transparency, and cross-country comparability.

- **Kaggle:**
AI tool adoption, AI Index ,AI jobs, AI Impact 2030.
- **OECD:**
Country-level research and development (R&D) expenditure data.
- **World Bank:**
Gross Domestic Product (GDP) .

The datasets collectively capture **technological adoption, economic capacity, innovation investment, and labor market outcomes**, allowing a comprehensive analysis of global AI adoption.

Methodology

A quantitative and exploratory research design was applied using **Python as the primary analytical tool**. All data processing, visualization, and modeling were conducted programmatically to ensure transparency, reproducibility, and analytical rigor.

1. Data Cleaning and Preparation (Python)

Data preprocessing was performed using Python libraries such as **Pandas** and included:

- Handling missing values by removing records with incomplete key variables
- Standardizing country identifiers to ensure consistency across datasets
- Selecting relevant variables and restructuring data for year-based analysis
- Merging datasets from Kaggle and the World Bank using common country and year identifiers

These steps ensured data quality and consistency prior to analysis.

2. Exploratory Data Analysis and Visualization (Python)

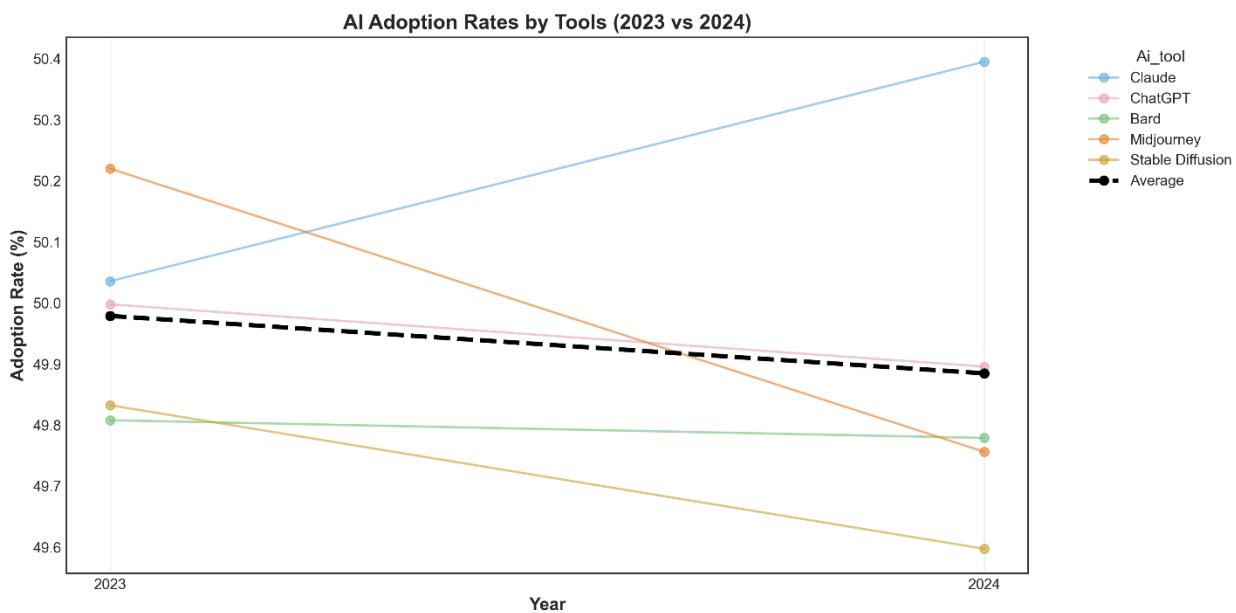
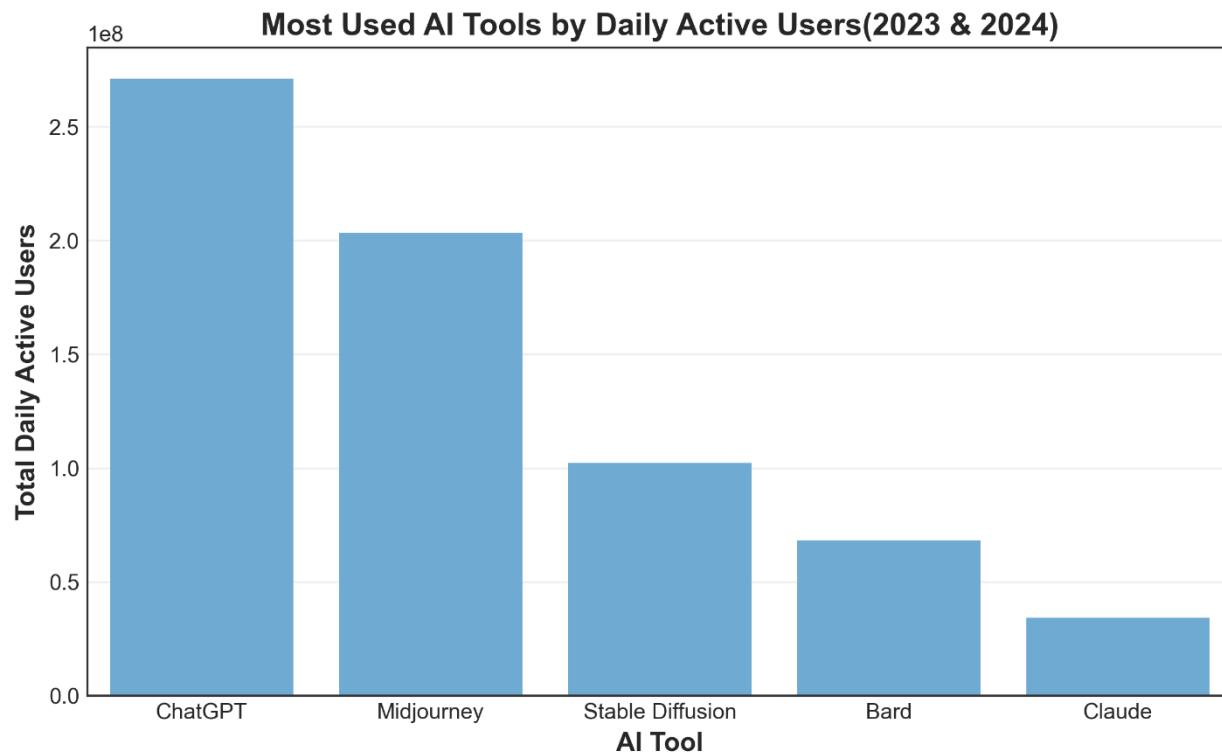
Exploratory Data Analysis (EDA) was conducted to identify patterns, trends, and relationships within the data.

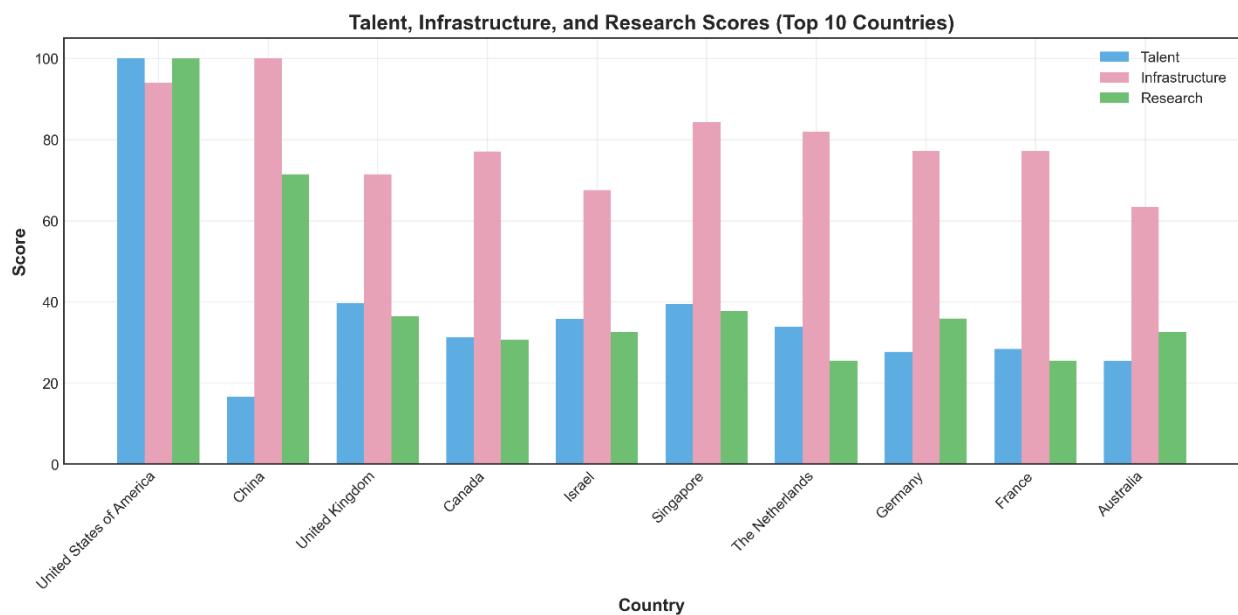
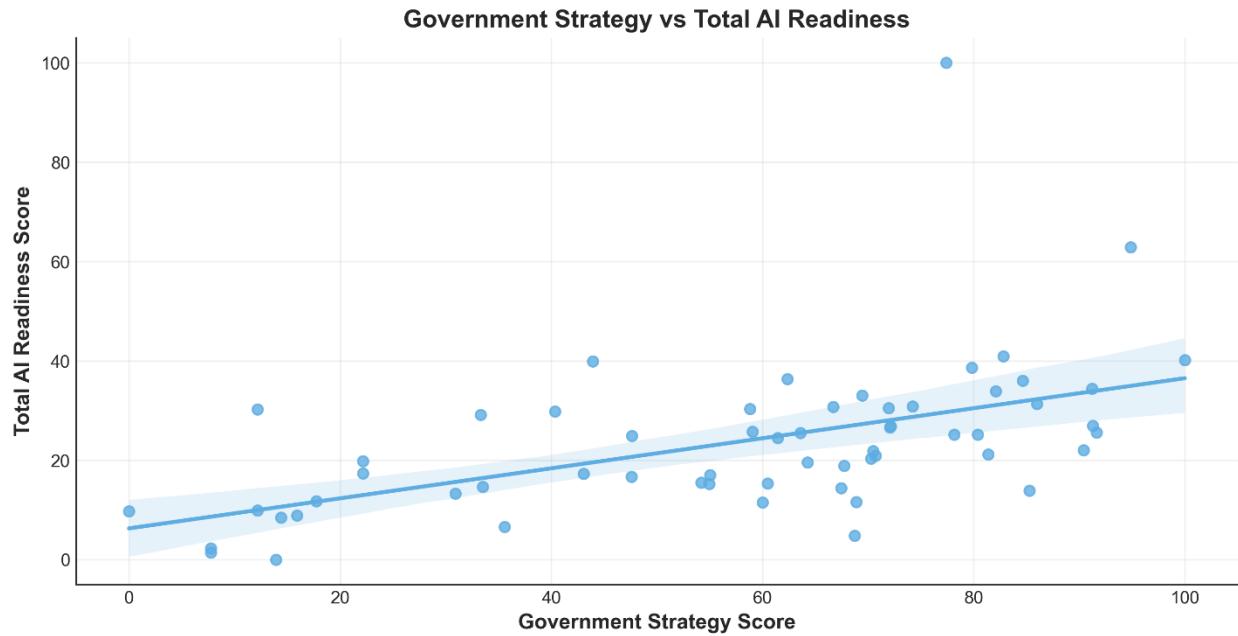
- **Trend analysis** of global AI tool adoption growth
- **Comparative analysis** across countries, industries, and firm sizes
- **Correlation analysis** between AI adoption, GDP, R&D expenditure, and government AI indicators

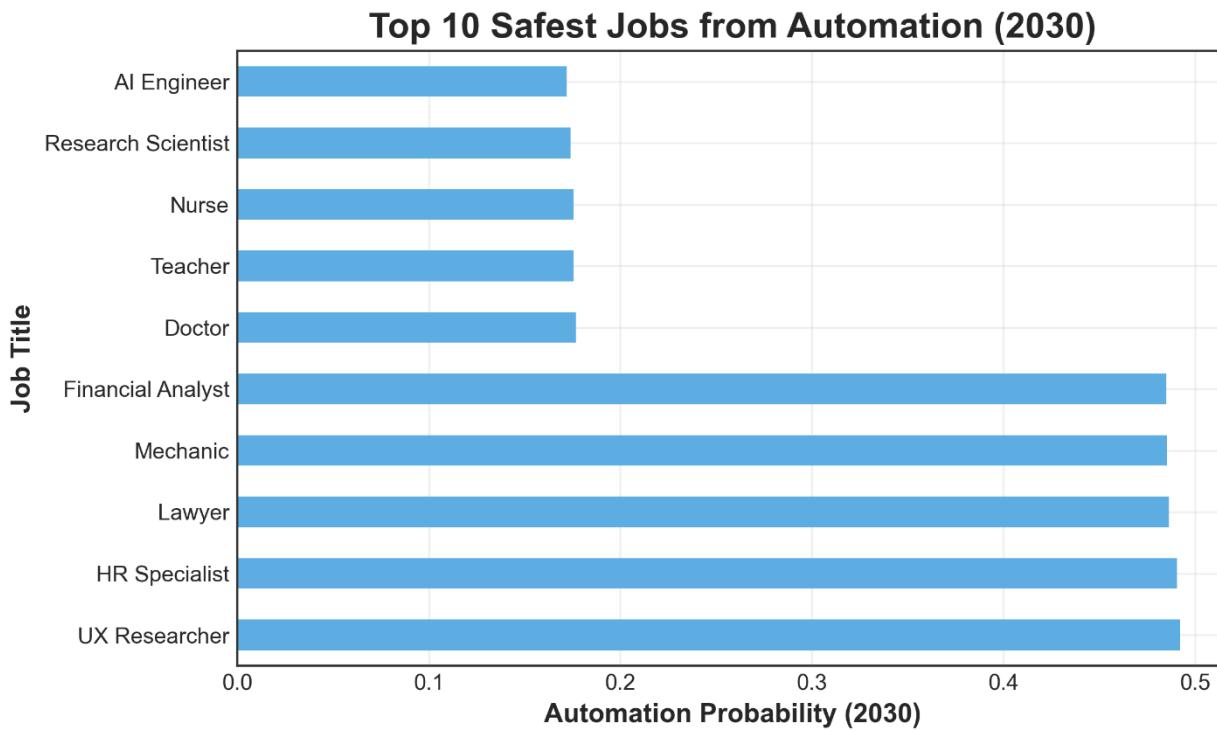
All visualizations were created in **Python using Matplotlib and Seaborn**, including:

- Line charts for adoption trends
- Bar charts for industry and regional comparisons
- Heatmaps for country–industry AI adoption intensity
- Scatter plots to examine relationships between economic indicators and AI readiness

These visualizations formed the analytical foundation for further modeling.







3. Clustering Analysis (K-Means in Python)

To uncover hidden structures beyond descriptive statistics, **K-Means clustering** was applied using **Scikit-learn**.

AI Job Role Clustering

AI job roles were clustered based on:

- Average salary
- Years of experience
- Remote work ratio

Prior to clustering, all variables were standardized to prevent scale bias. The optimal number of clusters was determined using the **Elbow Method** and validated with clustering performance metrics.

This resulted in **three distinct AI job clusters**:

- **Cluster 1 – Senior, High-Paying & Flexible Roles**

This cluster represents highly experienced AI professionals with an average salary of approximately **\$183,000** and over **13 years of experience**. Remote and hybrid work

options are almost equally available, indicating high flexibility. The cluster demonstrates that **experience is the strongest driver of salary and work flexibility** in the AI job market.

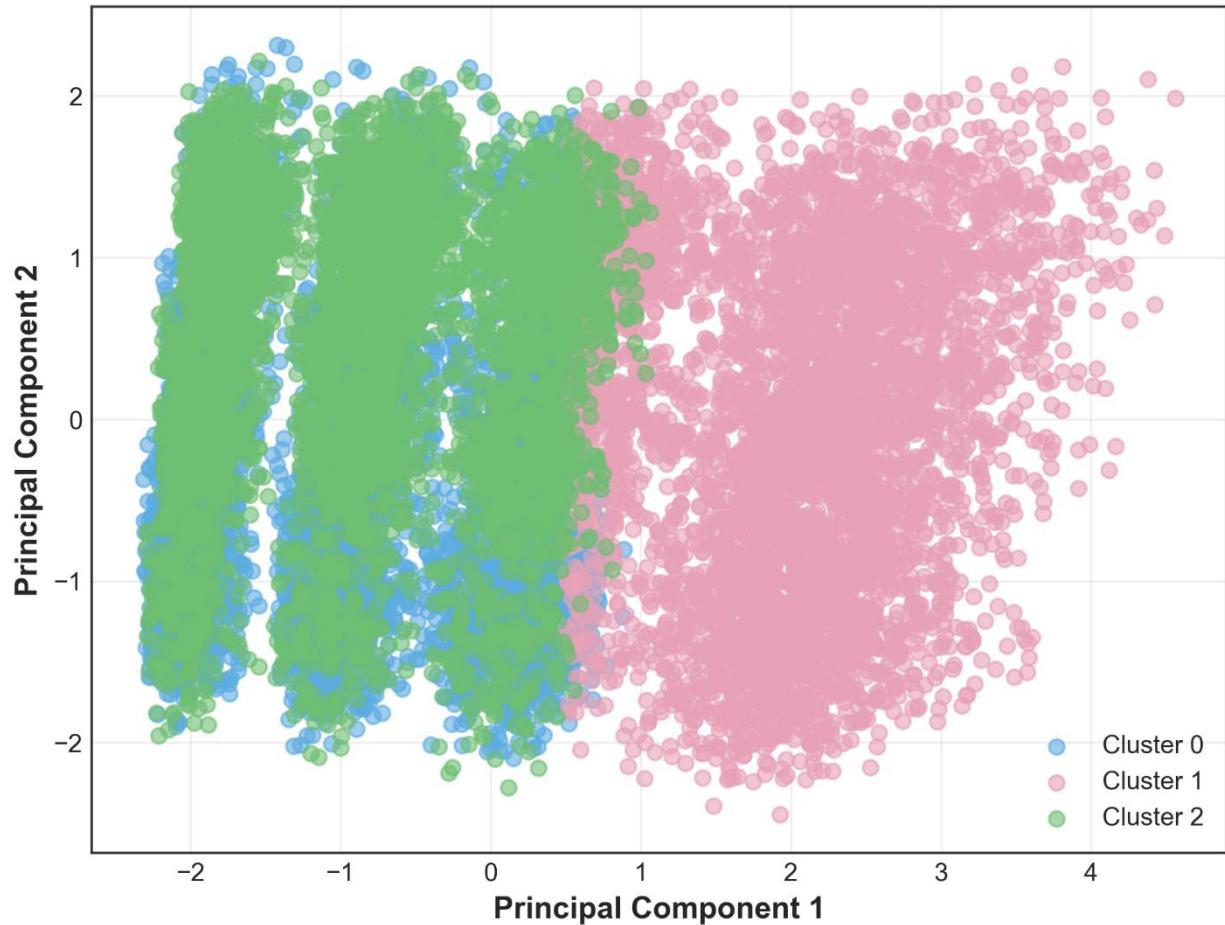
- **Cluster 0 – Entry-Level, Lower Salary & Highly Remote Roles**

This cluster consists of early-career AI professionals earning an average salary of around **\$80,000**. While experience levels are similar to Cluster 2, this group stands out due to its **very high remote work ratio**, making it the most remote-friendly cluster. The results suggest that **remote work often compensates for lower salaries** at early career stages.

- **Cluster 2 – Entry-Level, Higher Salary & Low Remote Work Roles**

This cluster also represents entry-level roles but with a higher average salary of approximately **\$88,000**. However, remote work availability is significantly lower. This cluster highlights a **trade-off between higher pay and reduced work flexibility** at early career levels.

PCA Visualization of AI Job Clusters



	salary_usd	remote_ratio	years_experience	benefits_score
0	80794.07	71.55	3.21	7.5
1	183136.17	51.65	13.13	7.5
2	88301.45	25.6	3.05	7.51

Conclusion

- ChatGPT has the highest number of daily active users in 2023 and 2024, indicating strong demand for conversational and productivity-focused AI tools.
- Claude has experienced rapid adoption between 2023 and 2024, showing dynamic growth in the AI landscape.
- AI adoption across industries shows technology leading, followed by Agriculture, healthcare, and traditional industries like retail and manufacturing, highlighting AI's expanding role in efficiency and innovation.
- GDP and AI readiness have a positive relationship, but smart strategy, talent, and investment can allow some lower-GDP countries to outperform expectations.
- AI automation risk is highest for repetitive, rule-based jobs such as retail workers, security guards, construction workers, and truck drivers. Jobs requiring creativity, judgment, and emotional intelligence, like doctors and AI engineers, are safer.
- Clustering analysis of AI roles shows that entry-level salaries vary with remote work availability: higher remote work often comes with lower pay, while lower remote work can be associated with higher pay.