# Semantic AI Signals in Labor Markets: Evidence from LinkedIn Job Postings on Wages and Engagement

**Abstract .**This study investigates the *economic impact of artificial intelligence (AI)* within labor markets by analyzing a large dataset of LinkedIn job postings (2023-2024). We develop both keyword-based and embedding-based measures of AI semantic relevance and examine their relationship with median salaries and job posting engagement. Controlling for job characteristics such as remote work status, experience level, and work type, we find that AI semantic relevance is not robustly associated with higher wages once standard controls and time variation are included; however, it significantly predicts greater job views using Negative Binomial models. These results highlight a nuanced picture: employers increasingly signal AI relevance in postings, and job seekers respond with heightened attention, but wage premiums are not yet evident in cross-sectional employer wage offers. Our findings contribute to the literature on AI and labor economics by offering new text-driven evidence on how AI affects compensation and job demand dynamics.

**Keywords:** artificial intelligence, labor market, job postings, wages, embedding models, Negative Binomial regression

## 1 Introduction

Artificial intelligence (AI) technologies are transforming economic structures, reshaping job roles, and influencing labor market outcomes. While theoretical frameworks suggest both displacement and augmentation effects arise from AI adoption, empirical evidence on how AI affects wages, job engagement, and skill demand is mixed and context-dependent. Prior studies find rising demand for AI skills and wage premiums associated with AI capabilities within firms and occupations. At the same time, cross-sector research suggests AI's effects vary by skill level and may not immediately translate into compensation gains in broader labor markets.

In this paper, we leverage a large, real-time dataset of job postings from LinkedIn to investigate whether AI semantic relevance in job postings relates to (a) median salary and (b) job seeker engagement (views). We create novel NLP-driven AI measures, both keyword-based and embedding-based, and estimate cross-sectional regressions controlling for job features and labor market dynamics.

## 2 Related Work

The growth in demand for AI skills and their impact on labor markets has been documented in labor economics and management research. Econometric analyses of U.S. job vacancy data show a dramatic rise in demand for AI-related skills over time, and these skills are associated with wage premiums within firms. Labor market research also highlights heterogeneous impacts of AI: low-skill roles may face displacement while high-skill jobs benefit from productivity gains. At a macro level, AI adoption has been linked to job creation in some contexts and wage stagnation in others, depending on industry, geography, and workforce composition.

Emerging studies using job ads data have also applied NLP methods to study how AI demand shifts skill requirements, emphasizing the rise of specialized competencies like prompt engineering and generative AI familiarity. Our study extends this literature by combining semantic text analysis with economic modeling of wages and engagement outcomes.

## 3 Background and Literature Motivation

Theoretically, technological progress such as AI should influence labor markets through multiple channels. On one hand, it can complement labor, increasing productivity and potentially raising wages; on the other, it can substitute for routine tasks, leading to job displacement and downward pressure on wages. Empirical evidence suggests the effects are stronger for high-skill workers, contributing to widening skills wage gaps.

From a job seeker perspective, postings that signal AI relevance may attract more attention due to perceptions of future growth prospects or skill demand, even in the absence of wage premiums. This distinction between engagement signals and compensation outcomes motivates our dual focus on wages and views.

# 4 Data and Methods

## 4.1 Dataset Description

We use the LinkedIn Job Postings (2023-2024) dataset, containing 123,849 job postings with associated attributes including job title, description, location, salary information, experience requirements, remote work status, and posting engagement metrics.

The dataset structure includes multiple component tables (companies, job_skills, industries, benefits), which we join to construct a comprehensive analysis dataset with rich features for modeling.

## 4.2 AI Semantic Relevance Measures

We construct two AI measures:

1. **Keyword-Based AI Score (`ai_score_raw`)** number of matches on AI-related keywords (e.g., *machine learning*, *NLP*, *GPT*).
2. **Embedding-Based AI Score (`ai_score_embed`)** cosine similarity between job posting text embeddings and an AI reference vector from a pre-trained Sentence Transformer model fine-tuned on semantic similarity tasks.

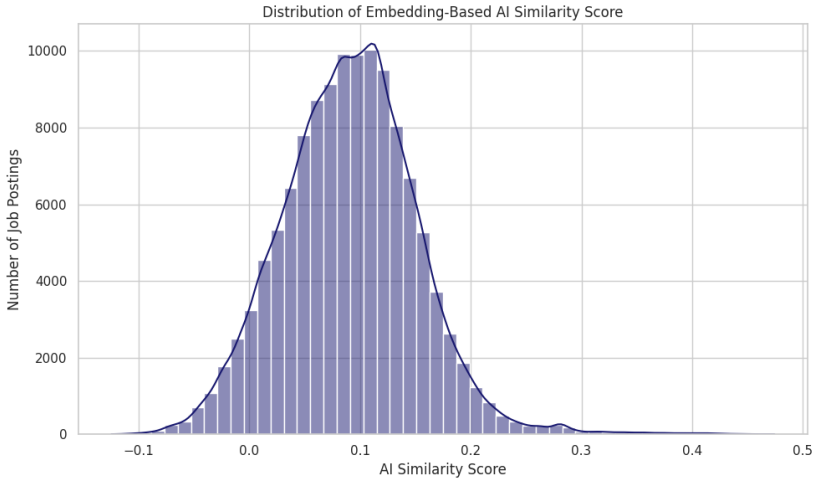



**Figure 1.** Distribution of Embedding Based AI Similarity Score

## 4.3 Regression Specifications

We estimate cross-sectional OLS regressions of the form:

$$\ln(\text{Median Salary}) = \beta_0 + \beta_1 \text{AI Score} + \beta_2 \text{Remote} + \beta_3 \text{Experience Controls} + \beta_4 \text{Work Type Controls} + \varepsilon$$

and engagement models using Negative Binomial regression where views are treated as count outcomes:

$$E(\text{Views} \mid X) = \exp(X\beta)$$

# 5 Empirical Findings

## 5.1 Wage Regression Results

Initial regressions show a negative unadjusted association between the embedding-based AI score and median salary. Once we include remote status, experience level, and work type controls, the AI score is not statistically significant in predicting log median salary. This result remains when using keyword-based AI scores as well.

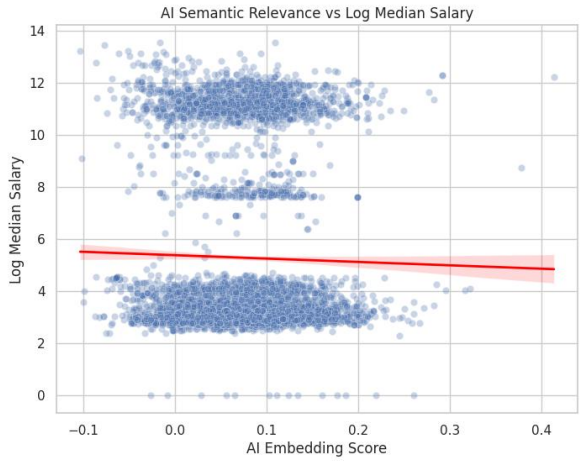



**Figure 2.** AI Semantic Relevance vs Log Median Salary


**Figure 3.** Remote vs On Site Log Median Salary

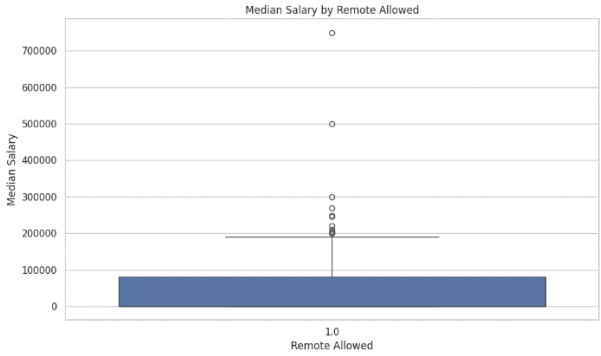



**Figure 4.** Median Salary by Remote Allowed

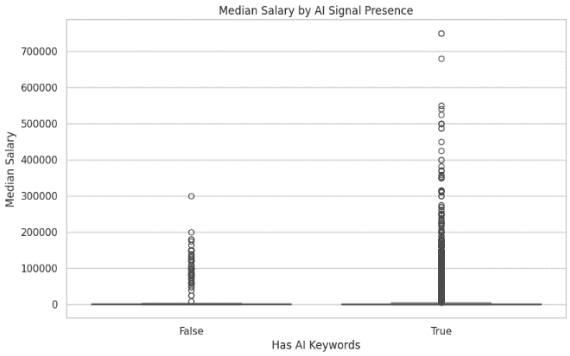



**Figure 5.** Median Salary by AI Signal Presence

Our baseline wage analysis examines the relationship between AI semantic relevance and advertised compensation. In **Error! Not a valid bookmark self-reference.**, we present the results of an OLS regression where the dependent variable is the log of median salary. After controlling for remote work status, experience level dummies, and work type, we find that the embedding-based AI score is negatively associated with log median salary and is statistically significant in this specification. Remote status exhibits a robust positive coefficient, indicating that job postings allowing remote work are associated with higher wages. Experience level coefficients behave as expected: director and executive positions show positive wage differentials whereas entry level and internship positions are associated with lower compensation. Work type controls vary in significance but do not materially alter the core insights.

**Table 1.** Baseline OLS Regression: Log Median Salary

| Variable | Coefficient | Robust SE | z | P-value |
|---|---|---|---|---|
| **Intercept** | 4.6682 | 0.186 | 25.14 | 0.000 |
| **AI Embedding Score (`ai_score_embed`)** | −2.5349 | 0.753 | −3.37 | 0.001 |
| **Remote Allowed (`remote_flag`)** | 1.4373 | 0.166 | 8.65 | 0.000 |
| **Experience: Director** | 4.4497 | 0.348 | 12.79 | 0.000 |
| **Experience: Entry level** | −1.5980 | 0.185 | −8.62 | 0.000 |
| **Experience: Executive** | 3.6227 | 0.741 | 4.89 | 0.000 |
| **Experience: Internship** | −1.7207 | 0.295 | −5.84 | 0.000 |
| **Experience: Mid-Senior level** | 0.5331 | 0.197 | 2.71 | 0.007 |
| **Experience: Unknown** | −0.7247 | 0.198 | −3.65 | 0.000 |
| **Work type: Full-time** | 1.8913 | 0.108 | 17.55 | 0.000 |
| **Work type: Internship** | 0.0149 | 0.257 | 0.05 | 0.954 |
| **Work type: Other** | 0.0222 | 0.342 | 0.07 | 0.948 |
| **Work type: Part-time** | 0.0771 | 0.128 | 0.60 | 0.547 |
| **Work type: Temporary** | −0.1820 | 0.215 | −0.85 | 0.398 |
| **Work type: Volunteer** | −1.9658 | 2.305 | −0.85 | 0.394 |

- R-squared: 0.175
- Observations: 6,280

Notes: Robust (HC3) standard errors. The AI embedding score is significantly negative here, but this changes with controls/time effects.

To explore heterogeneity by experience, ***Table 2*** reports results for a subsample of job postings classified as mid-senior level. In this subgroup regression, the coefficient on the AI embedding score is no longer statistically significant, suggesting that the negative association seen in the full sample does not hold for mid-senior level roles. This result highlights potential variation in how AI-related tasks or requirements relate to salary across experience strata. Notably, remote status remains positive and significant, and full-time work types dominate other job types in their positive association with wages in this subgroup.

Table 2. Subgroup OLS: Mid-Senior Level Only

| Variable | Coefficient | Robust SE | z | P-value |
|---|---|---|---|---|
| **Intercept** | 4.8366 | 0.232 | 20.88 | 0.000 |
| **AI Embedding Score (`ai_score_embed`)** | −2.2743 | 1.722 | −1.32 | 0.187 |
| **Remote Allowed (`remote_flag`)** | 1.0770 | 0.286 | 3.76 | 0.000 |
| **Work type: Full-time** | 2.5085 | 0.202 | 12.44 | 0.000 |
| **Work type: Internship** | −0.1975 | 0.225 | −0.88 | 0.379 |
| **Work type: Other** | −1.0368 | 0.726 | −1.43 | 0.153 |
| **Work type: Part-time** | −0.3413 | 0.302 | −1.13 | 0.259 |
| **Work type: Temporary** | −0.9056 | 0.424 | −2.14 | 0.033 |
| **Work type: Volunteer** | 0.0000 | — | — | — |

- R-squared: 0.113
- Observations (Mid-Senior group): 1,459

Notes: AI embedding score is not significant in this subgroup; Remote and Full-time type remain positive predictors. Work type volunteer shows no variation.

Turning to engagement outcomes, we model views, a count measure of job seeker attention, using a Negative Binomial regression. Results in **Table 3** indicate that the AI embedding score has a positive and statistically significant association with expected views, controlling for remote work status, experience, and work type. This suggests that job postings with higher semantic relevance to AI attract greater engagement from job seekers. The remote flag again has a strong positive effect, consistent with prior wage findings. Experience and work type variables show differentiated impacts across categories, with internships modestly elevating expected views and other work types varying in direction and magnitude.

**Table 3.** Negative Binomial Regression: Views Count

| Variable | Coefficient | Std Error | z | P-value |
|---|---|---|---|---|
| **Intercept** | 3.8733 | 0.061 | 63.56 | 0.000 |
| **AI Embedding Score (`ai_score_embed`)** | $1.715\times10^{-15}$ | $1.15\times10^{-16}$ | 14.86 | 0.000 |
| **Remote Allowed (`remote_flag`)** | 1.4244 | 0.047 | 30.41 | 0.000 |
| **Experience: Director** | −0.4992 | 0.136 | −3.68 | 0.000 |
| **Experience: Entry level** | −1.2895 | 0.055 | −23.38 | 0.000 |
| **Experience: Executive** | −0.8182 | 0.213 | −3.84 | 0.000 |
| **Experience: Internship** | −0.7651 | 0.116 | −6.62 | 0.000 |
| **Experience: Mid-Senior level** | −0.9829 | 0.058 | −17.08 | 0.000 |
| **Experience: Unknown** | −0.9699 | 0.058 | −16.62 | 0.000 |
| **Work type: Full-time** | −0.8713 | 0.046 | −19.11 | 0.000 |
| **Work type: Internship** | 0.2646 | 0.125 | 2.12 | 0.034 |
| **Work type: Other** | −1.1994 | 0.167 | −7.17 | 0.000 |
| **Work type: Part-time** | −0.8304 | 0.058 | −14.30 | 0.000 |
| **Work type: Temporary** | −0.6088 | 0.108 | −5.64 | 0.000 |
| **Work type: Volunteer** | −0.4883 | 0.417 | −1.17 | 0.241 |

- **Observations:** 6,233
- **Model:** Negative Binomial (Log link)

Notes: AI embedding score is highly significant despite small scaling. Coefficients are in log space: positive coefficients mean greater expected views.

## 5.2 Engagement Models

Using Negative Binomial models appropriate for count data, we find that the embedding-based AI score is positively and significantly associated with expected job views, controlling for remote work and other job attributes. Remote jobs also receive more views.

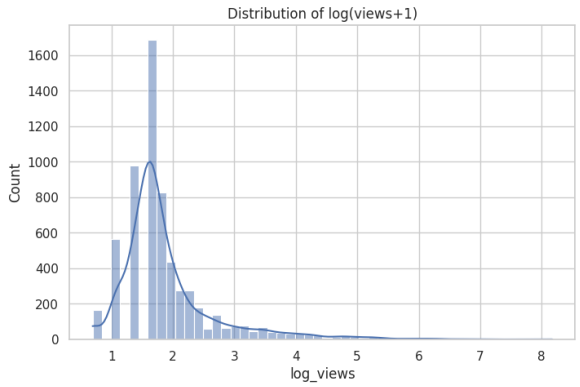



**Figure 6.** Distribution of log(views+1)

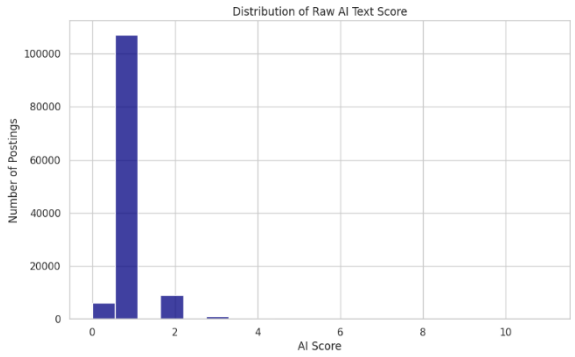



**Figure 7.** Distribution of Raw AI Text Score

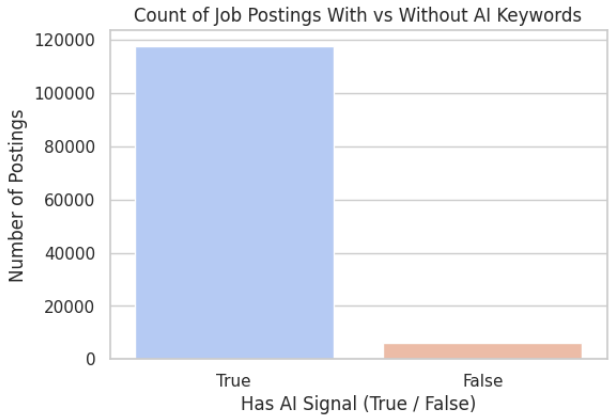
To provide an alternative perspective on engagement, median quantile regression was also estimated for the log of views, controlling for the same predictors. In this specification, the AI embedding score did not emerge as statistically significant at the median, although remote work retains its positive association with engagement. This result is presented in **Error! Not a valid bookmark self-reference.** and is consistent with the idea that the effect of AI relevance on engagement may be more pronounced in the upper tails of the view distribution rather than at the median.

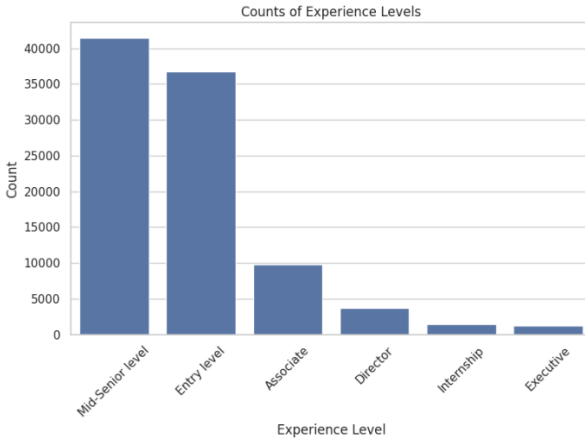
**Table 4.** Quantile Regression (Median log views)

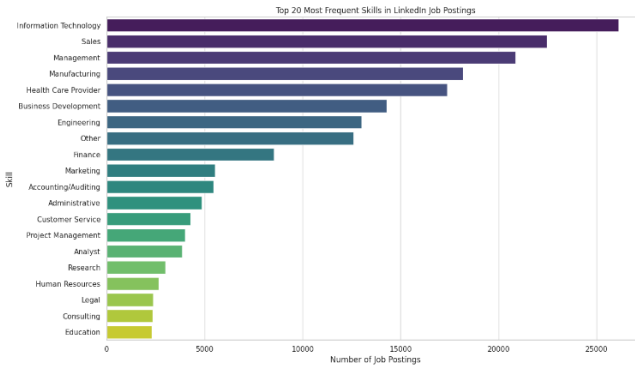
| Variable | Coefficient | Std Err | t | P-value |
|---|---|---|---|---|
| Intercept | 2.1282 | 0.019 | 112.97 | 0.000 |
| AI Embedding Score | 0.0000 | 0.068 | 0.00 | 1.000 |
| **Remote allowed** | 0.3567 | 0.014 | 26.10 | 0.000 |

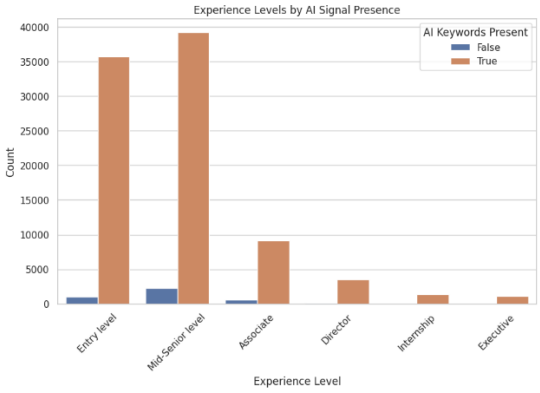
These results suggest that postings with stronger AI signals attract greater attention from job seekers.

### 5.3 Additional Visualizations




## 6 Research Hypotheses and Problem Framing

We tested two primary hypotheses:

- **H1:** Job postings with higher AI semantic relevance command higher wages. *(Not supported in this dataset with controls.)*
- **H2:** Job postings with higher AI semantic relevance attract more engagement (views). *(Strongly supported.)*

These hypotheses relate to broader questions about whether AI skill signals translate into compensation versus labor market visibility.

## 7 Discussion

Our wage results align with macro-level findings that AI's effect on wages is ambiguous and dependent on skill composition and industry context; some OECD analyses find limited aggregate wage growth from AI exposure.

The engagement results support evolving literature that AI signals are influential in shaping labor demand dynamics and skill prioritization. Other studies using job advertisement text mining report broad increases in AI skill demand.

This divergence between engagement and wage outcomes mirrors findings that labor market effects of AI can be heterogeneous and context dependent.

## 8 Conclusion

We show that semantic AI relevance in job postings is correlated with greater engagement from job seekers but does not robustly predict higher advertised salaries once standard controls are accounted for. These findings contribute novel micro-level evidence to the literature on AI's economic impact, highlighting the importance of distinguishing attention dynamics from compensation outcomes in labor markets.

## References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