

# Predicting salaries in the GTA

*A Bayesian approach*

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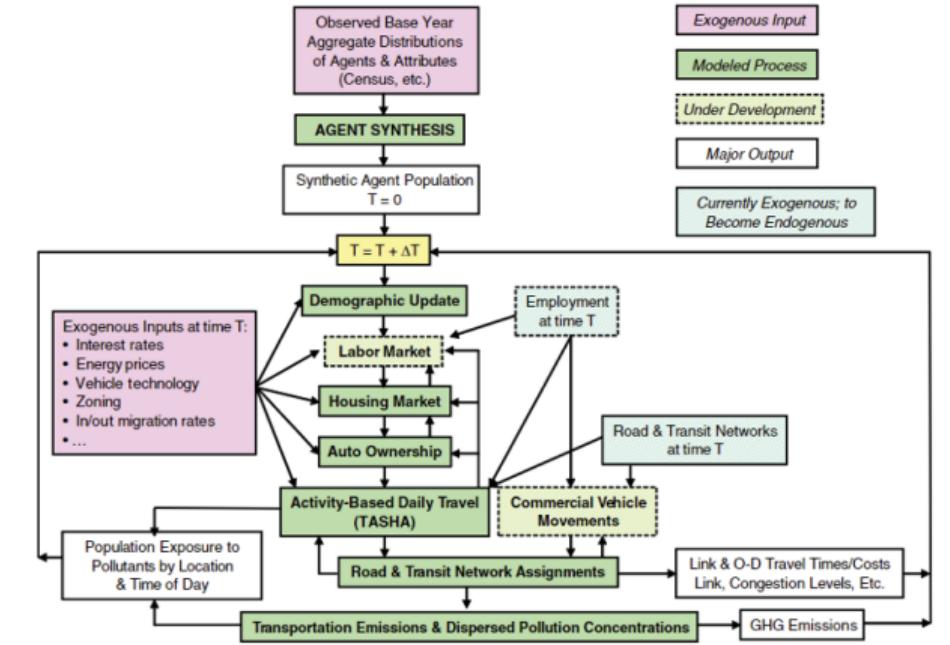
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# **Outline**

- 1. Research motivation**
- 2. Labour Market in ILUTE**
- 3. Predicting salaries in ILUTE**
- 4. Conclusions and future work**

# 1. Research motivation

- | Transportation models have grown in complexity, but some inputs are still considered **exogenous**.
- | Work (HBW) is the **second most frequent** trip purpose in the GTA (TTS, 2016).
- | Place of residence, place of work, household income, and auto ownership are **directly or indirectly related** to the labour market.



ILUTE flowchart (Miller et al, 2021).

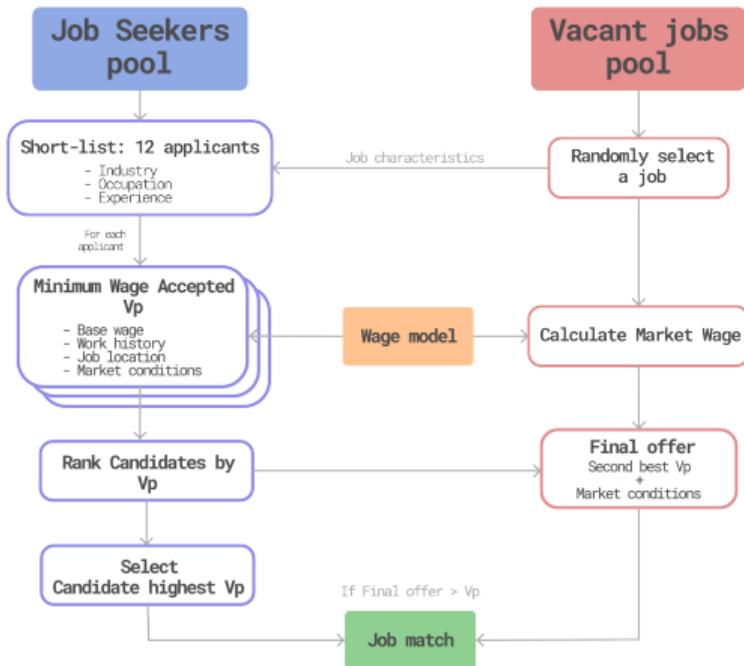
## 2. Labour Market in ILUTE

Job matching process

| Wages **facilitate the interaction** between agents in the labour market

| Wages **allocate labour** to the most efficient use

- Industries
- Occupations
- Regions



*Job search and matching process in ILUTE (Adapted from Harmon, 2013).*

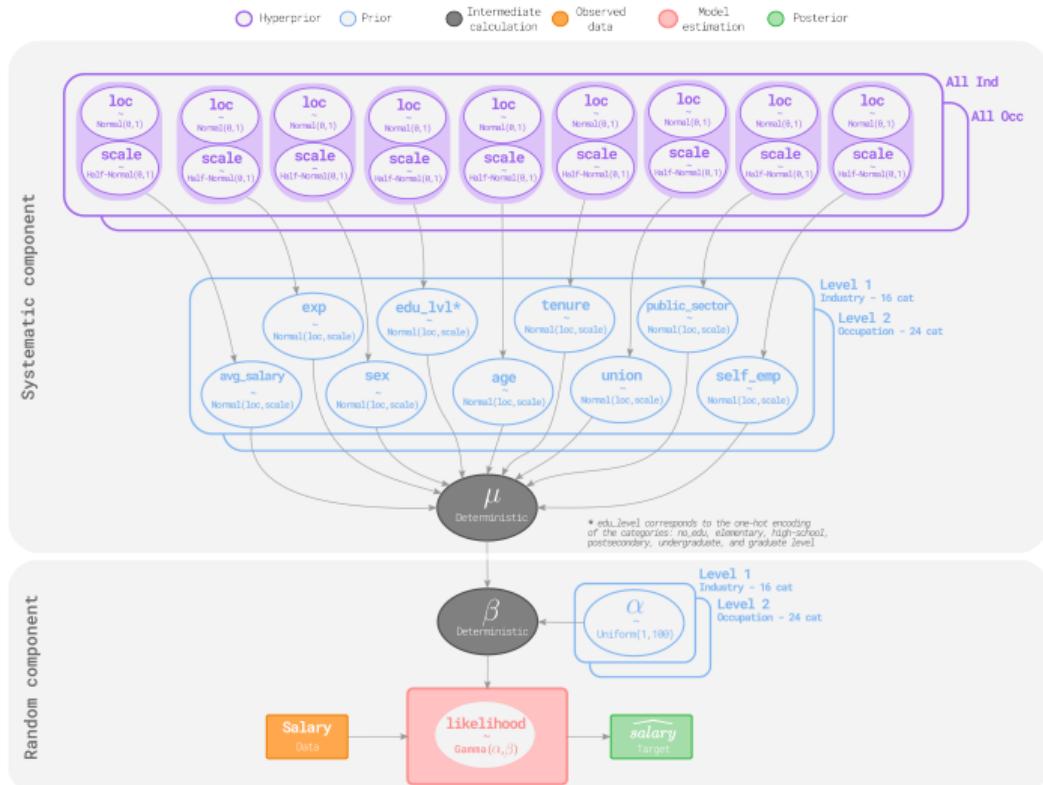
# 3. Predicting salaries in ILUTE

## Model structure

| Labour markets are organized in a **hierarchical** structure

- Industries
- Occupations

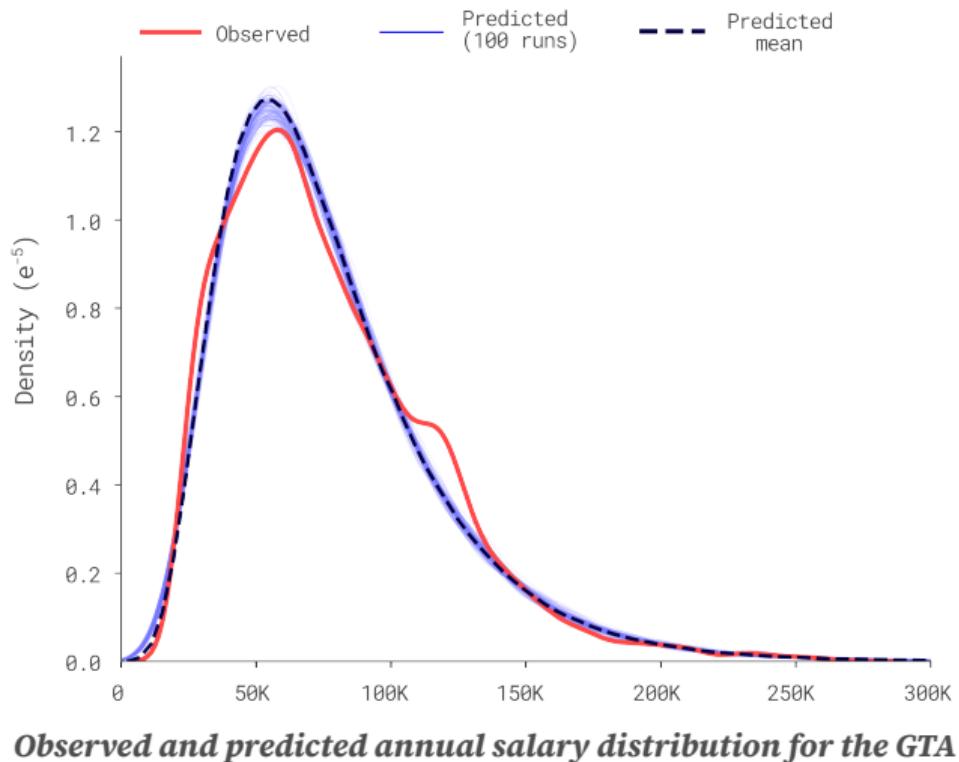
| The proposed model uses a **Hierarchical Gamma GLM** and **Bayesian inference**



### 3. Predicting salaries in ILUTE

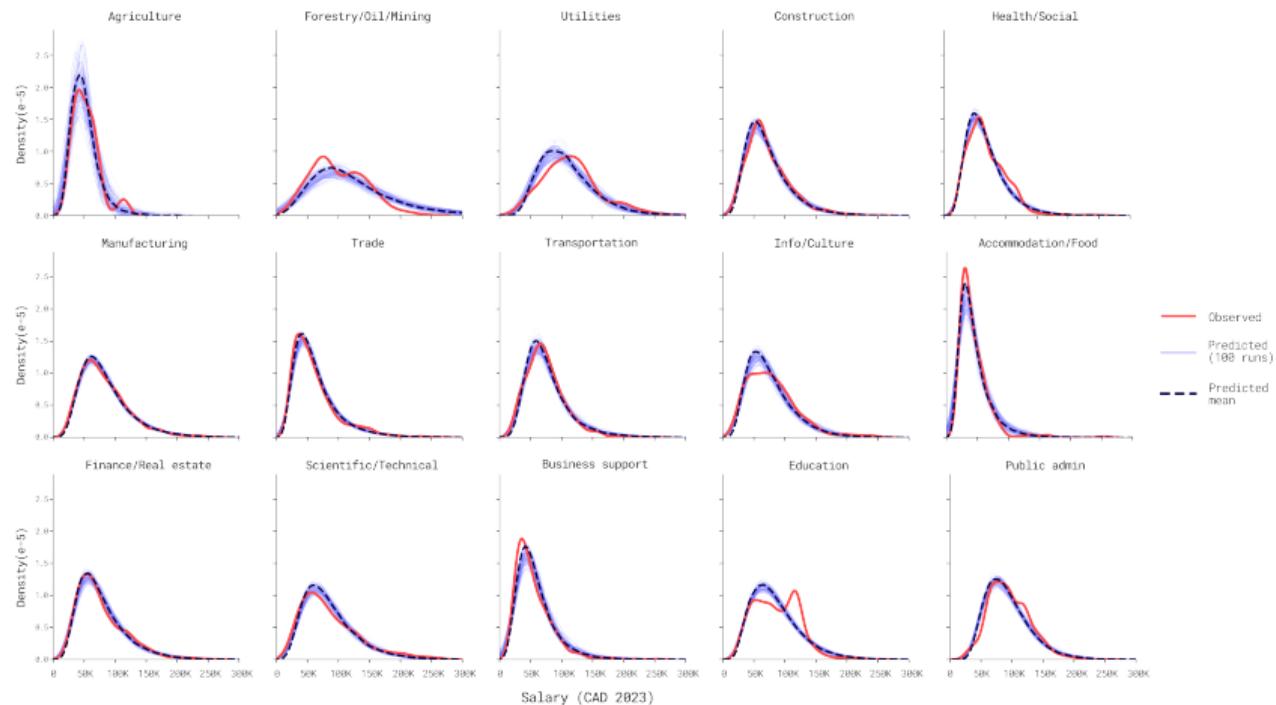
Results - Aggregated level (GTA)

- | Annual salaries are **positive** and **right skewed**.
- | The proposed model resembles the observed distribution by using the **Gamma random component**.



### 3. Predicting salaries in ILUTE

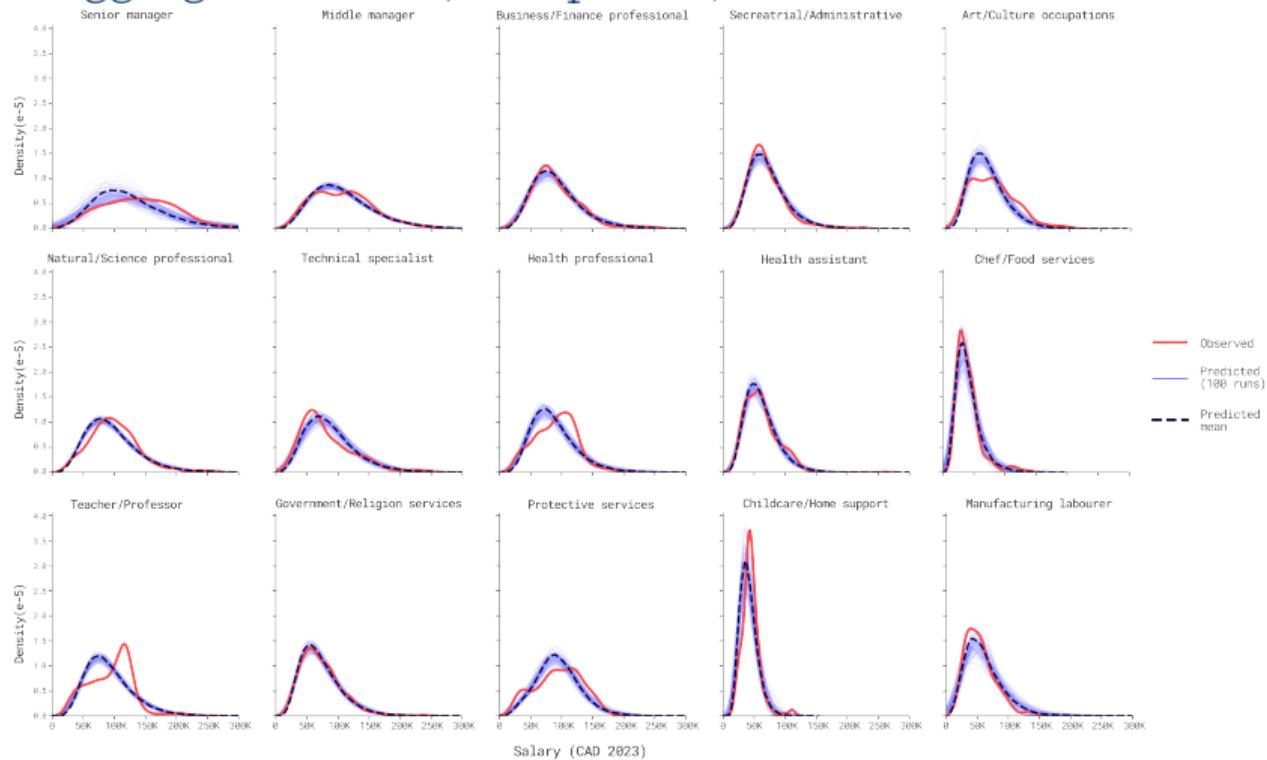
Results - Aggregated level (Industry)



*Observed and predicted annual salary distribution by industry for the GTA*

### 3. Predicting salaries in ILUTE

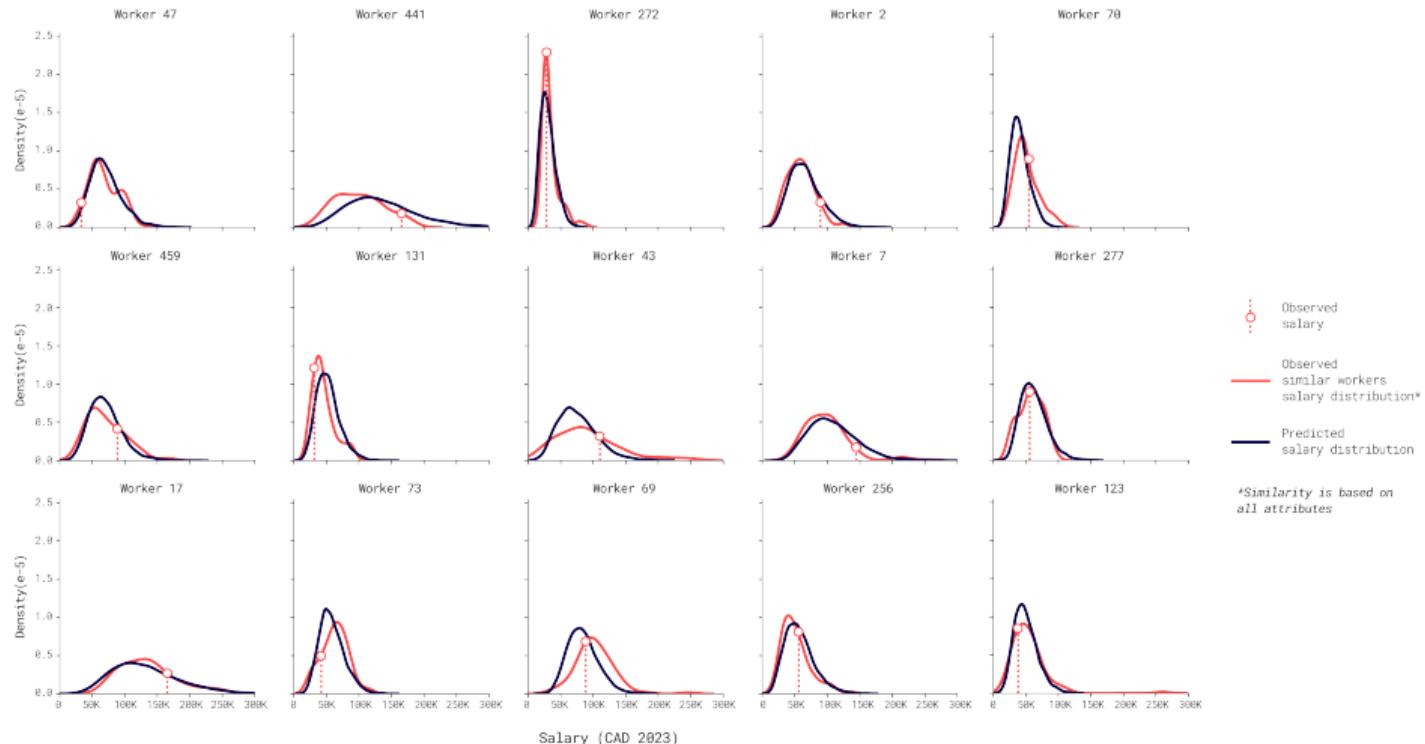
Results - Aggregated level (Occupation)



*Observed and predicted annual salary distribution by occupation for the GTA*

### 3. Predicting salaries in ILUTE

Results - Disaggregated level (Worker)



*Observed and predicted salaries for randomly selected workers*

## 4. Conclusions

- | Considering the hierarchical structure of the labour market has several advantages in the proposed model:
  - Improves the **prediction accuracy** of salaries by sharing information across industries and occupations.
  - Enhances the **robustness** by reducing the effect of outliers (*Shrinkage effect*).
  - Both **information sharing** and **shrinkage effect** reduces the risk of **overfitting**.
- | The **Gamma random component** allows the model to capture the **right skewness** of the observed salary distribution.
- | Replacing point estimates with **probability distributions** might improve the interactions within the ILUTE labour market module.

# Questions?

Thank you for your attention!