
Šiauliai Academy

**VILNIUS UNIVERSITY**

**ŠIAULIAI ACADEMY**

Bachelor Programme Software Engineering

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**Lecture:** Software Development Process

**Laboratory Work No. 4: "Solving a Problem Using Open Data"**

## 1. Introduction

This project looks at a real-life demographic issue using open data: the long-term decline in Lithuania's population. Lithuania is one of the fastest shrinking countries in the European Union.

The main goals of this analysis are to:

- Get open population data from Eurostat
- Clean and process the data using Python
- Study population changes from 1990 to 2024
- Find trends, long-term problems, and possible policy impacts

The analysis is based on open data and uses methods that can be easily repeated.

## 2. Problem Definition

**Research Question:**

**"How has Lithuania's population changed between 1990 and 2024, and what are the main demographic risks revealed by the data?"**

**Why this matters?**

- Lithuania lost **nearly 25% of its population since 1990**
- Large-scale emigration
- Low fertility rates
- Aging population

Understanding these trends can support policymaking in labor, immigration, education, and social planning.

## 3. Data Source and Dataset Description

**Dataset Used**

**Eurostat - "Population on 1 January by age and sex"**

Link: https://ec.europa.eu/eurostat

**Download Format**

- Format: **SDMX-CSV (.csv)**
- Extraction: Only Lithuania (geo = LT), year 1990–2024
- Age: **Total**
- Sex: **Total**

**Dataset Schema**

| **Column** | **Description** |
|---|---|
| geo | Country Code (“LT”) |
| sex | T (Total) |
| age | TOTAL |
| year | Observation year |
| population | Total population on Jan 1 |
| flags | Eurostat data quality flags |

## Sample Extract (cleaned)

| **year** | **population** |
|---|---|
| 1990 | 3,693,700 |
| 2000 | 3,496,200 |
| 2010 | 3,043,400 |
| 2020 | 2,795,700 |
| 2024 | 2,685,800 |

# 4. Methodology

### 4.1 Data Cleaning Steps Using

Python (Pandas):

1. Load SDMX-CSV file
2. Convert Eurostat codes to readable format
3. Filter Lithuania (geo = LT)
4. Select only TOTAL sex & TOTAL age
5. Convert year column to integers
6. Remove non-numerical population values
7. Restrict to 1990–2024
8. Compute:
    - yearly absolute change
    - yearly percent change

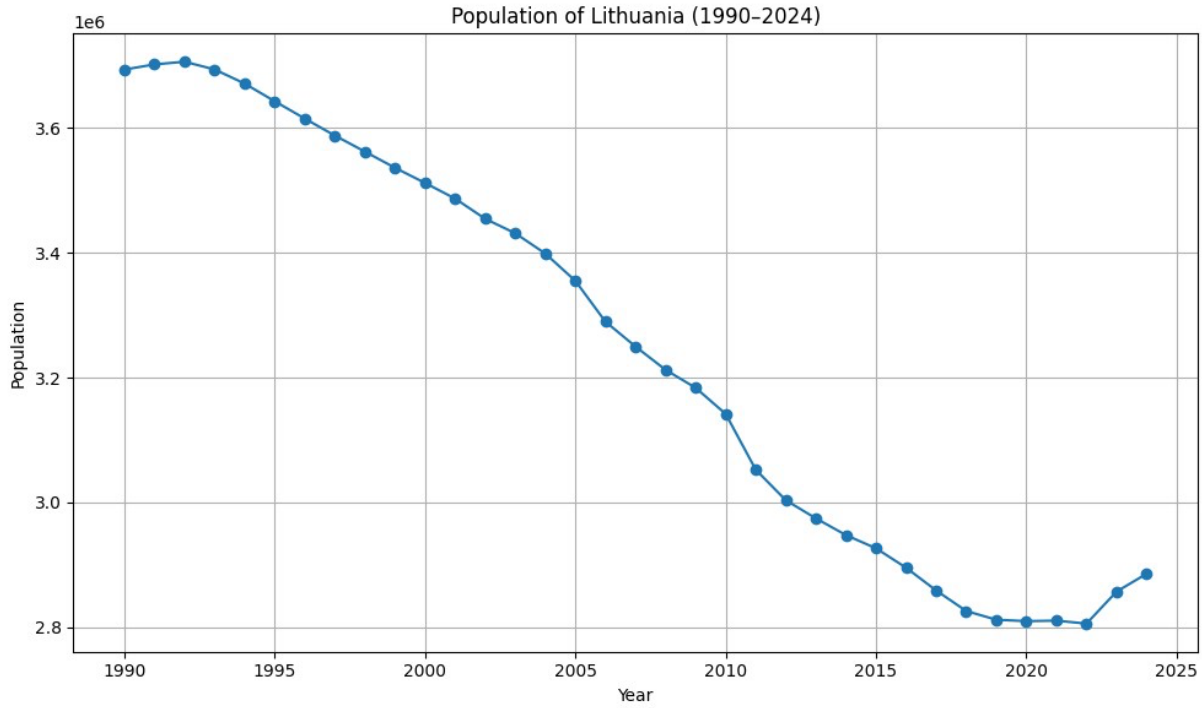
## 5. Results and Analysis

**5.1 Population Trend (1990-2024)** Lithuania's population dropped from:
3.69 million (1990) to 2.68 million (2024)

**Total loss: −887,817 people**

(~24% decline)

This places Lithuania among the fastest shrinking countries in Europe.

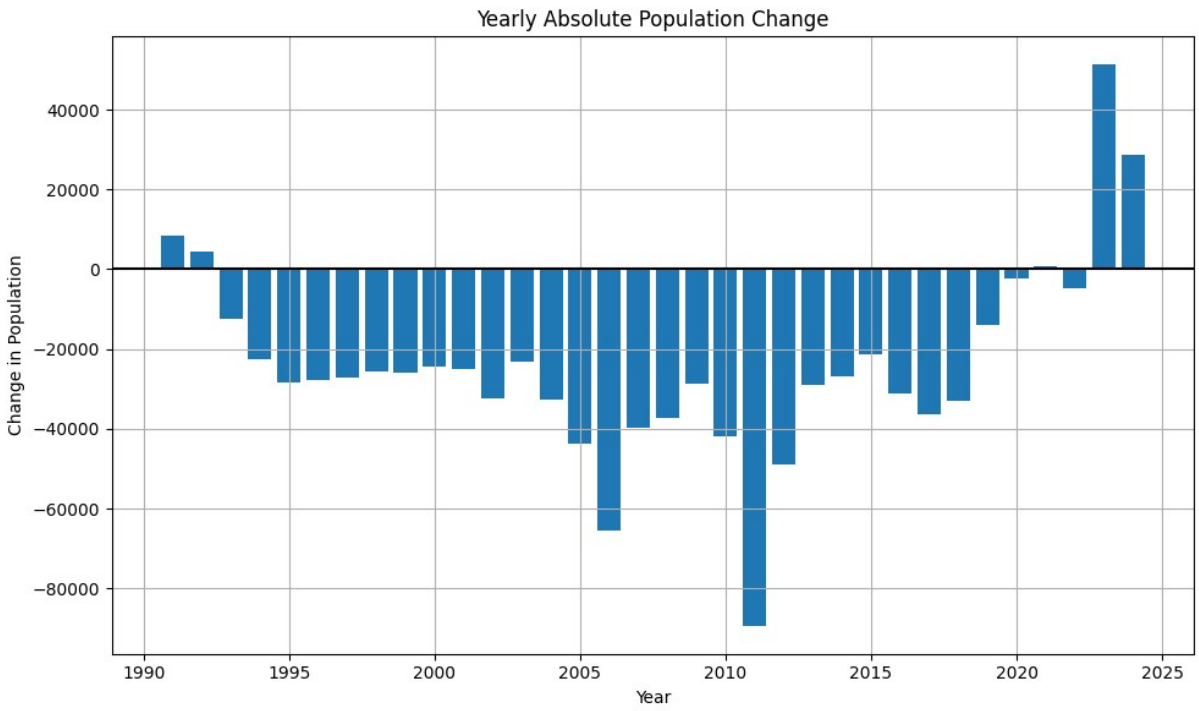



(Figure 1: Population of Lithuania (1990–2024))

## 5.2 Yearly Absolute Change

The largest decline occurred after EU accession (post-2004).

The **worst year** was: **2011: −89,388 people** (largest recorded drop)




(Figure 2: Yearly Absolute Population Change)

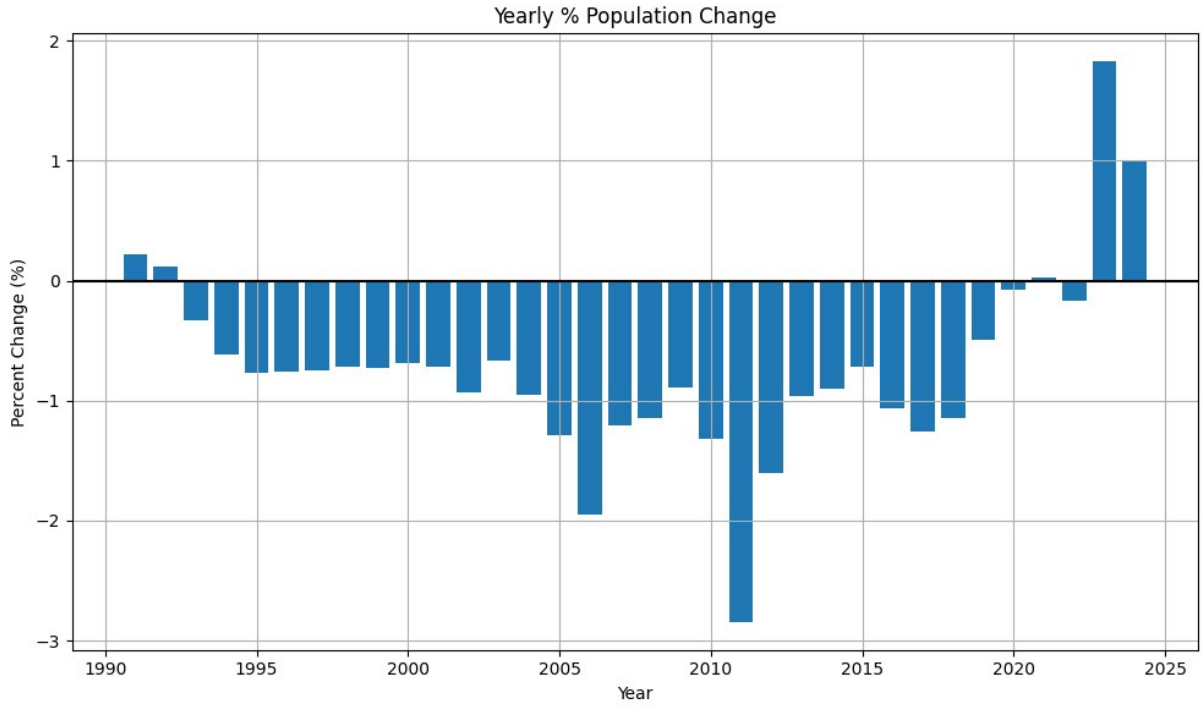
### 5.3 Yearly Percent Change

Average annual population change:

Declines accelerated during:

- 1990s economic transition

- Emigration wave after joining the EU
- 2008 financial crisis
- COVID-19 period




(Figure 3: Yearly % Change)

# 6. Discussion

## Major Causes of Decline:

1. **Emigration to Western Europe**

2. **Low fertility rates** (among Europe's lowest)
3. **Aging population / high dependency ratio**
4. **High outward student mobility**
5. **Post-Soviet demographic shock Consequences:**

- Reduction in working-age population
- Shortage in skilled labor
- Increased pressure on pensions and healthcare
- Risk of long-term economic stagnation
- Need for immigration to stabilize population

## 7. Conclusion

This study shows how open data can be used to understand serious demographic problems.

**Key findings:**

- Lithuania has lost almost 900,000 people since 1990
- The population decline is long-term and structural
- The biggest population losses happened between 2001 and 2011
- Without action, the population will continue to shrink

**Policy implications:**

- Improve economic conditions to reduce emigration
- Support families and childcare
- Allow and manage more immigration
- Encourage students to stay after higher education
- Prepare services for an aging population

**Repository Link:**

https://github.com/seifimilad/lithuania-population-analysis-Milad