**School of System and Enterprise**

**EM:624-Informatics for Engineering Management**

**Analysis of People Migration Data**

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**Summary of UN Migration Data:**

Migration has far-reaching repercussions for both individuals and the communities affected. When supported by appropriate policies, migration may contribute to inclusive and sustainable development in both origin and destination countries, while also helping migrants and their families. These Highlights indicates key findings from the UN International Migration data, which assesses global and regional levels and trends in international migration using the most recent estimates of international migrant stock and investigates migration's influence in demographic change.

**This project aims to answer questions like which are explained in the following paper-**

1. What are the major migration routes?

2. What were the overall trends in international migration numbers?

3. What causes forced migration across international borders?

4. Where do the majority of migrants originate from around the world?

5. Where are individuals leaving more developed areas?

6. Where are people relocating from less developed areas?

**Data Description:**

* **Source of Data:** **UN\_Migrations.csv**
* **Dataset:**

The data is the collection of 241 variables and dataset is of 475473 records which gives information of years (1990-2019), major areas or country of destination, area of origin.etc.

The United Nations Statistics Division divides countries and areas into seven Sustainable Development Goal (SDG) regions, which are utilized in The Sustainable Development Goals Report. Sub-Saharan Africa, Northern Africa and Western Asia, Central and Southern Asia, Eastern and South-Eastern Asia, Latin America and the Caribbean, Oceania, and Europe and Northern America are the seven SDG areas. These regions are subdivided further into 22 geographic subregions. Because of the magnitude of the migrant stock in the SDG region Europe and Northern America, and to maintain continuity with previous revisions of the international migrant stock produced by the Population Division, Europe is presented separately, combining the four subregions Eastern Europe, Northern Europe, Southern Europe, and Western Europe, as well as the subregion Northern America.

In this dataset, the terms "more developed regions" and "less developed regions" are used for statistical purposes on the stage of development attained by a particular country or territory. Europe, Northern America, Australia, New Zealand, and Japan are examples of more developed regions. And less developed regions include all of Africa, Asia (excluding Japan), Latin America, and the Caribbean as well as Melanesia, Micronesia, and Polynesia.

**Data Preparation:**

1. The dataset was read from the file and was transformed as data frame.
2. The following variables were ignored as they were not used for analysis:

* Sort order
* Notes
* Code
* Type of Data

1. The columns of Countries were of the "Object" data type, which was converted to the numeric, i.e. "float" data type. Furthermore, the year data column was originally in “String” format before being converted to “float” data type.
2. Data handling was simple; therefore, no further data cleaning was necessary.

**Methodology:**

1. Imported all required libraries such as Pandas, NumPy, Seaborn and Matplotlib

* Pandas imported for handling CSV and creating data frame and for its operation
* NumPy was imported to perform mathematical operation.
* Seaborn was used for creating various plots such as line plots, box plots etc.
* Matplotlib was used for plotting the plots.

1. Using Pandas read migration data csv into a variable.
2. Converted first two rows into “Column Heading” as they were in normal data format.
3. Checked data types of all the columns and converted to desired data type and displayed it.
4. Created function named as “migration” to find Top 5 countries from which people are migrating to given region which is passed to the function as a parameter. For that region it finds migration trend for every year present in Dataset.
5. Created function named as “more\_developed” to find Top 5 countries to which people are migrating from given region which is passed to the function as a parameter. For that region it finds migration trend for every year present in Dataset.
6. Plotted various graphs to visualize the migration trends.

**Results and Analysis:**

1. **What are the Major flows of migration?**

* **The populations of the following countries are migrating to more developed regions such as Europe, Northern America, Australia, Japan and New Zealand**

**Chart, bar chart

Description automatically generated Chart, bar chart

Description automatically generated**

From this graph we can interpret that, over the years from 1990 to 2019 the most migrating people are from Russian federation, Ukraine, Mexico, Kazakhstan, Turkey. Also, Indian and Chinese people started migrating after 2010 to Europe and Northern America. Similarly, graphs are plotted for other regions as well.

* **The populations of the following countries are migrating to less developed regions such as Africa, Asia, Latin America and Caribbean region etc.**

Chart, bar chart, treemap chart

Description automatically generated

From this graph we can interpret that, over the years from 1990 to 2019 the most migrating people are from South Sudan, Burkina Faso, Republic of Congo, Somalia, Mali to Sub Saharan African Region. Similarly, graphs are plotted for other regions as well.

* **Which countries have the most migrant people in the world?**

According to the graph below, most of the migrants are from Russia, Mexico, India, and China. This migration rose year after year. Also, after 2010, Indian people migration was determined at its peak.

Chart, bar chart

Description automatically generated

**Swarm Plot of Highest to Lowest Migration throughout the World from 1990-2019**

Chart, scatter chart

Description automatically generated

1. **Where people from the more developed regions are migrating to?**

* In general, the majority of European migration is to North America, notably the United States, Spain, Italy, Greece, and Germany. New Zealanders are relocating to Australia, Europe, and North America.
* In Japan, people migrated to the United States, Europe, Eastern and Southern Asia; in Australia, people migrated to the United Kingdom, Europe, and Northern America; and in northern America, people migrated to the United States, Europe, Canada, and Denmark.

1. **Where people from the less developed regions are migrating to?**

People from less developed region are migrating to USA, Europe, Russian Federation, India, Saudi Arabia and Latin America. Below are migrating trends of some less developed countries.

|  |  |
| --- | --- |
| Countries | Common Migration trend from less developed to? |
| Anguilla | Latin America and Caribbean, US of Virgin Islands, Europe and Northern America |
| Antigua and Barbuda | Europe and Northern America, USA, Caribbean, Latin America |
| British Virgin Islands | Latin America and Caribbean, US of Virgin Islands, Europe and Northern America |
| Aruba | Europe and Northern America, USA, Caribbean, Latin America |
| Bahamas | Europe and Northern America, USA, Caribbean, Latin America |
| Bonaire, Sint Eustatius and Saba | Europe and Northern America, USA, Caribbean, Latin America |

1. **What are the dynamics by income and geographic region?**

* **Dynamics according to geographic regions:**

According to the analysis below, people from India, Bangladesh, Afghanistan, Russian Federation, Pakistan, and China have migrated the most to Asia over the years. This migration is within continents and across continents.

**Text

Description automatically generated with medium confidence**

**Similarly, analysis of other geographic regions are as follows:**

* + - * 1. Over the years, the majority of immigrants to Africa have come from Somalia, Sudan, Burkina Faso, Mali, and Republic of Congo.
        2. The nations that have migrated to Europe the most over the years include Turkey, Kazakhstan, the Russian Federation, Ukraine, Morocco, Poland, and Romania.
        3. Over the years, the countries with the highest migration rates to Latin America and the Caribbean were Spain, the United States, Portugal, and Italy.
        4. The top five countries for immigration to North America are Mexico, the United Kingdom, India, China, the Philippines, and Puerto Rico.
        5. Most immigrants to Oceania have come from the UK, New Zealand, China, India, Philippines, and Italy.
* **Dynamics according to Income groups:**
  + - 1. In high-income countries between 1990 and 2005, people from Mexico migrated the most, but people from India migrated the most. Along with these two countries, a considerable number of individuals migrated to China, the United Kingdom, the Philippines, and Pakistan.
      2. From 1990 to 2005, the Russian Federation and Ukraine had the highest migration to Middle Income countries. Along with this, people were migrating from Pakistan, Bangladesh, and Kazakhstan. Furthermore, migration from the Syrian Arab Republic can be observed after 2015.
      3. People from Somalia, Sudan, and the Republic of Congo are migrating the most to low-income countries. We can also see migration from Iraq, India, Rwanda, and Mozambique.

1. **Analysis of migration trend for Central and Southern Asia.**

Central and Southern Asia countries include Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Afghanistan, Bangladesh, Bhutan, India, Iran, Maldives, Nepal, and Pakistan. We conducted three analyses in order to thoroughly investigate migration trends in this region. First, discovered a migratory trend of people leaving and relocating to another part of the world. Second, a migration pattern within the region was discovered. And, finally, if the trend increased or decreased from 1990 to 2019.

1. **Following are the regions include in Central and Southern Asia which are migrated towards another region: -**

|  |  |
| --- | --- |
| Countries | Common Migration trends towards other region of the world |
| Kazakhstan | **Europe and Northern America, Europe,Eastern Europe** |
| Kyrgyzstan | **Europe and Northern America, Europe,Eastern Europe, Russian Federation and Central Asia** |
| Tajikistan | **Europe and Northern America, Europe,Eastern Europe, Russian Federation and Central Asia** |
| Turkmenistan | **Europe and Northern America, Europe,Southern Europe, Russian Federation and Ukraine** |
| Uzbekistan | **Europe and Northern America, Europe,Eastern Europe,Russian Federation and Asia** |
| Afghanistan | **Central and southern Asia, Iran,Pakistan and Europe and Northern America** |
| Bangladesh | **Southern Asia,Central and Southern Asia, India, Western Asia, Northern America** |
| Bhutan | **Southern Asia, Central and Southern Asia, India, Nepal, Europe and Northern America** |
| India | **Southern Asia,Central and Southern Asia, Western Asia, Northern America and Eroupe, UAE** |
| Iran | **Europe and Northern America, Europe,USA, Western Europe** |
| Maldives | **Central and southern Asia,India,Europe, Northern America,Srilanka,Australia /New zealand** |
| Nepal | **Southern Asia,Central and Southern Asia, India, Western Asia, Northern America** |
| Pakistan | **Southern Asia,Central and Southern Asia, India, Western Asia, Northern AmeriCA,Saudi Arabia** |
| Sri Lanka | **India,Western Asia, Southern Asia, Central Asia, Europe, Saudi Arabia, Northern America** |

1. **Following are the regions which are migrating within Central and Southern Asian region and other regions of the world:**

Here we can see example of Country-India, which illustrates that people from Bangladesh, Pakistan, Nepal, Sri Lanka, China are migrated in India from 1990 to 2019. Similarly, findings for other countries in this region can be seen from the output.

**Chart, waterfall chart

Description automatically generated**

1. **Analysis of dynamics in Migration towards countries in this region from 1990 to 2019.**

**Chart, line chart, histogram

Description automatically generated**

From the above graphs of countries Turkmenistan, Uzbekistan, Afghanistan, Bangladesh, Bhutan and India we can understand that in some countries no. of migrants are increasing over the time or its decreasing. For example, in India, from year 1990-2019, ratio of people migrating has decreased over the time as most people were migrated outside India for jobs or education purpose.

**Conclusion:**

* Globally, the number of foreign migrants is increasing in Developed regions (e.g. USA, Europe).
* We can also see that, people from less developed are moving to moderate developed region from year 1990 to 2005. And in most of the cases, after 2010 people of less or moderate people have migrated to developed region for employment opportunities or education purpose etc.

**References:**

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