Capstone Project Proposal — World Population Projections

Population projections are routinely used by private, public and non-profit organizations for policy development. For example, projections are used in:

- ▷ Estimating central and local finance allocation
- ▷ Planning housing and land use
- ▷ Health care planning - for modelling and projecting health care indicators
- ▷ Weighting national and regional surveys
- ▷ Creating teacher workforce models at a national and local level
- ▷ Assessing ageing population and understanding its implications

Therefore, accurate and high-quality population projections are imperative for good policy-making. For my Capstone Project, I will be estimating aggregate, age-specific, and sex-specific population projections until 2100 for 200+ countries using United Nations 2012 Population Division Database since 1950.

Population projections are estimated using the demographic balancing equation

$$P_{c,t} = P_{c,t-1} + B_{c,t} - D_{c,t} + M_{c,t} \quad \text{———————————————————— (i)}$$

where $P_{c,t}$ is the population prediction in country c at time t,
$P_{c,t-1}$ is the population prediction in country c at time t−1,
$B_{c,t}$ is the number of births in country c at time t,
$D_{c,t}$ the number of deaths in country c at time t,
$M_{c,t}$ net migration in country c at time t.

Methodology uses the cohort component method to decompose the equation into age-specific and sex-specific components for population projections.

Analysis is divided into three steps

- ▷ Step 1 — Simulating a large set of trajectories for future values of total fertility rates using Bayesian hierarchical estimates
  - ◆ Done via BayesTFR package in R software
- ▷ Step 2 — Simulating a large and equal set of trajectories for future values of life expectancies using Bayesian hierarchical estimates
  - ◆ Done via BayesLife package in R software
- ▷ Step 3 — Converting trajectories from previous models to age-specific and sex-specific population projections using cohort component method
  - ◆ Done via BayesPop package in R software