Data Science For Social Good
Summer Fellowship

Imperial College Business School | Gandhi Centre for Inclusive Innovation | The University of Chicago

# Matching Job Seekers with interventions to improve employment outcomes in Portugal

INSTITUTO DO EMPREGO E FORMAÇÃO PROFISSIONAL

NOVA SCHOOL OF BUSINESS & ECONOMICS

***Project Fellows:*** Nathan Coulson (Birkbeck, Univ. of London), Rosa Lavelle-Hill (Univ. of Nottingham), Tobias Richter (Univ. of Cologne)
***Technical Mentor:*** Liliana Millán | ***Project Manager:*** Sara Guerreiro de Sousa | ***Partner Team Coordinator:*** Cristina Faro

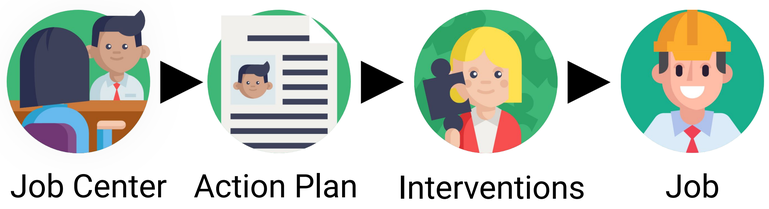
## Background

IEFP is the government institute responsible for reducing unemployment in Portugal (6.6% in 2019)

In 90 job centers across Portugal, dedicated job counsellors face 3 key constraints in recommending the best interventions for job seekers:

- **Limited time**
- **Limited experience**
- **Manually searching** through a large list of possible interventions

## IEFP counselling process




## Problem statement

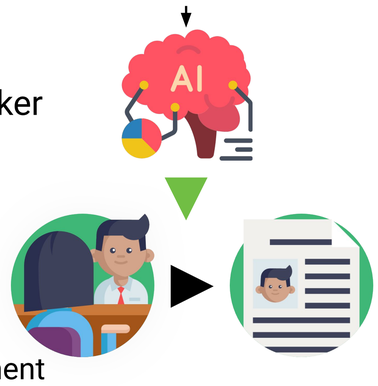
Which **interventions should job counsellors recommend to job seekers** to help them find meaningful employment?

## Data

- **9 years** of IEFP data (2010-2019)
- **3.1m** job seekers
- **101m** transactions
- **255** training courses


## Solution

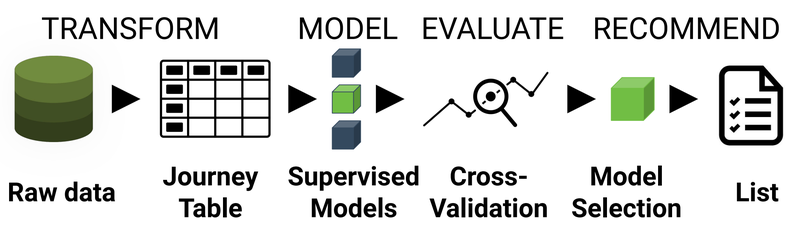
A system which suggests **relevant** and **effective interventions** for a job seeker




**Relevant:** meet the needs of the job seeker

**Effective:** optimised for an outcome: i.e. time to employment

## Approach




### Transform

Our raw data source consists of over 50GB of transaction records spread out over 16 Oracle DB tables.

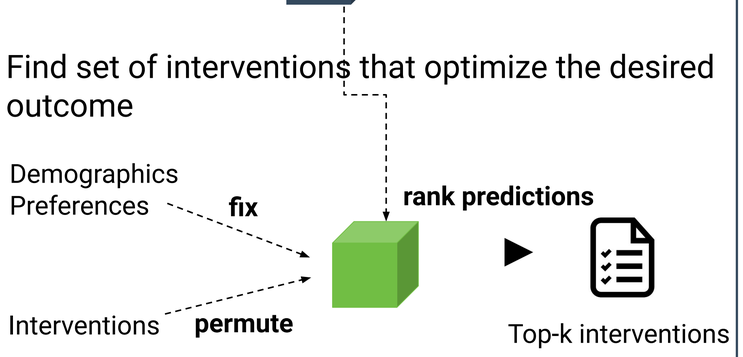
A key challenge was defining a set of rules, through domain knowledge, that facilitates the transformation from **transactional data** into a modelling table consisting of **user journey** data.

| | Journey (10) | | Demographics (25) | | Interventions (60) | | Outcomes (3) |
|---|---|---|---|---|---|---|---|
| ID | Journey | Start | Age | Education | CV Workshop | Internship | Time to job |
| 23 | 1 | 03/01/2017 | 31 | lower | 22/07/2017 | - | 168 |
| 23 | 2 | 16/02/2018 | 32 | lower | - | 15/05/2018 | - |
| 56 | 1 | 04/05/2017 | 51 | higher | 08/05/2017 | 22/11/2017 | 402 |

### Model

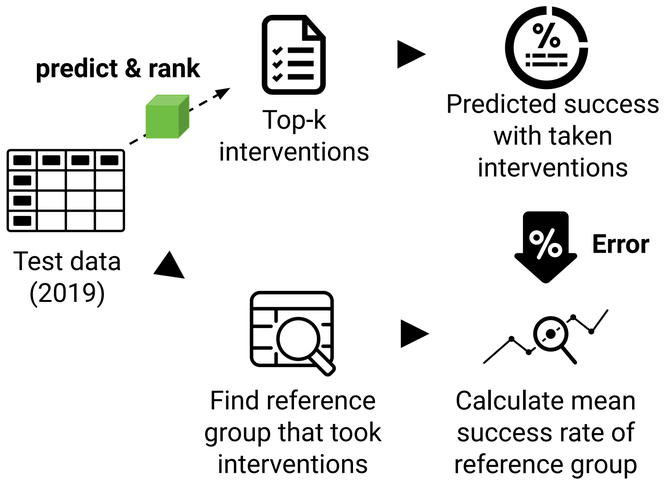
Train models on different employment outcomes


Find set of interventions that optimize the desired outcome

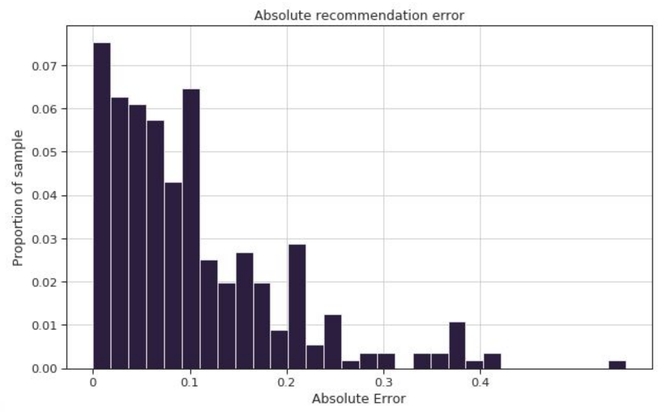



### Evaluate

Evaluate recommendations by comparing with ground truth of reference groups



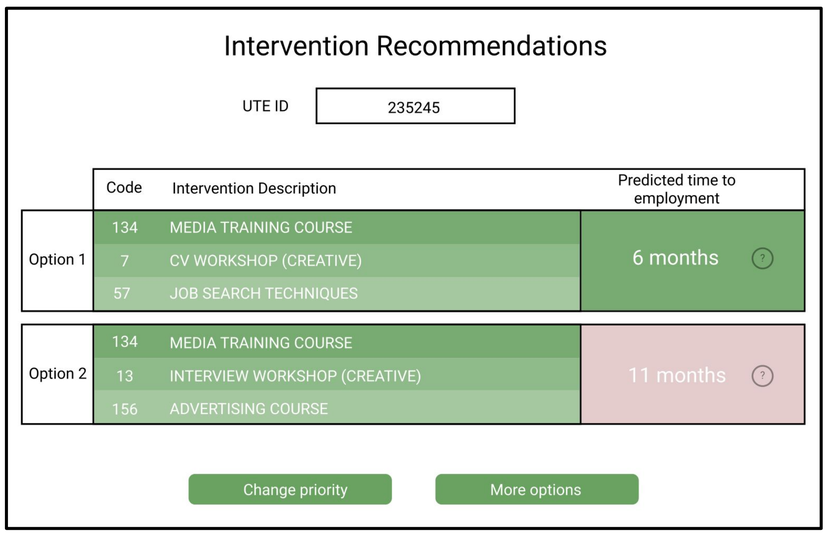

## Results




Recommendations generated by the **Random Forest** model performed the best in the ground truth evaluation process with a mean error rate of 0.096.

## Output

Below is an **example of a mock-up** that shows the output of the recommender system:




## Social impact

1. Providing action plans that are optimal for reducing the length of unemployment helps to break the **"unemployment spell".**
2. Providing a platform for **data-driven** approaches to understanding the pathways to employment and the impact of interventions.
3. Enabling **smarter decisions** about which interventions to divert funding towards.

## Next steps

- Implement **job-skills mappings** to intelligently guide people towards desired and feasible employment.
- Analyse current and desired employment **trends.**
- Enable a **human feedback** loop to optimise ai-empowered human decision making.

*Icons by The Noun Project (www.thenounproject.com) and from Flatpik of Flaticon (www.flaticon.com)*

This work was done during the Data Science for Social Good Summer Fellowship at Imperial College Business School, hosted by the Gandhi Centre for Inclusive Innovation, in partnership with the University of Chicago and the DSSG Foundation, using infrastructure from Amazon Web Services.