WELL FARGO

LIVE GREEN
LIVE HAPPY

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About the Project

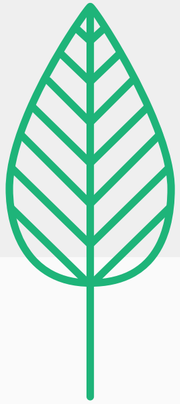
- Wells Fargo's priorities is to promote environmental sustainability.
- Individual actions can encourage collective responsibility to help achieve this.
- Use linear programming, create a data product to help individuals optimize the balance between their carbon footprint and quality of life.
- The data gives a peek into the lives of 1,000 individuals who rated several everyday activities on a scale of 1-100 based on how important those activities are to their daily lives.

Objective

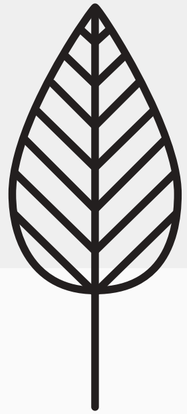
Create a Linear programming model that minimizes carbon footprint for each customer while maintaining their total quality of life.

DATA PREPARATION

Understand the Data Set



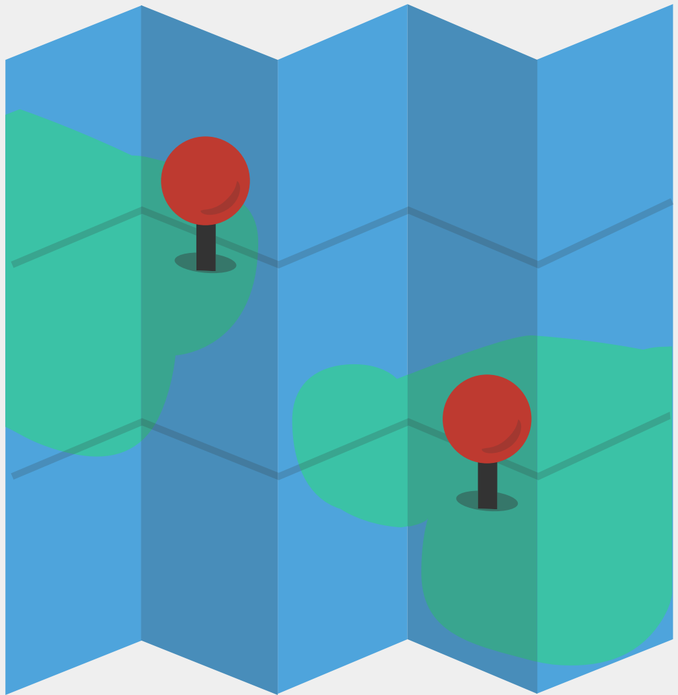
Clean the Data clean the errors



Connect Carbon Footprint with individual

About Data

Relevant Topics to Discuss

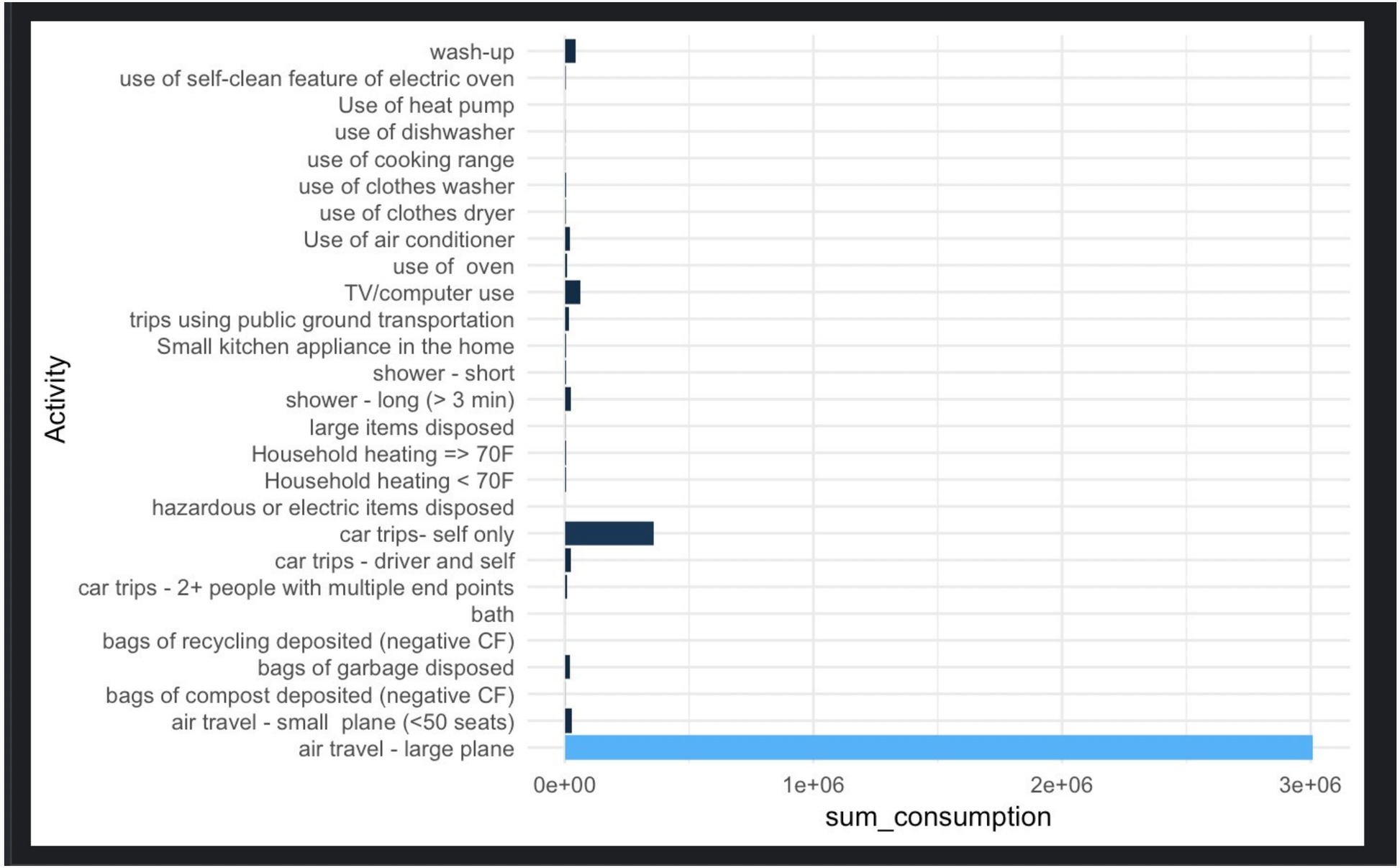


Individual
1002

Activities
27

Groups
6

Sources
11


wash-up
use of self-clean feature of electric oven
Use of heat pump
use of dishwasher
use of cooking range
use of clothes washer
use of clothes dryer
Use of air conditioner
use of oven
TV/computer use
trips using public ground transportation
Small kitchen appliance in the home
shower - short
shower - long (> 3 min)
large items disposed
Household heating => 70F
Household heating < 70F
hazardous or electric items disposed
car trips- self only
car trips - driver and self
car trips - 2+ people with multiple end points
bath
bags of recycling deposited (negative CF)
bags of garbage disposed
bags of compost deposited (negative CF)
air travel - small plane (<50 seats)
air travel - large plane
Activity
0e+00
1e+06
2e+06
3e+06
sum_consumption

Initial Objective Function

Objective Function

$$Z_{min} = C_{ij} * \sum CF_{ijk}$$

where

* i = individual
* j = activity
* k = source
* _C_ is the consumption per unit of an activity

Initial Constraints

Constraints

$$C_{ij} * QL_{ij} >= TrQL_{ij}$$

where

* i = individual
* j = activity
* _QL_ is the quality of life for an activity (constant)
* _TrQL_ is the true quality of life for an activity it is computed as $C_{ij} * QL_{ij}$

Final Objective Function

$$Z_{min} = \sum S_{ijk} * SCF_{ijk} * C_{ij}$$

where

- i = 1...n
- j = 1...27
- k = 1...10

`C` is the consumption per unit of an activity while `SCF` is the carbon footprint per source.

C_{ij} is assumed to be **constant** for each individual and activity and SCF_{ijk} is assumed to be **constant** for per source.

In the case that C_{ij} is 0 we will use the big `M` method to enforce a big penalty, this will ensure that the linear programming model won't choose that particular source

Final Constraints

The Constraints

The constraint below ensures that an activity can only use one source. The goal of this constraint is to use a single source that has the lowest carbon footprint.

$$\sum_{k}^{m} S_{ijk} == 1$$

where

- n = m = 10
- i = 1...n
- j = 1...27

Demo time