The Climate Challenge Hackathon

Channel 25: Make Home Office Great Again

The problem your project solves

Due to the various CoVid-19 measures implemented worldwide, global emissions from surface transport fell by –36% or –7.5 (–5.9 to –9.6) $MtCO_2$ d by 7 April 2020 in comparison to the previous year (1). CoVid-19 has thus been named as the digitization driver for home office, which is a significant part of surface transport (ca. 20%). We want to make sure that companies will not return to business as usual and continue to enable their employees to work remotely.

The reduction of personal CO2 emissions alone has shown to be not sufficient for the general public to adopt measures. Thus, we are convinced that solely personal benefits, in our case saving money and time by staying at home, would have the potential to be used by a wider audience. Based on a survey by Greenpeace (2020) we estimate the potential of home office in Germany to 4.8 mil tonnes per year which is around 3% of Germany's surface transport emissions.

The solution you bring to the table (including technical details, architecture, tools used)

We would like to provide an easy to use App or Outlook Add On which chooses the best days to work from home based on appointments, local mobility data and weather forecast data. Our goal is to minimize time, money and CO2 wasted on the way to work by still considering important appointments in the office as well as mental health and social interactions.

Using Big Data & Machine learning frameworks we will be able to learn individual preferences and thus find the optimal individual balance between staying at home and going to the office, which is currently highly debated both in corporates and in politics.

What you have accomplished during the weekend

After discussing with two experts, researching and brainstorming we have started collecting all the necessary data for our project. We query our mobility data from Apple, our weather data from OpenWeather and the Calendar data from Google's API. We have also used a dataset for all German cities from Simplemaps.

Since we do not yet have enough data to train a model to automatically minimize time, money and CO2, we used a constrained optimization algorithm. Our input data are the normalized number of appointments, Germany's mobility data from the last week, precipitation, temperature, and humidity forecast. We sum these normalized values to obtain a score for each

day. In order to obtain the best days to stay in home office under the constraint that we should go to office at least 2 days a week, to keep mental health, we use the "knapsack" model from Mixed Integer Linear Programming to solve this optimization problem. This model returns the integer weights [0,1] for each day in the upcoming week.

The result will then be displayed in a web-app, for which we used the Streamlit library. In the web-app the user is asked to select a German city. After pressing the “predict” button, the data is queried based on the city selected and combined with the number of appointments by the user. The homeoffice and go-to-work events are generated by our app and are automatically put in into the Google Calendar of the user.

The necessities in order to continue the project

Our biggest hurdle currently is time as we are all currently locked in our professions. Assuming we had more time (and a little bit of pocket money ;) we would:

Finalize the app by providing users an easy usage through single-log-in

Personalize the app by providing options to weigh different parameters (such as rain or traffic) and using NLP to analyze appointment content (e.g. distinguish high-profile meetings with the CEO vs. a daily via zoom)

Improve the app by adopting a wider range of high quality data sources and adoptingg a wider range of ML techniques after growing our labeled dataset (correlates with user growth)

Scale the app by providing a simple Outlook/Calendar plug-in for major corporations

(1) https://www.nature.com/articles/s41558-020-0797-x

(2) https://www.nature.com/articles/s41558-020-0797-x

(3) https://www.greenpeace.de/sites/www.greenpeace.de/files/publications/s03091_gp_home_office_studie_08_2020_dt_fly_fin_04.pdf

Evaluation:
•Impact: how big is the impact of the project in terms of sustainability on the targeted scale of the respective project?
•Progress: how much progress was achieved during the Hackathon?•Presentation: how is the project presented overall?
•Creativity: was the challenge solved in an original way?
•Innovation: how innovative is the project? Is there a comparable solution on the market already oris the idea brand new?

Storyline:

- **NATURE Article (https://www.nature.com/articles/s41558-020-0797-x)**
- **Apple Mobility (https://covid19.apple.com/mobility)**
- **Motivation (because we save time and make saving the climate easy…)**
- **Tech Stack/Architecture (Symbols)**
- **Demo**
- **Future Outlook**

The URL to the prototype [Github, Website,...] (if applicable)

www.github.com

The URL to the pitchvideo (Required)

www.youtube.com

Pick one speaker who may pitch your project on Sunday and provide his/her name at the end of your textual pitch on Devpost.

The speaker of our team is **firstname lastname**