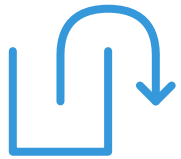


Spatial Optimisation with OSRM and R

Finding the perfect running route

Megan Beckett & Andrew Collier
Exegetic Analytics
useR 2019

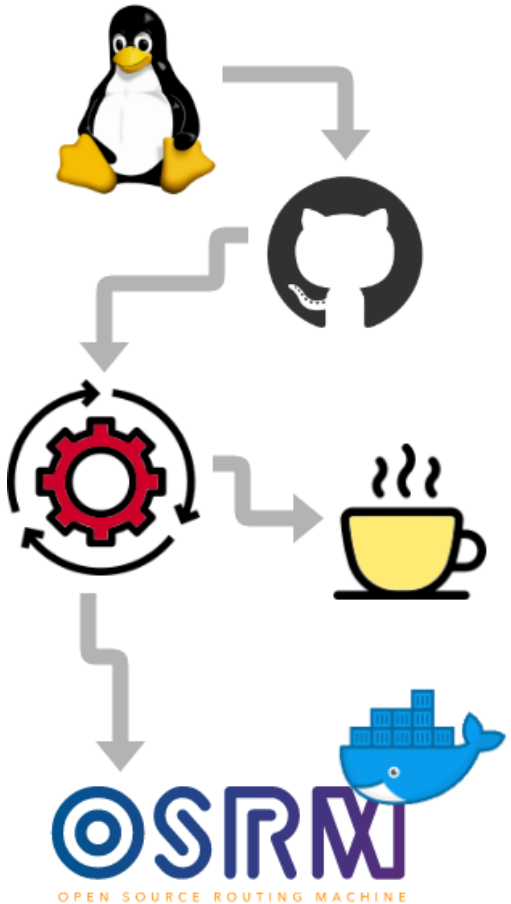
What can I see in Toulouse?

Within different time intervals?

With my running shoes on?

OSRM
OPEN SOURCE ROUTING MACHINE

Building OSRM




```
# Necessary infrastructure.
sudo apt update
sudo apt install -y git cmake build-essential jq htop \
                    liblua5.2-dev libboost-all-dev \
                    libprotobuf-dev libtbb-dev \
                    libstxxl-dev libbz2-dev

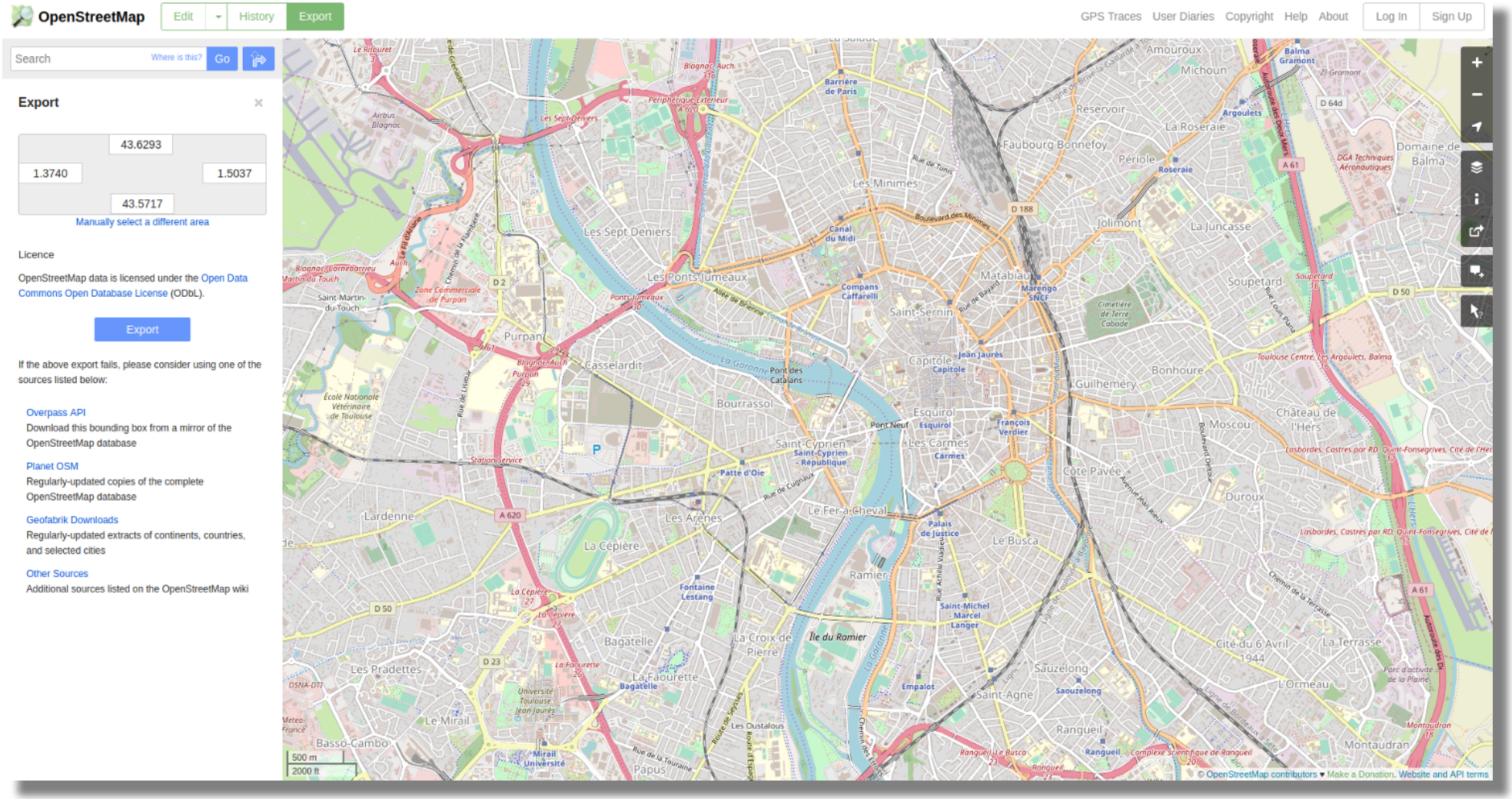
# Grab the source on GitHub.
git clone https://github.com/Project-OSRM/osrm-backend.git

# Create a build folder and then run cmake.
cd osrm-backend/
mkdir build
cd build/
cmake ..

# Next initiate the build.
# This will take some time - grab a cup of coffee!
make

# When the build completes,
# make the install target for OSRM.
sudo make install
```

Getting the data - www.openstreetmap.org



Preparing the data

Extract the map

- car
- bike
- foot

```
osrm-extract map.xml -p profiles/foot.lua
```

Preparing the data

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- car
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```

Create the hierarchy

```
osrm-contract map.xml.osrm
```

Launch the service

```
osrm-routed map.xml.osrm
```

How long and far to walk from here to the Capitole?

```
curl "http://127.0.0.1:5000/route/v1/walking/1.434562,43.611834;1.443372,43.604478" | jq

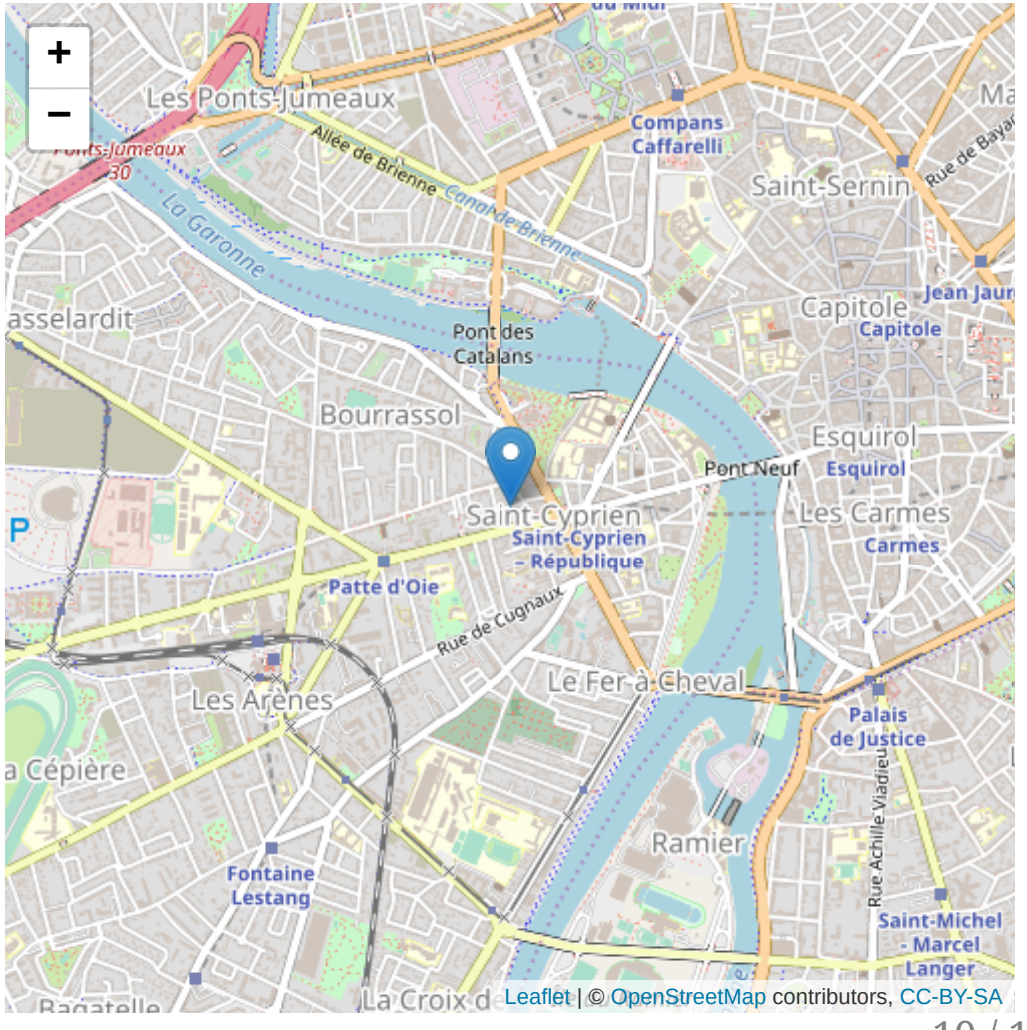
{
  "code": "Ok",
  "waypoints": [
    {
      "hint": "rF0BgK5dAYCwAQAA3AAAAAAAAAAAAAAA_25wQu2E80EAAAAAAAAAALABAADcAAAAAAAAAAAAAAABAAAAxQ",
      "distance": 22.597897,
      "location": [
        1.43482,
        43.611913
      ],
      "name": "Esplanade Compans Caffarelli"
    },
    {
      "hint": "IxMAgNvgAIA9AQAAPQEAAAAAAAAAAAA2VswQhh7L0IAAAAAAAAAAD0BAAA9AQAAAAAAAAAAAABAAAAkg",
      "distance": 33.50137,
      "location": [
        1.442962,
        43.604431
      ],
      "name": "Place du Capitole"
    }
  ],
```

How long and far to walk from here to the Capitole?


```
"routes": [
    {
      "legs": [
        {
          "steps": [],
          "weight": 824.4,
          "distance": 1142.2,
          "summary": "",
          "duration": 824.4
        }
      ],
      "weight_name": "duration",
      "geometry": "m}diGsfwGp@]_@gBrCyA|@Ah@_@jHiCxAmA|AsErAyBjAsCvN_R?o@lAO",
      "weight": 824.4,
      "distance": 1142.2,
      "duration": 824.4
    }
  ]
}
```

The osrm R package

```
install.packages('osrm')
```



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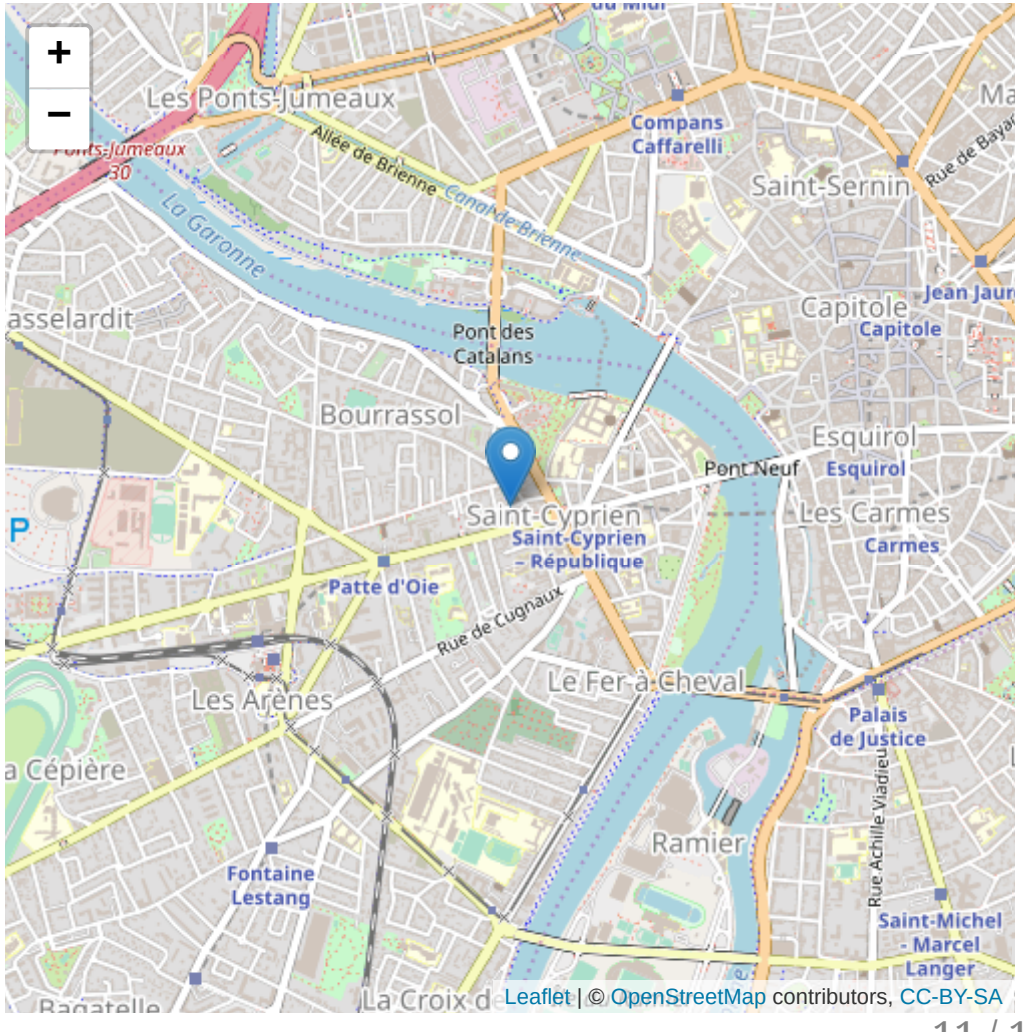
What can I see from my Airbnb with my running shoes on?

isochrone = a line connecting points relating to the same travel time.



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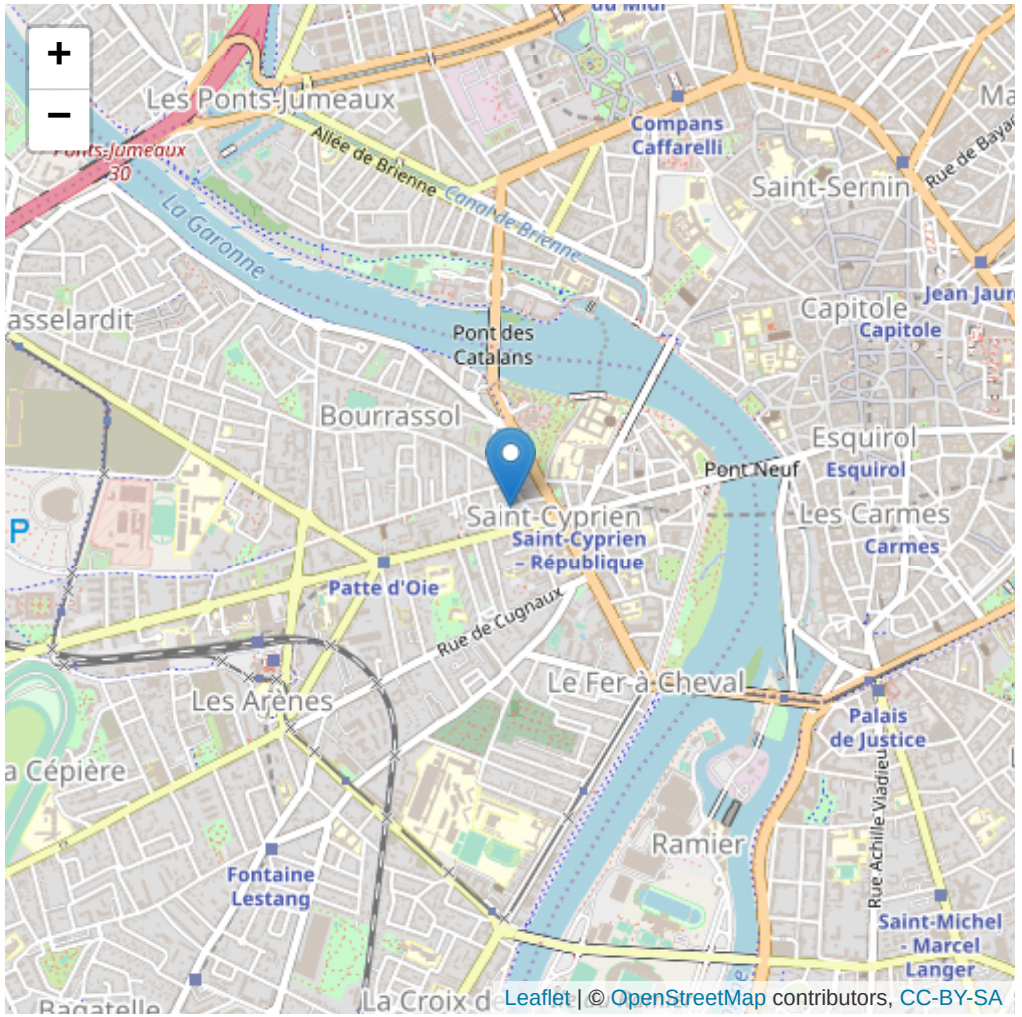


Running time isochrones to explore Toulouse

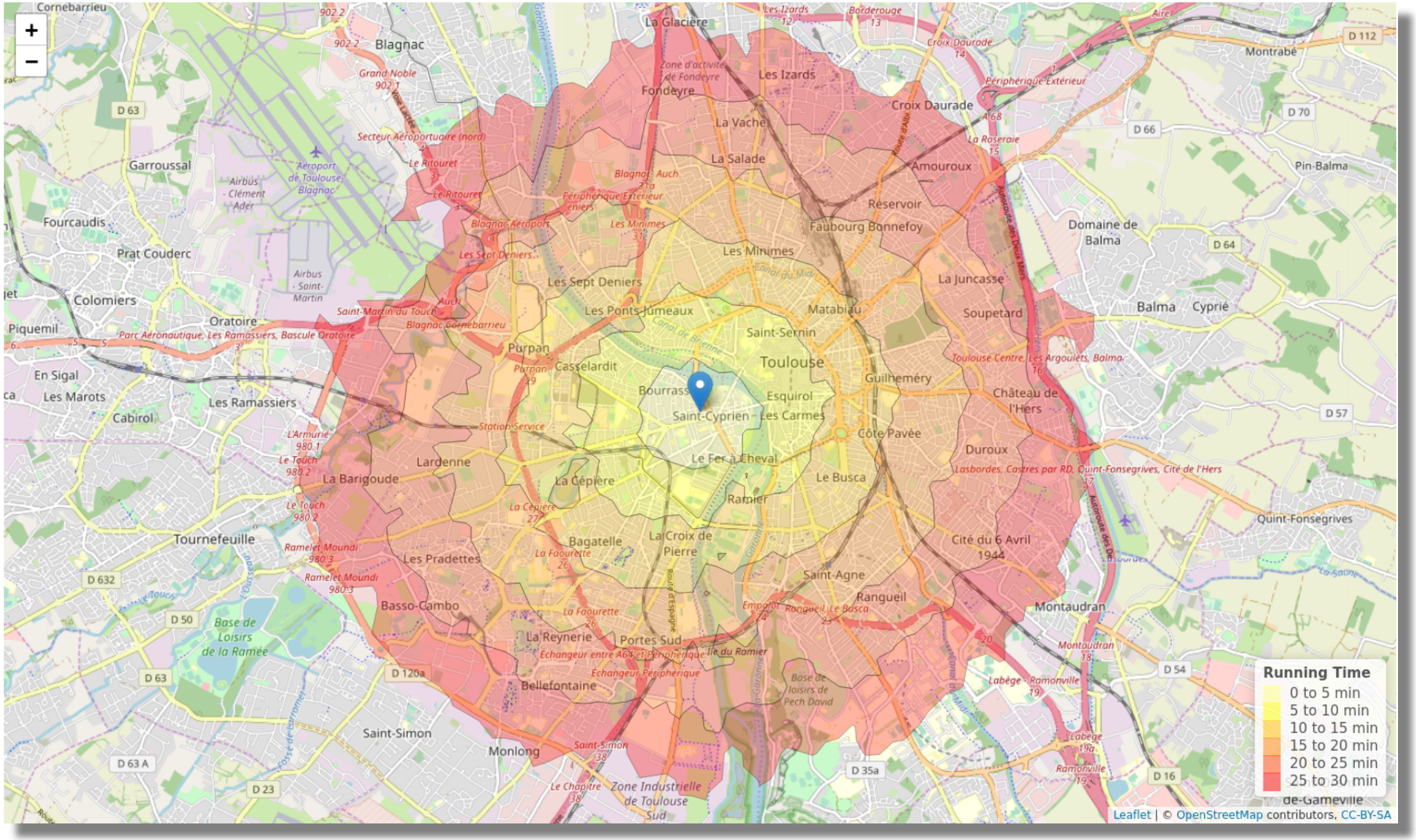
```r
# Libraries
library(osrm)
library(leaflet)
library(dplyr)

# Point to osrm server
options(osrm.server = "http://127.0.0.1:5000/")

# Set location
loc <- c(1.42, 43.59)

# Generate isochrones at time intervals
iso <- osrmIsochrone(loc,
                     breaks = seq(from = 0, to = 30, by = 5),
                     res = 400)

# Plot with Leaflet
leaflet(data = iso) %>%
  setView(lng = 1.42, lat = 43.59, zoom = 13) %>%
  addTiles() %>%
  addMarkers(lng = 1.42, lat = 43.59, popup = "My Airbnb") %>%
  addPolygons()
```


Running Time
0 to 5 min
5 to 10 min
10 to 15 min
15 to 20 min
20 to 25 min
25 to 30 min
Leaflet | © OpenStreetMap contributors, CC-BY-SA
Toulouse
Saint-Cyprien
Les Carmes
Esquirol
Bourrassé
Casselardit
Purpan
Les Ponts-Jumeaux
Saint-Sernin
Matabiau
Les Minimes
Les Sept Deniers
Faubourg Bonnefoy
Réservoir
Amouroux
Croix Daurade
Les Izards
La Vache
La Salade
Fondeyre
La Glacière
Blagnac
Cornebarrieu
Garroussal
Fourcaudis
Prat Couderc
Colomiers
Oratoire
Piquemil
En Sigal
Les Marots
Cabirol
Les Ramassiers
Lardenne
La Barigoude
La Cépière
Le Fer à Cheval
Ramier
Le Busca
Côte Pavée
Guilhemery
Château de l'Hers
Duroux
La Juncasse
Soupetard
Balma
Cyprié
Domaine de Balma
Pin-Balma
Montrabé
Quint-Fonsegrives
Cité du 6 Avril 1944
Saint-Agne
Rangueil
Montaudran
Tournefeuille
Les Pradettes
Basso-Cambo
Bagatelle
La Croix de Pierre
La Reynerie
Portes Sud
Bellefontaine
Saint-Simon
Monlong
Zone Industrielle de Toulouse Sud
Base de Loisirs de la Ramée
Base de loisirs de Pech David
Aéroport de Toulouse-Blagnac
Airbus - Clément Ader
Airbus - Saint-Martin
Périphérique Extérieur
Canal du Midi
Canal de Brienne
Garonne
D 63
D 63 A
D 23
D 120a
D 632
D 50
D 64
D 66
D 70
D 112
D 57
D 54
D 16
D 35a

So, who's coming at 6am tomorrow?!
@mbeckett_za
megan@exegetic.biz