Completing the Map

with Street-level Imagery

Mapillary

Christopher Beddow
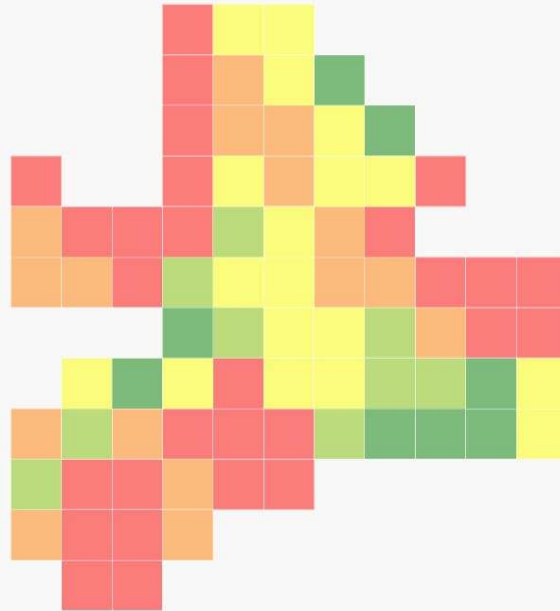
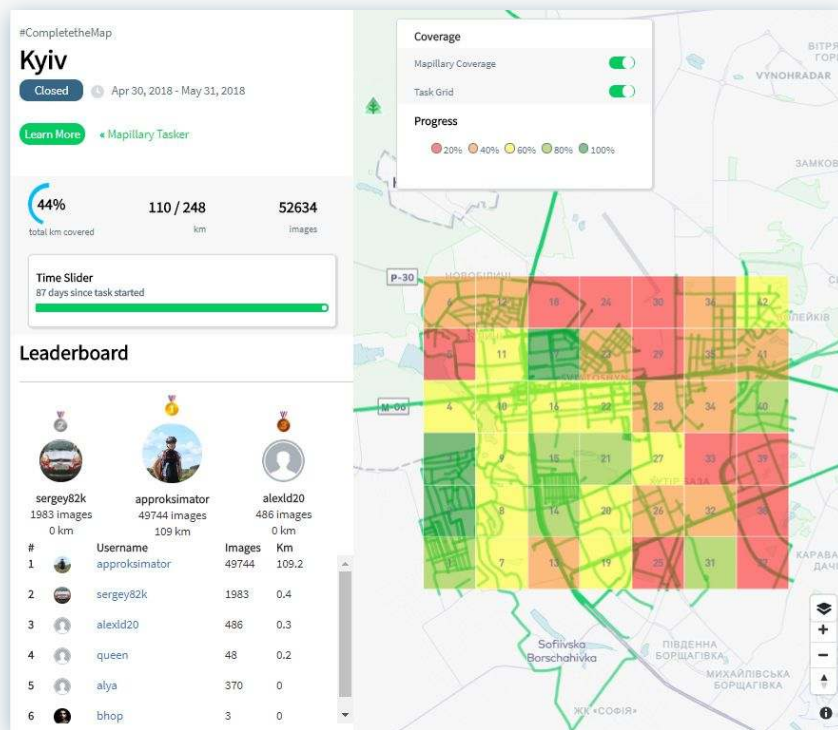# #CompletetheMap

What is it?

‣ Web application for image capture tracking

‣ Grid-based tracking of task or challenge

‣ Leaderboard for community coordination, recognition, and competition

‣ Measurement of progress based on OSM road distances

Why?

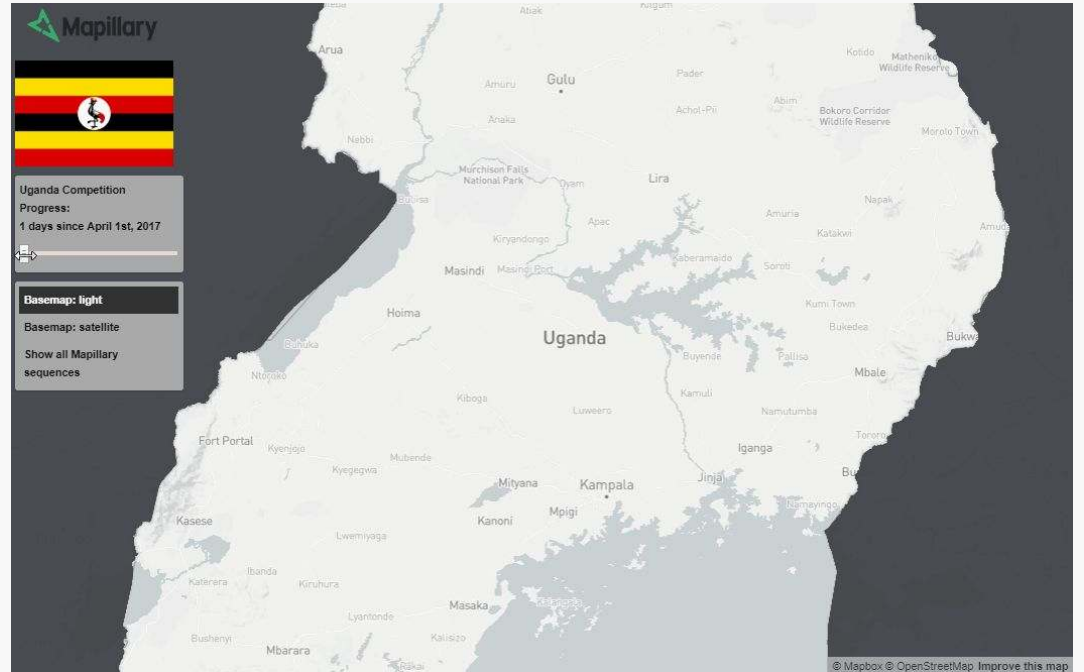‣ Targeted image collection

‣ Dashboard for community leaders

#CompletetheMap

Phase I: Uganda

- April 2017

- Over 100k images from YouthMappers

- University chapters organised Mapillary photo walks
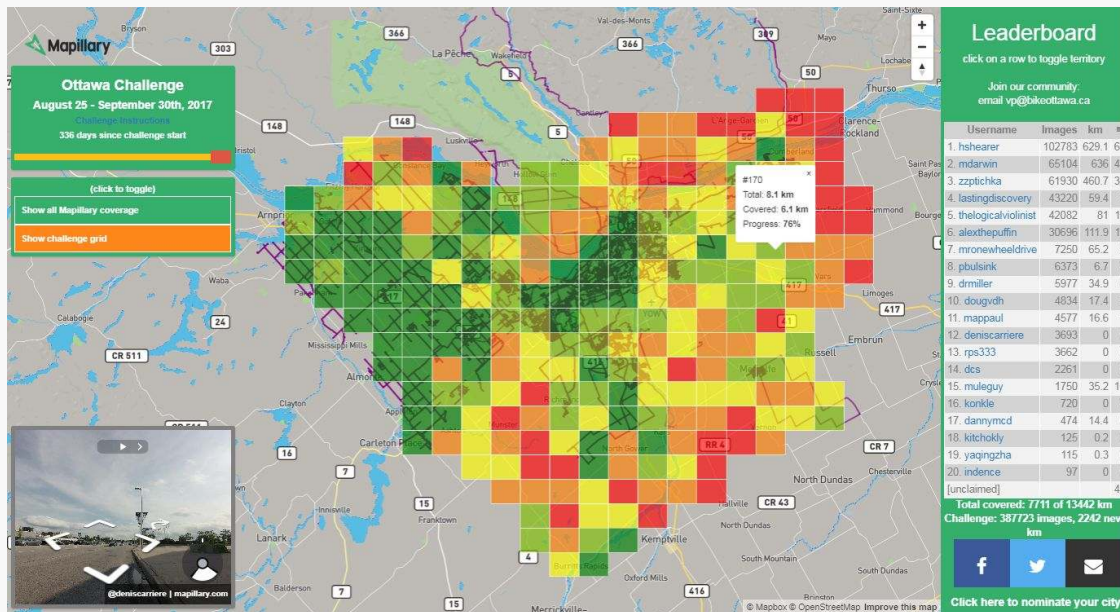
- Leaderboard showed user progress

Phase II: Ottawa

- August 2017

- Over 450k images from Bike Ottawa

- Open source app, **zzptichka** heavily contributed (Yaro Shkvorets)

- First grid-based system, metro area

- Unified leaderboard and map

- Resulting data used for OSM and bike stress map

Revamp

Challenges

- A better way to fetch and display contributor stats

- A better way to visualize progress

- A better way to see temporal change

- A better way to measure completion

- Reduce server load

- A DIY method to create a challenge

Solutions

- Leaderboard API (open)

- Simple grids, 5 quantiles

- Mapbox JS GL - filtering vector tiles by date, uniqueness

- Distance APIs -- unique and redundant (open)
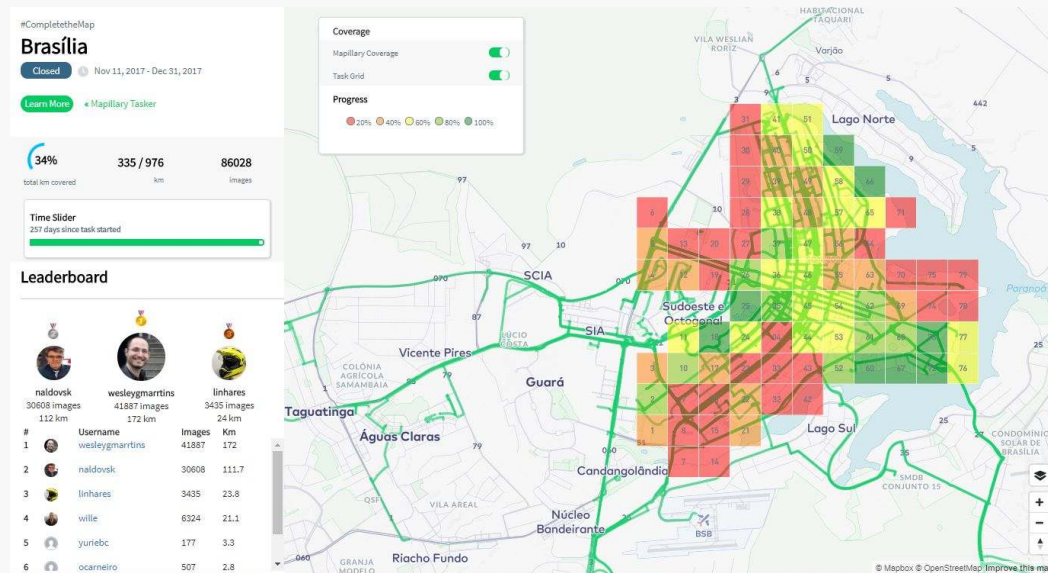
- Run API calls hourly from preset GeoJSON shape

- Grid generator tool and modifiable settings script

#CompletetheMap

Phase III: Brasilia

▸ November 2017

▸ Simplified layout

▸ More precise progress measurement

▸ Local users helped spread the word

▸ Over 86k images from OSM community

▸ 335km of OSM ways mapped

#CompletetheMap

Mobile version

‣ Web address redirects on mobile

‣ Compact layout

‣ Location icon

‣ Useful for mapping on the go

‣ Best with an external camera

Do it yourself

Creating a grid

https://mapillary.github.io/mapillary_greenhouse/grid-generator/

- Draw rectangle, upload geojson, or choose center point

- Indicate network type, cell units

- Indicate cell size, and number of columns

- OSM Overpass API - road distances

- Variation of Geoff Boeing's **OSMNX**

- Geoprocessing with **Turf.js**

Do it yourself

Creating a task

▸ Choose a city size area or smaller

▸ Add **grid.geojson** to directory

▸ Choose start and end date

▸ Edit **settings.js** to add details

▸ Submit to Mapillary for server-side hourly processing


```
//Chronological Information
var mindate = 1515024000000;
var maxdate = 1517443200000;
var mindateISO = new Date(mindate).toISOString();
var maxdateISO = new Date(maxdate).toISOString();

//Geographic Information
var city = 'Lisboa';
//enter country, state, territory, province, or other region name
var country = 'Portugal';
//name of the challenge folder, usually just the city unless the city has been done before
var challenge = 'lisboa';
```

Directory listing:
- img
- m
- favicon
- grid
- index
- initial_calcs
- layers
- map
- mobileredirect
- settings
- stats
- style

Verify the results

Teaching the computer

▸ Users can help improve algorithms

▸ Validating detections as accurate

▸ Traffic signs that are validated can be precisely positioned with computer vision

▸ Thousands of verifications ensure world class data quality

▸ Traffic signs detected in > 1 photo are added to traffic sign tiles in OSM iD

Back to the map

Using images in OSM

new ▸ **OSM iD:** resize viewer

new ▸ **JOSM:** 360 degree image support

▸ Traffic sign overlay - precise positions due to computer vision

▸ 326 million photos worldwide

▸ More new features on the way

Enhanced Editing

Placement Tools

http://mapillary.github.io/mapillary-js/

▸ Click in image to add map points

▸ Planned for OSM iD

▸ Available now in open-source library: **Mapillary-JS**
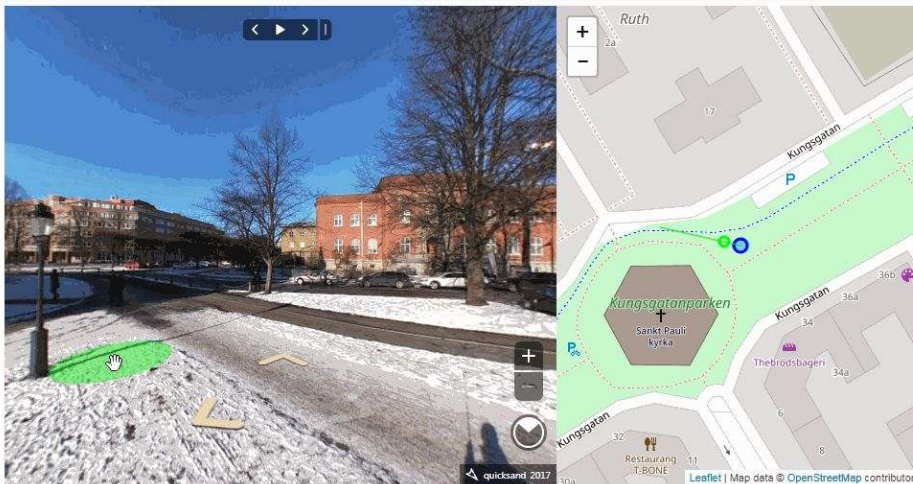
Open ↗

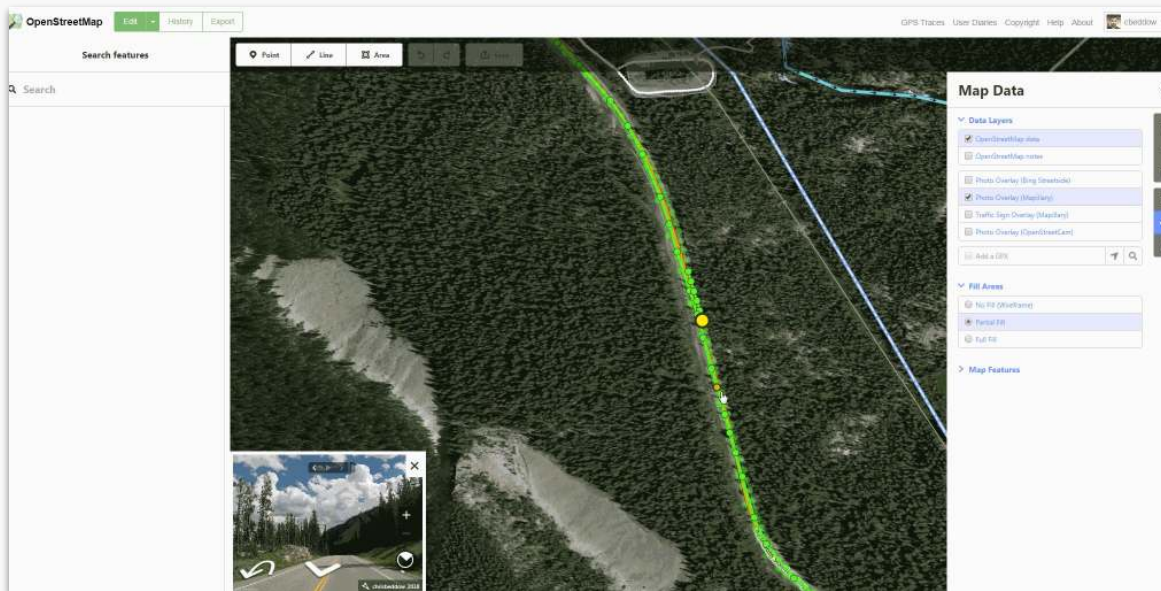# index.html

```html
<!DOCTYPE html>
<html>
<head>
    <meta charset='utf-8' />
    <title></title>
    <meta name='viewport' content='initial-scale=1,maximum-scale=1,user-scalable=no' />

    <link rel='stylesheet' href='https://unpkg.com/mapillary-js@2.12.1/dist/mapillary.min.css' />
    <link href='https://unpkg.com/leaflet@1.0.1/dist/leaflet.css' rel='stylesheet' />

    <script src='https://unpkg.com/mapillary-js@2.12.1/dist/mapillary.min.js'></script>
    <script src='https://unpkg.com/leaflet@1.0.1/dist/leaflet.js'></script>

    <style>
        html, body { margin:0; padding:0; height: 100%; }
        #mly { position: absolute; width: 60%; height: 100%; }
        #map { position: absolute; width: 40%; height: 100%; right: 0; }
    </style>
</head>
```

Highlights

2018 Global Challenge

- 1 - 31 May, 2018

- Ballerup, Denmark - 65k images/100km

- Kyiv, Ukraine - 52k images/109km

- Washington, DC, USA - 72k images/70km

- Funchal, Madeira - 63k images/81km

- Heredia, Costa Rica - 15k images/79km

- San Donato Milanese, Italy - 30k images/40km

- Myanmar, Hungary, Spain, Scotland, Canada, Lithuania, and more

#	Username	Location	Country	UKM	Images	Score
1	neogeografen	Ballerup	Denmark	88	56234	304.45
2	approksimator	Kyiv	Ukraine	103	48014	242.9
3	danbjoseph	Washington D.C.	United States	72	71937	231.86
4	nunocaldeira	Funchal	Portugal	79	61587	211.17
5	elotrojames	Heredia	Costa Rica	49	5481	120.48
6	marcuscalabresus	San Donato Milanese	Italy	39	30661	91.43
7	mghla	Mandalay	Myanmar	43	12277	73.05
8	cristinadc	Sevilla	Spain	55	9592	71.89
9	elopio	Heredia	Costa Rica	20	2725	51.01
10	arcvancouver	Richmond	Canada	40	4791	49.69
11	991.2gt3	Markham	Canada	24	2653	29.98
12	katl	Ballerup	Denmark	9	4339	28.4
13	ccbb7766	Edinburgh	Scotland	18	2297	26.59
14	aleksasfi	Vilnius	Lithuania	12	4522	24.28
15	plumgarden	Ann Arbor	United States	13	2360	19.24
16	lamaar639	York	England	7	7400	16.65
17	naylinnaung	Mandalay	Myanmar	11	1134	16.36
18	thelogicalviolinist	Carlington, Ottawa	Canada	0	8945	13.85
19	chicc0	Eching	Germany	5	4579	12.66
20	fmonge	Heredia	Costa Rica	5	535	12.64
21	daalso	Astoria	United States	7	3107	12.33
22	esiezar	Heredia	Costa Rica	2	1660	8.69
23	fod	Ballerup	Denmark	2	1057	7.46
24	snaysard	Reutlingen	Germany	3	2220	7.09
25	kmendezcr	Heredia	Costa Rica	0	2642	6.6
26	isapeixoto	Funchal	Portugal	1	1382	4.88
27	dzsombor96	Nyíregyháza	Hungary	1	2216	4.35
28	chris2	Edinburgh	Scotland	0	2655	4.03
29	sergey82k	Kyiv	Ukraine	0	1983	3.84
30	mun6u14cr	Heredia	Costa Rica	0	646	3.36

Map your world

Next Global Challenge

▶ 1 - 31 August, 2018

▶ Tweet to **@mapillary** using hashtag **#CompletetheMap** to nominate your city

▶ Current participants include **Norway, Sweden, Brunei, Costa Rica, Colombia, Uzbekistan, Australia, Denmark, Russia, Germany, Belarus, Falkland Islands/Malvinas, Spain, USA**

▶ Top 3 mappers receive a GoPro Hero 5 Black

▶ No setup required, we'll make a dashboard

Building better maps

‣ Better measurement of OSM edits from images

‣ Better OSM editing tools for street-level imagery

‣ Better data extraction using computer vision and structure from motion

‣ Better access to machine learning data layers

Questions?

@c_beddow / christopher@mapillary.com