



Vessel and Port Efficiency Metrics through Validated AIS data

Global OCEANS 2020

Tomaž Martinčič	Dejan Štepec	Joao Pita Costa	Kristjan Čagran	Athanasios Chaldeakis
XLAB d.o.o.	XLAB d.o.o.	XLAB d.o.o.	XLAB d.o.o.	Piraeus Port Authority

Microsoft Partner
Silver Application Development



Horizon 2020



AI Enabled Port Operations



- Growth across all the major cargo types
- More than 90% of the world's trade
- Expected to annually expand 3.5% (2019 - 2024)
- Increasing pressure on ports - turnaround times
- Digitalization in the ports (PCS)

Vessel turnaround time is one of the main indicators of ports efficiency and trade competitiveness*

Demonstrator



PARES















Vessel movements

Port area vessel movements

Port
PPA

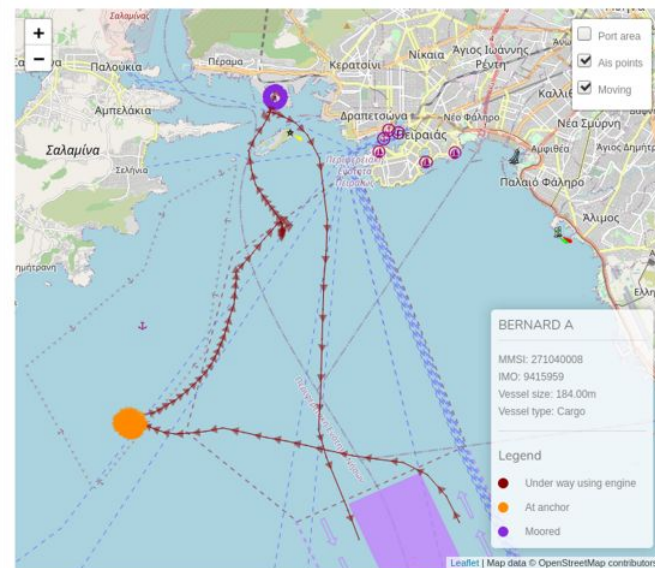
Arrival time

Total entries: 7665
Average vessel size: 163.28 m
Average time moving: 00:51
Average time moored: 1D 04:45
Average speed: 1.83 kn

	Port name	Ship name	Vessel type	Vessel size	Arrival time ↓	Departure time	Time moving	Time moored	Average speed
 	PPA	CONSHIP TOP	Cargo	148.00 m	23.08.2020 06:12	23.08.2020 20:42	00:16	14:17	2.20 kn
 	PPA	BERNARD A	Cargo	184.00 m	22.08.2020 22:45	23.08.2020 21:36	00:11	22:42	1.72 kn
 	PPA	NAVIOS INDIGO	Cargo	261.00 m	22.08.2020 21:36	23.08.2020 13:38	00:10	15:54	1.12 kn
 	PPA	LIBERTAS H	Cargo	128.00 m	22.08.2020 20:47	23.08.2020 19:12	00:18	22:08	2.27 kn
 	PPA	CMA CGM NERVAL	Cargo	300.00 m	22.08.2020 15:44	23.08.2020 06:09	00:31	13:55	1.10 kn
 	PPA	MSC MAUREEN	Cargo	300.00 m	22.08.2020 13:33	23.08.2020 06:44	00:06	17:08	0.96 kn
 	PPA	DIAPOROS	Cargo	300.00 m	22.08.2020 13:15	23.08.2020 06:53	01:50	15:50	0.51 kn

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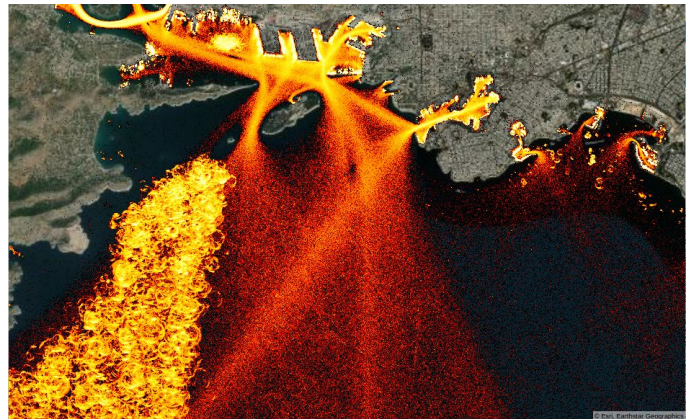
BERNARD A



Automatic Identification System - AIS



- Required for:
 - vessels above 300 GT
 - passenger vessels
- Collision prevention
- Vessel location, type, speed, identification number, course direction, navigational status ...
- Multiple times a minute



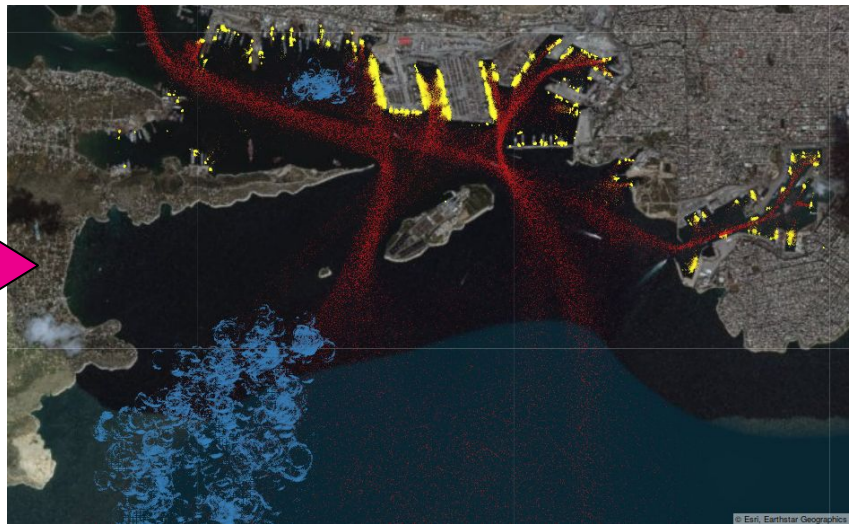
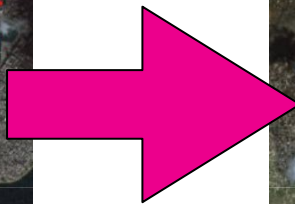
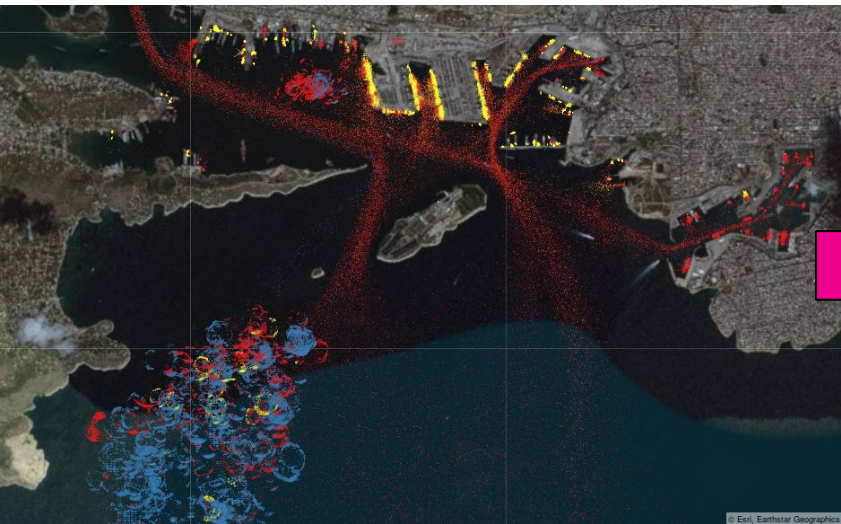
AIS Data has errors ... lot's of them



- Manually entered data
 - Wrong values
 - Late or missing change
- Automatic data
 - Uncovered areas
 - Noise

More than 30 % of reported navigational status are wrong*

Validating Navigational Status

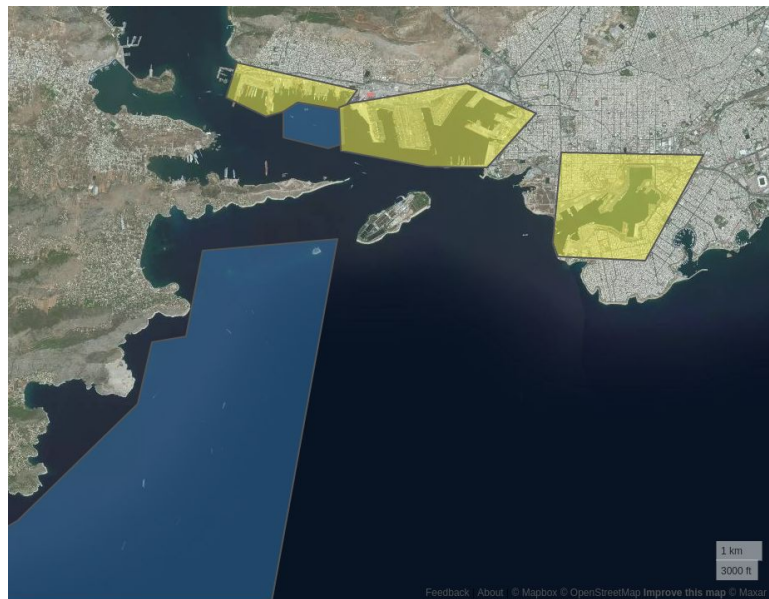


Validating Navigational Status Polygons



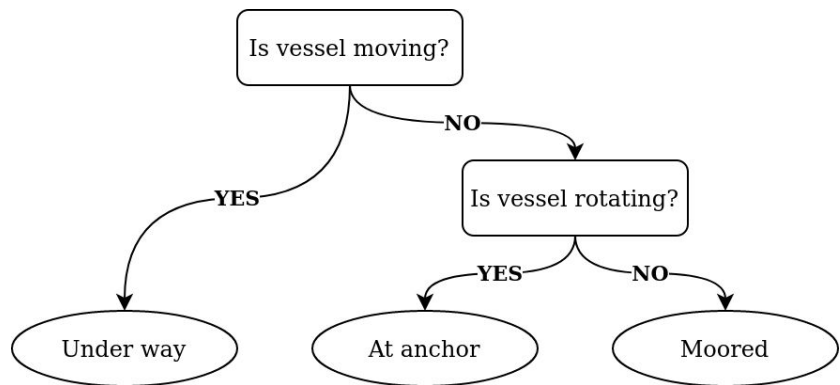
- Manually provided polygons:
 - Terminals (yellow)
 - Anchorage areas (blue)

- + Accurate
- + Split a port into multiple areas
- Manually drawn polygons
- Possibility of anchoring outside of polygons

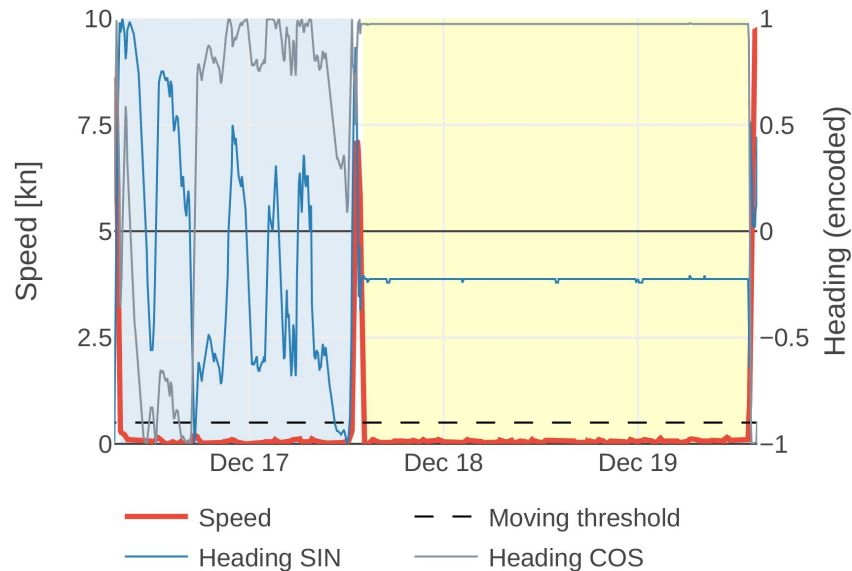


Validating Navigational Status

Vessel movements



- + No manual drawn polygons
- Not accurate for shorter stops



Validating Navigational Status

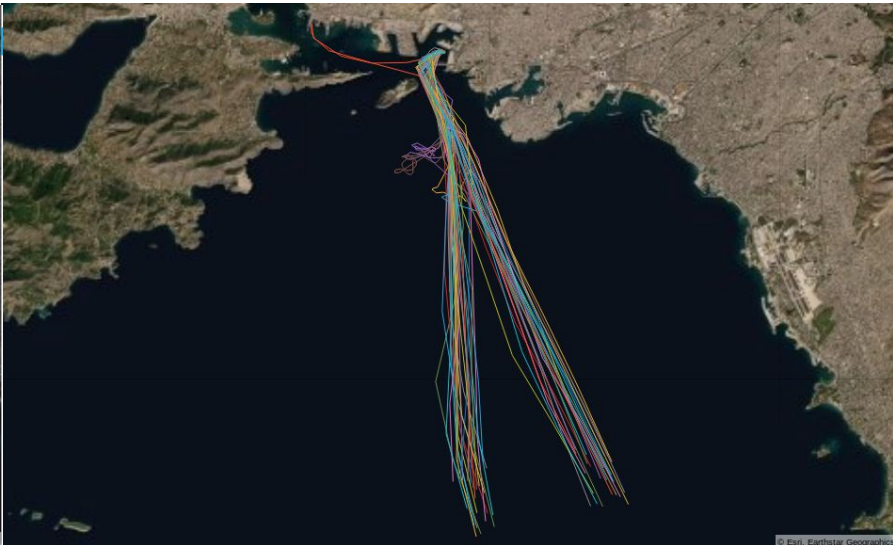
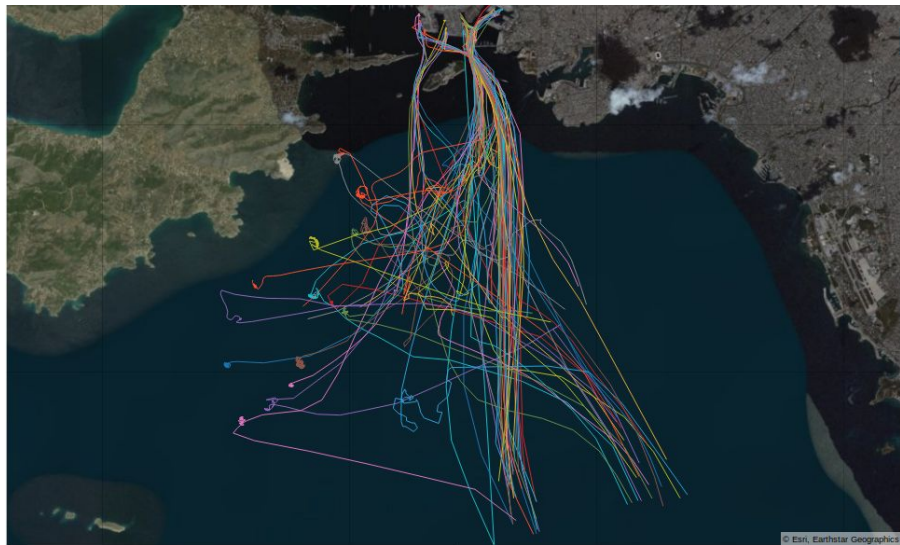
Machine learning



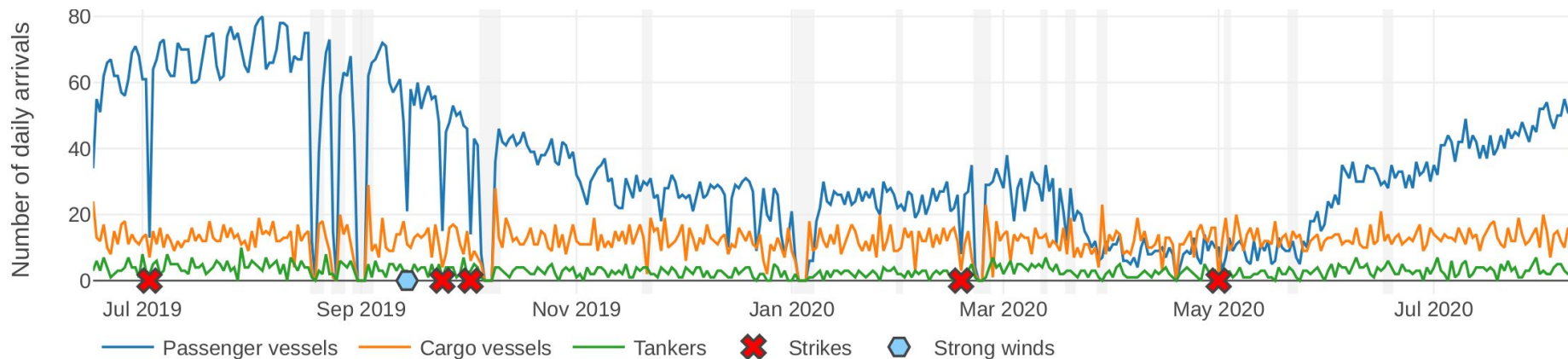
- Clustering:
 - HDBSCAN
- Classification:
 - CatBoost
 - K-Nearest Neighbours

- + No need for manually drawn polygons
- Reduced accuracy

Extracting Voyages



Vessels Arrivals Analysis



Route Reliability

Strong Winds affecting ferry itineraries 13 and 14 of September

SEPTEMBER 14, 2019 | FERRYHOPPER

As reported by the **National Meteorological Service of Greece**, the extreme weather phenomena of the last few days have reached a peak this weekend of September.

[Book your ferry tickets >](#)

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	MMSI	vessel_size	vessel_type	arrival_time	departure_time	time_moving	time_moored	average_speed_when_moving
0	239658000	93.0	40	2019-09-11 14:07:41	2019-09-12 04:22:02	00:15:12	0 days 13:59:09	8.325000
1	239658000	93.0	40	2019-09-12 14:27:26	2019-09-13 04:25:06	00:11:27	0 days 13:46:13	7.700000
2	239658000	93.0	40	2019-09-13 15:41:34	2019-09-15 04:20:56	00:12:52	1 days 12:26:30	7.388889
3	239658000	93.0	40	2019-09-15 16:17:09	2019-09-16 04:22:46	00:18:15	0 days 11:47:22	6.866667
4	239658000	93.0	40	2019-09-16 14:14:27	2019-09-17 04:22:04	00:14:56	0 days 13:52:41	7.840000
5	239658000	93.0	40	2019-09-17 13:53:31	2019-09-18 04:22:17	00:14:39	0 days 14:14:07	7.670000
6	239658000	93.0	40	2019-09-18 13:57:51	2019-09-19 04:22:32	00:18:42	0 days 14:05:59	5.733333
7	239658000	93.0	40	2019-09-19 13:52:29	2019-09-20 04:22:07	00:14:59	0 days 14:14:39	7.370000
8	239658000	93.0	40	2019-09-20 14:03:26	2019-09-21 04:20:51	00:11:59	0 days 14:05:26	7.644444
9	239658000	93.0	40	2019-09-21 14:33:38	2019-09-22 04:21:26	00:16:41	0 days 13:31:07	6.636364
10	239658000	93.0	40	2019-09-22 14:34:46	2019-09-23 04:22:22	00:13:15	0 days 13:34:21	6.250000
11	239658000	93.0	40	2019-09-23 13:57:10	2019-09-25 04:21:26	00:14:35	1 days 14:09:41	7.440000
12	239658000	93.0	40	2019-09-25 14:09:55	2019-09-26 04:22:08	00:15:16	0 days 13:56:57	7.190000
13	239658000	93.0	40	2019-09-26 13:46:52	2019-09-27 04:22:03	00:14:00	0 days 14:21:11	7.720000
14	239658000	93.0	40	2019-09-27 13:45:52	2019-09-28 04:20:17	00:13:37	0 days 14:20:48	7.800000
15	239658000	93.0	40	2019-09-28 13:55:36	2019-09-29 04:21:26	00:15:04	0 days 14:10:46	7.420000

Ferry Strike in Greece Announced for September 24

Posted On 17 Sep 2019 By : GTP editing team Comment: 0



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Conclusion



- We presented 3 different methods for navigational status validation
- We presented a method for extracting voyages
- The demo of the PARES tool is available on ports.xlab.si



Get IT done.