Issue 5 | November 2020

# MASTER

## Multiple ASpects TrajEctoRy management and analysis

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant No 777695 Duration: March 1 2018 | February 28 2022

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# Editorial

Welcome to the fifth issue of the MASTER newsletter!

It is undoubted that the COVID-19 pandemic affected the lives of all of us. MASTER is a project whose activities are based on the concepts of travelling to different countries and in-person presence of meetings and research work, therefore is substantially affected. Travelling from Europe to Brazil and Canada (and the other way around) is not allowed due to the many country restrictions, therefore the MASTER secondments have to be suspended for several months and still they are today.

Nevertheless, the research and dissemination activities related to the project are continuing as much as possible in remote mode.

This issue of the newsletter is therefore deeply reduced in the content since we do not have secondments experiences to report. However, we are happy to share with you some new content related to the projects we are hosting - this month EV-CHIP - and published MASTER papers, as well as events where we have been involved.

We are also very proud to announce that MASTER won the H2020 Dissemination Booster support. Read on to discover more about this experience.

You can download this and previous issues of the newsletter from the MASTER web site:
**http://www.master-project-h2020.eu**

Stay tuned and happy reading!

*Chiara Renso, Project Coordinator*

# Studying vessel movement traffic from AIS data with graph evolution analysis

## The case of North America coastal waters

*Emanuele Carlini and Vinicius Monteiro de Lira - ISTI-CNR Italy;*
*Amilcar Soares, Mohammad Etemad, Bruno Brandoli Machado, Stan Matwin - Dalhousie University, Canada.*

### MARITIME TRAFFIC

Maritime traffic plays a paramount role in today's economy, in terms of cargo shipping, passenger transportation, leisure navigation, and fishing operation. The study of vessel movements is a well-established source of information to understand the role of maritime routes and ports in economic, social, and environmental contexts, such as maritime traffic control and prediction, human migration flows, bioinvasion and maritime piracy. However, valuable information cannot be properly unraveled by looking at ports and routes in isolation, but rather they must be put in relation to one another. Therefore it is important to study the interplay of all the components in the complex maritime network, and it is even more important for understanding the evolution over time of that interplay.

### FROM TRAFFIC TO GRAPHS

A central concept for the analytical study of vessel routes is the Global Shipping Network (GSN), in which nodes are ports and edges are the routes between ports of cargo ships.

*Figure 1* illustrates the GSN resulting from the vessels routes of 2017 in the North American coast. Recently, many studies build the GSN and other maritime networks by using Automatic Identification System (AIS) data. However, only a few of them analyzed the network in terms of its evolution over the years. Also, those works which studied the network evolution used private data, and

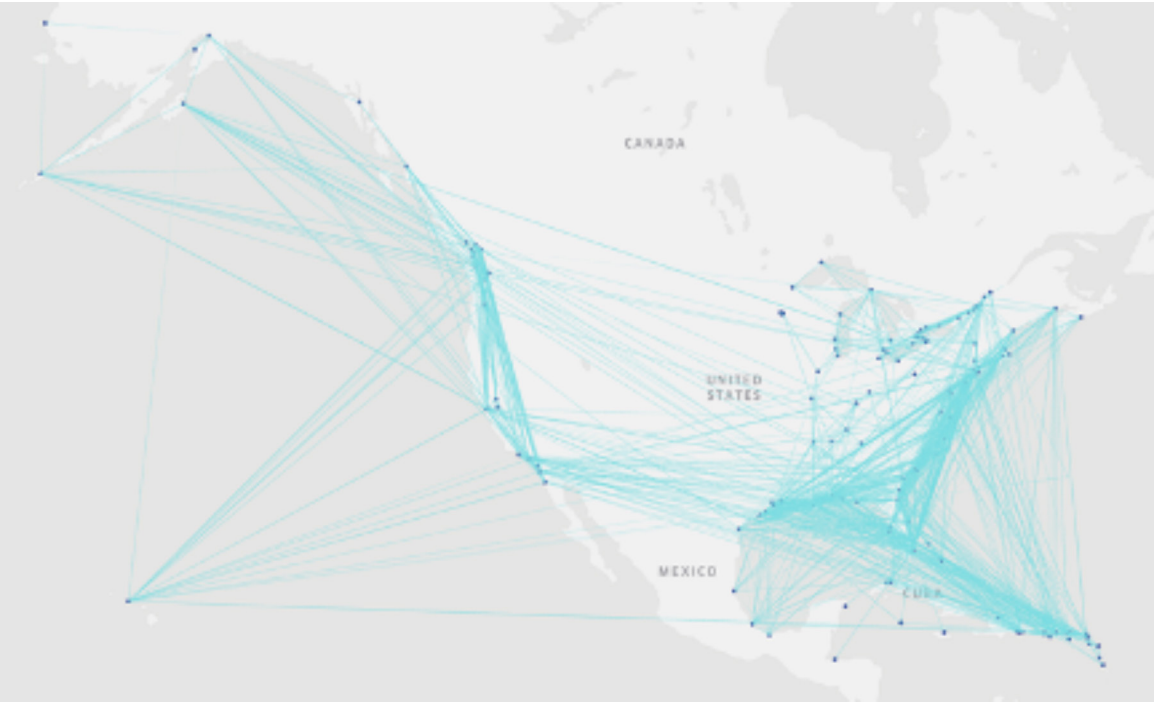



*Figure 1: North American vessels voyages in 2017. The nodes represent ports, and the edges are voyages between two ports*

performed exciting but high-level and coarse-grained analysis.

## OUR PROJECT

The main goal of our analysis is to provide a systematic study of the evolution aspect regarding maritime vessel routes, with the purpose of identifying recurrent patterns in their evolution. Our analysis considers the two necessary dimensions of time and layers (i.e., the evolution of the network can be observed for multiple types of vessels, such as cargo and passengers). Graphs have some properties useful to unravel interesting information about the dynamism between two and more entities. In particular, in the context of a voyages graph, the topological properties of the graph can help us identify relevant characteristics within a network that would not have meaningful information if the individual entities were examined separately. Our source of AIS data is the MarineCadastre.gov, from where we downloaded the AIS records for the US coastal waters for the years 2015-2017, for a total of about 934 GB and about 8 billions of records.

## INSIGHTS

*Figure 3* shows the amount of unique vessels and voyages count for each vessel type and for each month in the period considered. Looking at cargo and tug tows, we can notice an evident trend of less naval traffic in the winter periods (for example from February to March 2016), in which both the number of unique vessels and voyages has a clear drop. The drops are also visible (especially for cargo) in the same period of 2015 and 2017. In the future, we plan to extend our study both in terms of the geographical area covered (i.e., by including AIS data from other sources and possibly creating a worldwide network) and the time period.

Extracted from: "Uncovering vessel movement patterns from AIS data with graph evolution analysis"; Carlini, E., de Lira, V. M., Soares, A., Etemad, M., Machado, B. B., & Matwin, S. (2020). Uncovering vessel movement patterns from AIS data with graph evolution analysis. In EDBT/ICDT Workshops.

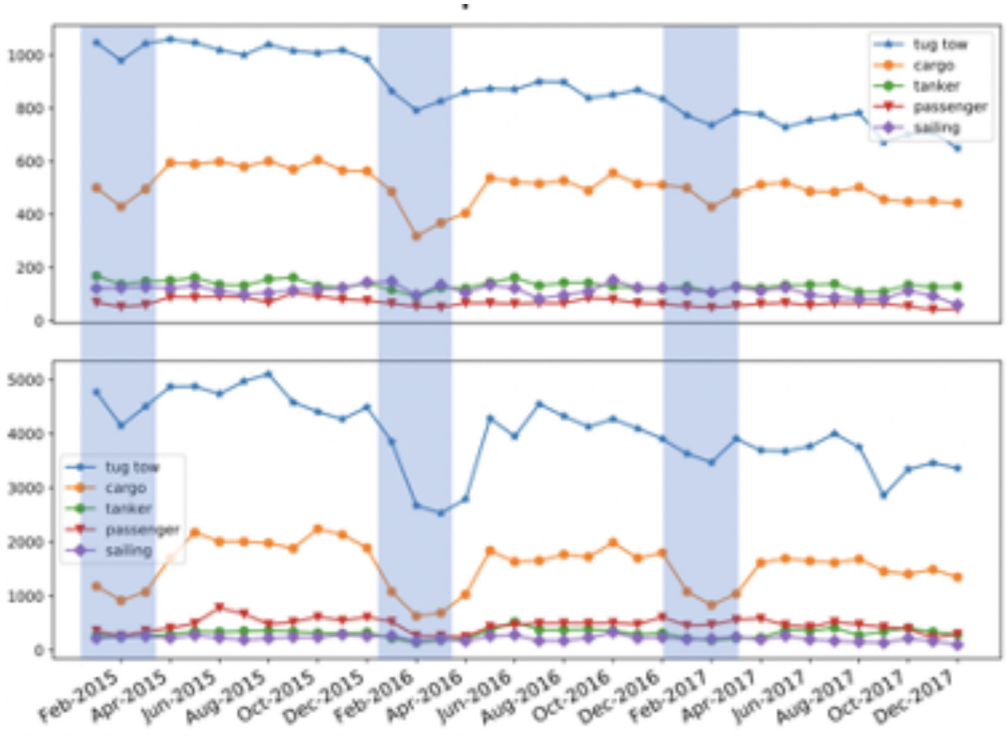



*Figure 2: Unique vessels and voyages count per vessel type over time*

Meeting

# EV-CHIP

## Electric Vehicles Charging Platform for Community Demand Response Aggregators

*Chiara Renso - ISTI-CNR, Italy*

EV-CHIP

EV-CHIP stands for *Electric Vehicles Charging Platform for Community Demand Response Aggregators* and is is an ERANET SGplusRegSys project co-financed by the Italian Ministry of Research (MUR) and the Sustainable Energy Authority of Ireland (SEAI). The consortium has two partners: ISTI institute of CNR and University College Dublin, Ireland. The project is coordinated by Dr. Fabiano Pallonetto from University College Dublin, Ireland while Dr. Chiara Renso from the HPC Lab is the ISTI-CNR Coordinator.

The project is based on the observation that in the next few years we will see a wide-scale electrification of private transport and this will have a profound impact on the operation of the power grid. This will represent a challenge both for distribution system operators and large commercial energy users such as universities, hospitals, business parks and shopping centres.

In this context, the research objective of EV-CHIP is to explore and validate a business model to establish the commercial value of the aggregation of EV charging services in a campus-like facility.

More specifically, the project research goals are the assessment of a standard methodology to evaluate the impact of electric vehicle charging points at the distribution level and the validation of a real-time predictive algorithm for the bi-directional power management of the charging stations. EV-CHIP will explore the potential for an aggregated electric

vehicle (EV) charging optimisation in a campus/shared facility, leveraging a rich set of data resources for building energy consumption, vehicle operation and parking and wholesale electricity pricing.

Researchers will apply a suite of modelling approaches to predict how centrally-optimised EV charging could provide suitable charging volumes at competitive rates for drivers while balancing facility-level electricity requirements and minimising grid usage.

It is fundamental to be able to develop mobility data analysis methods and specifically a parking mobility model representing the user behavior in a parking lot.

The mutual research interests between MASTER and EV-CHIP relies in the need to develop mobility models targeting urban transportation, that is one of the application scenarios of MASTER.

The benefits of the EVCHIP project are multi-fold, and include social, environmental, and economic impacts. Evaluating EVCHIPs social impact in particular will yield two primary benefits: social engagement through execution of the project itself, and validation of the underlying business model.

More infos at the project web site: https://evchip.ucd.ie/

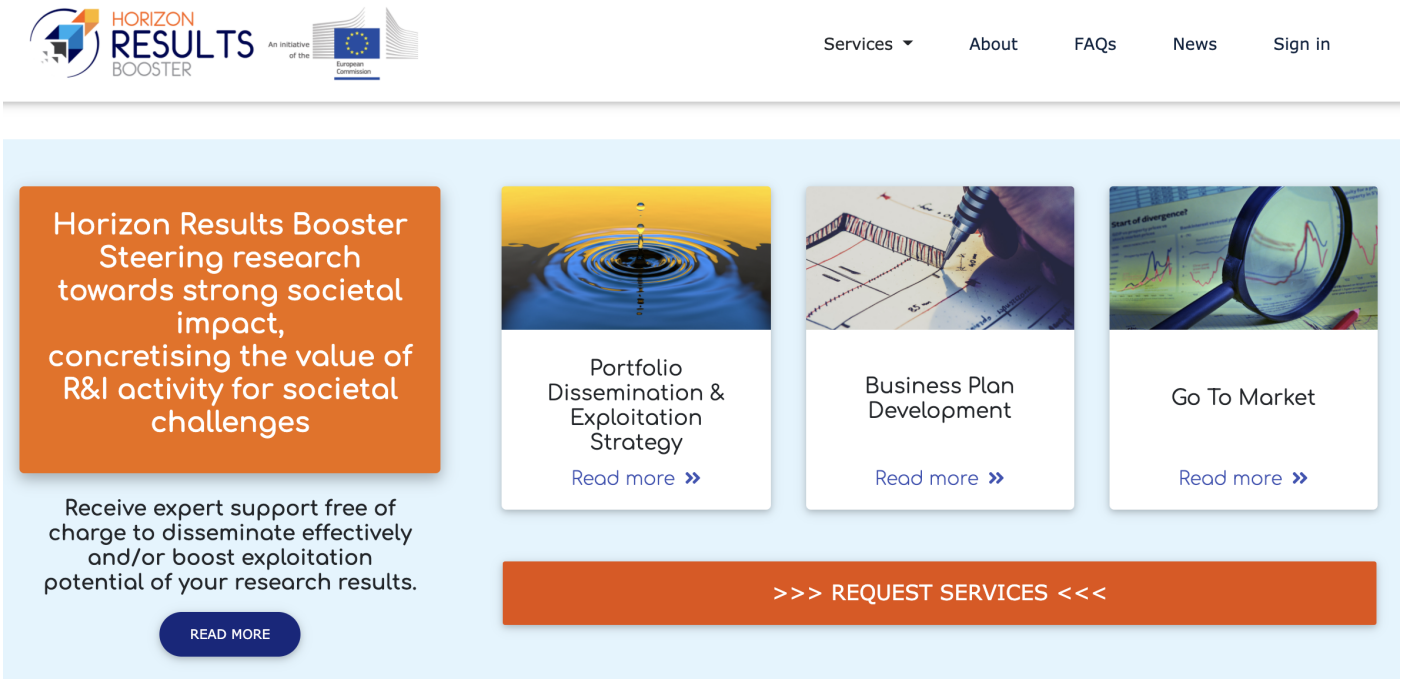
# MASTER and the Horizon Results Booster

MASTER won the support of the Horizon Results Booster services offered by the European Commission. MASTER formed a group with other projects, European and Nationals (Polluscope, SmartShip, i4Sea, Glasseas) with the objective of sharing results and stakeholders and therefore benefitting altogether from the Booster services.
During the Module A phase a number of results and stakeholder groups have been identified and shared among the projects and the Dissemination experts from Trust-It. In the forthcoming module B phase the experts will support us in creating dissemination materials.
We are looking forward to this amazing experience!

**4SEA**: https://i4sea.eu
**SmartShip** https://www.smartship2020.eu
**Polluscope** http://polluscope.uvsq.fr
**SoBigData**: http://www.sobigdata.eu

**https://www.horizonresultsbooster.eu/**

**https://www.trust-itservices.com/**



# Past Events

## EuroScience Open Forum (ESOF) 2020

### SEPTEMBER 2-6, 2020

### TRIESTE, ITALY

The EuroScience Open Forum (ESOF) is a biennial, pan-European, general science conference dedicated to scientific research and innovation. Each conference aims to deliver stimulating content and lively debate around the latest advancements and discoveries in the sciences, humanities and social sciences.
ESOF brings together over 4,500 leading thinkers, innovators, policy makers, journalists and educators from more than 90 countries, to discuss current and future breakthroughs in contemporary science.
MASTER is part of the 22 MSCA projects who takes part of the ESOF.

Thanks to the initiative of the EC RISE Unit and our Project Adviser Simona Losmanova, MASTER participated in a cluster of RISE projects (INCOGNITO, BEHAPI,SECONDO) who applied for participating in the ESOF Open Forum (https://www.esof.eu/).
The application has been accepted for a panel entitled "Network user security and privacy solutions in the new era of artificial intelligence and GDPR".
The conference has been held in hybrid mode in Trieste from September 2-6, 2020.
The Panel where MASTER participates on was held in fully remote mode On September 3 at 18.
Chiara Renso, the MASTER coordinator, presented a short talk entitled User Privacy in Mobility Data, aiming to create awareness about the possible issues but also solutions in the re-identification risk in mobility data.

The ESOF 2020 hybrid edition had more than 2500 participants registered for the event, and among them, more than 1000 present in person as well as 1400 connected remotely every day. ESOF2020 was in the global spotlight: online visitors came from 52 countries across five continents. Regarding online communication, and in particular social networks, the ESOF2020 Facebook page reached more than 500 000 contacts, with 26 000 interactions. There were 200 000 interactions on Twitter and 237 000 visits to the ESOF2020 website. ESOF2020 benefited from very substantial media coverage, with more than 700 mentions in print and on the web during the duration of the conference.
The session "Network user security and privacy solutions in the era of artificial intelligence and GDPR" attracted 82 on-line views in real time on the Livebit platform.




**More infos at https://www.esof.eu/**

## THIRD EDITION OF THE
# BIG MOBILITY DATA ANALYTICS WORKSHOP
## MARCH 2020

## VIRTUAL EVENT

MASTER partners Yannis Theodoridis and Nikos Pelekis from University of Piraeus (Greece), Chiara Renso from National Research Council (Italy) and Karine Zeitouni from University of Versailles Saint Quentin (France) participated in the organization of the Big Mobility Data Analytics (BMDA) workshop that has been held in conjunction with the Extended Data Base Technologies EDBT 2020 in March 2020. The event was originally planned to be held in Copenhagen, changed to fully remote due to the COVID-19 pandemic.

The workshop proudly included the Invited talk from Prof. Esteban Zimányi from Free University of Brussels with title *MobilityDB: Managing Mobility Data in PostgreSQL.*

The program of the workshop included 9 papers organized in 3 research paper sessions: Mobility Data Preprocessing and Enrichment, Big Trajectory Data Processing and Analytics, Mobility Data Analytics and Applications.
One MASTER paper entitled *Uncovering vessel movement patterns from AIS data with graph evolution analysis* by Emanuele Carlini, Vinicius Monteiro de Lira, Amilcar Soares, Mohammad Etemad, Bruno Brandoli Machado and Stan Matwin is also included in the present newsletter.

More info at **http://www.datastories.org/bmda20/**


# MOBILE DATA MANAGEMENT CONFERENCE

## JUNE 30 - JULY 3, 2020

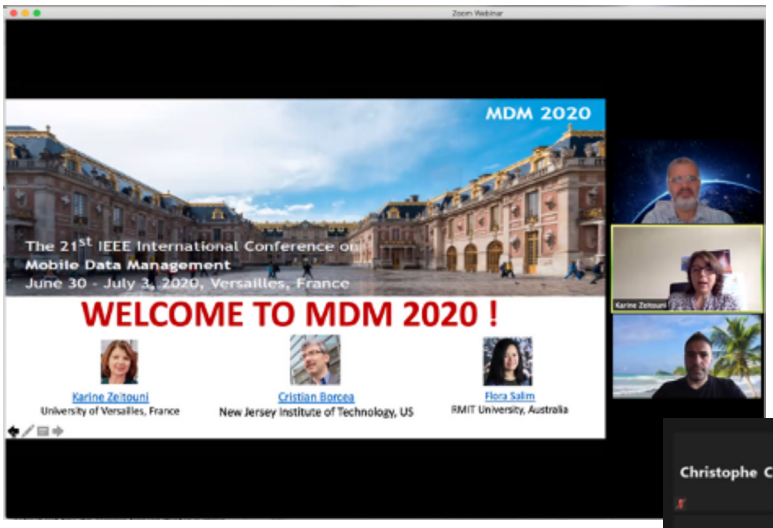
## VIRTUAL EVENT

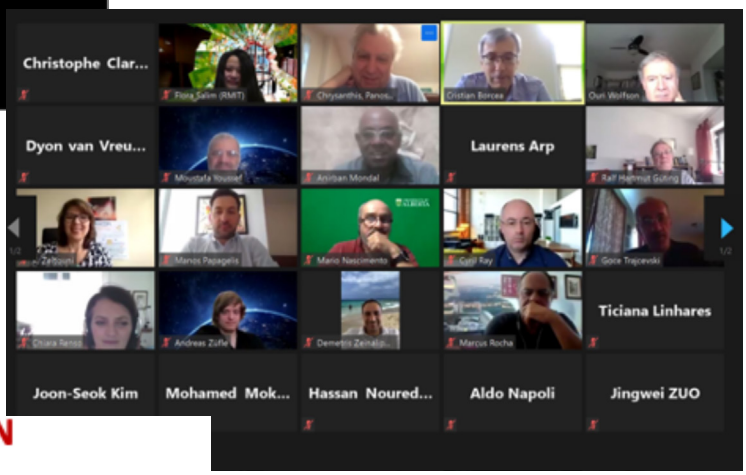
MASTER partner Prof. Karine Zeitouni from UVSQ has been the general co-chair of the 21st IEEE International Conference on Mobile Data Management held from June 30 – July 3, 2020 planned to be held in Versailles in July 2020. Due to the pandemic the conference ran in fully virtual mode.

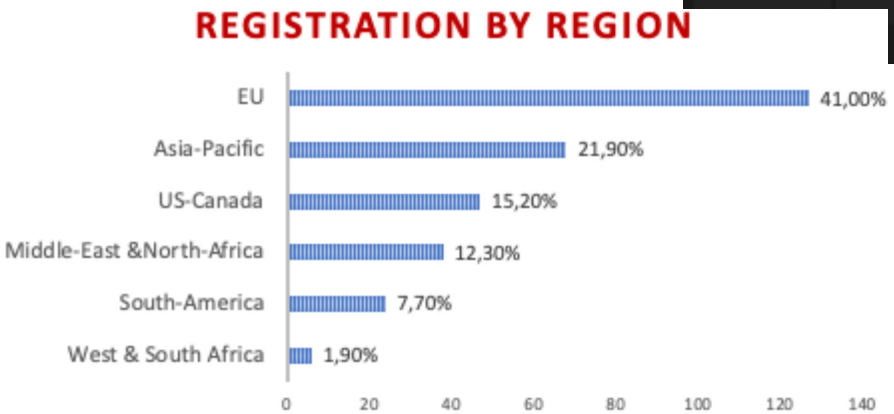
MDM gathered research from both academia and industry and offered a rich scientific program. In addition to research, industrial and demo tracks, the conference offered two keynote presentations, an advanced seminar, three workshops, a PhD forum, and a panel discussion. Given the current world situation, the panel was dedicated to the issues of COVID-19 mobile contact tracing. The three hosted workshops where as follows: 2nd Maritime Big Data Workshop (MBDW), International Workshop on Mobile Data Management, 5th workshop on Mining, and Computing on Social Networks (Mobisocial), and a workshop on Building Software Services in Smart City through Edge-to-Cloud Orchestration (3SCity-E2C).

This edition was successful with 350 registered participants, which is the triple of the average audience of the conference. Chiara Renso (CNR) and Jose Fernandes de Macedo (UFC) were the Workshop Chairs.

More info at **http://mdmconferences.org/mdm2020/index.html**



# SECOND WORKSHOP ON FAIRNESS, ACCOUNTABILITY, TRANSPARENCY, ETHICS AND SOCIETY ON THE WEB (FATES 2020)

## 21 APRIL 2020

## VIRTUAL EVENT

MASTER partners also participated in the organization of the FATES workshop colocated with The Web Conference. The goal of this workshop was to gather researchers and developers from academia, industry, and civil society to present and debate topics of the importance of developing better AI systems on the Web and tools to deal with privacy matters. The workshop accepted research initiatives, projects, results, and design techniques and experiments that are being developed to deal with fairness and accountability, transparency, and ethics on AI and privacy.
Due to COVID-19, the Web Conference and all associated workshops were held as virtual events. The session for FATES2020 occurred on April 21 from 9-5:30 Taipei Taiwan Time. Eleven paper were accepted and presented. In addition, Ricardo Baeza Yates from NTENT, Northeastern University, Universitat Pompeu Fabra, and Universidad de Chile gave a keynote address, “Biases and Social Media Data”, live during the virtual event. The papers presentations were organized into three sessions based on the main topic of the contribution: Bias, Fairness and Case studies. Each of these three sessions was concluded with a Question and Answering slot where we grouped all questions to the presented papers.

Videos of all presentations are available from the FATES website:
**http://fates.isti.cnr.it**

# MASTER CONCEPTUAL MODEL PRESENTED AT THE ITALIAN DATABASE CONFERENCE SEBD 2020

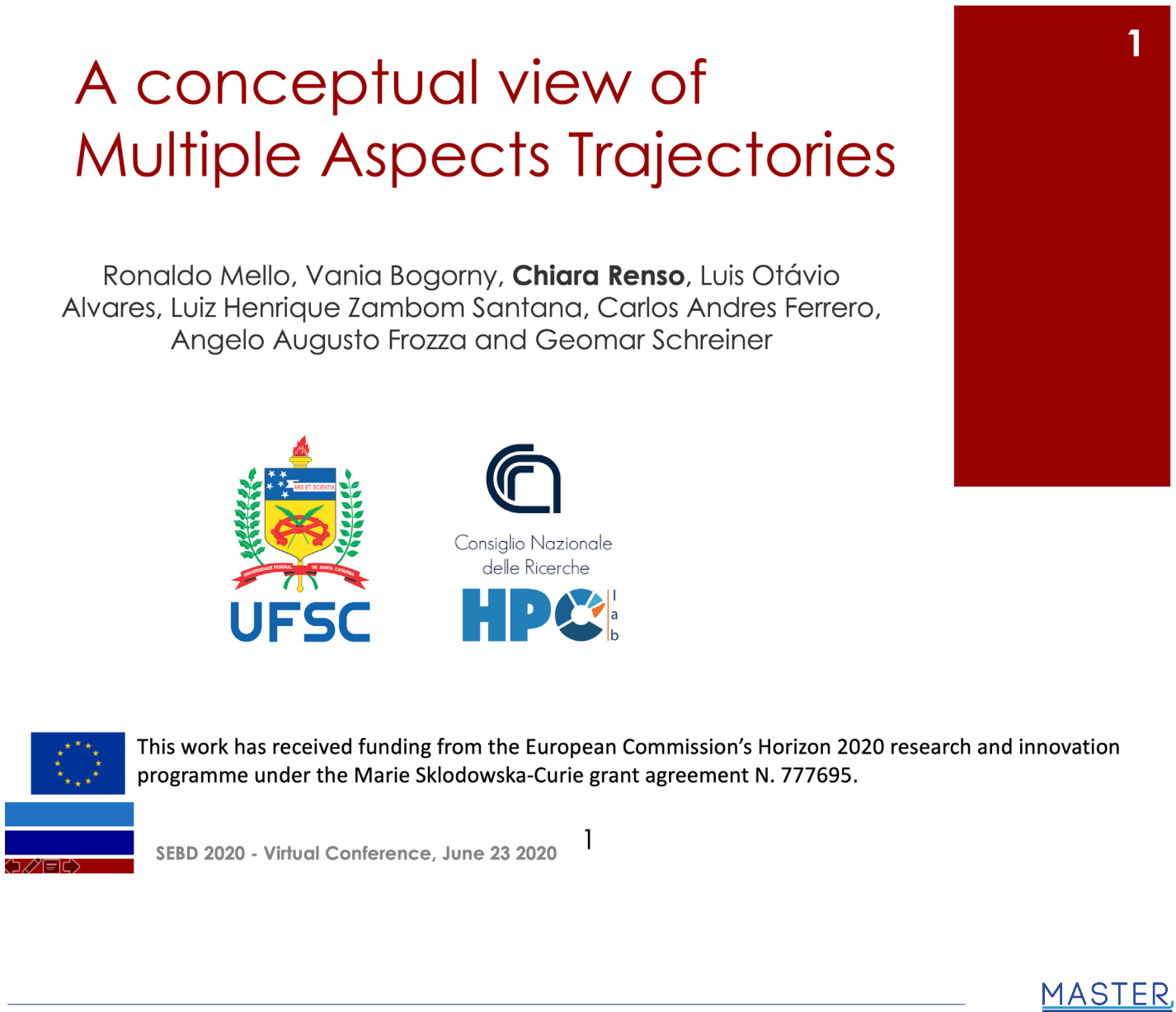
## JUNE 2020

The MASTER conceptual model developed by UFSC and CNR has been presented at the Italian Database conference, SEBD2020, which has been held virtually from June 21 to June 24, 2020.

Chiara Renso (CNR) presented the paper to an audience of about 35 attendees.

Link to SEBD program is here: https://sebd2020.unica.it/program

MASTER has also been included in the research projects in the SEBD web site: **https://sebd2020.unica.it/projects**



# Next Events

## FIRST INTERNATIONAL SUMMER SCHOOL ON DATA SCIENCE FOR MOBILITY

### SPRING 2021

### SANTORINI, GREECE

Massive amounts of spatio-temporal data representing trajectories of moving objects are produced by an ever-increasing number of diverse, real-life applications, ranging from mobile to social media apps and surveillance systems, from vehicle tracking systems to IoT mobile sensors. Such mobility-aware traces come in huge numbers and very complex forms, and can be enriched with multiple different semantic dimensions. These semantically enriched trajectories have the potential to unveil novel challenges in several domains, such as urban, maritime and aviation.

The explosion in Data Science is happening now. The Big Data technological infrastructure has reached maturity. Significant interest from the research community is being shown towards the Big Data Value Analytics reference model: data management, data processing, data analytics, data visualization. The time is right for the field of Mobility Data Science to follow the trend!

Our **First International Summer School on Data Science for Mobility** offers participants both visionary keynote speeches and hands-on mini courses held by leading experts in AI and Data Analytics for Mobility from Canada, Greece & Italy. The keynotes speeches will explore the challenges faced due to the voluminous and complex mobility data generated every day in maritime and aviation domains. The hands-on mini courses complement the keynotes by giving practical experience in the usage of analysis tools on real mobility datasets.

The Summer School was supposed to take place in April 27-May 1, 2020, but due to the coronavirus outbreak the school has been postponed to April 2021.

For updates, please visit:
**http://master-school.isti.cnr.it/**

# FOURTH BIG MOBILITY DATA ANALYTICS WORKSHOP (BMDA) 2021

## 23 MARCH 2021

## CYPRUS

MASTER partners Yannis Theodoridis from University of Piraeus Research Center (Greece) and Chiara Renso from National Research Council (Italy) together with Mahmoud Sakr, Université Libre de Bruxelles (Belgium) and Cyril Ray, Arts & Métiers Institute of Technology and Naval Academy (France) participate in the organization of the fourth edition of Big Mobility Data Analytics (BMDA) workshop to be held in conjunction with the Extended Data Base Technologies EDBT 2021 in March 2021 in Cyprus.

The BMDA workshop will foster the exchange of new ideas on multidisciplinary real-world problems, discuss proposals about innovative solutions, and identify emerging opportunities for further research in the area of big mobility data analytics, such as deep learning on mobility data, edge computing, visual analytics, etc. The workshop intends to bridge the gap between researchers and big mobility data stakeholders, including experts from critical domains, such as urban / maritime / aviation transportation, human complex networks, etc.

The workshop invites papers discussing novel research and ideas without substantial overlap with papers that have been published or submitted to a journal or a conference with proceedings. Submitted papers can be regular Research Papers or Demo Papers.

Deadline for submission is December 14th 2020.

More info at **http://www.datastories.org/bmda21/**

# SECOND MASTER WORKSHOP

## JUNE 2021

## VENICE, ITALY

We plan to hold a second MASTER workshop, planned to be in Venice hosted by our partner Alessandra Raffaeta' of University Ca' Foscari of Venice. The workshop was originally planned in September / October 2020 but postponed to June 2021 due to the COVID-19 pandemic. The objective of this workshop is to invite (local) stakeholders and present them some of the project results to discuss possible exploitation actions.

To stay up to date about the project news, please visit our website and our blog page

**WWW.MASTER-PROJECT-H2020.EU**

MASTER

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### Master participation in ESOF!

September 3, 2020

MASTER participated into the ESOF Euro Forum, in the panel "Network user security and privacy solutions in the era of artificial intelligence and GDPR" jojnt with other RISE projects: SECOND...

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### MASTER won the Horizon Results Booster services!

August 21, 2020

The MASTER consortium - supported by the precious contribution of Beatrice Rapisarda (CNR) - won the support for the results dissemination from the Horizon Results Booster of the European C

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### MASTER will be at ESOF 2020!

July 24, 2020

The MASTER project will participate in the Euro Science Open Forum event, from 2 to 6 September 2020. The EuroScience Open Forum (ESOF) is a biennial, pan-European, general sc

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### MASTER conceptual model presented at the Italian Database Conference SEBD 2020

June 29, 2020

The MASTER conceptual model developed by UFSC and CNR has been presented at the Italian Database conference, SEBD2020, which has been held virtually from June 21 to June 24, 2020. Chiara ...

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### Mobile Data Management Conference will be Online!

May 26, 2020

The 21st IEEE International Conference on Mobile Data Management will be held from June 30 - July 3, 2020 organized by our partner Prof. Karine Zeitouni from UVSQ .Due to the

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### Fourth issue of the MASTER newsletter

April 18, 2020

Issue N 4 April 2020. The issue N 4 of the MASTER newsletter has been published! You can download from here. In this issue, a choice of interesting research highlights from the proj...

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Duration: March 1 2018 | February 28 2022



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