



Newsletter #6  
April 2018

# RANGER

**RA**dars for lo**NG** distance maritime surveillance**E**  
and Search and Rescue ope**R**ations



# Contents

Foreword	2
Project News & Meetings	3
“New radar technology aims to save lives in the Mediterranean Sea”, article by LAUREA	7
“The scope and impact of RANGER on Search and Rescue operations”, interview with HMOD and DMA	9
Related Conferences & Events	11

Dear Readers,

Welcome to the sixth issue of the RANGER newsletter.

RANGER is a 42-month European project, co-funded by the European Union’s Horizon 2020 research and innovation programme. The consortium comprises 10 partners from 7 countries, in Correction: a balanced blend of Radar technology industrial organizations, academic/research institutes, high-tech SMEs, and highly relevant end-user organizations. RANGER combines innovative Radar technologies with novel technological solutions for early warning, in view of delivering a surveillance platform offering detection, recognition, identification and tracking of vessels, beyond current radar systems’ capabilities, thus drastically improving the response and intervention capacity of European Search and Rescue operations.

**This issue features two articles about the expected impact of the RANGER technology on Surveillance and on Search and Rescue operations. It also includes project news and updates.**

Enjoy reading and don’t forget to visit our website for more information!

The Project Coordinator



## For more Information

Please visit the RANGER website [www.ranger-project.eu](http://www.ranger-project.eu)

You can also keep up with more of what is happening at RANGER project by following us on:



@H2020Ranger



H2020Ranger

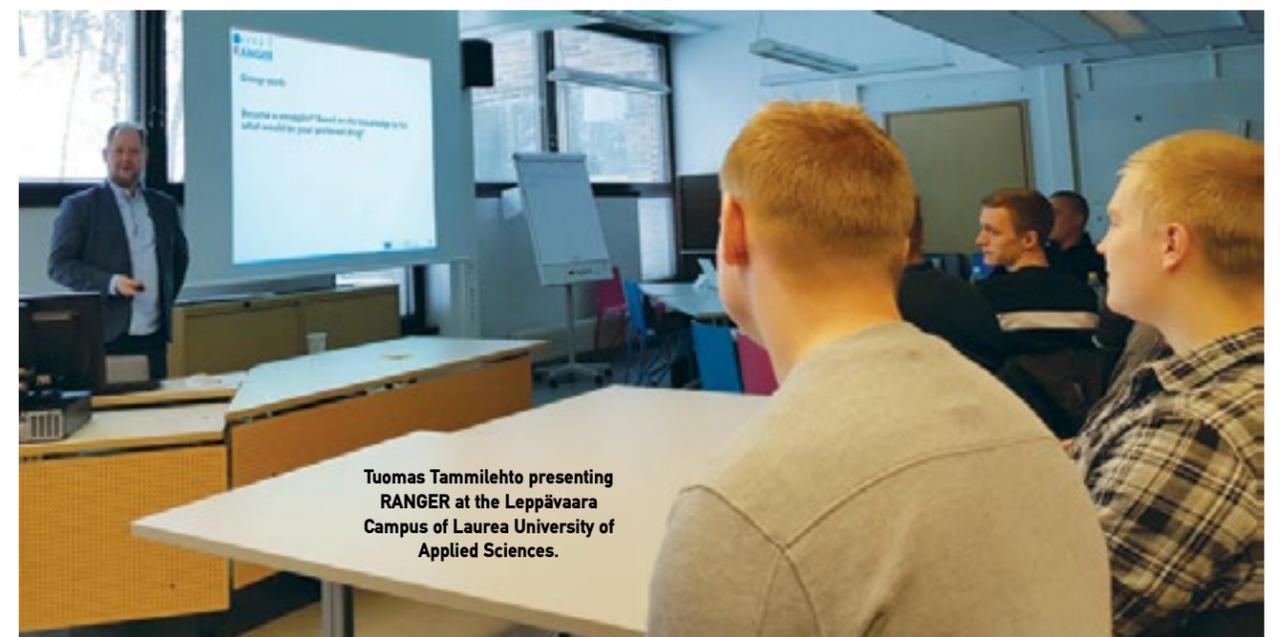
## Lecture delivered at the Laurea University on “RANGER project – Enhancing border security and crime prevention capabilities at the Mediterranean Sea

Criminologist and project manager of the RANGER-project, Mr. Tuomas Tammilehto, lectured on enhancing security and crime prevention capabilities on the Mediterranean Sea at the Leppävaara Campus of Laurea University of Applied Sciences on Thursday, 15th of February 2018.

The two and half hour lecture touch first a bit of European funded projects in general. Then, Tammilehto presented the RANGER project, before moving into the problems of smuggling drugs and the desperate situation of immigrants in the mists of the current migration crisis. Whilst, Tammilehto presented drugs and trafficking, and immigration more generally, the core of the lecture focused on irregular immigration and drug trafficking trends and patterns, and on how novel technology can have an impact on the above mentioned phenomena. A special emphasis was put on the decision making logics of both irregular immigrants and drug traffickers, and how this process is affected by new technology.

At the same time as presenting the findings, i.e. explaining the situation at the Mediterranean Sea, Tammilehto also covered the essentials of the methodology used when carrying this type of research. For example, critical evaluation of data, challenges of access to the data, different bias affecting the outcomes were all essential material of the lecture. Above was done so that the audience, the majority was students of security, safety and risk management, would have a clear view on both how and why research was done, and especially how it contributes to the RANGER project and larger to European security.

The lecture was well accepted, and Tammilehto was asked to hold another one later this spring.



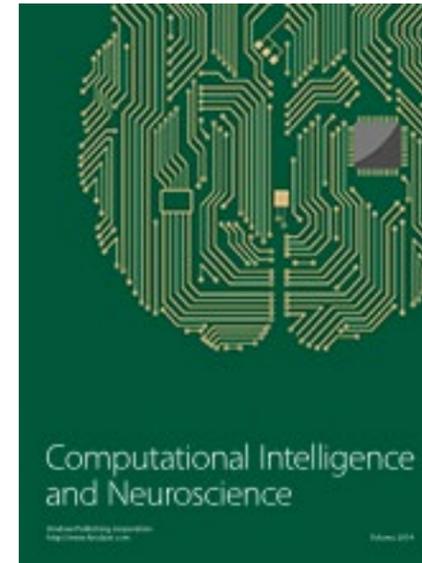
Tuomas Tammilehto presenting RANGER at the Leppävaara Campus of Laurea University of Applied Sciences.

### Diginext presents RANGER at Forum Horizon 2020

RANGER-partner Diginext participated at the fourth Forum Horizon 2020, held on the 4th of December 2017, in Paris and organized by the French Ministry of Research. Olivier Balet, Technical Director of Diginext, talked about the added value of RANGER to the Framework Program for Research and Innovation. Other speakers included Alain Beretz, French Minister of Research, Jean-David Malo, Head of Unit at DG RTD, and former Commissioner and Head of the World Trade Organization, Pascal Lamy.



### Scientific publication



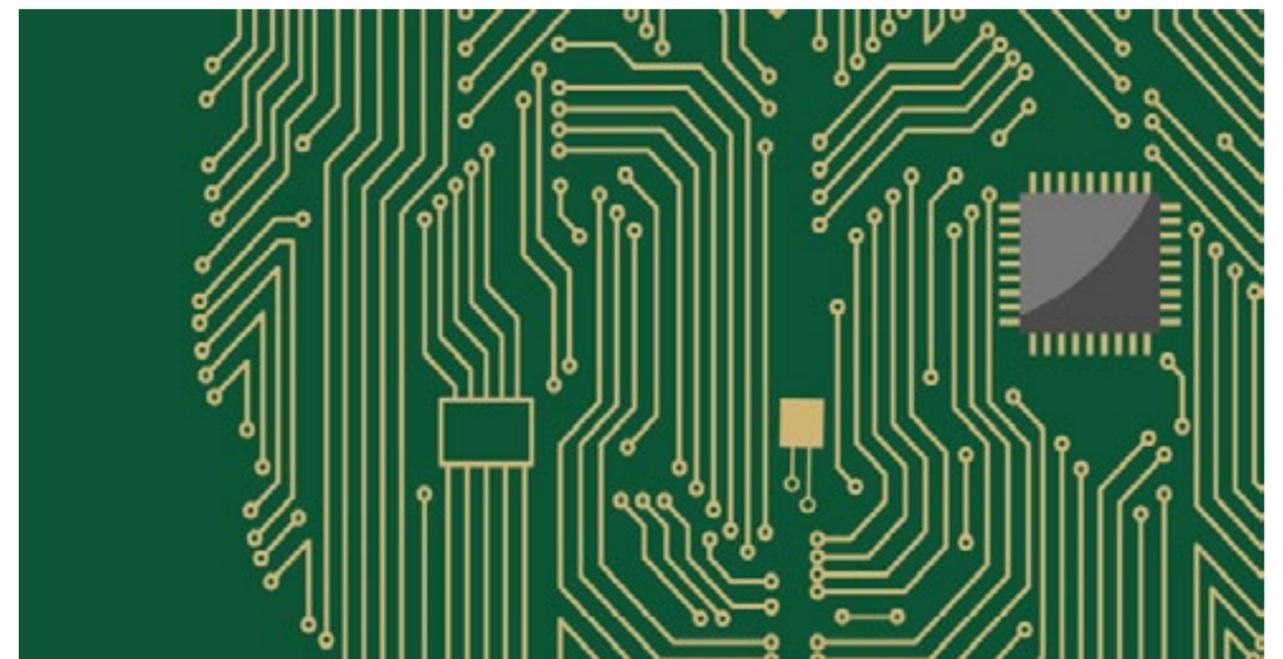
A paper entitled "Stacked Auto encoders for Outlier Detection in Over-The-Horizon Radar Signals" by RANGER partner TELESTO was published in the Computational Intelligence and Neuroscience journal (Impact Factor: 1.215). The paper presents part of the work TELESTO has implemented in the context of RANGER project.

Abstract:

Detection of outliers in radar signals is a considerable challenge in maritime surveillance applications. High-Frequency Surface-Wave (HFSW) radars have attracted significant interest as potential tools for long-range target identification and outlier detection at over-the-horizon (OTH) distances. However, a number of disadvantages, such as their low spatial resolution and presence of clutter, have a negative impact on their accuracy. In this paper, we explore the applicability of deep learning techniques for detecting deviations from the norm in behavioral patterns of vessels (outliers) as they are tracked from an OTH radar. The proposed methodology exploits the

nonlinear mapping capabilities of deep stacked autoencoders in combination with density-based clustering. A comparative experimental evaluation of the approach shows promising results in terms of the proposed methodology's performance.

View full paper here: <https://www.hindawi.com/journals/cin/2017/5891417/>



## RANGER plenary and review meeting in Athens (5-8 December, Athens)

The third plenary meeting of the RANGER consortium was held in Athens, Greece, on 5th and 6th of December. The very productive plenary was followed by a successful first periodic review meeting, on 8th of December.

During the plenary, partners had the opportunity to discuss project progress and developments within each one of the work packages, elaborate on technical aspects of the project work and plan future actions.

During the review meeting, the consortium presented in detail the work that has been completed to date and provided a concrete action plan for the next period. The reviewers commended on the work of the RANGER consortium and shared positive feedback in all fronts.



## Article: New radar technology aims to save lives in the Mediterranean Sea

By Tuomas Tammilehto - Published in Laurea University's Magazine, Forerunner, in January 2018

RANGER was presented in Laurea's magazine – Forerunner – that highlights current topics in Laurea research, development and innovation activities for University's interest groups in English. The article entitled "New radar technology aims to save lives at the Mediterranean Sea" gives an overview of the project and specifically talks about the radar technology developed in the RANGER project and how this enhances maritime surveillance and Search and Rescue operations.

Full article:

The RANGER project develops new kinds of radar technology to assist with sea surveillance and rescue. In recent years, increased flows of refugees from Europe across the Mediterranean Sea have begun to appear in news headlines. Besides growth in irregular immigration, the trafficking of drugs increases the pressure on sea surveillance in countries around the Mediterranean. Help with this problem comes from the RANGER project, funded by the European Union's Horizon 2020 programme, in which Laurea is participating. enabling sea surveillance resources for more effective use The premise of the RANGER project is technology that enables, amongst others, the identification of vessels from much farther away than before. Traditionally, radars see only to the horizon, in practice a few dozen nautical miles away, which has made surveillance of the entire Mediterranean region a challenge. This new technology helps enhance surveillance and speeds up search and rescue operations. The RANGER project includes 10 project partners from six different countries. The goal is to

pilot new radar technology and also develop solutions that include machine learning and integration with existing sea and border control systems. "The project's fundamental objective is, of course, to save lives," says Tuomas Tammilehto, who acts as the project manager at Laurea. "At the moment, the Mediterranean is, quite frankly, a mass grave where thousands of people have drowned in recent years. No one even knows the exact figure, it can only be estimated." The same new solutions can also manage to reduce the costs of sea surveillance. Since the current surveillance vessels have a limited radar range, vessels must patrol an extensive area to obtain an overall picture of the traffic. The new radar system could help send patrols more effectively to the areas where they are needed. "Of course, a radar alone will not save lives or catch drug smugglers, but it would provide an extremely valuable tool for border control and sea rescue operations", Tammilehto continues. laurea acts as researcher and facilitator In the RANGER project, Laurea is responsible for the implementation of two work packages. The first one includes the preparation of a "compliance framework". It ensures that the whole project complies with all necessary laws and guidelines and is otherwise constructed on an ethically sustainable foundation. "In this work, we started with human rights, people's legal security and matters concerning privacy, and we always end up in affairs concerning environmental protection, which affects the placement of radar systems, for example", project manager Tammilehto describes. In the second work package, Laurea has been responsible for ensuring that the

[continue to the next page](#)

continue from previous page

new radar system is compatible with different existing information-sharing systems pertaining to border security and sea surveillance. "In practice, besides the research, one of the most important things Laurea has done is to chart different user perspectives: what do potential end users wish and require from the system? We have done this work, for instance, in different workshops with various operators", Tammilehto says. Indeed, Tammilehto describes Laurea's role as a kind of interpreter.

On the one hand, you have end users who look at the matter from their own, practical perspective; and on the other hand, you have engineers who develop the technology. "This is precisely where Laurea's strength lies, as we act as a facilitator between different operators", he sums up. At Laurea, the project has also included students from the Ethical Management and Leadership Master degree programme, who have studied the threats and opportunities in the development of new technology in the form of "social impact assessment". The next step in the RANGER project comprises pilot projects with the first one to be implemented in Southern France and on the Island of Crete in Greece.

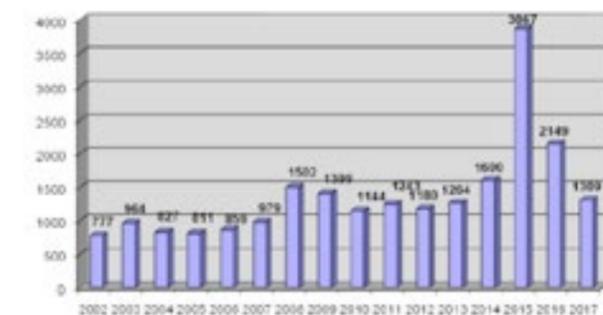
## Article: The scope and impact of RANGER on Search and Rescue operations

Interview with the Hellenic Ministry of Defence (HMOD) and the French Ministry for an Ecological and Solidary Transition (DMA), RANGER consortium partners.

### 1) How would you describe the situation of SAR operations today and the development of SAR operations since the escalation of the crisis in the Mediterranean at the start of 2014 (rescuing large numbers of refugees)?

**HMOD:** According to the Hellenic Joint Rescue Coordination Center (JRCC Piraeus) and within its area of responsibility, namely the FIR of Athens, an increase in the already high number of incidents is observed, with higher figures in 2015 and 2016.

heading/speed, other vessels in the area, distressed craft name or type/call sign, persons on board (POB), craft description, on-scene weather and sea conditions etc.); b) Search planning and operations procedures; c) Communications throughout a SAR mission including the transmission of a distress message, the notification of the search unit, the coordination of the search and the intercommunication within the individual rescue unit; d) Multiple Rescue Decision (Sea state, visibility, and location of/distance between the survivors are all factors that should be considered).



SAR incidents in Hellenic FIR (source: Hellenic Coast guard - JRCC Piraeus)

In 2017 JRCC Piraeus handled a total of 1309 SAR cases in Greek FIR and 206 cases out of the Greek FIR, as the Center which received the first SOS message (a total of 1516 incidents). 548 of these incidents concerned illegal migration.

**DMA:** French maritime search and rescue services are not involved in the operations mentioned above. However, a similar situation exists in the Comoros between Anjouan and Mayotte islands. These events generate a large number of deaths or disappearances at sea compared to other marine activities.

### 2) What are the basic challenges of SAR operations?

**HMOD:** a) Data collection (position and time of emergency,

**DMA:** The main challenge of a rescue operation is to save time, more precisely not to lose it. The time saving limits the phenomena of drifts due to the marine currents and the wind. The less drift there is the less risk of dispersal of researched persons is. The smaller the search area is, the greater the chances of success are. The quickness of rescue also limits the risk of drowning or hypothermia. The rapid location of the incident site, or even the anticipation of the incident, are therefore key elements.

### 3) What is the importance of international collaboration in SAR?

**HMOD:** In mass rescue operations a high number of assets which may not be available to a country is required and thus the assistance of other countries is necessary. Therefore, the importance of international collaboration is very high as evidenced by incidents such as that of Norman Atlantic (Adriatic Sea – Dec 2014) where we had the successful cooperation of the Greek and Italian authorities and the incidents in the East Aegean region where they operate the Hellenic Navy, Hellenic Coast Guard, FRONTEX and NATO forces.

**DMA:** The number of rescue operations, their occurrence and the number of people involved may exceed the capacity/technical availabilities of a coastal state.

continue to the next page

**STRATEGIC RESEARCH AREAS**

**HEALTH AND SOCIAL INTEGRITY AIMS TO IMPROVE HEALTH AND WELLBEING WITH THE EXPLOITATION OF INNOVATION.**

In the RANGER project, Laurea, together with other consortium partners, researches and develops innovative solutions for the prevention and management of risks and the improvement of safety and security.

**SERVICE BUSINESS FOCUSES ON LAUREA'S EXPERTISE IN SERVICE INNOVATIONS AND SERVICES.**

We have an European 2020 funded project aiming to develop innovative and efficient technologies and services to improve citizens, public administrations and local companies (40 the innovation process).

**COHERENT SECURITY AIMS TOGETHER DIFFERENT ASPECTS OF SAFETY AND SECURITY.**

The Laurea coordinated Horizon 2020 funded EUCO project has been aiming to enhance our local prevention capabilities.

**ENHANCING SEA SURVEILLANCE RESOURCES FOR MORE EFFECTIVE USE**

The mission of the RANGER project is to develop a technology that enables the identification of vessels from a much further away than before. Traditionally, radar was only in the backbone of maritime surveillance systems.

In recent years, increased focus on migration routes across the Mediterranean Sea has led to the development of new technologies. The RANGER project aims to improve the efficiency of the existing surveillance systems and to develop new technologies and solutions that include machine learning and integration with existing sea and border control systems.

The project's fundamental objective is to create a "social impact assessment" that will help to identify and address the needs of the project managers in Laurea.

In the meantime, the Hellenic Navy is, quite frankly, a mass game when thousands of people have drowned in recent years. The sea does not know the exact figures. It can only be estimated.

The other core solutions can be surveillance. Since the current surveillance vessels have a limited range, vessels must patrol extensive areas to obtain an overall picture of the waters. The new radar system could help send patrols more effectively to the areas where they are needed.

"Of course, a radar alone will not save lives or catch drug smugglers, but it could provide an extremely valuable tool for border control and sea rescue operations", Tammilehto continues.

**LAUREA ACTS AS RESEARCHER AND FACILITATOR**

In the RANGER project, Laurea is responsible for the implementation of two work packages. The first one includes the preparation of a "social impact assessment". It ensures that the whole project complies with all necessary laws and guidelines, such as ethical and environmental issues.

On the one hand, you have end users who look at the matter from their own, practical perspective; and on the other hand, you have engineers who develop the technology. "This is precisely where Laurea's strength lies, as we act as a facilitator between different operators", he sums up.

At Laurea, the project has also included students from the Ethical Management and Leadership Master degree programme, who have studied the threats and opportunities in the development of new technology in the form of "social impact assessment".

The next step in the RANGER project comprises pilot projects with the first one to be implemented in Southern France and on the Island of Crete in Greece.

continue from previous page

Because the technical devices and the means of rescue corresponding to the average probable risks due to global risks assessment, without taking into account the extreme risks whose occurrence is unlikely. Co-operation therefore becomes paramount as soon as an exceptional situation occurs.

**4) How can technology help to improve SAR operations?**

**HMOD:** One of the key issues to be addressed in a SAR operation is to initially notify and locate the point at which the possible event took place. To solve this problem, technology can contribute in two ways. The first one is through the GMDSS system use which includes voice communications and real-time or almost real-time data sharing. In this way, vessels can manually or automatically notify the local control authority of any issues they encounter. The second one is through continuous vessel tracking and monitoring via surveillance systems such as RADAR or VMS (Vessel Monitoring System), making easier and faster to detect and locate the potential targets involved in a SAR incident.

**DMA:** The knowledge of abnormal behaviour aims to ensure the awareness of the maritime situation.

**5) How will the RANGER platform contribute to the improvement of SAR operations?**

**HMOD:** SAR operations would be enhanced by the ability of the RANGER RADAR to detect and depict immediately the vessels that are in danger, even if those are moving

in blind sectors. Fast and accurate detection of a critical situation will be improved in high level SAR operations.

**DMA:** The early warning system based on long range tracking ships should improve the knowledge of what happens continuously by using discrete technical means.

**6) Can you describe us a potential scenario that could be presented in the context of the RANGER pilots?**

**HMOD:**

1st Scenario (drug trafficking coastal area) - A small vessel (simulating an inflatable boat) carrying drugs and with no AIS signal, will sail from Heraklion to another place in Crete. It will be tracked by the RANGER system (PE-MIMO and legacy systems) as a suspicious vessel in order to give all the information to the authorities, so that they can proceed and arrest.

2nd Scenario (human trafficking in open seas) - A big ship that carries immigrants is sailing in the Aegean Sea. It is transmitting AIS signal as usual. All of a sudden the AIS signal is stopped. An inflatable vessel of smaller size is leaving the mothership carrying immigrants. It is tracked by the system, information are given to the authorities to proceed.

3rd Scenario (SaR Operations) - A small or medium vessel is having an accident in open seas. It is transmitting the AIS signal and is requesting SOS. As it is tracked through the system, the authorities know exactly where it is and where to operate.

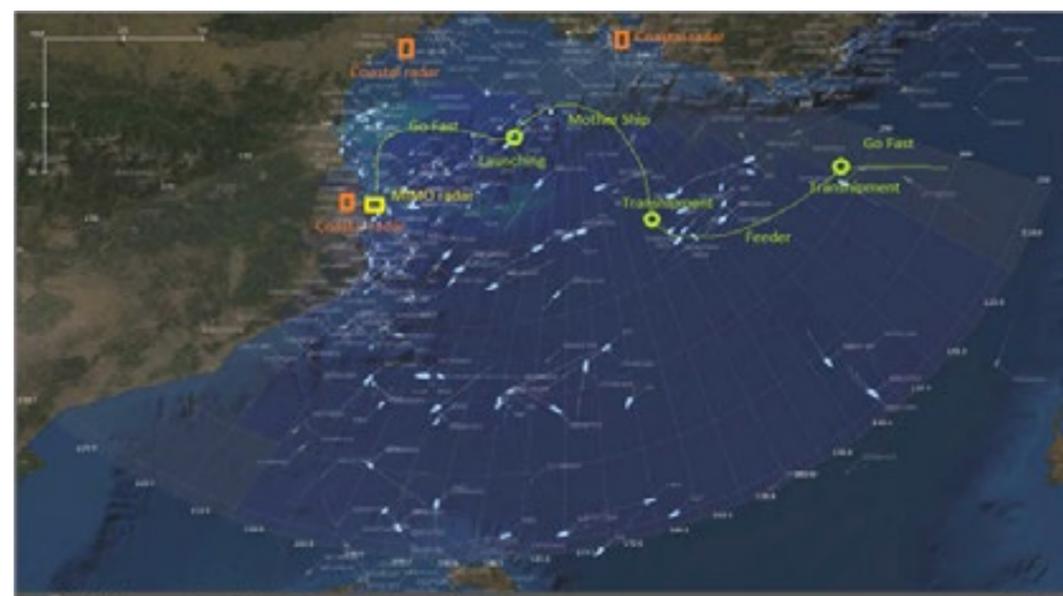


Figure: Example of relevant scenario in the frame of the French pilot, provided by DMA



**Maritime Search & Rescue Conference 2018**

22-24 May 2018, Helsinki, Finland

<http://maritime-sar.com/>



**2018 IEEE MTT-S International Microwave Symposium (IMS)**

11-15 June 2018, Philadelphia, USA

<http://ims2018.org/>



**European Microwave Week (EuMW)**

23 - 28 September 2018, Madrid, Spain

[http://www.eumwa.org/en/21st-eumw-2018.html?cmp\\_id=20&news\\_id=30&vID=50](http://www.eumwa.org/en/21st-eumw-2018.html?cmp_id=20&news_id=30&vID=50)



**ISAP 2018 2018 International Symposium on Antennas and Propagation (ISAP)**

23 Oct - 26 Oct 2018, Busan, South Korea | Submission: 18 May 2018

<http://www.isap2018.org/>



**2018 Asia-Pacific Microwave Conference (APMC)**

06 Nov - 09 Nov 2018, Kyoto, Japan | Submission: 19 May 2018

<http://www.apmc2018.org>



**2018 IEEE Radio and Antenna Days of the Indian Ocean (RADIO)**

15 Oct - 18 Oct 2018, Mauritius | Submission: 15 June 2018

<http://www.radiosociety.org/radio2018/>



**2018 International Workshop on Computing, Electromagnetics, and Machine Intelligence (CEMi)**

21 Nov - 24 Nov 2018, Stellenbosch, South Africa | Submission: 1 August 2018

[cem18.computing.technology/](http://cem18.computing.technology/)



## Contact us

### Coordinator

EXUS Software

Tower 42, 25 Old Broad Street

EC2N 1PB London, UK

innovation@exus.co.uk

[info@ranger-project.eu](mailto:info@ranger-project.eu)



## For more Information

Please visit the RANGER website

[www.ranger-project.eu](http://www.ranger-project.eu)

You can also keep up with more of what is happening at RANGER project by following us on:



@H2020Ranger



H2020Ranger

## THE CONSORTIUM



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 700478.