4 Members of the consortium

4.1 Participants (applicants)

1, EAWAG

Dr. Carlos J. Melian will work for EAWAG in ROBHOOT.
Carlos J Melian takes the official coordinator lead of the ROBHOOT project and takes care of the management.

The Swiss Federal Institute for Aquatic Science and Technology (EAWAG) is an independent research institute within the Swiss Federal Institute of Technology (ETH) domain. As such it is an independent partner in a network of exceptionally strong research and education institutions (2 federal universities and 4 federal research institutes). EAWAG is a world-leading water research institute. EAWAG hosts over 300 research fellows, postdocs and PhD students, who are supported by technical and support staff.

Contributions to ROBHOOT

EAWAG is the coordinator of the project. EAWAG contributes to WP2 and WP5 for eco-evolutionary diversification modeling (EEDA) and management, respectively. EAWAG has a wide experience in theoretical ecology and computational biology with particular attention to diversification processes in ecosystems. In WP2, EAWAG will lead the development of a theoretical model linking diversifying traits and interactions for species, human groups and technologies to allow WP2 to implement this feature in causal knowledge discovery. On the other hand, in WP5, EAWAG will be responsible for the management and work process of the project.

Dr. Carlos Melián (male) is a tenured researcher in Theoretical Evolutionary Ecology at EAWAG and associate professor at the University of Bern. Dr. Melián is widely recognized as an expert in Eco-evolutionary networks where he has contributed with novel approaches combining stochastic modeling and empirical patterns to study the interaction between ecological and evolutionary dynamics in multispecies assemblages. Dr. Melian has made important contributions to the fields of Ecological Networks. Most of his contributions combine stochastic modeling, large empirical datasets, and Bayesian approximations, to quantify the impact of intra- and inter-specific trait variation on species interactions, divergence and the macroscopic properties of ecological networks. He has been Principal Investigator in 15 projects obtained in 5 different countries (Spain, USA, UK, Germany and Switzerland) with a total of approx. 1 Million Euro. He has successfully co-supervised 5 PhD students and supervised 7 postdocs. The feasibility of this proposal is firmly established by his track record further reinforced by his solid and active international network of collaborators. Among others, he works with Prof. S. Allesina (U Chicago, USA), Dr. A. Eklöf (Linköping U, Sweden), Prof. P. Guimares (U Sao Paulo, Brazil), Prof. M. O'Connor (U Vancouver, Canada), and Dr. F. De Laender (U Namur, Belgium). Currently he coordinates a project about coevolving traits in species-rich ecosystems to investigate how feedbacks between interacting traits control the functioning of aquatic ecosystems. This provides a direct link to the work planned in ROBHOOT.

Gender balance

Dr. Melián's Lab has currently three female scientists. Dr. Catalina Chaparro (Colombia), is a postdoctoral researcher working in theoretical ecology. She has been recently funded by the Marie Curie EU grants. Dr. Chaparro is currently working on modeling the eco-evolutionary interactions between overfishing and trait evolution to explore coexistence mechanisms in complex ecological systems. Dr. Cecilia Andreazzi (Brazil) is a postdoctoral researcher working in theoretical ecology with a strong background in evolutionary processes. She is working in how trait coevolution between predators and preys control

the functioning of aquatic ecosytems mostly to avoid or decrease the frequency and intensity of algal blooms. Dr Malena Sabatino (Argentina) is a scientist working in mutualistic networks with a strong component in field studies of plant-pollinator networks. Dr. Sabatino currently explores eco-evolutionary dynamics models of mutualistic networks and specifically the effect of intraspecific interaction and migration trait variation on the coexistence of rare and common plants and pollinators along spatial gradients. Dr. Chaparro, Dr. Andreazzi and Dr. Sabatino will contribute to the development of ROBHOOT with their expertise in eco-evolutionary dynamics in ecosystems.

List of publications

1. Melián C. J., et al. 2018. Deciphering the interdependence between ecological and evolutionary networks. **Trends in Ecology & Evolution** 33,7: 504-512.

2. Andreazzi C., Guimaraes P, Melián C. J. 2018. Eco-evolutionary feedbacks promote fluctuating selection and long-term stability of antagonistic networks. **Proc. R. Soc. B** 285: 20172596.

3. Melián C. J., Seehausen O, Eguiluz V, Fortuna M, Deiner K. 2015. Diversification and Biodiversity Dynamics of Hot and Cold Spots. **Ecography** 38, 393-401.

4. Melián C. J., et al. 2015. Dispersal dynamics in food webs. **American Naturalist** 185, 2: 157-168.

5. Melián C. J., et al. 2014. Individual trait variation and diversity in food webs. **Advances in Ecological Research**. Vol. 50. Academic Press, 207-241.

List of relevant projects

1. 2020 Melián, C. J. (PI) and Ferrão Filho, Aloysio S. Granted: Brazilian-Swiss Joint Research Programme SNSF, Title: Feedbacks between coevolving predator-prey interactions and the functioning of aquatic ecosystems. SFr 228k
2. 2018 Melián, C. J. (PI), Andreazzi, C., and Astegiano, J. Swiss National Science Foundation, Scientific exchange program, Title: Biodiversity Dynamics in Coevolutionary Metaecosystems. SFr 20k
3. 2015 Melián, C. J. (PI) Granted: Swiss National Science Foundation, Division III. Switzerland. Title: A theory for next-generation food web data. SFr 200k.
4. 2012 Melián, C. J. (PI), Klecka, J., Krivan, V., and Altermatt, F. Granted: Sciex, Switzerland. Title: Food webs in space: integrating metacommunity and food web research. SFr 93k.
5. 2012 Pomati, F., and Melián, C. J. (Co-PI). Granted: Swiss National Science Foundation, Division III. Switzerland. Title: An individual-level approach to disentangle niches, drift and dispersal in phytoplankton metacommunity dynamics. SFr 243k

Infrastructure relevant to the proposed work

EAWAG in Kastanienbaum Lucerne offers excellent office, meeting rooms, laboratory and testing facilities in modern, state-of-the-art buildings. EAWAG provides access to first-class research facilities that regularly offer training for the use of equipment, tools and software. Of particular relevance for this research project is the access to two computing clusters "Leonhard" and "Euler" with more than 50 000 processor cores available for scientific computations, and training for their use offered by ETH Zürich.

2, CSIC

The Spanish National Research Council (CSIC) is Spain's largest public research institution and ranks third among Europe's largest research organizations. Attached to the Spanish Ministry of Science and Innovation, the CSIC plays a key role in scientific and technological policy in Spain and worldwide. According to its Statute (Article 4), it has 4 main missions:

- to foster multidisciplinary scientific and technological research,

- knowledge transfer to industry and society,

- education and training of scientific and technical staff,

- creation of Technology-Based Companies (spin-offs).

The CSIC has more than 10 000 employees, including nearly 4 000 staff researchers. Currently, it has 120 institutes spread across the country, of which 67 of them are fully-owned institutes and 53 are Joint Research Units in partnership with other Spanish universities or research institutions. The CSIC supports research and training across a wide range of knowledge, from the most basic or fundamental aspects of science to the most complex technological developments; from human and social sciences to food science and technology, including biology, biomedicine, physics, chemistry and materials, natural resources and agricultural sciences. It carries out research in all fields of knowledge, distributed in three global areas: Life, Society and Materia. The CSIC produces 20% of the national scientific output (over 10 000 publications in high impact international journals in 2017) and remains the first institution in Spain in the generation of patents, with around 200 patent applications in 2017. The Vice-presidency for Technology Transfer assists the CSIC's researchers with patent evaluation and application processes, commercialization of the CSIC's technology offer and with the creation of start-ups. As of December 2019, the CSIC has obtained 643 projects in H2020, with a total EU financial contribution of 270 million euros and is listed as the 1st organization in Spain and the 4th participant by number of projects (E-CORDA).

Contributions to ROBHOOT

Miguel Fortuna and Victor Eguiluz work for CSIC in ROBHOOT. CSIC contributes to WP1 with evolving semantic algorithms (Miguel Fortuna, ESA) and multilayer network metrics (Victor Eguiluz) to decipher processes and patterns in the data knowledge discovery graphs. CSIC team has a wide experience in theoretical evolutionary ecology, computational biology and complex systems with particular attention to data-driven patterns in networks. In WP1, CSIC will lead the development of evolving semantic algorithms to translate the semantically annotated database to graph database to produce data knowledge discovery graphs.

Gender balance

Currently, VME is supervising a female PhD student, is responsible of a female junior postdoc and a male senior postdoc. Including the PI, the lab is gender balanced. The aim of the group is to keep a gender balance by attracting the application of female researchers and offering flexibility to the specific needs. The good ratio of female/male researchers, in a field where the ratio is very unbalanced, is an incentive to attract more women. Besides balance, our group hosts a female student from Iran, where she faces great issues to develop her research career and we are taking all the efforts to facilitate her a career in complex systems science.

EBD-CSIC

Dr. Miguel A. Fortuna (male) is an ecologist and evolutionary biologist turned network scientist who thinks differently about problem-solving. He conducts interdisciplinary research by combining mathematical models, computer simulations, and database analysis, to answer questions that go beyond the traditional boundaries among disciplines, merging ecology with evolution, sociology, genetics, software design, and artificial life. His current research line builds on his previous research and is among the few trying to understand how evolution in complex networks of interactions can help us control human diseases. This research line combines, with a solid methodology, community ecology and evolutionary biology in a new fresh way. It has implications in at least three burgeoning fields of biotechnological and biomedical research: 1) cancer research (i.e., recent advances have shown that tumours—like species striving for survival—harbor intricate population dynamics, which suggests the possibility to exploit the ecology of tumours for treatment), 2) phage therapy (i.e., recent findings are showing the success of using phage cocktails to fight antibiotic resistance), and 3) human microbiome (i.e., the manipulation of evolving interactions among bacteria to restore unbalanced human microbial ecosystems).

List of publications

1. Fortuna et al. (2019). Coevolutionary dynamics shape the structure of bacteria-phage infection networks. Evolution, 73:1001-1011.

   This is the first time that the influence of coevolutionary dynamics (i.e., arms race dynamics versus fluctuating selection) on the architecture of an ecological network is quantified in an experimental host-parasite system. This study is the starting point towards integrating coevolution into ecological network approaches.

2. Fortuna et al.(2017). Non-adaptive origins of evolutionary innovations increase network complexity in interacting digital organisms. Philosophical Transactions of the Royal Society B., 372:20160431.

   This was the first study on webs of self-replicating and coevolving computer programs (i.e., digital organisms) aimed at disentangling the ecological and evolutionary mechanisms shaping species interaction networks. I found that host resistance traits arising as exaptations increase the complexity of host-parasite networks.

3. Fortuna et al. (2010). Nestedness versus modularity in ecological networks: two sides of the same coin? Journal of Animal Ecology, 79:811-817.

   This paper was published at a time when researchers thought that the two most pervasive structural properties of species interaction networks, nestedness and modularity, were opposed to each other. I showed that only when the complexity of the network is large enough, network structure can be either modular or nested.

4. Fortuna et al. (2009). Networks of spatial genetic variation across species. Proceedings of the National Academy of Sciences, USA, 106:19044-19049.

   In this paper I explored the consequences of habitat fragmentation for the maintenance of genetic variation. It was the first time that the structure of genetic variation across different species inhabiting the same landscape was compared, opening new research paths in landscape genetics.

5. Fortuna Bascompte. (2006). Habitat loss and the structure of plant-animal mutualistic networks. Ecology Letters, 9:281-286.

   I developed here the first spatially-implicit model to describe the dynamics of mutualistic metacommunities interacting in realistic ways. This study paved the way toward studying the biogeography of species interactions.

List of relevant projects

1. Name of the project: An eco-evolutionary network of biotic interactions. Entity where project took place: Scientific Research Network (WOG) City of entity: Brussels, Belgium Name principal investigator (PI, Co-PI....): Dries Bonte; Luc Brendonck; Erik Matthysen; Hans Jacquemyn; Filip Volckaert; Lander Baeten; An Martel; Frederik Hendrickx; Ellen Decaestecker; Frederik De Laender; Nicolas Schtickzelle; David G. Angeler; Florian Altermatt; Rampal S. Etienne; Rosemary Gillespie; Mark Urban; Erik Svensson; Mathew A. Leibold; Joel White; Alison Duncan; Miguel A. Fortuna; Kerstin Johannesson; Steven Declerck; Michael Begon; Justin Travis. Nº of researchers: 25 Funding entity or bodies: Research Foundation Flanders (FWO) Start-End date: 01/01/2016 - 31/12/2020 Total amount: 62.500

2. Name of the project: Dinámica espacio-temporal de redes de flujo génico: unidades de conservación y propagación de enfermedades de anfibios (RNM-8147) Entity where project took place: Estación Biológica de Doñana (EBD-CSIC) City of entity: Seville, Spain Name principal investigator (PI, Co-PI....): Jordi Bascompte; Andrew P. Dobson; Miguel A. Fortuna; Jaime Bosch Nº of researchers:4 Funding entity or bodies: Proyecto de Investigación de Excelencia, Junta de Andalucia Start-End date: 01/02/2013 - 31/01/2016 Total amount: 134.242

3. Name of the project: Síntesis Ecológica — Postdoctoral Fellowship JAE-Doc (JAEDOC025) Entity where project took place: Estación Biológica de Doñana (EBD-CSIC) City of entity: Seville, Spain Name principal investigator (PI, Co-PI....): Jordi Bascompte; Miguel A. Fortuna Nº of researchers: 2 Funding entity or bodies: Ministry of Economy and Competitiveness European Social Fund Start-End date: 01/09/2012 - 31/08/2015 Total amount: 82.620,72

4. Name of the project: Unifying ecological and evolutionary networks — Marie Curie International Outgoing Fellowship (IOF) Entity where project took place: Princeton University (USA) City of entity: Princeton, New Jersey, United States of America Name principal investigator (PI, Co-PI....): Miguel A. Fortuna; Simon Levin; Jordi Bascompte Nº of researchers: 3 Funding entity or bodies: European Community (International Outgoing Fellowship (IOF) Type of entity: 7th European Community Framework Programme Start-End date: 01/05/2009 - 30/04/2012 Total amount: 225.036,19

5. Name of the project: Integrando redes espaciales y genética de poblaciones: conservación de dos especies de anfibios autóctonas de Andalucia (RNM-02928) Entity where project took place: Estación Biológica de Doñana (EBD-CSIC) City of entity: Seville, Spain Name principal investigator (PI, Co-PI....): Jordi Bascompte; José A. Godoy; Peter Buston; Miguel A. Fortuna Nº of researchers: 4 Funding entity or bodies: Proyecto de Investigación de Excelencia, Junta de Andalucia Start-End date: 01/08/2008 - 01/07/2011 Total amount: 124.330,12

Instituto de Fisica Interdisciplinar y Sistemas Complejos (IFISC-CSIC)

IFISC (Institute for Cross-Disciplinary Physics and Complex Systems) is a joint research Institute of the University of the Balearic Islands (UIB) and the Spanish National Research Council (CSIC) created in 2007. IFISC has been awarded in 2018 the "Unit of Excellence María de Maeztu" distinction, entering the selective SOMMa Alliance and thus consolidating IFISC as a reference institute in the research field of complex systems. The award has been granted by the Spanish National Agency (AEI), Ministry of Science, Innovation and Universities. Emerging from a backbone transversal research line of exploratory nature on Complex Systems, Statistical and Nonlinear Physics, IFISC has 5 research lines of transfer of knowledge in the interface with other disciplines (Quantum Technologies, Information and Communication Technologies, Earth Sciences, Life Sciences and Social Sciences). These are: i) Biocomplexity, ii) Dynamics and collective phenomena of social systems, iii) Transport and Information in Quantum Systems, iv) Nonlinear Photonics, v) Nonlinear dynamics in fluids.

Dr. V.M. Eguíluz is a complex systems' scientist with an interest in interdisciplinary applications at the interface between Physics, Biology and Social Sciences. Our early studies on co-evolution networks showed the relevance of network plasticity on the emergence of cooperation, and as a generic mechanism leading to fragmentation transitions. The extensive study of the voter model on complex networks is an example of the micro-macro connection in social collective phenomena: how to link microscopic rules to macroscopic emergent phenomena. Recently we combined census data and election results to present the first model based on microscopic rules compatible with the patterns of voting. In Biology, we introduced the first large scale functional network of the brain. Our expertise on complex networks, on the one hand, and the more recent research activity on the connection between ecological-human activity-and environmental factors In connection to the current project supports his contribution to the current proposal. Current research includes the characterization and modeling of the structure-function relationship of real systems. He is Associate Editor of frontiers in Physics (since 2016) and Advances in Complex Systems (since 2007), Young Researcher Award from the Spanish Royal Physical Society (2003).

List of publications

1. GC Hays et al, Key questions in marine megafauna movement ecology, Trends in Ecology & Evolution 31 (6), 463-475 (2006).

2. F Vazquez, VM Eguíluz, M San Miguel, Generic absorbing transition in coevolution dynamics, Physical Review Letters 100, 108702 (2006).

3. A Cózar et al, The Arctic Ocean as a dead end for floating plastics in the North Atlantic branch of the Thermohaline Circulation, Science Advances 3 (4), e1600582 (2017).

4. AF Rozenfeld et al, Network analysis identifies weak and strong links in a metapopulation system, Proceedings of the National Academy of Sciences 105, 18824-18829 (2008).

5. N Queiroz et al. Global spatial risk assessment of sharks under the footprint of fisheries Nature 572, 461–466 (2019).

List of relevant projects

1. Coupled Animal and Artificial Sensing for Sustainable Ecosystems (CAASE). The Red Sea as a CAASE study Project OSR-KAUST. From 2016 to 2020 Coordinator: C. Duarte (KAUST); PI IFISC: V.M. Eguíluz.

2. SPASIMM Spatiotemporality in sociobiological interactions, models and methods. Project FIS2016-80067-P of the MINECO (Spain). From 2017 to 2020. PI: V.M. Eguìluz, K. Klemm.

3. LASAGNE: multi-LAyer SpAtiotemporal Generalized Networks. FP7-ICT-2011-8 Collaborative Project, Grant Agreement 318132. From 2012 to 2015 Coordinator: S. Thurner (Vienna University).

4. MODASS: Modeling and analysis of social systems: structural evolution, temporal correlations and opinion propagation) Project FIS2011-24785 of the MICINN (Spain). From 2012 to 2015. PI: V.M. Eguíluz.

5. IBESINC: Network on Dynamics and synchronization in networks. Complementary action FIS2010-09832-E (subprogram FIS) of MCINN (Spain). 2011. PI: J. M. Buldú (U. Rey Juan Carlos); Coordinator IFISC: V.M. Eguíluz.

3, Scitation Lda (SCITE)

Dr. Miguel Leal (male) and Dr. Charles De Santana (male) will work for SCITE in ROBHOOT. SCITE is a scientific-based communication SME comprising a multi-disciplinary team of scientists, communicators, designers and illustrators committed to convert scientific data into communication outputs to various audiences. SCITE has been providing services to universities, research centres, international non-governmental organizations and to the private sector. SCITE's area of expertise is environmental and applied sciences, particularly to the agrofeed and blue biotechnology sectors.

contribution to ROBHOOT

SCITE will be involved in all WP of ROBHOOT; creating visualizations and animations to represent the models related to WP1-3. SCITE will also contribute to the communication, dissemination and exploitation in WP4.

Miguel C. Leal, has a PhD in marine biology, yet multidisciplinary research interests focused in applied ecology and blue biotechnology. He participated in ¿12 international research projects funded by the EU, NORAD, FAO, and ETH-Switzerland. He is an author of 60 peer-reviewed publications, including high-impact publications in Science, Nature Ecology Evolution, Trends in Ecology Evolution, and Trends in Biotechnology. He is also regularly invited as a guest lecturer about science communication, science writing, and also several ecology and marine biology topics. He founded SCITE – Science Crunchers in 2017, a start-up focused on communicating scientific and technical data to different audiences.

Charles De Santana, PhD has an academic background in computer science, multi-disciplinary research interests also focused in computer modeling in ecology, climate change, neurosciences and bioinformatics using concepts of graph theory, complex systems and artificial intelligence. He has also a trajectory in the data science industry, working with data analysis and data visualization in the area of marketing and data-driven-journalism. He is an author of 13 peer-reviewed publications in a diverse range of journals, from Physics to Neuroscience, Ecology and Remote Sensing fields. He founded in 2017 DataSCOUT, a Brazilian start-up focused in Data Science and Scientific Computing, and in 2019 he founded Dadoscope, a Brazilian data-driven-journalism initiative in which he uses data visualization and storytelling to tell journalistic stories.

Gender balance

SCITE currently has a team of 2 males and 3, thus the company is gender balanced. The aim of the SCITE is to keep an international gender balance by attracting female researchers and females interested in communicating science. The good ratio of female/male researchers is a plus for SCITE and we are committed to keep it rising in a close future.

List of relevant publications (Miguel Leal)

1. Vieira, H., Leal, M.C., Calado, R. (2020) Fifty Shades of Blue: How Blue Biotechnology is Shaping the Bioeconomy. Trends in Biotechnology in press doi.org/10.1016/j.tibtech.2020.03.011

2. Ishikawa, A., Kabeya, N., Ikeya, K., Kakioka, R., Cech, J. N., Osada, N., Leal M.C. ... Tezuka, A. (2019). A key metabolic gene for recurrent freshwater colonization and radiation in fishes. Science, 364(6443), 886-889.

3. Leal, M.C., Seehausen, O., Matthews, B. (2017). The ecology and evolution of stoichiometric phenotypes. Trends in ecology evolution, 32(2), 108-117.

4. Best, R.J., Anaya-Rojas, J.M., Leal, M.C., Schmid, D.W., Seehausen, O., Matthews, B. (2017). Transgenerational selection driven by divergent ecological impacts of hybridizing lineages. Nature ecology evolution, 1(11), 1757.

List of relevant publications (Charles De Santana)

1. AN Santana, I Cifre, CN De Santana, P Montoya (2020) Using Deep Learning and Resting-State fMRI to Classify Chronic Pain Conditions. Frontiers in Neuroscience 13, 1313

2. O Hagen, L Vaterlaus, C Albouy, A Brown, F Leugger, RE Onstein, CN De Santana, ... (2019) Mountain building, climate cooling and the richness of cold-adapted plants in the Northern Hemisphere. Journal of Biogeography 46 (8), 1792-1807

3. F Leprieur, P Descombes, T Gaboriau, PF Cowman, V Parravicini, CN De Santana, (2016) Plate tectonics drive tropical reef biodiversity dynamics. Nature Communications 7 (1), 1-8

4. CN De Santana, AF Rozenfeld, PA Marquet, CM Duarte (2013). Topological properties of polar food webs. Marine Ecology progress series 474, 15-26

5. CN De Santana, AS Fontes, MAS Cidreira, RB Almeida, AP González, (2009) Graph theory defining non-local dependency of rainfall in Northeast Brazil. Ecological Complexity 6 (3), 272-277

List of relevant projects (SCITE)

Multiple science dissemination and communication projects coordinated within SCITE: 12 projects in 2017, 33 projects in 2018, 59 projects in 2019, and 28 projects thus far in 2020. Some of SCITE's Clients include: AIR Centre, CERN, Evonik, Lisbon Zoo, Olmix Group, Prince Albert II Foundation of Monaco, Virginia Tech University, Wageningen University, World Aquaculture Society, and others.

1. 2016/2018. Ecosystem consequences of eco-evolutionary change. Funded by EAWAG – Swiss Federal Institute of Aquatic Sciences and Technology.

2. 2015/2017 EpiPhysX the physics of epithelium. Funded by the Swiss National Science Foundation (SNSF) SystemsX initiative

3. 2013/2015 FoodWebs: a theory for next generation food web data. Funded by the Swiss National Science Foundation (SNSF)

4. 2012/2014 SymbioCoRe SYnergies through Merging BIOlogical and biogeochemical expertise in COral Research. Funded by the EU FP7 International Research Staff Exchange Scheme

5. 2009/2013 LINC-GLOBAL International Laboratory in Global Changes. Funded by the Spanish National Research Council (CSIC)

Infrastructure relevant to the proposed work

SCITE office in Lisbon (Portugal) is fully equipped for data analysis, visualization, illustration, design and science communication. Computer power is available to all data analysis and visualization tasks involved in this project.

4, TARTU

University of Tartu founded in 1632 is the largest and highest-ranked university in Estonia and with a number of students of approximately 15,000 (2018). University of Tartu is ranked 301 by the QS World University Ranking (2014) and 301-350 by the Times Higher Education World University Ranking (2019). The university is home to more than 1800 international students from 105 countries and 3,500 employees, which includes around 1,700 academics, and close to 200 professors among them. Today, it is a leading centre of research and training, and a member of the prestigious Coimbra Group of European universities.

Contributions to ROBHOOT

Raul Vicente work for TARTU in ROBHOOT. Dr. Vicente is the lead of WP2. TARTU will develop deep learning technology to infer sustainability paths from causal inference in federate networks composed by species-rich communities, human groups and exploitation technology with special focus on the sustainability of the Oceans case study.

Prof. Raul Vicente (male) is full professor of Data Science at the Institute of Computer Science of the University of Tartu. He received the B.Sc. (first honours class) and Ph.D. (Summa Cum Laude) in Physics from the University of the Balearic Islands, Spain, in 2001 and 2006, respectively. In 2004 and 2005 he was a visiting scholar at the Department of Electrical Engineering of the University of California, Los Angeles (UCLA). From 2006 to 2013, he was a postdoc at the Max-Planck Institute for Brain Research in Frankfurt, Germany. In 2014 he became Senior Researcher in Neuroscience at the Institute of Computer Science, University of Tartu. Since 2016 he is Full Professor at the University of Tartu. He also received: 2001 Extraordinary Award for B.Sc. from the Department of Physics of the University of the Balearic Islands; 2006 Extraordinary Award for Ph.D. from the Department of Physics of the University of the Balearic Islands; 2007 QEOD European Physical Society award for the best PhD thesis in Applied Optics in Europe; and 2012 Attendee at the 62nd Lindau Nobel Laureate Meeting. He is also the head of the PhD program in Computer Science at the University of Tartu, and leader of the group of computational neuroscience (3 senior members + 8 PhD students). Founded in 2013, the lab focuses on the intersection between neuroscience and AI, and in particular on implementing and applying insights from brain research into AI solutions for the analysis of biological data.

Gender balance

University of Tartu strictly adheres to the Gender equality Act and Equal Treatment Act that ensure equal rights, obligations, opportunities and responsibility of men and women in professional life, upon

acquisition of education and participation in other areas of social life, as well as protecting people against unequal treatment on grounds of primarily nationality (ethnic origin), race, colour, religion or other beliefs, age, disability or sexual orientation.

List of relevant papers

1. Gómez-Herrero, G., Wu, W., Rutanen, K., Soriano, M. C., Pipa, G., Vicente, R. (2015). Assessing coupling dynamics from an ensemble of time series. Entropy, 17(4), 1958-1970.

2. Tampuu, A., Matiisen, T., Kodelja, D., Kuzovkin, I., Korjus, K., Aru, J., ... Vicente, R. (2017). Multiagent cooperation and competition with deep reinforcement learning. PloS one, 12(4).

3. Bzhalava, Z., Tampuu, A., Bała, P., Vicente, R., Dillner, J. (2018). Machine Learning for detection of viral sequences in human metagenomic datasets. BMC bioinformatics, 19(1), 336.

4. Lindner, M., Vicente, R., Priesemann, V., Wibral, M. (2011). TRENTOOL: A Matlab open source toolbox to analyse information flow in time series data with transfer entropy. BMC neuroscience, 12(1), 119.

5. Wibral, M., Vicente, R., Lizier, J. T. (Eds.). (2014). Directed information measures in neuroscience (pp. 3-36). Berlin: Springer.

List of relevant projects

1. H2020-EIC-FETPROACT-2019, with the project TRUST-AI, PI, 600K Eur (2020-2024)

2. Smart Specialisation Grant, RD with Milrem Robotics, PI, 355K Eur (2018-2021)

3. Estonian Center of Excellence in IT, PI, 130K Eur (2016-2023)

4. Personal Research Grant, Estonian Research Council, PI, 190K Eur (2017-2019)

5. Personal Research Grant, Estonian Research Council, PI, 180K Eur (2014-2016)

5, EPFL (SDSC)

Dr. Christine Choirat (female) is the Chief Innovation Officer of the Swiss Data Science Center (SDSC, https://datascience.ch/), where she provides leadership over the lifecycle of sponsored projects in the domains of environmental science, health science and technology, personalized medicine, and open science. She also fosters engagement with partners to facilitate the adoption of FAIR data and workflow sharing platforms nationally and internationally. At SDSC, she leads the strategic development and outreach efforts of the Renku platform (https://renkulab.io/) for reproducible, collaborative and open data-driven science. Dr. Choirat has over 15 years of experience in data science, computational statistics and in industry-standard software development. She is passionate about education in data science and reproducible research. She created a module for the HarvardX MOOC "Principles, Statistical and Computational Tools for Reproducible Science" and is also the instructor of "Computing for Big Data" at Harvard University. Dr. Choirat will advise on best practice in data science to organize FAIR data management, and on creating and distributing high-quality software tools.

The mission of the Swiss Data Science Center (SDSC) is to accelerate the adoption of data science and machine learning techniques within academic disciplines between the Swiss academic community at large, and the industrial sector. In particular, it addresses the gap between those who create data, those who develop data analytics and systems, and those who can extract value from it. The Center is composed of a large multidisciplinary team of data scientists and computer scientists, and experts in select domains, with offices in Lausanne and Zurich (www.datascience.ch).

Contributions to ROBHOOT

Christine Choirat work for EPFL/SDSC in ROBHOOT. Christine will coordinate the full life-cycle reproducibility of ROBHOOT (WP1, WP2, WP3). Christine will also apply and develop techniques for replicability of the data and causal knowledge discovery. EPFL/SDSC team has a wide experience in reproducibility and replicability in data science and reproducible research.

Gender balance SDSC is committed to employ an equal number of women and men, involving both in research and teaching. Currently the ratio of men and women is well balanced with a ratio of 40/60.

List of Publications

Wasfy, J. H., Zigler, C. M., Choirat, C., Wang, Y., Dominici, F., Yeh, R. W. (2017). Readmission rates after passage of the hospital readmissions reduction program: A pre-post analysis. Annals of Internal Medicine, 166(5), 324–331. https://doi.org/10.7326/M16-0185 Di, Q., Wang, Y., Zanobetti, A., Wang, Y., Koutrakis, P., Choirat, C., . . . Schwartz, J. D. (2017). Air Pollution and Mortality in the Medicare Population. New England Journal of Medicine, 376(26), 2513–2522. https://doi.org/10.1056/NEJMoa1702747 Di, Q., Dai, L., Wang, Y., Zanobetti, A., Choirat, C., Schwartz, J. D., Dominici, F. (2017). Association of short-term exposure to air pollution with mortality in older adults. JAMA - Journal of the American Medical Association, 318(24), 2446–2456. https://doi.org/10.1001/jama.2017.17923 Zigler CM, Kim C, Choirat C, Hansen JB, Wang Y, Hund L, Samet JM, King G, and Dominici F (2016) Causal Inference Methods for Estimating Long-Term Health Effects of Air Quality Regulations. The Health Effects Institute, Cambridge, MA. http://pubs.healtheffects.org/view.php?id=453 Henneman, L. R. F., Choirat, C., Zigler, C. M. (Forthcoming). Accountability assessment of health improvements in the United States associated with reduced coal emissions between 2005 and 2012. Epidemiology.

List of relevant projects

1. R01 ES026217 (PI: Zigler) - NIH
   Causal Inference with Interference for Evaluating Air Quality Policies
   02/01/2016 - 01/31/2021

   Public health interventions routinely target upstream determinants of health to advance the health of pop- ulations, but methods for causal inference to evaluate their effectiveness are limited by a current focus on clinical investigations of individual-level therapies. This work develops methods for bipartite causal inference with interference for the evaluation of complex public health interventions. We deploy the newly-developed methodology to compare the effectiveness of regulatory policies designed to reduce health burden associated with pollution emissions from power plants across the US.
   Role: Co-Investigator

2. R01 ES028033 (PI: Laden) - NIH
   Relationship Between Multiple Environmental Exposures and CVD Incidence and Survival: Vulnerability and Susceptibility
   12/15/2017 - 11/30/2022

   The major goals of the proposed project are to study associations of lmultiple environmental exposures on cardiovascular disease (CVD), mortality and survival after a non-fatal CVD event in the context of multiple confounders and effect modifications. We will be developing new statistical methods, assessing air pollution (particulate matter, nitrogen dioxide, and ozone) and weather (e.g. temperature variability) as main effects, and evaluating effect modification by contextual, lifestyle and genetic factors.
   Role: Co-Investigator

3. 83587201-0 (PI: Koutrakis) - EPA grant (ACE Center)
   12/01/2015 - 11/30/2020
   Regional Air Pollution Mixtures: The Past and Future Impacts of Emission Controls and Climate Change on Air Quality and Health

   The overarching goal of this Center is to generate new scientific knowledge on past and future US in air quality and the associated health impacts. Specifically, we will investigate the sources, composition, trends and effects of regional air pollutant mixtures across the US over a relatively long chronological period span- ning past and future years (2000-2040), and will examine the influence of climate, socioeconomic factors, policy decisions, and control strategies on air pollution, human health and economic outcomes.
   Role: Co-Investigator

4. swissuniversities (PI: Choirat)
   01/01/2020 - 21/31/2020
   Easy FAIR: Supporting the adoption of FAIR and reproducible digital scholarship with Renku

   The World Wide Web and digital technologies are fundamentally changing how scientific knowledge is produced, disseminated and preserved. This transformation represents an opportunity to make the scientific en- deavor more transparent, inclusive, collaborative, reproducible and impactful. However, research in the digital age requires new standards, tools and infrastructures, as well as a new set of research skills. The change is reflected by new requirements from funders, journals, from the research community in general, as well as society at large. Supporting researchers active in Swiss institutions in their adoption of digital best practice is necessary to guarantee they produce research results of the highest quality and impact.
   Role: Principal Investigator

5. EPFL Open Science Fund (PI: Unser)
   01/08/2020 - 02/28/2021
   Interdisciplinary Collaborations in Imaging at EPFL: A Pilot Project with RENKU

   The present project is a collaboration between Imaging@EPFL and the Swiss Data Science Center (SDSC). It aims at the evaluation of how the open-source platform RENKU can facilitate the sharing of data, meta- data, and code within the imaging community at EPFL. Concretely, we shall extensively test and improve RENKU in a series of collaborations that will involve two (or more) imaging laboratories with complementary skills. In parallel, we shall build a repertoire of reproducible, reusable, and well-documented image-processing workflows, and make them accessible to the whole imaging community. A range of new features in RENKU will be developed throughout the project to support these objectives. Of central importance is the definition of a common language (ontology) to describe the vast and heterogeneous world of imaging at EPFL. The widespread adoption of a transparent environment for interactive research can have a huge impact for EPFL, as the imaging community represents about a quarter of its laboratories (80+ groups). Role: Co-Principal Investigator

6, TU Graz

The main research areas of the Institute of Theoretical Computer Science at TUGRAZ are algorithm design, machine learning, spiking neural networks, computational neuroscience. It currently has 3 Professors, 3 University Assistants, 1 System Administrator, 2 Administrative Assistants, and 15 Phd students. The focus of the group of Wolfgang Maass is on computation and learning in networks of spiking neurons and other innovative computing paradigms.

contribution to ROBHOOT

Prof. Wolfgang Maass' (male) experience is in research on spiking neural networks (SNNs), co-inventor of liquid computing and reservoir computing, stochastic computing in SNNs, design of unsupervised and supervised deep learning algorithms for SNNs Experience in leading workpackages on brain-inspired computing and learning in 6 FET-projects of the EU. Wolfgang Maass will lead WP3 in ROBHOOT. He will implement the Evolutionary neural diversification-inspired processes to allow WP3 to implement this feature for discovery in federated networks.

Gender balance

TU Graz wants to employ an equal number of women and men, involving both in research and teaching. The Office for Gender Equality and Equal Opportunity supports the university in achieving this by implementing numerous measures, particularly with the aim of increasing the proportion of women at TU Graz. The equal treatment of women and men is rooted in the Universities Act and belongs to the guiding principles and tasks of the University.

List of relevant papers

1. Papadimitriou, C., Vempala, S., Mitropolsky, D., Collins, M., Maass, W. (2020). Brain computation by assemblies of neurons. PNAS, in press.

2. Bellec, G., Scherr, F., Subramoney, A., Hajek, E., Salaj, D., Legenstein, R., Maass, W. (2020). A solution to the learning dilemma for recurrent networks of spiking neurons. Nature Communications, in press (draft on bioRxiv, 738385).

3. Bellec, G., Salaj, D., Subramoney, A., Legenstein, R., Maass, W. (2018). Long short-term memory and learning-to-learn in networks of spiking neurons. In Advances in Neural Information Processing Systems (pp. 787-797)

4. Maass, W., Natschläger, T., Markram, H. (2002). Real-time computing without stable states: A new framework for neural computation based on perturbations. Neural computation, 14(11), 2531-2560. (2777 citations)

5. Maass, W. (1997). Networks of spiking neurons: the third generation of neural network models. Neural networks, 10(9), 1659-1671. (1688 citations)

Relevant projects

1. 2013 – 2023 Human Brain Project (Flagship Project)

2. 2011 – 2014 BRAINSCALES: Brain-inspired multiscale computation.

3. 2010 – 2014 AMARSI: Adaptive Modular Architectures for Rich Motor Skills

4. 2010 –2012 BRAIN-I-NET: Novel Brain-Inspired Learning Paradigms for Large-Scale Neuronal Networks

5. 2008 – 2012 SECO: Self-Constructing Computing Systems

6. 2005 – 2009: FACETS: Fast Analog Computing with Emergent Transient States in Neural Architectures.

Contributions

Description of any significant infrastructure, relevant to the proposed work CPU and CPU clusters for computing are available at the Institute.

7, SPANISH INSTITUTE OF OCEANOGRAPHY (IEO)

The Spanish Institute of Oceanography (IEO), founded in 1914, is a public research organization dedicated to research in marine science, especially in relation to scientific knowledge of the oceans, sustainability of fishing resources and the marine environment. Attached to the Spanish Ministry of Science and Innovation, the IEO is an autonomous body, with its own personality and legal assets, with a workforce of approximately 700 people, of which 80% are research and research support personnel. The IEO budget exceeds 65 million Euros and has a wide geographical coverage and important facilities. It has a central office in Madrid, nine coastal oceanographic centers and five marine culture experimentation plants. Its oceanographic fleet, with more than twenty vessels, has five important oceanographic vessels. The IEO not only conducts basic and applied research, but also provides scientific and technological advice to administrations in matters related to oceanography and marine sciences, being the research and advisory body for the fisheries sector policy of the Spanish Government. Furthermore, it is the scientific and technological representative of Spain in most of the forums and international organizations related to the sea and its resources.

Contribution to ROBHOOT

IEO is the coordinator of Dissemination, Knowledge transfer and Outreach (WP4). IEO contributes to the dissemination and exploitation plan, the communication for the sustainability of the Oceans case study and the publications and conferences outreach. Dr. Francisco Baldó (male) will be the lead of WP4 in ROBHOOT. He works for the Spanish Institute of Oceanography in Cadiz as a Senior Researcher. His main scientific motivation is to understand the biodiversity of marine ecosystems and contribute to the sustainable management of fisheries resources. During many years, he has been involved in long-term ecological research in the Guadalquivir estuary, which has set up a time series of monthly sampling of the aquatic communities of the estuary. The basis for his PhD was theoretical individual-based models based on a high resolution individual-based food web data-set of the Guadalquivir estuary. Since 2008 he is the cruise leader of the Porcupine bottom trawl survey, which takes place every September at the Porcupine bank (West of Ireland) and a member of the ICES International Bottom Trawl Surveys Working Group (IBTSWG), which coordinates the European bottom trawling surveys in the North Sea and the North East Atlantic. Overall, he has extensive experience in field work including over 50 oceanographic cruises. The combination of the empirical and theoretical facets is, perhaps, the most outstanding characteristic of his background.

Gender balance

Gender balance is currently a priority for Spanish society and, therefore, for IEO. The Women and Science Unit of the Spanish Ministry of Science and Innovation is in charge of promoting the proper application of the principle of gender mainstreaming in the scientific, technological and innovation fields. At the IEO there is also a Gender Equality Plan and Commission to ensure the effective promotion of equality between men and women. In addition, since 2015 IEO has carried out the project "Women and oceanography" (https://oceanicas.ieo.es/) which aims to disseminate the work of scientists dedicated to the study of oceans, both current and past, to publicize their life and work, thus, trying to generate scientific vocations in girls and boys. Currently, approximately half of the researchers of the IEO are women, but they only represent a third of the directive staff.

List of publications

1. Barros-García D, et al. 2020. Phylogeography highlights two different Atlantic/Mediterranean lineages and a phenotypic latitudinal gradient for the Deep-Sea Morid Codling Lepidion lepidion (Gadiformes: Moridae). Deep-Sea Research Part I: Oceanographic Research Papers 157: 103212.

2. Bañón R, De Carlos A, Alonso-Fernández A, Ramos F, Baldó F. 2020. Apparently contradictory routes in the expansion of two fish species in the Eastern Atlantic. Journal of Fish Biology 96, 1051–1054.

3. Carvalho-Souza GF, et al. 2019. Natural and anthropogenic effects on the early life stages of European anchovy in one of its essential fish habitats, the Guadalquivir estuary. Marine Ecology-Progress Series 617-618: 67-79.

4. Melián CJ, Baldó F, et al. 2014. Individual trait variation and diversity in food webs. Advances in Ecological Research. Vol. 50. Academic Press, 207-241.

5. Melián CJ, et al. 2011. Eco-evolutionary dynamics in individual-based food webs. Advances in Ecological Research. Vol. 45. Academic Press, 225-268.

List of relevant projects

1. PIMETAN: The role of penguins in the biogeochemical cycles of trace metals in the Southern Ocean. Project RTI2018-098048-B-I00 of the Spanish Program for Research, Development and Innovation. From 2019 to 2021. 153,670 Euros.

2. ERDEM: Evaluation of demersal resources by direct methods in the ICES area. European Maritime and Fisheries Fund (EMFF). From 2018 to 2020. 70,420 Euros.

3. DILEMA: Oceanografic dynamics in the Gulf of Cadiz and its influence on the planktonic ecosystem. Project CTM2014-59244-C3-2-R of the Spanish Program for Research, Development and Innovation. From 2015 to 2018. 121,000 Euros.

4. ECOBOGUE: Ecology of early stages of anchovy Engraulis encrasicolus: The role of the Guadalquivir Estuary - Gulf of Cadiz coupled system in the recruitment of the species. Project RNM-7467 of the Andalusian Program for Research. From 2013 to 15. 114,885 Euros.

5. TPEA: Transboundary Planning in the European Atlantic. DG MARE (European Commission). From 2012 to 2014. 1,250,000 Euros.

8, URV

Universitat Rovira i Virgili (URV) is a young university that employs around 1.800 professionals, 1.150 of which are researchers and/or academic staff. The URV welcomes annually 12.000 undergraduate students, 1200 masters students, and 1200 PhD students. Despite its youth and small size (it is barely 25 years old), the URV occupies the 5th position in scientific research production at higher education institutions in Spain, and it is ranked within the 100 best universities less than 50 years old worldwide.

Principal team members involved in the proposed research activities Prof. Roger Guimerà (male) is the co-director of the SEES:lab and ICREA professor at the Dept of Chemical Engineering. His research work focuses on the development of methodologies to build probabilistic models for complex systems, and

on Bayesian methods for machine learning and automated discovery. According to the Scopus database, Dr. Guimerà has published 68 articles in international journals including top journals such as Nature, Science and Proceedings of the Natural Academy of Sciences USA. He has an h-index of 29 (Google Scholar (GS): 34). His publications have received 9,256 citations (GS: 14,741). In 2010, he received the award Talent Jove by the Generalitat de Catalunya to the best young investigator; in 2012 he received the Erdös-Rényi Prize to the best young researcher on complex networks; in 2014, he received the award to the Best Young Researcher in socio-econophysics by the German Society of Physics.

Prof. Marta Sales-Pardo (female) is the co-director of the SEES Lab and Associate professor at the Dept of Chemical Engineering. Her research focuses on the development of methodologies to model and understand complex and disordered systems in a number of contexts, including, physical, biological, and social. Dr. Sales-Pardo has authored 64 publications in international journals including top journals such as Science, Science Advances or the Proceedings of the National Academy of Sciences, which have received 3,351 citations (GS: 5,022). She has an h-index of 25 (GS: 27). In 2013, she received an ICREA Acadèmia award for excellence in research.

Contribution to ROBHOOT

Roger Guimerà and Marta Sales-Pardo work for URV in ROBHOOT. Roger will coordinate the full life-cycle automation of ROBHOOT (WP1, WP2, WP3). Roger and Marta will also apply and develop techniques for automating evolutionary expressions for the data, causal knowledge discovery and discovery in federated networks. URV team has a wide experience in Bayesian machine scientist and automation of complex systems.

Gender balance

The SEES Lab has 1 male and 1 female PI, which ensures gender balance at the highest scientific level. The SEES Lab actively participates in initiatives to encourage the participation of women in STEM. In particular, during the 2019-2020 academic year, Dr. Sales-Pardo has participated in the Inspira program to inspire girls aged 12-16 to pursue careers in STEM fields. Dr. Sales-Pardo is also responsible for gender issues at the School of Chemical Engineering, URV.

Relevant publications, products, services

1. Reichardt, I, Pallarès, J, Sales-Pardo, M, Guimerà, R. Bayesian machine scientist to compare data collapses for the Nikuradse dataset, Phys. Rev. Lett. 124 , 084503 (2020).

2. Guimera, R, Reichardt, I, Aguilar-Mogas, A, Massucci, FA, Miranda, M, Pallares, J, Sales-Pardo, M. A Bayesian machine scientist to aid in the solution of challenging scientific problems, Sci. Adv. 6 (5) , eaav6971 (2020).

3. Godoy-Lorite, A, Guimera, R, Moore, C, Sales-Pardo, M., Accurate and scalable social recommendation using mixed-membership stochastic block models, Proc. Natl. Acad. Sci. USA 113 (50) , 14207 -14212 (2016).

4. Massucci, FA, Wheeler, J, Beltran-Debon, R, Joven, J, Sales-Pardo, M, Guimera, R., Inferring propagation paths for sparsely observed perturbations on complex networks, Sci. Adv. 2 , e1501638 (2016).

5. Vallès-Català, T, Massucci, FA, Guimera R, Sales-Pardo, M., Multilayer stochastic block models reveal the multilayer structure of complex networks, Phys. Rev. X 6 , 011036 (2016).

6. Guimera, R, Sales-Pardo, M., Missing and spurious interactions and the reconstruction of complex networks, Proc. Natl. Acad. Sci. U. S. A. 106 , 22073 -22078 (2009).

List of related projects

1. Project: Statistical Mechanics for Modeling and Prediction of Human Behavior; Spanish Ministry of Enconomy and Competitivity (FIS2016-78904-C3-1-P); Roger Guimerà PI, (2017-19)

2. Project: Multiplex: Foundational Research on MULTI-level comPLEX networks and systems; EU-FP7 (FET-Proactive 317532); full member of the consortium (2011-2016).

3. Project: Statistical Inference for the analysis of system wide perturbations in complex networks; Spanish Ministry of Enconomy and Competitivity (FIS2015-71563-ERC); Roger Guimerà PI, (2015-16)

4. Activity: Organisation of the European Conference for Complex Systems (ECCS´13) in Barcelona, Spain ($http://eccs13.eu$).

5. Project: Discovery, decomposition and dynamics of complex networks, James S. McDonnell Foundation Award (USA); Roger Guimerà and Marta Sales-Pardo PIs (2011-2016).

Resources to be committed

The SEES:lab owns a 96-node high performance IBM blade system and has access to a shared 500-node high-performance cluster within the URV. The blade system also hosts a database server for large datasets and a GPU server for massively parallel computations using GPUs. Additionally, the group has access to the facilities of the Barcelona Supercomputing Center (BSC-CNS, https://www.bsc.es/).

9, Stockholm Resilience Center (SRC)

Stockholm Resilience Centre (SRC) was tasked to "make a difference for sustainable development by building a world-leading research centre that would take the interdisciplinary research on linked ecological and social systems significant steps forward" and provide "insights and means for the development of management and governance practices in order to secure ecosystem services". We took on this task with great excitement, asking new questions, collaborating across disciplinary borders, and generating new findings and insights of relevance for sustainability.

How do we do it? We regularly and flexibly adjust and restructure our research to stay at the frontier. Since the beginning this was essential because the science is moving rapidly. In our first ten years, research has accumulated on what it means to live in the Anthropocene – the age of humanity. Industrialised societies are shaping the Earth system at the planetary scale. Humanity has moved from being part of the biosphere – that thin sphere around the planet which supports all life on Earth – to the prime driver of change in the biosphere. Humanity is truly intertwined in biosphere processes from local to global scales. It is becoming clear that a resilient biosphere serves as the basis for just and sustainable development, for human health and well-being, and transformations towards global sustainability are necessary, definitely possible, and highly desirable.

Contribution to ROBHOOT

Prof. Jon Norberg' (male) experience is in research on eco-evolutionary dynamics in ecosystems with special emphasis on global change. He combines stochastic and deterministic modeling. Jon Norberg will work in WP3 in ROBHOOT. He will implement the extended Eco-Evolutionary diversification-inspired models in federated networks processes to allow WP3 to implement this feature for discovery in federated networks.

Gender balance

Stockholm Resilience centre has a gender equal leadership team with a women Director. The centre applies a formalised gender perspective on both research as well as internal administrative, human resources and positions.

List of relevant publications

1. Crépin, A. S., J. Norberg, and K. G. Mäler. 2011. "Coupled Economic-Ecological Systems with Slow and Fast dynamics—Modelling and Analysis Method." Ecological Economics: The Journal of the International Society for Ecological Economics.

2. Dakos, Vasilis, Blake Matthews, Andrew P. Hendry, Jonathan Levine, Nicolas Loeuille, Jon Norberg, Patrik Nosil, Marten Scheffer, and Luc De Meester. 2019. "Ecosystem Tipping Points in an Evolving World." Nature Ecology Evolution 3 (3): 355–62.

3. Lindkvist, Emilie, Örjan Ekeberg, and Jon Norberg. 2017. "Strategies for Sustainable Management of Renewable Resources during Environmental Change." Proceedings. Biological Sciences / The Royal Society 284 (1850).

4. Lindkvist, Emilie, and Jon Norberg. 2014. "Modeling Experiential Learning: The Challenges Posed by Threshold Dynamics for Sustainable Renewable Resource Management." Ecological Economics: The Journal of the International Society for Ecological Economics 104 (August): 107–18.

5. Schill, Caroline, John M. Anderies, Therese Lindahl, Carl Folke, Stephen Polasky, Juan Camilo Cárdenas, Anne-Sophie Crépin, Marco A. Janssen, Jon Norberg, and Maja Schlüter. 2019. "A More Dynamic Understanding of Human Behaviour for the Anthropocene." Nature Sustainability 2 (12): 1075–82.

List of relevant projects

1. The role of biodiversity in fluctuating environments, Swedish science foundation 2002-2003

2. Institutional and economic tools for managing biodiversity, Swedish science foundation 2002-2004

3. A general trait-based approach for ecology: Understanding ecosystem dynamics and implications for climate impact predictions, Swedish science foundation 2002-2006

4. Management of coastal recreational fishery with emphasis on biodiversity. 2006-2007 Swedish research council for sustainable development

5. Pollution and ecosystem adaptation to changes in the environment, Research council of Norway 2015-2019 (advisory board)

4.2 Third parties involved in the project (third party resources)

None

5 Ethics and Security

5.1 Ethics

There are no ethical issues concerning the ROBHOOT project.

5.2 Security

1. Activities or results raising security issues: (NO)

2. EU-classified information' as background or results: (NO)