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*IFIP is the global non-profit federation of societies of ICT professionals that aims at achieving a worldwide professional and socially responsible development and application of information and communication technologies.*

IFIP is a non-profit-making organization, run almost solely by 2500 volunteers. It operates through a number of technical committees and working groups, which organize events and publications. IFIP's events range from large international open conferences to working conferences and local seminars.

The flagship event is the IFIP World Computer Congress, at which both invited and contributed papers are presented. Contributed papers are rigorously refereed and the rejection rate is high.

As with the Congress, participation in the open conferences is open to all and papers may be invited or submitted. Again, submitted papers are stringently refereed.

The working conferences are structured differently. They are usually run by a working group and attendance is generally smaller and occasionally by invitation only. Their purpose is to create an atmosphere conducive to innovation and development. Refereeing is also rigorous and papers are subjected to extensive group discussion.

Publications arising from IFIP events vary. The papers presented at the IFIP World Computer Congress and at open conferences are published as conference proceedings, while the results of the working conferences are often published as collections of selected and edited papers.

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Ioannis N. Athanasiadis · Steven P. Frysinger ·  
Gerald Schimak · Willem Jan Knibbe (Eds.)

# Environmental Software Systems

## Data Science in Action

13th IFIP WG 5.11 International Symposium, ISESS 2020  
Wageningen, The Netherlands, February 5–7, 2020  
Proceedings

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# Preface

This book contains the papers presented at the 13th International Symposium on Environmental Software Systems (ISESS 2020), held during February 5–7, 2020, in Wageningen, the Netherlands. ISESS was initiated in 1995 as a forum to present and discuss research fundamentals and state-of-the-art applications in environmental informatics. Over the years, it has also evolved into a networking event for academics and industry experts focused on the intersection of software engineering, data science, and environmental sciences.

The ISESS conference series is organized by the Working Group 5.11 Computers and Environment of the International Federation for Information Processing (IFIP). The mission of **IFIP WG 5.11** is to foster environmental informatics and advance the state of the art of information science applications for environmental research, monitoring, assessment, management, and policy. To achieve this mission, IFIP WG 5.11 brings together researchers who deal with environmental challenges and try to provide solutions using forward-looking and leading-edge information technology. The conference connects academia and industry to overcome a manifold of technology changes and dynamics by using their best knowledge to improve our environment, and therefore the well-being of our society. Previous editions of the conference have been held in Zadar, Croatia (2017), Melbourne, Australia (2015), and Neusiedl am See, Austria (2013).

The theme of ISESS 2020 was **Data Science in Action**, and aimed to serve as a forum to present primary research in data science and its applications in the social, environmental, and green life sciences. The present volume includes 25 papers that have been reviewed by at least 2 members of the Program Committee. A wide range of topics is covered including data mining, artificial intelligence, high performance and cloud computing, visualization and smart sensing for environmental, earth, agricultural, and food applications.

The program also included an invited talk by Prof. Steven P. Frysinger on user engagement, discussing how environmental data science may end up helping real decision makers to make better environmental decisions and carry out more effective environmental management.

ISESS 2020 was organized by the Wageningen Data Competence Centre and was part of a broader event: the **Wageningen Data Science Week**. During this week a variety of activities were organized at the Wageningen University Campus, including crash courses, a data sprint hackathon, workshops, a movie, research project meetings, and an information market. This further fostered the discussion about the requirements and potential advances of data science applied in environmental sciences.

December 2019

Ioannis N. Athanasiadis  
Steven P. Frysinger  
Gerald Schimak  
Willem Jan Knibbe

# Organization

The 13th International Symposium on Environmental Software Systems (ISESS 2020) was organized by the Wageningen Data Competence Center on behalf of the IFIP Working Group 5.11 Computers and Environment. It was held during February 5–7, 2020, in Wageningen, The Netherlands.

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# **Engaging Users: How to Make Decision Support Systems Relevant to Real Environmental Decision Makers (Abstract of Invited Talk)**

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**Abstract.** Those of us who have been involved with environmental informatics for a while know that only a fraction of the impressive technology we develop actually ends up helping real decision makers to make better environmental decisions and carry out more effective environmental management. This is because our community is largely composed of scientists and engineers specialized in computer science and environmental science, while the people who really need to use the fruits of our labors are usually not from these fields. Most of us aren't trained to connect our work to them. The true value of our effort isn't measured by papers written and talks presented, but by the degree to which our technology is used by environmental decision makers in the real world. This talk is a "call to arms" to break down that barrier: to engage the environmental end-users with our research and our designs, and to assess our effectiveness by measuring THEIR effectiveness when using our technology.

**Keywords:** EDSS • Environmental decisions • Human factors



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