

## **Fifth edition ICT with Industry 2017**

### **Introduction**

Since 2013, the NWO Domain Science (ENW) and the NWO Domain Applied and Engineering Sciences (TTW, former STW) are collaborating with the research schools ASCI, IPA and SIKS in the organisation of the ICT with Industry workshop. The main aim of the workshop is to stimulate contacts and future collaborations between researchers and professionals from industry and public organisations. At the 2017-edition the steering committee received overall very positive feedback from the participants. The most common remarks were, first of all, that the participants gained a broader view, and learned about new fields and the techniques that they use, which may possibly also be useful in their research work or within their organisations. Second, participants enjoyed meeting new people in a creative setting, yielding useful professional contacts for future collaborations. The workshop also allowed them to showcase their knowledge and skills, and thus gain more visibility. Third, participants appreciated gaining a better understanding of industry needs, and how their research may be useful for practical applications. The format of the workshop also gave people the opportunity to work on problems that they otherwise would not have the time for. Finally, several participants appreciated the additional guidance from the steering committee in solving their specific cases.

Experience of the existing workshops, such as Physics with Industry, Life Sciences with Industry, Mathematics with Industry and the previous editions of ICT with Industry, was used as points of considerations for this edition. The Workshop ICT with Industry 2017 took place at the Lorentz Center in Leiden from 27 November to 1 December 2017.

### **Problems & Outcome**

The industrial partners presented their case study and objectives on the first day. Immediately afterwards, groups of participants began to brainstorm, to program and to look for possible solutions. Each team was guided by an academic team leader and the case owners. The case studies of 2017 were as follows:

1. Triodos Bank: The United Economy is a group of companies who want to pay each other's invoices in Uniteds, in order to keep the money in their own circle where possible. The Uniteds can be considered as an alternative currency to the Euro, but is only valid in the group of participating companies. It allows a participant to pay for a service provided by another participant, and enables to manage currency-related issues by the group itself rather than a central bank. The sustainable Triodos Bank (Zeist, The Netherlands) and the University of Twente executed a successful pilot in November 2016, showing the feasibility of using the Hyperledger blockchain technology that facilitates the exchange of the alternative currency called "United". A key problem is how to put this blockchain into operation, specifically with respect to the required eco-system. For example, in the prototype setup, Triodos Bank hosts at least three Hyperledger nodes, which is a required function in the eco-system to operate a Hyperledger setup. However, on the long term, strategies need to be developed which allow the United group to operate the blockchain independently from Triodos Bank, and thereby hosting the nodes itself. Understanding the eco-system requires a thorough knowledge of the chosen technology, for example with respect to the used consensus mechanism. Additionally, once the eco-system is better elaborated, the technical solution (now Hyperledger) might change to better meet the eco-system requirements. We will analyze the required eco-system using the e3value methodology (see [e3value.com](http://e3value.com)). This methodology, developed at the VUA/CS department, helps to understand networks of enterprises from the business value perspective. The result will be a clear description of the required business roles and the value-added services which are needed to run the United blockchain. It may very well be possible that the final result has consequences for the selected technology. The workshop will include a tutorial on the e3value methodology and blockchain technology (e.g. Bitcoin and Hyperledger). The eco-system design will be done with the participants in an interactive way. Therefore, the participant will not only learn about the e3value methodology and blockchain technologies, but also obtains the expertise to apply this knowledge.

2. **Blendle:** In this workshop, we take on the challenges of filter bubbles and recommendation bias. A balanced, diverse, and relevant selection of news clearly helps with discovering quality journalism. With data from Blendle, two recommender system experts from industry and academia, and the participants, we will develop a better way of finding news. One that doesn't reward fake news, filter bubbles and an endless stream of cat videos. We will provide participants with the curated selection made by Blendle's editorial team (a daily selection is available for several years) with metadata and enrichments for the original content. As Blendle does not own the copyright of the original content from publisher, we cannot release this, but we can make this available under an NDA during the workshop. This will allow participants to start working on the research challenges as soon as they join. We are looking for PhDs and Postdocs with a wide range of skills, from data mining and visualization aimed at finding patterns for what a complete news selection looks like, to algorithm and machine learning skills to operationalize an approach for generating a complete selection. Together we will work on answering the following questions: How to select a balanced and diverse selection of items using mixed initiative approaches (e.g., editorial team + content enrichment + machine learning), how to best present a diverse selection of items (how to mix editorial and algorithmically recommended content, e.g., as a sequence or top-N set), which information should be used to accompany these diverse items (e.g., textual or visual explanations), to help address users' concerns that they might be missing something.
3. **TNO-ESI & Océ:** The complexity in high-tech systems is increasing rapidly, therefore development of these systems is becoming a huge challenge. The role of a system architect in a company that is developing complex systems is becoming increasingly hard. It is difficult to identify and manage all system aspects that are relevant for stakeholders, such as customers, senior management, on one hand and the technical solutions worked on by the development organization on the other hand. The current situation is that large and complex it is nearly impossible for a system architect to stay in control. Workshop aim is finding innovative directions for research to exploit the knowledge graph to support the system architect: e.g. notification for inconsistencies or incompleteness, suggestions for analysis, generation of relevant questions, suggestions for 'thinking tracks', analysis or synthesis elements using expert system reasoning. These options should be of great value to system architects, and are intended as an add-on (not replacement) to the 'human way' of working. Possible research directions include: search heuristics, architecture knowledge management, text and data mining, machine learning, architecture documentation theory and practice, expert systems, semantic web & linked data, natural language processing, information retrieval, agent-based systems, (data/graph) visualization techniques, time-series analysis, and sentiment analysis.
4. **I3B & EagleVision:** In recent years, machine learning techniques, including deep learning, have gained wide use in computer vision. In industrial inspection applications however, machine learning is not yet widely used. Until now, in most applications, the use of traditional image processing algorithms is sufficient and easier to implement. A recent trend however, especially in the baby food nutrition market, is demand for higher inspection performance as a result of higher quality assurance demands from customers. An industrial inspection system will usually classify images of products into two classes: accept for images of good products and reject for images of wrong or damaged products. Using traditional techniques, like template matching and image comparison, it is difficult to distinguish between image irregularities caused by defects on the surface as shown above, and image irregularities caused by reflections or by normal surface geometry or "normal" surface variations due to the can production process. A requirement for using machine learning techniques is the availability of a very large set of images ("big data") for training. By collecting real data from production, it is possible to acquire this large set. Eagle vision intends to integrate the developed technology in the Basic Scout industrial inspection system. Applications in the baby food nutrition are mentioned above, but it is expected that other applications can benefit from the technology like inspections of bottles, contamination inspection in cans, and others. The computer vision for industrial inspection is a multi-billion Euro market. The team will work on the following challenges: Selecting and implementing the best machine learning techniques for the classification of the images, optimizing to achieve the desired error rate, optimizing to achieve the required analysis time constraint, trying to apply the same technique on a second inspection application.

In short, the workshop resulted in new collaborations and research ideas, which all have the potential to be further developed into research proposals. Funding possibilities were offered by NWO.

### Visibility

The workshop results were communicated through the following channels:

- NWO EW newsletter: <http://www.nwo.nl/actueel/nieuws/2015/ew/onder-druk-presteren.html>
- NWO website: <http://www.nwo.nl/over-nwo/organisatie/nwo-onderdelen/ew/bijeenkomsten/ict+with+industry+workshop/case+studies>

During ICT.OPEN2017, the main ICT research conference in the Netherlands held at 19-20 March 2018, there will be a plenary session dedicated to ICT with Industry 2017. <http://www.ictopen.nl/>

### Governance

The steering committee consisted of:

- [Prof. Dr. Arend Rensink \(UT\) - chair](#)
- [Prof. Dr. Remco Veltkamp \(UU\)](#)
- [Dr. Claudia Hauff \(TUD\)](#)
- [Dr. Ana Maria Oprescu \(UvA\)](#)
- [Prof. Dr. Patricia Lago \(VU\)](#)



NWO in collaboration with the research schools, ASCI, IPA, SIKS and [IPN](#) (a national platform for the Dutch ICT research field) are currently planning the sixth edition Workshop ICT with Industry to be organized in November 2018.

A Call for Case Studies will be published soon at the NWO website.

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