Annual Report 2018

ICE-TCS

Icelandic Centre of Excellence
in Theoretical Computer Science

Contents

1 Introduction

The Icelandic Centre of Excellence in Theoretical Computer Science (ICETCS) celebrated its thirteenth birthday on 29 April 2018. As usual, this thirteenth annual report is meant to give the (Theoretical) Computer Science community in Iceland and elsewhere, our sponsors and funding agencies, and our scientific advisory board an overview of the activities of the centre in 2018. It will also allow us to evaluate our achievements vis-a-vis our original aims in setting up this centre, and to set ourselves goals for the future. This annual report will focus on the main highlights of a busy year for ICE-TCS and refer our readers to the data collected at the centre's web page at

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http://www.icetcs.ru.is

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for full details.

2 Executive Summary and Highlights for the Reporting Period

Once again, the calendar year 2018 has been an active one for ICE-TCS, both nationally and internationally. The quality and impact of the research carried out by the members of the centre in 2018 is witnessed by the following main achievements.

- The paper *Universal Framework for Wireless Scheduling Problems* by E. I. Ásgeirsson, M. M. Halldorsson and T. Tonoyan has been invited to the 2018 edition of the Highlights

[in Algorithms](#) conference, which is meant to showcase some of the best recent papers in algorithms.
- The [CombSpecSearcher algorithm](#), developed by the combinatorics group at ICE-TCS, has led to fully automated proofs of known theorems in enumerative combinatorics, including some that have just recently been published in the literature.
- Antonis Achilleos was an invited speaker at [NYCAC 2018, The New York Colloquium on Algorithms and Complexity 2018](#), The Graduate Center, CUNY, New York City.
- ICE-TCS research was featured in an ICE-TCS workshop held at the [Gran Sasso Science Institute (GSSI)](#) (L'Aquila, Italy). The purpose of the event was to establish scientific collaborations and joint PhD supervisions between ICE-TCS and the [Computer Science group at the GSSI](#). The programme for the workshop is available [here](#).
- Luca Aceto and Anna Ingólfsdóttir have been awarded a PhD Student Grant from Reykjavik University Research Fund for the research project *Open problems in the Equational Logic of Processes*. The grant amounts to 5,340K ISK for one year (roughly 40K Euros).
- ICE-TCS researchers have been awarded two grants by the Icelandic Research Fund in response to the call for applications for the year 2018.
  - Antonis Achilleos received 29,987K ISK (approximately 237,800 EUR) for a three-year postdoctoral grant.
  - Ian Cassar received 9,600K ISK (approximately 76,130 EUR) for a two-year doctoral grant.

As in previous years, ICE-TCS researchers organized high-quality scientific events at Reykjavik University and elsewhere, increasing the international visibility of the centre and of Reykjavik University as a whole. To wit, we mention the following events.

- Bernd Fischer and Tarmo Uustalu organized and co-chaired [ICTAC 2018](#), together with a spring school, in Stellenbosch, South Africa; Tarmo Uustalu also organized the [EWSCS 2018](#) winter school in Palmse, Estonia.
- The 14th annual ICE-TCS Theory Day was held at Reykjavik University. The event featured an invited talk by [Takeshi Tokuyama](#) (Tohoku University, Japan). Further details are available [here](#).
- [Eugenio Coccia](#) (Rector of the Gran Sasso Science Institute, L'Aquila, Italy) delivered a public talk entitled *The dawn of gravitational wave astronomy* at Reykjavik University. See [here](#) for further details on the talk. This public talk was jointly organized by the Icelandic Academy of Sciences (Vísindafélag Íslendinga), the Icelandic Centre of Excellence in Theoretical Computer Science, the Icelandic Physical Society and Reykjavik University. The talk introduced the 2017-Nobel-Prize-winning work that led to the discovery of gravitational waves and discuss its future potential.

The centre also maintained a vibrant guest programme and hosted [18 foreign researchers](#) during 2018 for stays ranging from a few days to about three weeks. Each of the guests delivered a seminar in the [ICE-TCS seminar series](#), which consisted of 20 seminars in the reporting period. At the time of writing the ICE-TCS seminar series has hosted 328 talks since the establishment of the centre.

ICE-TCS researchers have also continued to serve the community in a variety of leading roles. By way of example, we limit ourselves to mentioning that

- Tarmo Uustalu is the publicity chair and member of the [Executive Board of ETAPS](#); he is also vice-chair of the EU COST action [EUTYPES](#) running 2016-2020;
- Magnús Halldórsson is a member of the [Council of the EATCS](#);
- Anna Ingólfsdóttir is a member of the [Executive Committee of the Scandinavian Logic Society](#);
- Luca Aceto is the chair of the [editorial board of LIPIcs](#) (Leibniz International Proceedings in Informatics).

2.1 Research Output

At the time of writing, according to our records that are available at

http://www.icetcs.ru.is/publications.pdf,

ICE-TCS members have a total of 563 publications since the establishment of the centre: two books, 47 edited volumes, 12 book chapters, 251 journal papers, 244 conference and workshop papers and seven abstracts in peer-reviewed ISI-indexed journals. In 2018, researchers at the centre have published two edited volumes, two book chapters, 13 journal papers and nine conference papers. This is in keeping with previous years. Most importantly, the published papers appear in selective outlets and this gives some evidence, albeit of an indirect nature, of the quality of the research carried out at the centre,

The centre still has more journal publications than conference publications. However, the difference between the two figures has been slowly decreasing in the last few years. We expect that this trend will continue in the coming years, but we will strive to continue publishing in journals a substantial percentage of our scientific work.

3 Current Members

At the time of writing, ICE-TCS has nine permanent members (seven at Reykjavik University and one at deCODE Genetics and at the University of Iceland), namely Luca Aceto, Eyjólfur Ingi Ásgeirsson (Scientific Co-director), Yngvi Björnsson, Bjarni V. Halldórsson, Magnús M. Halldórsson (Scientific Director), Anna Ingólfsdóttir (Scientific Co-director), Páll Melsted,

Henning Úlfarsson and Tarmo Uustalu. In 2018, Luca Aceto held a position as Professor of Computer Science at the Gran Sasso Science Institute in L'Aquila, where he was the director of the PhD programme in computer science and the scientific director of the computer science group. However, he kept a part-time position at Reykjavik University and actively contributed to the activities of ICE-TCS.

In 2018, the centre hosted the postdoctoral researchers Antonis Achilleos (logic in computer science, runtime verification), Murilo Santos de Lima (design and analysis of algorithms) and Tigran Tonoyan (design and analysis of algorithms), and one PhD. student, namely Christian Bean (supervised by Henning Úlfarsson), who successfully defended his thesis in June 2018. Tarmo Uustalu supervises Hendrik Maarand, a doctoral student at Tallinn University of Technology. In addition, Luca Aceto and Anna Ingólfsdóttir co-supervise Duncan Paul Attard and Ian Cassar, two PhD students from the University of Malta who are enrolled in a joint Reykjavik University/University of Malta doctorate and whose main supervisor is Adrian Francalanza. It is clear that we could do better, and we are working on attracting PhD students to the centre using some financial support that has now been made available by the School of Computer Science at Reykjavik University, the Reykjavik University Research Fund and other grants. We also hope to be in a position to hire more postdocs in the first half of 2019, using funding from two new grants awarded to ICE-TCS researchers by the Icelandic Research Fund in January 2019.

4 A first look at 2019

ICE-TCS has started the year 2019 maintaining a very high level of activity, which bodes well for the remainder of the year.

In January 2019, the centre has already hosted two foreign guests, Robin Cockett (University of Calgary, Canada) and Dirk Draheim (Tallinn University of Technology, Estonia), who visited Tarmo Uustalu at Reykjavik University. Both guests delivered talks in the ICE-TCS seminar series, which also featured presentations by Omer Egecioglu (University of California at Santa Barbara, visiting RU) and Luca Aceto.

We look forward to hosting Ravi Boppana (Department of Mathematics, MIT), who will visit ICE-TCS in the period 1-17 May 2019, hosted by Magnús M. Halldórsson. Ravi Boppana received a Ph.D. in Math from MIT at the age of 22. He is best known for his works with Noga Alon showing that monotone circuits for NP-complete problems require exponential size, and linking the expansion property of graphs to the second eigenvalue of its adjacency matrix. He received teaching awards both at Rutgers University and New York University and is celebrated for his exposition. He also founded and directs the national Math Prize for Girls contest. Ravi Boppana will be one of the keynote speakers at the 2019 Theory Day, which will be held on Friday, 3 May 2019. Other speakers at the Theory Day will be announced in due course.

Tarmo Uustalu will organize the [24th Estonian Winter School in Computer Science](#) in Palmse, Estonia, in the period 3-8 March 2019.

Since the ICE-TCS/GSSI workshop held in November 2018 was successful, we plan to hold a second edition of that event at some point this year.

Once more, ICE-TCS researchers have received the only two project grants awarded in the field of computer science by the Icelandic Research Fund for 2019. The grants, which are for the period 2019-2021, are for the projects:
- "Open problems in the Equational Logic of Processes" (Luca Aceto, PI; Anna Ingolfsdottir, Bas Luttik and Alexandra Silva co-proposers; 54,525 K ISK, roughly 396,000 EUR) and
- "Quantified computational effects and interaction" (Tarmo Uustalu PI, Shin-ya Katsumata and Maciej Piróg co-proposers; 46,314 K ISK, roughly 336,000 EUR).

Using these grants, ICE-TCS will be able to hire some more postdoctoral researchers and PhD students. Moreover, ICE-TCS researchers have been successful in hiring PhD students using PhD grants provided by the School of Computer Science at Reykjavik University and by receiving a grant from the Reykjavik University Research Fund. PhD student Elli Anastasiadi will join the centre on the 1st of March 2019 as a PhD student (supervised by Luca Aceto and Anna Ingólfsdóttir) and Émile Nadeau is a new doctoral student in the combinatorics group working under the supervision of Henning Úlfarsson.

Magnús M. Halldórsson will give a keynote address, titled "How well do we know the physical model?", at [DCOSS 2019](#) to be held in the period 29-31 May 2019. This is an international recognition for the work carried out Magnús and his group on wireless algorithmics.

We feel that these events mark the beginning of yet another very active year for ICE-TCS. There are still eleven more months to go and we look forward to seeing what they will bring, even though there is no guarantee that they will be as rich of events and successes as January 2019 has been.

5 Summary and Self-Evaluation

Overall, ICE-TCS has maintained a high level of activity during the reporting period. We feel that we can be proud of what the centre has achieved since its establishment in 2005 and it seems fair to say that ICE-TCS has a good amount of international visibility within the international TCS community. This is also witnessed by the high quality of applications from TCS researchers for academic positions at the School of Computer Science. Of course, we are always looking at ways in which we can improve our activities and impact, and welcome suggestions on this point from our advisory board and other readers of this report.

The core personnel of the centre has remained largely unchanged for some time now, apart from the hiring of Tarmo Uustalu. Unfortunately, at least for ICE-TCS, the current hiring policy at the School of Computer Science prioritizes hirings in areas different from theoretical computer science, broadly construed, and strong TCS-related applicants were not selected for academic positions in the last round of hires. We hope that this will change in the future. For the time being, we will keep exploiting all available means to maximize our impact and research collaborations, as we have done since April 2005.

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