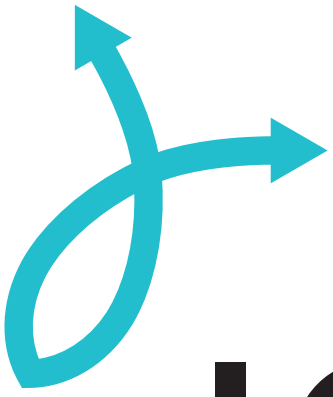
Annual Report 2016



ICE-TCS

Icelandic Centre of Excellence
in Theoretical Computer Science

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1 Introduction

The Icelandic Centre of Excellence in Theoretical Computer Science (ICE-TCS) celebrated its eleventh birthday on 29 April 2016. This belated eleventh 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 2016. 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.

In the light of its lateness, and since the reporting of our many activities for 2017 is only four months away, this report will be substantially shorter than the ones for previous years. We will simply limit ourselves to mentioning the main highlights of the centre-related activities in 2016 and refer our readers to the data collected at the centre's web page at

http://www.icetcs.ru.is

for full details.

2 Executive Summary and Highlights for the Reporting Period

Once again, the calendar year 2016 has been an active one for ICE-TCS, both nationally and internationally.

As in previous years, the quality of the research conducted at ICE-TCS has received recognition within the community. To wit, Magnús M.

Halldórsson has been invited to deliver invited talks at the 32nd British Colloquium of Theoretical Computer Science (BCTCS 2016), Queen's University, Belfast, and at the 14th International Symposium on Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks (WiOpt 2016). Moreover, ICE-TCS researchers received the only two project grants awarded by the Icelandic Research Fund for 2016 within the field of computer science. The two awarded grants are:

- TheoFoMon: Theoretical Foundations for Monitorability (Luca Aceto, PI; Adrian Francalanza and Anna Ingolfsdottir co-proposers; 23,917K ISK, roughly 170,337 EUR).

- SEADA-Pilot (Marjan Sirjani, PI).

Moreover, Agnes Cseh, a postdoctoral researcher at ICE-TCS was awarded the Klaus Tschira Preis für verstndliche Wissenschaft, which is a 5000 Euro prize for the most human-readable 3-page summary (in German) of a PhD thesis in Mathematics.

ICE-TCS researchers continued their effort to bring high-quality international events to Reykjavik University. As part of this enterprise, ICE-TCS organized and hosted two international conferences and one international workshop at Reykjavik University. More specifically,

- Marjan Sirjani was general chair for the 12th International Conference on integrated Formal Methods, iFM 2016, which was held in the period 1–3 June 2016. The invited speakers were Marsha Chechik (University of Toronto, Canada), Laura Kovács (Chalmers University of Technology, Sweden) and Reiner Hähnle (Technical University Darmstadt, Germany). The conference had four co-located workshops, a PhD symposium and hosted the COST Action Meeting ARVI.

- Luca Aceto, Adrian Francalanza and Anna Ingolfsdottir organized the workshop Pre- and post-deployment verification techniques (Pre-Post), co-located with iFM 2016. Dino Distefano (Facebook) and Kim G. Larsen (Aalborg University) delivered invited talks at the workshop.

- Magnus M. Halldorsson organized the 15th Scandinavian Symposium and Workshops on Algorithm Theory (SWAT 2016) at Reykjavik University in the period 22–24 June 2016. The event featured invited talks by Christos Papadimitriou (University of California at Berkeley), Julia Chuzhoy (Toyota Technical Institute, Chicago) and Dániel Marx (Hungarian Academy of Sciences, Budapest).

In addition, ICE-TCS held a "Theory Week" in the period 23–27 May 2016, which featured talks by Huimin Lin (Chinese Academy of Sciences), Zoltán Ésik (University of Szeged) and Tamas Fleiner (Budapest University of Technology and Economics). Murray Tannock's MSc Thesis defence also took place during this week. On Friday, 27 May 2016, the Theory Week culminated in our annual Theory Day.

Sadly, our friend Zoltán Ésik passed away in Reykjavik the day after delivering his talk at the Theory Week. Luca Aceto and Anna Ingólfsdóttir have written a tribute to Zoltán Ésik that includes a discussion of some of his scientific achievements and are amongst the editors of a special issue of Logical Methods in Computer Science devoted to his memory.

In 2016, ICE-TCS graduated one PhD student, Ali Jafari, who defended his PhD thesis *Performance Evaluation and Model Checking of Probabilistic Real-time Actors* on Friday, 15 April 2016. The thesis was supervised by Marjan Sirjani and was examined by Holger Hermanns (Saarland University, Germany) and Wan Fokkink (VU Amsterdam, the Netherlands). Before the thesis defence Holger and Wan delivered two ICE-TCS seminars. Holger's talk was entitled *How good is your embedded design, if at all?* and Wan gave a presentation entitled *Quantum computing for dummies*.

During the reporting year, ICE-TCS researchers have continued to play leading roles within the community. Here we limit ourselves to mentioning that Luca Aceto stepped down as president of the EATCS at ICALP 2016 in Rome in July, but became a member of the Steering Committee for GandALF, the International Symposium on Games, Automata, Logics and Formal Verification in September. Magnús M. Halldórsson is an elected member of the council of the EATCS.

During the reporting period, there were 15 seminars in the ICE-TCS research seminar series and six in the Pearls of Computation seminar series (which is aimed at a general public). ICE-TCS also hosted 13 guests, each of whom delivered a talk at one of our events and contributed to the local research environment.

Research

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 501 publications since the establishment of the centre: two books, 40 edited volumes, 10 book chapters, 231 journal

papers, 211 conference and workshop papers and seven abstracts in peer-reviewed ISI-indexed journals. By way of comparison, the overall number of publications was 297 at the time of writing our annual report for 2010, 339 for 2011, 360 for 2012, 403 for 2013, 435 for 2014 and 463 for 2015.

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: it is now 20 and was 26 in 2015, 39 in our report for 2014, 43 in 2012 and 45 in 2011. 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 eight permanent members (six at Reykjavik University and one at deCODE Genetics and at the University of Iceland), namely Luca Aceto (Scientific Co-director), Eyjólfur Ingi Ásgeirsson, Yngvi Björnsson, Bjarni V. Halldórsson, Magnús M. Halldórsson (Scientific Director), Anna Ingólfsdóttir (Scientific Co-director), Páll Melsted and Henning Úlfarsson. Marjan Sirjani left the centre after becoming a full professor at Mälardalen University in Sweden.

In 2016, the centre lost five postdoctoral researchers (namely, Agnes Cseh, Ignacio Fabregas, Alvaro Garcia-Perez, Christian Konrad and Janne Korhonen), who took up positions elsewhere. Antonis Achilleos (logic in computer science, runtime verification) joined ICE-TCS as a postdoctoral researcher and Tigran Tonoyan (design and the analysis of algorithms) extended his stay.

During 2016, ICE-TCS hosted three PhD. students: Christian Bean (supervised by Henning Úlfarsson), Ali Jafari and Ehsan Khamespanah (both supervised by Marjan Sirjani). After Ali Jafari's graduation in the spring of 2016, the centre has only one active PhD student, since Ehsan Khamespanah is largely based in Tehran.

4 A first look at 2017

The first half of 2017 has been very eventful and rich of recognition for ICE-TCS. We will provide a full report on ICE-TCS-related events in our next annual report, so here we limit ourselves to mentioning a few highlights.

First of all, in March 2017, Magnús M. Halldórsson, the scientific director of ICE-TCS, became the first researcher at Reykjavik University to have an

h-index of 40 according to Google Scholar. Even though one has to take metrics with a pinch of salt, we feel that this gives an indication of the impact of the work of the algorithmics group at ICE-TCS on the research community. This view is reinforced by the following two best paper awards received by Magnús M. Halldórsson and his colleagues:

- The paper *Universal Framework for Wireless Scheduling Problems* by Eyjólfur I. Ásgeirsson, Magnús M. Halldórsson and Tigran Tonoyan received the best paper award for Track C at ICALP 2017.

- The paper *Leader Election in SINR Model with Arbitrary Power Control* by Magnús M. Halldórsson, Stephan Holzer and Evangelia Anna Markatou received the SIROCCO 2017 best paper award.

In March 2017, Eyjólfur I. Ásgeirsson received the 2017 Reykjavik University Teaching Award. We are very pleased with this teaching award, as delivering high-quality teaching is one of the ways in which ICE-TCS can have impact on Icelandic society.

We have continued to serve the research community by organizing workshops and conferences. In 2017 we have so far hosted the following events, listed in reverse chronological order.

- In period 26–30 June 2017, Henning Úlfarsson organized Permutation Patterns 2017, The 15th International Conference on Permutation Patterns at Reykjavik University. Invited speakers were Peter Winkler (Dartmouth College) and Vt Jelnek (Charles University).

- In the period 18–23 June 2017, Luca Aceto and Anna Ingolfsdottir organized the very prestigious LICS 2017 at Reykjavik University. The main conference was preceded by seven co-located workshops. As a service to the community, ICE-TCS co-sponsored the 2nd Logic Mentoring Workshop, which was co-located with LICS 2017.

- On Friday, 17 February 2017, ICE-TCS celebrated Anna Ingólfsdóttir's 65th birthday with a small workshop, featuring invited talks by Kim G. Larsen (Aalborg University) and Hanne Riis Nielson (DTU).

Dexter Kozen (Cornell University) visited ICE-TCS in the period 27 April–1 May 2017. Dexter held a mentoring session for students and young researchers of all ages at Reykjavik University and delivered a talk on *NetKAT: A Formal System for the Verification of Networks*.

The 13th annual ICE-TCS Theory Day was held on Friday, 28 April 2017, and featured invited talks by Dexter Kozen (Cornell University) and Jason

P. Smith (Department of Computer and Information Sciences, University of Strathclyde).

At the start of the year, the project "New horizons in algorithms for wireless networks", with Magnús M. Halldórsson as PI, received funding by the Icelandic Research Fund. The funding for the project is of $15,625,000$ ISK (roughly $129,323$ Euros). This was one of the two projects that were funded in the field of computer science during this grant year. So ICE-TCS researchers continue to be successful in attracting a good fraction of the small amount of research funding that is available in Iceland.

Overall, the levels of ambition and activity remain high within ICE-TCS, and we hope that 2017 will be as successful as the previous years were.

5 Summary and Self-Evaluation

The reporting period has seen ICE-TCS continue to achieve a fair amount of visibility in the research community. The centre has been very active in organizing high-quality scientific events at Reykjavik University and some of its members have served on the PCs of conferences and workshops in theoretical computer science, and play leadership roles in PCs, steering committees and boards for conferences, journals and learned societies. These are all signs of recognition for the research work that has been carried out within the centre, and for the role that the centre as a whole has played in the theoretical-computer-science community since its inception.

Scientifically, the centre has continued to play an important role in the computer-science and discrete mathematics communities in Iceland. As in previous years, the vast majority of the scientific events in those fields taking place in Iceland have been associated with the centre and, to the best of our knowledge, the ICE-TCS seminar series and guest program are pretty much unique in the country. Internationally, the centre has continued to contribute to the TCS community via its research output and its service activities.

We find it disappointing that, despite our long-term efforts in building a research and scientific culture at Reykjavik University, the public talks and Pearls of Computation seminars we organize are still largely badly attended. All those talks are accessible to undergraduate students in scientific disciplines and often to a general, educated public. We have no solution to this issue, as this has happened even at events where free food was available.

Overall, we feel that we can be happy with what has been achieved in 2016. However, we have lost most of our postdoctoral researchers and some permanent members of the centre have left Reykjavik University. We have

already mentioned that Marjan Sirjani has taken up a professor position at Mälardalen University in Sweden. Moreover, Luca Aceto will become a professor at the Gran Sasso Science Institute in L'Aquila, Italy, in September 2017, but will maintain a 30%-affiliation with Reykjavik University and will continue to offer some contribution to ICE-TCS activities.

Moreover, the centre has a shortage of PhD students and it seems to be difficult to find suitable doctoral students to work on funded research projects led by ICE-TCS researchers. Fortunately, we have established a joint degree agreement with the University of Malta, covering two PhD students (Duncan Paul Attard and Ian Cassar) who are working on the TheoFoMon project. Moreover, Henning Úlfarsson has been very successful in involving bright students from our Discrete Mathematics and Computer Science programme in his research via Undergraduate Research Opportunities and master thesis projects. Attracting students to TCS remains one of the areas in which we need to be more successful.

Overall, we feel that we can be pleased with the quality and the quantity of the research work carried out by our members, and with the ensuing publications. In keeping with the centre's ambitions, it will be a useful exercise for us to find ways to increase the influence and activities of ICE-TCS even further. However, growth in the centre's research activities will strongly depend on increasing the number of its permanent members and on the quality of the PhD students and postdoctoral researchers that we will manage to attract. Our own experience over the last two or three years indicates that it might be easier for us to attract postdoctoral researchers than PhD students. The main obstacle to attracting postdoctoral researchers is the lack of funding, and we will have to do our best to be successful in grant-winning.

The leadership of the centre has not changed since its inception. We feel that the time is ripe for giving more responsibilities to the younger members of the centre and for a restructuring of our organizational structure. In particular, since Luca Aceto will spend a significant part of his time in Italy, we will need to find a new scientific co-director in his place.

We feel that the commitment of ICE-TCS researchers to the activities of the centre has waned a little over the last couple of years. This is perhaps not so surprising since we are spread across three institutions and each of us has many tasks to accomplish. Moreover, the centre has been active since 2005 and some of the early pioneering spirit underlying it seems to have petered out. Even though we find it hard to imagine what the research environment at Reykjavik University would be like without ICE-TCS and its activities, it might be time to ask ourselves whether we are still committed to making the centre a hotbed of research activity in TCS in Iceland, and what we

could and should do to enhance its national and international reputation.

We look forward to addressing the above-mentioned issues and to what the future will bring.