



"Science is what we understand well enough to explain to a computer.
Art is everything else we do."

— Donald Ervin Knuth

Dear Colleagues,

It is the 22nd issue of The HSE Look and it is the first time when we did not choose the quote for the editorial on our own: it was kindly offered by our main interviewee, Ivan Arzhantsev, Dean of the Computer Science Faculty. On the one hand, this surely tells a lot about Prof. Arzhantsev and the Faculty, not only they have a big vision, but also do not forget even the tiniest details which make the picture vivid and complete. On the other hand, the fact that the quote has become the integral part of every The HSE Look issue means that the tradition which we do our best to foster is taking root and gaining a life of its own. So, continuing the tradition, we bring to your attention an article about the Faculty of Computer Science and introduce another international colleague, Geoffrey Decrouez. We also prepared a novelty for you and are glad to announce that from now on, we will share the information about the upcoming short-term visits of international scholars to the HSE. This time we are introducing colleagues who are coming to the HSE in June and July.

Yulia Grinkevich
Director of Internationalization

Faculty of Computer Science: an Impressive Start

The Faculty of Computer Science is only one year old – it was founded March 28, 2014 – but it already has a rich history and ambitious plans. This new 'big faculty' brings together the departments of applied mathematics and informatics, of software engineering, and Yandex's department, which were previously part of the Faculty of Business Informatics. The restructured faculty now consists of the School of Software Engineering, the School of Data Analysis and Artificial Intelligence, the School of Big Data and Information Retrieval, and the Department of Technologies for Complex System Modelling.

Ivan Arzhantsev, the dean of the Faculty of Computer Science, spoke to The HSE Look about highlights from the past year, current research focuses, and the faculty's plans for the future.

Students – a highly competitive enrollment

The Computer Science Faculty offers two undergraduate programs (Software Engineering and Applied Mathematics

& Information Science) and three programs for graduate students: Data Science, System and Software Engineering, and Mathematical Methods of Optimization and Stochastics.

The first enrollment in 2014 was crucial, and the faculty had unprecedentedly good results. The initial enrollment quota of 180 state-funded places was raised because nearly double that number of Science Olympiads winners applied to study in the faculty. A total of 216 students were accepted for state-funded places and they are already showing impressive results in their studies.

Naturally, such an advanced and diverse group of students requires sufficient challenges so that they do not lose momentum.

"We started a pilot group for those who already had introductory programming or mathematical analysis at school," said Prof. Arzhantsev. "We tested the first-years in late August and offered that they join an advanced group. After screening all

those who expressed such a wish, we selected 25 students. The pilot group follows the regular study track with one exception: advanced electives on programming and math are obligatory for them. Teachers are very happy with them, as it is rare to have one group with such a high level and motivation. After the winter exam session I met with the students and offered a chance to quit the pilot group if they found it too hard to keep up with but nobody opted out.”

A team of three first-year students was short-listed for the World Finals of the ACM International Collegiate Programming Contest and will compete in the final round this May. Two second-year students have won scholarships to attend the Apple Worldwide Developers Conference (WWDC).

A shared research environment

“We very much wanted to have a research seminar without a rigid specialization, and that is how our colloquium was initiated. From my experience in Europe and at German universities in particular, it is a university-wide or faculty-wide seminar,” Prof. Arzhantsev said. Over 20 seminars have been held since September 2014, and all of them were recorded and uploaded to the faculty’s YouTube channels in Russian and English. These videos have proven to be quite popular.

“Computer science deals with theoretical informatics and certain fields in mathematics, such as computational complexity. But, of course, only about 10-20% of students are interested in science per se, and the majority wants a deeper understanding of how to apply the knowledge they receive rather than look for solutions to theoretical problems,” explained Prof. Arzhantsev. He also discussed the format of the IT Lectorium: faculty-wide lectures, where specialists from IT companies and research labs share know-how and analyze existing projects, and also present to students opportunities for internships.

Because lectures are not the optimal format for all topics, sometimes the faculty organizes smaller-scale, interactive workshops as a part of its Tutoring Centre. Colleagues and students from other universities sometimes participate in these events. The trio of colloquium, IT-Lectorium and Tutoring Centre is augmented by more specialized seminars held by laboratories and departments.

Research topics

The departments that make up the newly created ‘big faculty’ have been working since 2006, and have their own research strengths.

The first research direction is **data analysis, machine learning, and big data**. The two departments that focus on this are the **School of Data Analysis and Artificial Intelligence** and the **School of Big Data and Information Retrieval**. The **Laboratory of Methods for Big Data Analysis (LAMBDA)** was created jointly with Yandex. The European Organization for Nuclear Research (CERN) has a project with Yandex’s School of Data Analysis, and they decided to relegate some

of their research needs to the Faculty of Computer Science’s laboratory, which will help in analyzing data generated by the Large Hadron Collider.

The second major direction for the Faculty of Computer Science is **computer linguistics**. In this sphere, the focus is on the analysis of natural languages and on the algorithms of working with symbol sequences. The student research group “Methods for the analysis and visualization of web corpora” is led by tenured Professor **Boris Mirkin** and supported by HSE’s Academic Fund program.

The Faculty of Computer Science is considering **bioinformatics** as one of the possible areas for further development. Bioinformatics deals with data from genome research, deciphering symbolic sequences and analyzing big datasets gathered through experiments or observations. An idea for a graduate program in bioinformatics is currently in the works.

Theoretical informatics is another very important research direction for the HSE’s Faculty of Computer Science. It covers such topics as computational complexity, Kolmogorov complexity, and the analysis of algorithms.

In the sphere of software engineering, the two major directions are **software development** and **process mining**. The **Laboratory of Process-Aware Information Systems (PAIS Lab)** is headed by **Wil van der Aalst**, one of the best computer science specialists in Europe. For his contributions to research at the HSE, van der Aalst was awarded the status of HSE Honorary Professor.

Cooperation: abroad and at home

Different departments within the faculty have their own international partnerships. The School of Software Engineering closely cooperates with the **Technical University of Eindhoven** in the Netherlands. Led by Prof. **Sergey Avdoshin**, the school is likely to become the basis for the **Vietnamese-Russian Technological University**, formed together with Le Quy Don University of Science and Technology (Vietnam). A new agreement with the **Vietnamese Engineering and Technology University** provides ground for student and staff exchanges as well as joint conferences.

Despite its recent creation, the faculty already has a strong team and many distinguished scholars who bring their international academic connections to the table. Prof. Boris Mirkin used to work at University College of London (UCL), and with his help the faculty will hold a workshop with UCL this autumn.

The Faculty of Computer Science cooperates on **joint projects with other HSE faculties**. Students from the Faculty of Mathematics work as teaching assistants in computer science courses. The School of Linguistics is interested in maintaining and further developing the Corpus of Russian language together with one of Computer Science laboratories. The study-research Laboratory of Input-output Analysis headed by Prof. Baranov at the Faculty of Economics has many computer science students. There are also strong contacts with

the Department of Psychology, and students have a chance to do internship projects working with the results of neuroscience research.

End of the academic year and the start of a new cycle

The Faculty of Computer Science is working hard to build interest among both Russian and international students in enrolling for Fall 2015 and has high expectations for the new students.

Days of Computer Science were held in early April to celebrate the faculty's birthday and the achievements of the strongest students, as well as to present the programs to prospective students. The Ilya Segalovich Scholarship, which was founded by Yandex to commemorate its late founder, was awarded to 16 HSE Computer Science students for outstanding academic achievements (10 for undergraduate students, 3 for graduate students, 3 for post-graduate students).

In order to work more closely with international students, five computer science courses are offered to **HSE Summer University** students in 2015. There will also be a **summer school on mobile development for iOS**, based on a similar elective course that is very popular among students from HSE and other universities.

One of the ideas for the 2015 enrollment campaign is to attract talented graduates and winners of nation-wide competitions in mathematics and informatics from Latvia, Ukraine and other CIS and Eastern European countries. There is a chance for them to apply for a full-tuition scholarship at HSE through the quota for foreign students funded by the state, and this is a good opportunity both for motivated students and for the university, as it can attract international students with strong backgrounds on favourable conditions.

Ivan Arzhantsev is a Doctor of Science in Mathematical Logic, Algebra and the Theory of Numbers, a member of the HSE Academic Council, and the Dean of the Faculty of Computer Science. He was born in Kiev and graduated with honors from Moscow State University's Department of Mechanics and Mathematics. Prof. Arzhantsev has close academic ties with Université Joseph Fourier (Grenoble, France) and Eberhard Karls Universität Tübingen (Germany). He has worked with the IT company Yandex on the development of academic programs.

Welcome Aboard

Geoffrey Decrouez was born in Dunkerque, France. He studied electrical engineering and signal and image processing in France for his undergraduate degrees. In 2009, he defended his PhD dissertation on The Generation of Multifractal Signals with Underlying Branching Structure at the Department of Mathematics and Statistics, the University of Melbourne. After receiving his PhD, Decrouez conducted research in stochastic modeling, with applications in neural networks and finance

as a postdoctoral fellow at the University of Melbourne. In September 2014, he started working as an Assistant Professor at the Faculty of Computer Science at HSE. In his free time Decrouez enjoys exploring Moscow, where he has quite a few Russian and international friends.

– How did you come to work at HSE?

– Before coming here I was in Australia for ten years. I was studying and doing a postdoc there, and later I was looking for a permanent position. I had been to Moscow for conferences a few times during my postdoctoral fellowship. So I already liked the city, I knew several colleagues who are professors here, and I kept an eye on possible vacancies. Of course, I did other job applications as well, but I must say that I was very interested in this position at HSE. It was an easy choice given that during the last three years I was attracted to the idea of moving to Russia.

– What do you focus on in your research?

– I had different specializations over the years – I started with signal processing, and I am still into it these days. My first postdoc was in probability theory and my second postdoc was in statistics, so now I am more and more interested in statistical application. Together with my colleagues at the faculty we are thinking about collaborating more on some machine learning projects; I also have another French colleague in the Faculty of Economics who is doing research in this sphere. Machine learning is going to be my main research focus for the nearest future.

– In terms of collaboration, do you see many opportunities here? Is there any language barrier?

– The language barrier is actually not a problem at all – I speak a bit of Russian and my colleagues speak English. Now there is a new dynamic in our department, we want to enhance collaboration, so we are going to meet more often in the future in order to work on common topics. And I also still have my collaborations in Australia and France and I keep them very active.

– Do you teach?

– I am teaching three courses. The first course is in probability theory and statistics. The second one is a MAGoLego course – it is an elective for first-year Master's-degree students from different faculties. It focuses on statistics in experimental design – it is an introduction to statistics for non-mathematicians. I really enjoy these classes; it's quite refreshing to speak about statistics to non-statisticians because they look at things in a very different way. There are about 25 students who come from the Faculties of Social Sciences, Humanities, Business and Management. So there is a really broad variety of students and backgrounds. My third subject is about machine learning and is more advanced, designed for first-year Master's-students in our faculty. I teach these subjects in English and they are brand new to our faculty. I hope there will be more such courses later, so that students can take more classes in English.

– *Do students work with you on their term papers and Masters' theses?*

– I have two students working with me now. One of them is a fourth-year bachelor student who is implementing a neural network. With two colleagues we proposed a mathematical model describing the dynamics between neurons. At the moment there are a few theoretical results but we still don't really understand how the network is behaving on a large scale. So this project is looking at the general behaviour of the network depending on different types of connections and different parameters of the model.

The work of another student (Master's level) is related to the multifractal theory. Basically we are looking at another way of representing time series that demonstrate multifractal behaviour.

– *Do international exchange students attend your classes?*

– There are no international students in my classes yet. We are a very young faculty. I know that there are plans to build connections with several French universities and bring students here on a regular basis. We had a winter school for prospective students this year that I missed, unfortunately. But I would like to take part in the Summer University if the opportunity arises.

– *If you had to sum up your feelings about being at HSE Moscow so far and your plans for now, what are they?*

– I have been enjoying my time here so far. When I arrived to Moscow, I participated in the HSE Day in September and met many of my international colleagues there, so I would really recommend it for the newcomers. I like teaching all these courses and meeting students. What is really good about working here is the amount of freedom and flexibility we have in terms of what we want to teach. I have been given some directions, but it was up to me to create three new subjects. We don't have this sort of autonomy in a similar position at many other universities, so it's been a great experience.

As for plans, at this stage I am really doing a lot of independent research as I have several ongoing projects that I need to finish, and with all the teaching I am yet to start new collaborations. Right now I am focusing on finishing my ongoing research papers and moving to the new projects with my colleagues at the School of Data Analysis and Artificial Intelligence here at Computer Science Faculty and Quentin Paris, a colleague from the Faculty of Economics.

Visiting Scholars

The HSE Look is happy to promote the upcoming **short-term visits to HSE by international scholars**, which were supported by institutional funding based on the hosting departments' applications. The following visits are scheduled for June. For details please, contact visiting scholar@hse.ru.

Carlo Ginzburg, Professor of History of European Cultures, Scuola Normale Superiore (Pisa, Italy).

Hosting department at HSE: Poletayev Institute for Theoretical and Historical Studies in the Humanities, Faculty of Humanities

Dates: May 30 – June 10, 2015

Olga Matyash, Adjunct Professor, Ivy Tech State College, Communication Program (Indianapolis, USA).

Hosting department at HSE: School of Integrated Communications, Faculty of Communications, Media and Design

Dates: March – July 2015

Mark Reynolds, Professor, Head of the School of Computer Science and Software Engineering, University of Western Australia

Hosting department at HSE: School of Data Analysis and Artificial Intelligence, Faculty of Computer Science

Dates: June 20 – July 1, 2015

Peter Schmidt, Professor, Justus Liebig University Giessen (Germany)

Hosting department at HSE: Department of Sociology, St. Petersburg School of Social Sciences and Humanities

Dates: May 26 – July 17, 2015

Arkady Shemyakin, Professor, Department of Mathematics, University of St. Thomas (Minnesota, USA)

Hosting department at HSE: Department of Applied Economics, Faculty of Economics

Dates: June 14-21, 2015

Stephen George Wheatcroft, Professorial Fellow of School of Historical and Philosophical Studies, University of Melbourne

Hosting department at HSE: Institute of Demography, Faculty of Social Sciences

Dates: April 5 – July 5, 2015