SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED: Faculty of Information Technology

FORD: 2 - Engineering and technology

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.[1] The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

Self-assessment:

Faculty of Information Technology (FIT) of Czech Technical University in Prague (CTU) is a faculty established in 2009. The FIT's R&D&I focus covers all domains of Informatics: it ranges from theoretical computer science through software engineering, machine learning, computer security to hardware design. The faculty has a main study program, called Informatics, for all levels of university education, both in Czech and English. The number of bachelor-level students is steadily over 1500, master-level over 400, and PhD over 50, with a steady growing trend, reaching our full capacity. More study programs are planned now: master level Quantum computing (in cooperation with other faculties) and splitting of the master program into Informatics and Applied informatics. A steady growth of the faculty can be seen in most of the indicators: number of academic staff, number of projects and contract research, number of publications, etc. While in the first years after the foundation of FIT, most of the staff focused on teaching, the focus is now fully shifted towards the other domains as well and the faculty obtains more and more external funding through projects, contract research, partnership program etc. Besides the not so long history, an important characteristic of faculty staff is the never-ending competition with industry: It is challenging to attain and maintain a stable core of employees, mainly in applied domains (such as software engineering and machine learning).

[1] Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

Table 3.1.1 - Staffing per FTE[2]

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	4,2 / 0	4,2 / 0	5,2 / 0	7,1 / 1	7,1 / 1	27,6 / 2
Associate Professor	16,5 / 3	17,5 / 3	16,5 / 3	16 / 2	14,9 / 2,1	81,2 / 13,1
Assistant Professor	57,3 / 8,6	58,5 / 10,8	59,2 / 10,8	59,1 / 11,8	59,3 / 11,8	293,4 / 53,6
Assistant	7,4 / 1	8,4 / 1,5	9,7 / 1,5	10 / 1,5	10 / 1,5	45,4 / 7
R&D Personnel[3]	24,5 / 14,8	26,8 / 16,5	29,8 / 17,5	31,6 / 17,2	33,8 / 16	146,4 / 81,9
Researchers in other categories[4]	16,1 / 2,2	16,9 / 2,2	19,7 / 2,2	29,2 / 3,9	23,9 / 1,7	105,8 / 12,2
Technical and economic staff[5]	24,2 / 13,9	25,3 / 12,6	24,6 / 11,6	26,6 / 11,6	28,6 / 10,6	129,1 / 60,1
Scientific, research and development staff involved in teaching activities	77,8 / 10,8	81,9 / 13,5	85,2 / 14,5	87,3 / 15,5	86,6 / 15,6	418,8 / 69,9
Early career researchers[6]	55,6 / 7,2	59,6 / 9,2	59,1 / 9,2	61,3 / 10,9	57,7 / 8,7	293,2 / 45,2
Total[7]	150,2 / 43,5	157,6 / 46,6	164,7 / 46,6	179,6 / 49	177,6 / 44,7	828,9 / 229,9

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)[8]

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	1	0	0	0	3	0	2	0

[2] The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full- time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

[3] The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

[4] The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

[5] Who participates in the management and support of R&D&I in the institution.

[6] See Definition of Terms in Methodology HEI2025+.

[7] Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

[8] The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

Associate Professor	0	0	1	0	8	0	1	1	5	2	2	0
Assistant Professor	3	0	36	5	16	3	2	0	1	0	0	0
Assistant	5	1	2	0	1	0	1	0	0	0	0	0
R&D Personnel[9]	7	2	8	2	3	3	7	6	3	3	0	0
Researchers in other categories[10]	9	1	19	2	1	0	4	0	0	0	0	0
Technical and economic staff[11]	0	0	2	0	0	0	0	0	0	0	0	0
Scientific, research and development staff involved in teaching activities	9	2	40	5	26	3	4	1	9	2	4	0
Early career researcher[12]	17	2	58	7	0	0	0	0	0	0	0	0
Total[13]	24	4	68	9	30	6	15	7	12	5	4	0

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)[14]

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	1	0	1	0	5	1	1	0
Associate Professor	0	0	1	0	8	0	2	0	2	2	4	1
Assistant Professor	0	0	31	6	28	6	4	1	1	0	0	0
Assistant	1	0	11	2	1	0	0	0	1	0	0	0
R&D Personnel[15]	13	1	12	4	8	5	7	4	4	4	0	0

[9] The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).
[10] The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).
[11] Who participates in the management and support of R&D&I in the institution.
[12] See Definition of Terms in Methodology HEI2025+.
[13] Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.
[14] The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.
[15] The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

Researchers in other categories[16]	19	3	17	0	1	0	2	0	0	0	0	0
Technical and economic staff[17]	7	0	2	0	2	0	2	0	0	0	0	0
Scientific, research and development staff involved in teaching activities	1	0	44	9	39	6	7	1	9	3	5	1
Early career researcher[18]	20	3	60	8	0	0	0	0	0	0	0	0
Total[19]	40	4	74	12	49	11	18	5	13	7	5	1

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	1 683	226	1 800	255	1 763	243	1 940	271	1 880	268	9 066	1 263
Master's[20]	412	42	418	46	465	48	501	58	505	63	2 301	257
Doctoral	52	5	63	6	65	6	60	6	66	5	306	28
Lifelong Learning Courses	42	13	48	16	33	16	48	28	65	33	236	106
Total	2 189	286	2 329	323	2 326	313	2 549	363	2 516	369	11 909	1 654

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total[21] / Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	1/1	0/0	1/1	0/0	1/1	0/0	1/1	0/0	1/1	0/0	5/5	0/0
Master's	1/1	0/0	1/1	0/0	1/1	0/0	1/1	0/0	1/1	0/0	5/5	0/0
Doctoral	1/1	0/0	1/1	0/0	1/1	0/0	1/1	0/0	1/1	0/0	5/5	0/0
Lifelong Learning courses	4/0	0/0	4/0	0/0	3/0	0/0	4/0	0/0	7/0	1/0	22/0	1/0

[16] The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).
[17] Who participates in the management and support of R&D&I in the institution.
[18] See Definition of Terms in Methodology HEI2025+.
[19] Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.
[20] All master's degree students are listed, regardless of the length of their programme of study.
[21] The total number of study programmes for which admissions have been announced in a given academic year.

Total	9/3	0/0	8/3	0/0	6/3	0/0	7/3	0/0	10/3	1/0	37/0	1/0

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	9,63%	Basic Research	81,40%
	1.2 Computer and information sciences	69,30%	Balanced basic and applied research	
	1.3 Physical sciences	1,74%	Basic Research	
	1.4 Chemical sciences	0,48%	Basic Research	
	1.5 Earth and related environmental sciences	0,00%	Zvolte položku.	
	1.6 Biological sciences	0,08%	Basic Research	
	1.7 Other natural sciences	0,17%	Balanced basic and applied research	
2. Engineering and Technology	2.1 Civil engineering	1,28%	Basic Research	14,91%
	2.2 Electrical engineering, Electronic engineering, Information engineering	12,85%	Balanced basic and applied research	
	2.3 Mechanical engineering	0,00%	Zvolte položku.	
	2.4 Chemical engineering	0,00%	Zvolte položku.	
	2.5 Materials engineering	0,00%	Zvolte položku.	
	2.6 Medical engineering	0,78%	Applied Research	
	2.7 Environmental engineering	0,00%	Zvolte položku.	
	2.8 Environmental biotechnology	0,00%	Zvolte položku.	
	2.9 Industrial biotechnology	0,00%	Zvolte položku.	
	2.10 Nanotechnology	0,00%	Zvolte položku.	
	2.11 Other engineering and technologies	0,00%	Zvolte položku.	
3. Medical and Health Sciences	3.1 Basic medicine	0,00%	Zvolte položku.	1,54%
	3.2 Clinical medicine	1,07%	Applied Research	
	3.3 Health sciences	0,47%	Applied Research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0,00%	Zvolte položku.	0,00%
	4.2 Animal and Dairy science	0,00%	Zvolte položku.	
	4.3 Veterinary science	0,00%	Zvolte položku.	
	4.4 Other agricultural sciences	0,00%	Zvolte položku.	
5. Social Sciences	5.1 Psychology and cognitive sciences	0,00%	Zvolte položku.	1,76%
	5.2 Economics and Business	0,80%	Applied Research	
	5.3 Education	0,00%	Zvolte položku.	
	5.4 Sociology	0,00%	Zvolte položku.	

	5.5 Law	0,45%	Applied Research	
	5.6 Political science	0,00%	Zvolte položku.	
	5.7 Social and economic geography	0,00%	Zvolte položku.	
	5.8 Media and communications	0,51%	Applied Research	
	5.9 Other social sciences	0,00%	Zvolte položku.	
6. Humanities and the Arts	6.1 History and Archaeology	0,15%	Applied Research	0,41%
	6.2 Languages and Literature	0,26%	Applied Research	
	6.3 Philosophy, Ethics and Religion	0,00%	Zvolte položku.	
	6.4 Arts (arts, history of arts, performing arts, music)	0,00%	Zvolte položku.	
	6.5 Other Humanities and the Arts	0,00%	Zvolte položku.	
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

Self-assessment:

Considering the selected indicators, the recognition by the research community of FIT is slow but steadily growing. We lack larger involvement in evaluation of programme calls. As the main focus of the faculty is Informatics, a relevant indicator is also membership in prestigious international conferences. We list here examples of program committee memberships from the period of 2019-2023 with CORE ranking in square braces:

- doc. RNDr. Dušan Knop Ph.D.: AAAI 2020-2023 [A*], ECAI 2023 [A*], IJCAI 2020-2023 [A*]
- prof. RNDr. Pavel Surynek Ph.D.: AAAI 2019-2020 [A*], IJCAI 2019-2022 [A*], SoCS 2022 [B] (chair of doctoral consortium)
- Ing. Šimon Schierreich: ECAI 2023 [A*]
- doc. Ing. Petr Fišer Ph.D.: DAC 2020-2022 [A], DATE 2020-2023 [B]
- Ing. Milan Dojčinovski Ph.D.: ESWC 2022 [A (Core2021)], ACM CIKM 2022 [A]
- Ing. Petra Pavlíčková Ph.D.: CaiSE 2021 [A]
- RNDr. Jakub Klímek Ph.D.: ISWC 2019 [A]
- Dr.-Ing. Martin Novotný: DATE 2022-2023 [B]

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Ing. Jan Říha, Ing. Jakub Klemsa and Dr-Ing. Martin Novotný	BEST STUDENT Paper	2019 8th Mediterranean Conference on Embedded Computing (MECO)
prof. RNDr. Pavel Surynek, Ph.D.	ICAPS Influential Paper Award 2020	ICAPS
Pierre Donat-Bouillud, Ph.D.	Seal of Excellence (Horizon 2020)	European Commission
Ing. Karel Hynek, Ph.D., doc. Ing. Tomáš Čejka, Ph.D.	BEST paper award	IEEE Annual Information Technology, Electronics and Mobile Communication Conference 2020
doc. RNDr. Dušan Knop, Ph.D.	AAAI-21 Outstanding Program Committee Member	Association for the Advancement of Artificial Intelligence
Ing. Marek Sušický	Civic Tech Open 2021 - Best application in category of Health	Nadace OSF
Bc. Jiří Pihrt, Bc. Rudolf Raevskiy, Mgr. Petr Šimánek and Ing. Matej Choma	NeurIPS 2022 - Winner of Weather4cast challenge	NeurIPS
Ing. Ondřej Podsztavek	NeurIPS 2022 - Winner of Ariel Machine Learning Data Challenge	NeurIPS

Ing. Petr Kasalický	KDD 2023 - Best Student Paper Award	ACM KDD (Knowledge Discovery and Data Mining)
Ing. Jaroslav Pešek, Ing. Dominik Soukup, doc. Ing. Tomáš Čejka, Ph.D.	BEST paper award	IEEE Annual Computing and Communication Workshop and Conference (CCWC) 2023

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
doc. Ing. Jan Janoušek, Ph.D.	COMSIS - Computer Science and Information Systems, 1820-0214
doc. Ing. Petr Fišer, Ph.D.	Microprocessors and Microsystems, 0141-9331
doc. Ing. Petr Fišer, Ph.D.	Elektronika ir Elektrotechnika, 1392-1215
doc. Ing. Robert Pergl, Ph.D.	The Enterprise Engineering Series, 1867-8920
Dr.-Ing. Martin Novotný	Microprocessors and Microsystems, 0141-9331
prof. Ing. Hana Kubátová, CSc.	Microprocessors and Microsystems, 0141-9331
prof. Ing. Viktor Fischer, CSc.	Journal of Cryptography Engineering, 2190-8516
doc. Ing. Robert Pergl, Ph.D.	The Enterprise Engineering Series, 1867-8920
prof. Ing. Michal Haindl, DrSc.	Kybernetika, 0023-5954

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
prof. Ing. Hana Kubátová, CSc.	Dependability Problems in Interconnected World	2019 8th Mediterranean Conference on Embedded Computing (MECO)	2019
doc. Ing. Robert Pergl, Ph.D.	The Two Pillars	11th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management	2019
prof. RNDr. Pavel Surynek, Ph.D.	SAT-based Multi-Agent Path Finding	IJCAI 2019 Workshop on Multi-Agent Path Finding	2019
Ing. Josef Pavlíček, Ph.D.	Business Process Models (BPMN and DEMO Notation) - Usability Study	EOMAS 2019: 15th International Workshop on Enterprise and Organizational Modelling and Simulation	2019
Ing. Marek Suchánek, Ph.D. et Ph.D.	Towards Evolvable Ontology-Driven Development with Normalized Systems	15th International Conference on Evaluation of Novel Approaches to Software Engineering	2021
Mgr. Eva Pernecká, Ph.D.	Functionals on Lipschitz spaces and measures	Lancaster: International Workshop on Operator Theory and its Applications. A	2021

		special session: Operator ideals and operators on Banach spaces	
doc. RNDr. Dušan Knop, Ph.D.	High-Multiplicity Fair Allocation: Integer Programming Theory in Application	Leiden: Advanced Optimization for Social Choice, Lorentz Center.	2022
Mgr. Eva Pernecká, Ph.D.	Integral representation of functionals on Lipschitz spaces	Lille: Functional Analysis in Lille. A conference in honor of Gilles Godefro	2022
doc. Ing. Robert Pergl, Ph.D.	Minimum metadata for FAIR Semantic artefacts	Oslo: Second Global Workshop - OntoCommons addressing the challenges of the Industry 5.0 transition, OntoCommons	2023
Dr. techn. Ing. Jan Legerský	Flexibility of frameworks using edge colorings	Schloss Weinberg, Kefermarkt: Conference on Geometry: Theory and Applications (CGTA 2023)	2023

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Darius Blasband	Raincode	Grow your own language: The YAFL story	2021
Professor Joan Daemen	Radboud University in Nijmegen	Permutation-based cryptography	2022
Professor Lejla Batina	Radboud University in Nijmegen	Deep Learning and Physical Attacks on Embedded Systems: How Deep can we go?	2022
Dipl.-Inf. Roman Pipek	Imining GmbH München	O teorii informace, neurovědě a digitální demenci	2023
Professor Travis Gagie	Faculty of Computer Science of Dalhousie University	Pangenomic FM-indexes	2023

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting authority/guarantor of the project/programme call	Year
prof. Ing. Pavel Tvrdík, CSc.	Standard grants	Czech Science Foundation (GA ČR)	2019 - 2021

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research[22]) that it has implemented or participated in during the period of 2019–2023[23]. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)[24], regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

Self-assessment:

Contract research with Meteopress: The company Meteopress was a significant partner of FIT CTU due to its long-term collaboration in the field of short-term weather prediction, particularly precipitation. Together with the Data Science Laboratory, Meteopress contributed to several key projects focused on innovations in radar rainfall forecasting and storm movement modelling using mathematical modelling and artificial intelligence methods.

The collaboration was most intensive between 2019 and 2022, during which three large research projects were carried out. The results of these projects contributed to advancements in predictive models that can improve the accuracy and reliability of meteorological forecasts. This research attracted the attention of the professional community and even reached the finals of the prestigious AI Awards, demonstrating its high quality and relevance.

Thanks to this collaboration, researchers at FIT CTU gained access to real meteorological data and expert knowledge of Meteopress, enabling the more efficient development and testing of new approaches to weather forecasting. At the same time, faculty students and academic staff had the opportunity to participate in practical applications of their research, strengthening their professional competencies, and bridging the gap between academia and industry.

Overall, Meteopress was not only a significant partner for FIT CTU in applied research but also a key ally in promoting innovations in meteorology and utilizing artificial intelligence to enhance predictive models. This collaboration contributed to the advancement of the field and demonstrated how the connection between academia and industry can lead to practical and technologically advanced solutions.

Contract research with Škoda Auto: Škoda Auto stands as a strategic partner within the automotive industry, a cornerstone sector of the Czech economy. Our joint endeavours are centered around cutting-edge projects such as vehicle aerodynamics modelling, automated testing of intelligent sensors, and, more recently, the development of digital twin models for cars and production systems.

[22] For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.
[23] Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.
[24] The evaluated unit shall only fill tables that are relevant to it.

These initiatives are designed to integrate advanced artificial intelligence methods, with the most significant contributions coming from the Data Science Laboratory and the Department of Digital Design. This long-standing partnership plays an important role for the faculty and transferring its knowledge within the automotive sector.

Contract research with DataMole: DataMole has been a prestigious Gold Partner of the Faculty since its inception. The company's roots trace back to the Data Science Laboratory at FIT, and the collaboration has remained strong ever since. DataMole's engagement with the Faculty is centered around the application of artificial intelligence and smart sensor technologies in agriculture, with notable impact primarily outside of the Czech Republic. DataMole continues to leverage the Faculty's knowledge and expertise, recognizing us as a key strategic partner in driving their business forward.

Contract research with CESNET: FIT maintains a dynamic and ongoing partnership with the CESNET association, focusing primarily on three FIT laboratories: Hardware Workshop and Laboratory, Network Visualization Laboratory, and Network Traffic Monitoring Laboratory. This collaborative effort is driven by continuous exploration in the development of hardware, software, and web technologies, as well as enhancing tools for the creation and analysis of real-world traffic datasets. A key initiative includes designing a prototype knowledge database that extends the capabilities of the NERD Reputation Database (a database of known malicious network entities, https://github.com/CESNET/NERD). CESNET has thus emerged as one of our most active and valued collaborators, contributing significantly to cutting-edge research and innovation.

Project Evolving Language Ecosystems: the project contributed to advances in the concept of gradual typing which is a software engineering concept where a program can be extended with type annotations after it has been completed. This idea corresponds to the notion of evolving software from prototyping to robustness. The novel contribution was a study of the performance impact of various approaches to gradual typing, which revealed that many existing approaches are too costly to adopt in practice. The second major area of advances is in the concept of speculative compilation which is an approach that allows programs to evolve at run-time, that is, speculative compilation allows the addition of new code and the change of existing code while retaining peak performance. Another contribution of the project is within the Julia language semantics and is explaining the design of the language and laying the groundwork for evolving the Julia ecosystem. It also explained how the subtype relation worked, and uncovered that it is not decidable, and formalized the two notions of type stability and world age, both of which are unique to the Julia language.

Project Big Code: The project aimed to study massive codebases on the Internet. The four most significant achievements of the project are: 1) CodeDJ - an infrastructure for querying repositories composed of a persistent datastore, constantly updated with data acquired from GitHub, and an in-memory database with a Rust query interface. CodeDJ supports reproducibility, historical queries are answered deterministically using past states of the datastore; thus, researchers can reproduce published results. To illustrate the benefits of CodeDJ, biases in the data of a published study were identified and, by repeating the analysis with new data, it was demonstrated that the study's conclusions were sensitive to the choice of projects. 2) Formally Verified Speculation - a model just-in-time compiler with an intermediate representation that lists the synchronization points used for deoptimization and the assumptions made by the compiler's speculation. It was accompanied by a demonstration how one could use the verified optimization to obtain significant speed ups in an end-to-end setting. 3) Impact of Programming Languages on Code Quality - a reanalysis of a 2014 study claiming to have uncovered a statistically significant association between eleven programming languages and software defects and the relation between bugs and languages. Several serious flaws in the original study was uncovered which is considered important, as many subsequent works have

cited the 2014 result. 4) Genthat - a tool non-invasively recording execution traces of R programs and extracting unit tests from those traces.

Project Flow-based Encrypted Traffic Analysis: The project researches new methods of effective protection against cyber threats that misuse secured communication for cyber-attacks against servers and computers in the environment of high-speed networks. The project investigated machine learning methods suitable for determining the characteristics of the encrypted network flows and associated risks base on available data. The goal was to design a system using a hardware-accelerated traffic monitor and a software prototype for high-speed detection of security incidents. Further, a plug-in to the IBM Security QRadar EDR system for incident analysis was developed. The project outcomes also include reference data sets of network traffic and a system for their collection and annotation. The project was coordinated by the CESNET organization and with Brno University of Technology as another beneficiary.

Project Dowry Towns of the Queens of Bohemia: The project focused on so-called royal dowry towns (9 towns in the Czech Republic), which are a special category among Czech historical towns in many perspectives. The main objective of the project was to present this Czech historical phenomenon to the general public through the tools of historical geography and advanced computer graphics. The main outputs of the project are a dedicated mobile application and a web portal that served as a specialized historical guide to the dowry towns and their urban landscape and specialized (reconstruction) maps of the entire regional enclave and the towns themselves. The outputs also include 3D visualization in the so-called expanded virtual reality, incl. 3D reconstruction of already destroyed urban complexes. The project was coordinated by University of Hradec Králové and another participant was the Institute of history of Czech Academy of Sciences. FIT oversawthe technical outcome related to graphics, e.g., 3D visualization of the monuments.

Project Connect and align ELIXIR Nodes to deliver sustainable FAIR life-science data management services: The project aimed to enhance and align ELIXIR, European life sciences infrastructure, nodes to provide sustainable and FAIR-compliant (Findable, Accessible, Interoperable, and Reusable) life-science data management services. By fostering collaboration and developing essential resources, the project results empower researchers with tools and best practices for efficient data management. CTU played an active role in several key work packages, contributing to training, toolkit development, and SARS-CoV-2 data tracking solutions. CTU contributed to the development of user documentation and training materials for the Data Stewardship Wizard (DSW). We also delivered training sessions focused on data management planning using DSW, equipping researchers with the knowledge and tools necessary for effective data stewardship. We contributed to the development and enrichment of RDMkit (https://rdmkit.elixir-europe.org), a comprehensive resource for the best practices in research data management. Our key contributions included Bi-directional integration between DSW and RDMkit. CTU developed a proof-of-concept solution for the FAIRification of Czech COVID-19 data from COG CZ, leveraging FAIR Data Point technology. This work aimed to transition COVID-19 data from a human-readable format, as presented on the https://virus.img.cas.cz website, to a machine-actionable format that adheres to the FAIR principles. This approach demonstrated how structured data management could facilitate machine access and automation, ensuring greater usability and integration within broader scientific research frameworks. The project was coordinated by the European Molecular Biology Laboratory, Heidelberg, Germany, with a total of 58 participants: https://cordis.europa.eu/project/id/871075.

Project Development and testing of algorithms for predictive behavioral analysis of persons crossing the EU's external borders: The objectives of the project were to create a system for early detection of persons crossing the external borders of the EU and the Czech Republic. The project

outcomes include the description of the analysis of the available data and their applicability for behavioural analysis of persons, a detailed description of the algorithms examined and an evaluation of their quality and scalability. It covers also ensembles (combinations) of the selected algorithms. A web application was created, which is the main software output presenting the results of the algorithms and enabling the user's own exploratory analysis.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider[25]	Project name	Support (in thousands CZK/EUR)[26]				
		2019	2020	2021	2022	2023
Czech science foundation	logicMOVE: Logic Reasoning in Motion Planning for Multiple Robotic Agents				870 / 34 320	961 / 37 909
Czech science foundation	The structure of free Banach spaces and of their second duals				1 143 / 45 089	1 143 / 45 089
Czech science foundation	New Frontiers in Computational Social Choice				1 557 / 61 420	2 114 / 83 393
Czech science foundation	Local-global problems over number fields				446 / 17 594	1 338 / 52 781
Czech science foundation	Paradoxical flexibility of frameworks				67 / 2 643	835 / 32 939
Ministry of education youth and sports	International Mobility of Researchers MSCA-F-I at CTU in Prague					1 178 / 46 469
Czech science foundation	Rigorous Engineering of Data Analysis Pipelines (RiGiD)					10 090 / 398 028
Technology Agency of the Czech Republic	Development of a communication assistant using artificial intelligence and					2 678 / 105 641

[25] If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.
[26] Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

	the created knowledge base in the field of industrial property					
Ministry of education youth and sports	Research Center for Informatics	9 337 / 368 323	11 366 / 448 363	13 004 / 512 978	11 401 / 449 744	6 647 / 262 209
Ministry of education youth and sports	Center for advanced applied sciences	492 / 19 408	474 / 18 698	461 / 18 185	435 / 17 160	184 / 7 258
CESNET, z.s.p.o.	Videostream Hunter			487 / 19 211	198 / 7 811	
Ministry of education youth and sports	International Mobility of Researchers in CTU	627 / 24 734			879 / 34 675	
Ministry of education youth and sports	Big Code: Scalable Analysis of Massive Code Bases	7 247 / 285 878	9 564 / 377 278	9 917 / 391 203	10 662 / 420 592	
Ministry of education youth and sports	Mobility CTU - STA				2 156 / 85 049	315 / 12 426
European Commission	Evolving Language Ecosystems	9 123 / 359 882	9 601 / 378 738	8 166 / 322 130	4 502 / 177 594	
Ministry of the interior of the Czech Republic	Development and testing of algorithms for predictive behavioral analysis of persons crossing the EU's external borders	1 558 / 61 460				
Czech science foundation	Tight Parameterized Results for Directed Connectivity Problems	540 / 21 302				
Czech science foundation	Superintegrable systems in magnetic fields in three spatial dimensions	452 / 17 830				
Czech science foundation	Selected topics in non-linear functional analysis and approximation theory	2 200 / 86 785	2 038 / 80 394			

Czech science foundation	Efficient String Matching for Bioinformatics	994 / 39 211	999 / 39 408			
Czech science foundation	Intelligent Algorithms for Generalized Variants of Multi-Agent Path Finding	1 097 / 43 274	842 / 33 215	754 / 29 744		
Total		33 926 / 1 338 304	34 884 / 1 376 095	32 789 / 1 293 452	34 316 / 1 353 688	27 483 / 1 084 142
In the role of another participant						
Provider[27]	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Ministry of the interior of the Czech Republic	Tools for AI-enhanced Security Verification of Cryptographic Devices				2 939 / 115 937	2 961 / 116 805
Ministry of the interior of the Czech Republic	Flow-based Encrypted Traffic Analysis				2 966 / 117 002	3 377 / 133 215
Ministry of culture czech republic	Most – a city that did not disappear					651 / 25 680
Czech science foundation	Advancing the frontiers of first-principle modeling of atomic nuclei				218 / 8 600	738 / 29 112
European Commission	DigiQ					26 / 1 026
Czech science foundation	Selected questions of discrete and computational geometry					525 / 20 710
Technology Agency of the Czech Republic	Creation of advanced risk analysis and a software tool for the purpose of identification of risk subjects on their entrance to the VAT system		1 023 / 40 355	2 455 / 96 844	2 455 / 96 844	1 432 / 56 489

[27] Ibid.

Technology Agency of the Czech Republic	Development of equipment for automatic evaluation of defect indications, magnetic powder method and fluorescent penetration method			2 912 / 114 872	2 912 / 114 872	2 912 / 114 872
Technology Agency of the Czech Republic	Analysis of thematic clusters from the field of current cultural and social categories and their application to literary works of Czech 19th and 20th century			621 / 24 497	828 / 32 663	828 / 32 663
Technology Agency of the Czech Republic	Plant biomass in sustainable landscape: Learning platform on photosynthesis of terrestrial and aquatic plants to know the plant role in the landscape			339 / 13 373	678 / 26 746	679 / 26 785
Ministry of culture czech republic	Dowry Towns of the Queens of Bohemia (A living part of historical consciousness and its support of the instruments of historical geography, virtual reality and cyberspace)	678 / 26 746	683 / 26 943	772 / 30 454	683 / 26 943	
Czech science foundation	Combinatorics on words formalization		602 / 23 748	656 / 25 878	656 / 25 878	
Technology Agency of the Czech Republic	Software for evaluation of age with use of pelvis in Retrospective Anthropology,		421 / 16 607	463 / 18 264	505 / 19 921	

	Archeology and Forensic Sciences					
Ministry of education youth and sports	Czech National Infrastructure for Biological Data		3 241 / 127 850	3 001 / 118 383	2 942 / 116 055	
European Commission	Connect and align ELIXIR Nodes to deliver sustainable FAIR life-science data management services'			708 / 27 929	530 / 20 907	
Czech science foundation	Governance support tools for dynamic aspects of Big Data environments	1 771 / 69 862				
Czech science foundation	Fusion-Based Knowledge Discovery in Human Activity Data	1 112 / 43 866	1 112 / 43 866			
Total		3 561 / 140 473	7 082 / 279 369	11 927 / 470 493	18 312 / 722 367	14 129 / 557 357

Table 3.3.2 - Contract research activities

Client[28]	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
1st Cloud Republic a.s.	Software tool for checking in changes to tasks between scientific departments, report on the validation of the software tool in collaboration with the Hydrolanaut research laboratory			599 / 23 627		
ACREA CR, spol. s r.o.	Text data analysis - entity extraction. SW realised as an independent functional module based on the "state of the art" BERT technology					2 077 / 81 949
AGC Flat Glass Czech a.s.	Detection of matted glass defects	344 / 13 556				
CESNET, z. s. p. o.	Code development for Internet of Things (IoT) sensor	10 / 403				
CESNET, z. s. p. o.	Expert cooperation focused on implementation, debugging and testing work on systems developed by CENET's interest group as well as hardware development, software development and web technologies.	875 / 34 534	1 049 / 41 394	1 213 / 47 845	1 058 / 41 722	913 / 36 000
CLOUDAPER s.r.o.	Analysis, design and implementation of software solutions for intelligent document content			234 / 9 243		

[28] If the client is from abroad, indicate in brackets the country of origin of the client.

	analysis using advanced artificial intelligence methods, conceptual modelling, software engineering and technologies available to the contractor.					
Cogniware, s.r.o.	Image classification in the project Creation of an image classification tool.					74 / 2 924
CompuGroup Medical Česká republika s.r.o.	UX analysis of SW for doctors within the project UX testing of SW for doctors, the purpose is to evaluate the time efficiency of the tested SW for doctors.		101 / 3 970			
DataMole, s.r.o.	Dairy Barn Simulaton, Behavior analysis of dairy cattle, Predictive maintenance of sensoric devices, Computational Infrastructure	1 268 / 50 013	1 227 / 48 390	726 / 28 639	430 / 16 973	297 / 11 732
EDAG Engineering CZ, s.r.o.	Research and development of methods to innovate the field of using machine learning methods to improve computational networks.					720 / 28 400
GoodAI Research s.r.o.	Research and development of methods in the field of multi-agent systems optimization.		496 / 19 570			
IMAGE CZ, a.s.	Development of a web application that will enable the client to keep more detailed records of orders and facilitate work in buying, selling and managing media campaigns using data sources and third-party software.		597 / 23 541			
INRIA Domaine de Voluceau [France]	Creation of type inference of dynamically typed languages and its use. Extension of information on method parameters. Refining the list of method call points and method implementations.					146 / 5 764
Institut mikroelektronických aplikací, a.s.	Creation of a hand gesture classification algorithm based on classical image processing methods.		121 / 4 773			
Jihočeský vědeckotechnický park, a.s.	A software tool for data stream classification.	242 / 9 546				
LearnerOn SE	Advanced innovative data structures in support of lifelong learning. Creation of an ontological model of the application domain, data models and analysis of suitable technologies for their implementation.			499 / 19 665		
Lesíkář a.s.	Resilience of TSAES and TS3DES tachographic sensors to differential sampling analysis	351 / 13 842				
Manta Tools, s.r.o.	Tools for governance of dynamic aspects of Big Data environment.	128 / 5 066	195 / 7 696	78 / 3 085	142 / 5 612	165 / 6 521
MarketUp s.r.o.	Centralized media plan as a browser executable application, connected to a cloud database and definition of its interface for communication with other systems.			580 / 22 883		
Meteopress, spol. s r.o.	Research and development of methods to innovate the field of radar rainfall forecasting.			1 356 / 53 491		
Meteopress, spol. s r.o.	Research and subsequent development, implementation and validation of advanced methods for modelling and predicting the movement of storms and precipitation using a		1 195 / 47 159			

	combination of mathematical modelling and artificial intelligence methods.					
Monster Worldwide CZ s.r.o.	Development of research methods in the field of multiagent systems.					296 / 11 694
Národní úřad pro kybernetickou a informační bezpečnost (National Cyber and Information Security Agency of the Czech Republic)	Secure use of OpenSource libraries.					182 / 7 160
Národní úřad pro kybernetickou a informační bezpečnost (National Cyber and Information Security Agency of the Czech Republic)	Possibilities and security aspects of remote exchange of a part of firmware in a cryptographic resource.				593 / 23 389	
NetRex s.r.o.	SW for video analysis of customer behaviour before entering a retail branch.			599 / 23 627		
Obec Dolní Břežany	Extension of the virtual exposition on the territory of the national cultural monument Závist - modern forms of extension of the infrastructure for CR - stage 2: mobile and internet application.					384 / 15 149
Oxford University Press	Consultancy Services			380 / 14 977		
Parker-Hannifin Česká republika s.r.o.	Optimization of the vision system of the PVA facility on the SRR5 line.			36 / 1 432		
PAS Procesní Automatizace s.r.o.	Automatic system for detection of leaks from pipelines.					803 / 31 657
Poster Media Network s.r.o.	SW solution BOSS 4.0, extension of the advertising space management module to include equipment/advertising space operation and registration.			601 / 23 713		
PRAGOEDUCA s.r.o.	Innovation and development of the knowledge portal - analysis of the status, design and implementation of a new version of the portal in order to achieve a better user experience.			261 / 10 310		
PROKOP & BROŽ s.r.o.	Design and prototype implementation of a specialised information system for the management of a specific custom production - luxury watch manufacturing.			304 / 11 981		
PROZETA Broadcasters s.r.o.	Detection algorithms for motion tracking - creation of a proof-of-concept modular information system that can be connected to the company's smart cameras, capable of automated image processing using other data provided by the cameras.		604 / 23 818			

Remmark, a.s.	Data platform for marketing communication.			3 825 /150 888		
Saint-Gobain Construction Products CZ a.s.	Process data correlation - AI analysis.			399 / 15 751		
Saint-Gobain Construction Products CZ a.s.	Artificial intelligence project for dome furnace ČA1.		448 / 17 661			
Second Foundation s.r.o.	Research and development in the field of optimization of mutliagent systems.					339 / 13 365
ŠKODA AUTO a.s.	Beta Phase of the AeroInterferences.	1 137 / 44 868				
ŠKODA AUTO a.s.	Fluctuation analysis.	424 / 16 706				
ŠKODA AUTO a.s.	Requirements for processing of AE optimization	1 461 / 57 636				
ŠKODA AUTO a.s.	Finding Aero-Interferences - Working out of PoC	1 554 / 61 311				
ŠKODA AUTO a.s.	AI optimization of CCX settings - Implementation for SK 326/0 PA		301 / 11 885			
ŠKODA AUTO a.s.	Modification of AI/ML wheel model for MP - Whole car parameters		301 / 11 885			
ŠKODA AUTO a.s.	Tire properties for AI		254 / 10 024			
ŠKODA AUTO a.s.	HPC Digital Twin - Completion		1 283 / 50 596			
ŠKODA AUTO a.s.	2020 EBW 006 "AI optimization of CFD solver setup		1 800 / 71 001			
ŠKODA AUTO a.s.	HPC digital twin - environment modelling		145 / 5 728			
ŠKODA AUTO a.s.	HPC digital twin - data and base model		145 / 5 728			
ŠKODA AUTO a.s.	HACKFIT 2020		61 / 2 387			
ŠKODA AUTO a.s.	076-2021 Implementation AI 076-2021			1 832 / 72 285		
ŠKODA AUTO a.s.	061-2021; Extension AI Model			303 / 11 933		
ŠKODA AUTO a.s.	Completion of MGV, modification of AI model (048-2021; Extension of MGV with AI)			303 / 11 933		
ŠKODA AUTO a.s.	AI in the EPA for the inlet to the aggregate			206 / 8 114		
ŠKODA AUTO a.s.	Feasibility study for SkodaLab				336 / 13 258	
ŠKODA AUTO a.s.	Artificial Intelligence 26753991/611				290 / 11 456	
ŠKODA AUTO a.s.	FIM phase 1				1258 / 49 641	
ŠKODA AUTO a.s.	WAI development for ELROQ				290 /	

					11 456	
ŠKODA AUTO a.s.	AI in EPA Phase 2				271 / 10 692	
ŠKODA AUTO a.s.	Validation set analysis.					375 / 14 797
ŠKODA AUTO a.s.	Icing Prediction.					223 / 8 783
ŠKODA AUTO a.s.	WAI model development and tools					290 / 11 456
University of Bergen [Norway]	Cooperation with FIT		451 / 17 799			
Ústav organické chemie a biochemie AV ČR, v.v.i.	Implementation study for the ELIXIR allhands project	34 / 1 327				
Valeo Autoklimatizace k.s.	Research and development of methods for innovation in the field of IT projects		68 / 2 683			
Vzdělávací a diagnostické centrum, s.r.o.	Application of artificial intelligence and image analytics for the educational product iSophi SMART 3.0.			603 / 23 770		
Vzdělávací a diagnostické centrum, s.r.o.	IT system iMAT Portal for the creation of diagnostic materials.			599 / 23 627		
Vzdělávací a diagnostické centrum, s.r.o.	Design and implementation of appropriate software tests for the iSophi IT system.		253 / 9 966			
WDF s.r.o.	Research and development in the area of conversational intelligence with design of chatbot framework solution.			73 / 2 878		
WDF s.r.o.	Device localization based on WiFi signal.					148 / 5 847
Total		7 828 / 308 809	11 095 / 437 653	15 608 / 615 698	4 669 / 184 198	7 433 / 293 199

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts[29], on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

[29] See Terms definition.

Self-assessment:

Software Data Stewardship Wizard:
The Data Stewardship Wizard (DSW) software has been developed to streamline and enhance data stewardship practices. Effective data stewardship is essential to ensure the quality, accessibility, and long-term usability of research data. The importance of structured Data Management Plans has been widely recognized by major funding agencies and institutions. DSW was started as part of the ELIXIR CZ infrastructure services provided by CTU. Over time, it has evolved into a widely recognized and adopted tool for data management. A major milestone in its development was its adoption by the entire European ELIXIR infrastructure, which led DSW to be awarded the ELIXIR Recommended Interoperability Service status. DSW has acquired a strong global user base within the three user groups: researchers, data stewards, and funders and evaluators. The cloud-based service operated by ELIXIR currently has approximately 6,500 registered users. Additional users rely on on-premises installations, as DSW is open-source. While the exact number of these users cannot be counted, numerous institutional installations exist worldwide. Another key indicator of DSW's success is its commercial uptake. Several companies have developed commercial versions based on the open-source framework, demonstrating its value beyond academia and research. This commercial interest contributes to its sustainability, continuous improvement, and long-term innovation. DSW also plays a crucial role in national and international initiatives: 1) EOSC CZ (National Repository Platform) (2024-2028): DSW is a key component of this national project aligned with the European Open Science Cloud goals. It helps to ensure that research data are managed in accordance with FAIR principles and supports the national research infrastructure in providing sustainable and transparent data stewardship; 2) Horizon Europe project OSTrails: DSW is actively contributing to this Horizon Europe project, which focuses on improving data stewardship practices across disciplines, further reinforcing its role in fostering best practices in research data management. The homepage of DSW is https://ds-wizard.org. The software is one of the outcomes of the project Czech National Infrastructure for Biological Data.

Software ipfixprobe:

The ipfixprobe software is an open-source tool for network traffic monitoring, available at https://github.com/CESNET/ipfixprobe. A server with ipfixprobe and a network interface can be used to analyze and aggregate IP packets into IP flows that represent network conversations. The ipfixprobe software is optimized for high speeds at the magnitude of hundreds of gigabits per second. Additionally, it can be used with smaller embedded devices such as a router with OpenWrt system, especially Turris routers by CZ.NIC – a large association operating the domain name registry for the .cz domain. It has been used for creating many useful and popular datasets for traffic analysis and research in machine learning applied for network monitoring and security. Users of ipfixprobe are primarily from academic institutions and government offices. This technology is deployed to monitor peering lines of CESNET, the Czech national research and education network. It is also used in ROWANET, part of the backhaul of the network in the Czech Republic. There are instances in universities in Munich, Dresden and Brno.

Software MassSpecBlocks:

The MassSpecBlocks software tool is relevant for laboratories focused on metabolomics experiments (i.e., the analysis of small molecules) which are equipped with mass spectrometers. However, it can also be used by other researchers working in bioinformatics/cheminformatics who are interested in the compositions of small molecules from various building blocks. Currently, the tool is used at the

Laboratory of Molecular Structure Characterization at the Institute of Microbiology of the Czech Academy of Sciences, to study the structures of nonribosomal peptides, polyketides, and siderophores that may serve as potential markers of infectious diseases caused by bacteria and fungi. At this moment (March 2025), the tool (https://ms.biomed.cas.cz/msb) has about 30 registered users.

Software for automatic evaluation of defects:

The device for detecting and evaluating defects using magnetic powder (MPI) and fluorescent penetrant (FPI) methods represents the final stage of automation in Industry 4.0. Quality control of metal products is a crucial step in their entire manufacturing process. Each method (MPI or FPI) enhances defect indications in metal products through a combination of chemical processes (such as an appropriate solution, developer, etc.) and physical processes (such as part magnetization, fluorescence, etc.). The inspected product passes through the production line, undergoes the mentioned chemical and physical processes, and is ultimately evaluated in terms of quality. Defect detection and classification are still the most commonly performed by quality control workers.

Manual inspection takes place in a darkened room using UV lamps, where quality control workers examine each product in a three-shift operation, visually inspecting the defect indications highlighted through chemical and physical processes. The worker must identify the indication and then assess its severity. Due to the required precision and overall success rate, the majority of workers are women.

The result is a fully automated production line (consisting of HW and SW), where previously manual tasks have been completely replaced by machines, primarily in the area of visual inspection. A robot equipped with a camera and UV light replaces the worker handling the product (HW), while an algorithm based on image processing and artificial intelligence methods replaces the objective part of defect indication detection and severity assessment (SW).

The positive impact on society is mainly in eliminating manual inspection, thereby improving working conditions for quality control personnel—especially considering that most of them are women. Another positive outcome is the creation of an objective, robust, and scalable technology for quality control of critical metal products—components that are now present almost everywhere.

The software is one of the outcomes of the project Development of equipment for automatic evaluation of defect indications, magnetic powder method and fluorescent penetration method.

Software System for semi-automatic creation of datasets:

The System for Semi-Automatic Dataset Creation is built on the Python-based software called Traffic Capture Infrastructure (TCI), which enables centralized control of the traffic capture process through monitoring probes. The infrastructure consists of a hive component, running on a central server or within a virtual machine, and monitoring probes equipped with drones that receive capture requirements from hive. Its primary goal is to provide real-world network traffic data samples for research purposes. By enabling researchers to move beyond synthetic, lab-generated datasets—whose real-world relevance is often questionable—the system facilitates significant advancements in computer networking research. To date, it has been used to generate at least eight distinct datasets, which have collectively recorded over 2,000 unique downloads from researchers worldwide (the most downloaded are these zenodo.org/records/5956044, zenodo.org/records/3906526, zenodo.org/records/4911551).
Additionally, the CESNET association leverages this system to semi-automatically capture ongoing

network attacks for forensic analysis and investigation, helping the security teams to quickly identify threats and protect the national e-infrastructure and its critical resources more efficiently. The presentation about this system was accepted at an annual Cisco Live! event in Amsterdam, where a huge community listens to emerging technologies related to Cisco, such as TCI deployable in Cisco products as a docker container.

The flexibility of the TCI system's deployment, spanning small personal networks to high-speed provider networks, is highly beneficial for real-world deployments. This simplifies the collection process of network traffic datasets and brings an ecosystem of additional modules for dataset quality evaluation. It also brings awareness and best practices for building datasets. The software is one of the outcomes of the project Flow-based Encrypted Traffic Analysis.

Software The collection of classification modules detecting security threats:
The collection of classification modules represents a technological breakthrough in encrypted traffic analysis that quickly found its users from the security community. These modules have been deployed within the national e-infrastructure managed by the CESNET association, protecting over half a million users and computational resources. For example, the crypto-miner detector protects Metacentrum—a distributed super-computational grid—against resource misuse. Furthermore, the National Center for Cyber Operations of Ministry of Defense has integrated this technology to protect critical state infrastructure. The software is one of the outcomes of the project Flow-based Encrypted Traffic Analysis.

3D time travel through Hradec Králové (Virtual reality application):
A virtual reality application that displays expert historical reconstructions of buildings that no longer exist in the city of Hradec Králové. The historical reconstructions of buildings were created based on archival, historical and building-historical research using the tools of historical geography. The application works with 3D models of these buildings and is implemented using Unreal 4D engine. The application is used in the Museum of East Bohemia in Hradec Králové in an attractive journey through time. It is one of the outcomes of the project Dowry Towns of the Queens of Bohemia (A living part of historical consciousness and its support of the instruments of historical geography, virtual reality and cyberspace).

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result[30]	Year of application	Name
Software	2021	Software tool for IPFIX flows export (ipfixprobe)
Software	2021	Data Stewardship Wizard
Software	2021	MassSpecBlocks
Software	2022	Device for automatic evaluation of defect indications by the magnetic powder method and the fluorescent penetration method
Software	2022	3D time travel through Hradec Králové (Virtual reality application)
Software	2022	System for semi-automatic creation of datasets
Software	2022	The collection of classification modules detecting security threats

[30] Specify the specific type of result. Add rows as needed.

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)[31], providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).[32]

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

Self-assessment:

At FIT CTU, responsibilities related to technology transfer and communication with the commercial sector have been assigned to a dedicated position – the Vice-Dean for Industry Collaboration, under whom a fully established office operates.

The Office for Cooperation with Industry represents a well-established system dedicated to this agenda. Its primary focus is on developing and maintaining strategic partnerships with the commercial sector, increasing the conversion rate from sponsors to long-term partners, identifying and engaging potential partners, facilitating communication, pinpointing faculty areas suitable for contract research, supporting technology transfer, building and maintaining an experienced and high-quality office team, and raising awareness of its activities within the faculty.

Currently, the most common form of transferring research results into practice is through the implementation of contract research for commercial companies. Here, we can identify two primary types of users – (1) companies already collaborating with the faculty (Partners) and (2) newly incoming commercial firms [see the examples below]. The Department for Cooperation with Industry is responsible for communicating with both types and setting up their collaboration.

The office maps the expertise, specializations, and capacities of internal faculty resources, including specialized laboratories, research groups, and individual offices and staff. This allows it to maintain

[31] In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.
[32] If the commercialisation of R&D&I results is carried out in this way.

the most comprehensive overview of faculty capabilities and to identify the best match between industry needs and the faculty's expertise.

Additionally, the office is responsible for identifying new industry partners. It continuously monitors the current network of partnering companies and seeks out new potential partners, typically in the IT or banking sector (3) or manufacturing industries (4). This enables the office to proactively respond and represent the entire faculty in negotiating potential contract research projects. Manufacturing companies are of particular interest, as their growing need for data-driven production management and quality enhancement through automated output control presents significant opportunities for collaboration.

Through continuous communication with industry partners, the office encourages them to submit real-world research challenges, engage in joint research projects, and support PhD students via the Industrial PhD framework. Research projects and PhD student support also provide ideal knowledge-transfer opportunities, including collaborations with state enterprises or even national security agencies (5).

The office is also responsible for presenting industry partners and their opportunities, needs, and offerings to faculty students. A key initiative in this area is the annual career fair, a full-day event where students and industry representatives meet in person and establish connections. As of 2023, this event has been a well-established activity for nine years and is highly popular among students. Due to high demand, participation in the fair is exclusively reserved for official faculty Partners.

This strong mutual awareness between students and industry partners enables knowledge transfer through academic projects and final theses. The office actively facilitates this process, ensuring that student work can have a direct impact on industry.

5 examples of most typical users of our results follow.

(1) Partner Company

The most common user of research results transferred into practice is a Partner company. This is primarily because Partners maintain ongoing communication with the faculty, allowing the faculty to be well acquainted with their focus and needs while actively negotiating collaboration and responding reactively to their requirements. The most frequent forms of collaboration include participation in joint grant projects under the Technology Agency of the Czech Republic (TA CR) or the Ministry of Industry and Trade (MPO), research projects funded by the Czech Science Foundation (GA CR), support for PhD students and their research, commercialization of academic projects, and fulfilling specific demands for contract research.

(2) New Company

Another user of research results transferred into practice is a commercial company that has not yet collaborated with the faculty. These are typically technology firms seeking expertise in artificial intelligence, data science, statistics, cybersecurity, or image analysis. Such companies most often engage in contract research, commercialization of academic projects, or, in rare cases, participation in joint technological or research projects.

(3) Banking Sector

Due to the nature of its business, the banking sector is another typical user of research results. Contract research projects in this area usually involve expertise in time series analysis, value prediction, anomaly detection, classification of suspicious data, and statistical modelling. Banks primarily seek collaboration in the form of contract research or commercialization of academic projects.

(4) Manufacturing Enterprises

With increasing demands for quality assurance, manufacturing enterprises are another key user of research results. The faculty data science and image processing laboratories are ideal partners for the most common requests in contract research, which include production process monitoring, predictive maintenance, data storage optimization, and automated visual inspection. Occasionally, these companies also engage in joint projects or academic project commercialization.

(5) Government and Security Agencies

Another frequent user of the research results is the government sector and security agencies. These collaborations typically involve security-related research projects, where the preferred form of cooperation is through joint research initiatives. However, due to the sensitive nature of these projects, they are often under a non-disclosure agreement.

Commercialization of R&D&I results

The faculty's income of licences is slowly increasing. While in recent years, there are some, in the selected period of 2019 - 2023 the only notable income from licences is the income from licencing of final theses. At the faculty, assignments of final theses from an industry partner rare in the form of working on a real problem of the partner. Such assignments are now very common. They mostly concern the development or improvement of internal processes or software of the company. The faculty decided to respond to this by introducing an internal process leading to the joint commercialisation of school works in the form of a fee-based waiver of the right to licence the commercialisation of school work. The administrative fee introduced in this way allowed for less control over the results of the theses produced and therefore the transfer of the results into practice. Let us give examples of such theses: Security analysis of smart lockers, Multiple Object tracking in Top-View CameraVideo-Sequences, Versatile Hardware Framework for Elliptic Curve Cryptography, Robust flash memory bootloader for a microcontroller over near field communication or A model for dictated number recognition for an interactive voice response (IVR) company.

As for other sources of income besides licencing incomes, the faculty has partners involved in the Industrial PhD framework, sponsoring a specific student, partners supporting talented students (in the form of donations).

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)

	2019	2020	2021	2022	2023
Industrial PhD framework		432 / 17 041	1 056 / 41 657	480 / 18 935	600 / 23 669
Support for talented students	131 / 5 160	150 / 5 917		145 / 5 704	12 / 473
Donation made to support the education of PhD students, specifically for the Computer Architecture and Diagnostics seminars	130 / 5 128				
Licensing of final theses		110 / 4 339	120 / 4 734	170 / 6 706	60 / 2 367
Total	692 / 27 298	1 176 / 46 391	795 / 31 345	672 / 26 509	692 / 27 298

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF VAVAI

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Self-assessment:
FIT CTU is regularly involved in popularization and communication with the public by organizing or participating in various activities and events (lectures, seminars, summer schools, excursions, fairs, competitions...) and publishing news and scientific and other achievements of students and employees of the faculty, especially on the web, social networks and through the media. As part of the popularization of science and information technology, FIT experts and scientists also appear in the media and present these areas, their applications and future visions to the general public.

Specific examples:

Technology Podcast Ones and Zeros, which the faculty started publishing in 2021. The goal is to let listeners get a glimpse into the world of IT and show them how it affects the world around us. The podcast is therefore also suitable for the general public. Interesting questions from the world of ones and zeros are answered directly by experts from FIT CTU in the podcast. Some of the most popular episodes are:
- Why is mathematics important for computer science?
- How do algorithms recommend content on the Internet?
- When will drones deliver our shopping?
- Can we live without artificial intelligence?
- What are the risks of using the same passwords?
- How can artificial intelligence be used in space exploration?

https://fit.cvut.cz/cs/zivot-na-fit/aktualne/podcast, in Czech only.

The next example of PR activities is organizing events for high school students, the number of which has grown significantly in recent years. Throughout the year, FIT CTU organizes excursions to

laboratories, during which they can learn about new technologies. In May, a two-week internship is held for students of secondary industrial schools. In July and August, summer schools are available for high school students on various topics according to current trends. Newly, the faculty conducts one-day workshops for high school students on weekends. A traditional event is the Open House, which is held twice a year and is not only for prospective students but is also open to the public.

The number of public outreach events in which faculty participates has also increased. Traditional events include the Researchers' Night, Science Fest or the CTU Children's Summer University. In recent years, the faculty has been involved, for example, in the Science Fair, AI Days, or Maker Fair. At these events, FIT experts and their students present the world of IT in an entertaining way through faculty projects and practical theses.

The next example is FIKS, which stands for FIT Computer Science Correspondence Seminar and is a competition for high school students interested in computer science, mathematics and programming. Students solve interesting algorithmic problems over the course of several months and receive feedback and comparison with other solvers. The best of them are invited to a joint camp, and successful solvers can even be admitted to a Bachelor's degree without an entrance exam.

Another example is the series of lecture called Informatics Evenings, where domestic and foreign experts from the world of IT present. The series is open to the public and a recording is made of most events, which is publicly available on the faculty's website and YouTube channel for all interested parties.

The faculty research group Graphs, Games, Optimization, Algorithms, Theoretical Computer Science (G^2OAT) of FIT CTU organizes the G^2OAT Seminar focused on the areas of its research. The speakers are both members of the group and other FIT CTU academics, as well as external guests, including foreign ones.

Every year, FIT CTU organizes the LAW FIT conference, a meeting of experts who discuss current issues linking the fields of law and information technology. The conference is open to students and the public.

FIT regularly concludes new memoranda of cooperation and joins various initiatives and alliances, the outputs of which are also educational and popularization activities for the public and applicants. For example, FIT has been a member of the Alliance for Electrical and Computer Engineering since 2024 with the aim of increasing interest in IT fields. In 2023, FIT signed a Memorandum of Cooperation with the House of Lobkowicz with the aim of digitising and making the Lobkowicz collections accessible to the general public.

FIT participates in the prg.ai initiative, which seeks to nurture new AI talent at various levels of education, from teaching AI in high schools and universities to upskilling employees and the public.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

Self-assessment:

Recommendation 3.2:
In the past years, we also obtained some larger projects (BigCode, Polirural+, Rigid), lowering the disbalance between small and large project numbers. We consider this growth to be natural, as large project requires a better prepared administration with sufficient know-how. In 2019, we had about 1.5 FTE of experienced project managers, while at this moment, in 2025, we are over 4.5 FTE. The benefit of small projects is as follows: they are simple to administer, important for researchers to gain experience and items for their CV, and mostly risk-free of additional costs.

Recommendation 3.3 and 3.7:
While we were not able to significantly increase our incomes from licences, we have managed to increase incomes from licencing of final theses results and we have been constantly improving our system of cooperation with industry. We have decided to build a sustainable model of collaboration with industrial partners through the Faculty Partnership Program. Since its inception, this program has gradually expanded from an initial 40 companies to approximately 60 partners in the field of information technology. Instead of a one-time transfer of technologies, we strive for long-term relationships with companies of various sizes that engage with the academic environment and gradually increase their involvement.

The program is divided into three levels of partnership (gold, silver, bronze), allowing companies to enter into collaboration flexibly and increase their commitment according to their capabilities and needs. Companies remain engaged over the long term, contribute to student education and research, while the faculty benefits from stable financial support.

Each partner contributes approximately 100,000 CZK annually, which is utilized by the faculty as part of its supplementary activities. These financial resources are used to support educational and research activities, creating a positive impact not only on faculty but also on industrial partners.

Our jobs fair called COFIT is a proof that the Partnership Program creates and increases the involvement of companies at the Faculty (https://fit.cvut.cz/en/cooperation/for-students/cofit-job-fair/past-events).

Recommendation 3.5:
As already mentioned, the faculty methodology to evaluate research outputs has been incrementally improved to fit our needs. For instance, in contrast to the university and state-level methodology, it includes evaluation of conferences which are important for many research domains at the faculty. The increase in quality can be seen in the data: 1) articles with a co-author from FIT, ranked by best AIS quartile - 2019: Q1:7, Q2:10, Q3:7, Q4:3; compared to 2023: Q1: 15, Q2: 18, Q3: 6, Q4: 4; 2) conference proceedings with a co-author from FIT, ranked by CORE ranking,

if available, otherwise internal ranking (using CORE grades): 2019: A*: 6, A: 18, B: 48, C: 62; compared to 2023: A*: 11, A:20, B: 29, C:69.

Recommendation 3.6:

At the faculty level, we have not implemented a system that would aim to increase the number of interdisciplinary projects. In other words, such projects are rather ad-hoc or within an already established cooperation.

Recommendation 3.11 and 3.12:

We have further developed our internal methodology for evaluation of scientific outputs to incentivise quality and included the possibility of ad-hoc faculty level rewards for specific achievements.

Recommendation 3.12:

FIT CTU has been actively involved in popularization for a long time. In recent years, we have set up new processes in internal communication and increased the cooperation of the Office of Public Relations with individual faculty departments and other departments, such as laboratories or research groups. This has had a positive effect both in terms of greater involvement of faculty experts in popularisation events and in obtaining more information about the results and achievements of individuals and groups, which the Office of Public Relations then uses to promote the faculty.

The Office of Public Relations publishes the results in the form of press releases to the media and actively collaborates with the media (https://fit.cvut.cz/cs/media-a-pr/tiskove-zpravy, https://fit.cvut.cz/cs/media-a-pr/fit-v-mediich, in Czech only), on the faculty and university websites, on faculty and university social media (IG, FB, X, LinkedIn and YouTube) and in internal communications. For example, in the evaluation period (2019-2023), FIT CTU issued 93 press releases and had just under 700 media outputs, including media such as Czech Television, Czech Radio, Forbes, CzechCrunch and Vědavýzkum.cz. Moreover, FIT CTU is regularly involved in many popularization events, such as Researchers' Night, Science Fest, CTU Children's Summer University, Science Fair, AI Days or MakerFair. At these events, FIT experts and their students present the world of IT in an entertaining way through faculty projects and practical theses.

In 2021, the faculty's Office of Public Relations began publishing a technology podcast, called Ones and Zeros. In the podcast, the experts from FIT CTU answer interesting questions from the world of ones and zeros.

In addition to the podcast, the Office of Public Relations also produces other multimedia outputs such as videos, which are also produced in cooperation with the new faculty Recording Studio. Thanks to state-of-the-art technology and staffing, it supports the creation of online teaching materials and the presentation and popularisation of science and research.

The faculty has also created a new lecture series from the research group Graphs, Games, Optimization, Algorithms, Theoretical Informatics (G^2OAT) at FIT CTU, focusing on the areas of its research.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
AI Awards Success Story	3.3.	https://fit.cvut.cz/en/life-at-fit/fit-live/success-stories/20408-precipitation-forecast-research-using-ai-made-it-to-the-finals-of-the-ai-awards
NERD Reputation Database	3.3.	https://github.com/CESNET/NERD
RDMkit	3.3.	https://rdmkit.elixir-europe.org
Fair data / COVID-19	3.3.	https://virus.img.cas.cz
ELIXIR-CONVERGE project page	3.3.	https://cordis.europa.eu/project/id/871075
Data Stewardship Wizard Homepage	3.4.	https://ds-wizard.org
Software ipfixprobe	3.4.	https://github.com/CESNET/ipfixprobe
Software MassSpecBlocks	3.4.	https://ms.biomed.cas.cz/msb
Archived Dataset fo Software System for semi-automatic creation of datasets 1	3.4.	https://zenodo.org/records/5956044
Archived Dataset fo Software System for semi-automatic creation of datasets 2	3.4.	https://zenodo.org/records/3906526
Archived Dataset fo Software System for semi-automatic creation of datasets 3	3.4.	https://zenodo.org/records/4911551
Podcast Ones and Zeros (in Czech)	3.6	https://fit.cvut.cz/cs/zivot-na-fit/aktualne/podcast
Cofit / facult job fair	3.7.	https://fit.cvut.cz/en/cooperation/for-students/cofit-job-fair/past-events
Faculty press releases (in Czech)	3.7.	https://fit.cvut.cz/cs/media-a-pr/tiskove-zpravy
Faculty in media (in Czech)	3.7.	https://fit.cvut.cz/cs/media-a-pr/fit-v-mediich