Stanovisko habilitační komise k návrhu na jmenování docentem

Masarykova univerzita	
Fakulta	Fakulta informatiky
Obor řízení	Informatika
Uchazeč	RNDr. Martin Maška, Ph.D.
Pracoviště uchazeče	Fakulta informatiky, Masarykova univerzita
Habilitační práce	Object Tracking in Bioimage Data
Složení komise	
Předseda	prof. RNDr. Petr Hliněný, Ph.D. *Fakulta informatiky, Masarykova univerzita*
Členové	prof. Ing. Jiří Jan, CSc. *FEKT VUT v Brně* doc. RNDr. Barbora Kozlíková, Ph.D. *Fakulta informatiky, Masarykova univerzita* prof. Dr. Ing. Jan Kybic *FEL ČVUT v Praze* Prof. Dr. Timo Ropinski *Ulm University, Germany*

Hodnocení vědecké / umělecké kvalifikace uchazeče

When evaluating the applicant's scientific qualifications, the Board based its decision on the submitted materials, in particular, on the list of publications, CV and research topics of the applicant. It follows from these materials that the applicant has published his results in numerous journal and proceedings papers. Namely, these include 13 scientific journal papers listed in the WoS database, where in two of them the applicant has been the first author. The list also includes 17 papers in proceedings of refereed international conferences, and the applicant has been the first author in 9 of them. The CORE ranks of these conferences range mostly between B and sometimes C; specifically there are 5 papers in the conference ISBI considered of rank B (but it was ranked A in ERA2010 of CORE) and 3 papers in the conference ICIP of rank B (which has an alternative GGS ranking A-). WoS currently indexes in total 31 publications by Martin Maška.

Topics of the vast majority of these papers cover the analysis and simulation of microscopy images, and specifically tracking cells in time-lapse series of images. The applicant has also been heavily involved in the organization of international benchmarking and of competitions of tracking algorithms. His papers record (at the time of writing this report) altogether 887 non-self citations in WoS, and the most cited many-authors paper *Objective comparison of particle tracking methods* in Nature Methods itself records 399 citations. His first-author paper entitled *A benchmark for comparison of cell tracking algorithms* has 195 citations there. WoS gives his h-index as 9. These numbers are very good in computer science 10 years after PhD. It seems that the applicant does not have a public Google Scholar profile (which is a pity).

The applicant has been involved in several grant projects investigated within the Centre for Biomedical Image Analysis (CBIA) at FI MU. We particularly mention two projects; M. Maška was the PI of the Czech Science Foundation Junior Grant in 2016-2018, named *Development of Reliable Methods for Automated Quantitative Characterization of Cell Motility in Fluorescence Microscopy,* and he is a co-PI of the MU Interdisciplinary grant named *Deciphering the mechanisms of mammary epithelial branched pattern formation through iterative biological and mathematical modelling*, in 2019-2021. He also serves as an Associate Editor of the IEEE International Symposium on Biomedical Imaging. In 2016, M. Maška was awarded the Masaryk University Rector's Award for Outstanding Research Results Achieved by Young Scientists under 35.

Závěr: Vědecká / umělecká kvalifikace uchazeče **odpovídá** požadavkům standardně kladeným na uchazeče v rámci habilitačních řízení v oboru Informatika.

Hodnocení pedagogické způsobilosti uchazeče

The applicant M. Maška received his Ph.D. in Computer Science in 2011. Already since 2006 he had been employed as a Research assistant at FI MU, in the Centre for Biomedical Image Analysis (CBIA). After his graduation, he spent 1 and half years as a postdoctoral fellow at the University of Navarra in Spain, and then 2 and half years as a postdoc at FI MU. Since 2015 he has been employed as a scientific researcher at FI MU (with the expected 50% teaching load).

Despite having only a part-time teaching load at FI MU, the applicant taught numerous tutorial classes of several subjects in the past 8 years. These include 4 semesters of tutorials of *FI:IB000 Mathematical Foundations of Computer Science*, 3 semesters of tutorials of *FI:IB111 Foundations of Programming*, 2 semesters of tutorials of *FI:PB173 Domain specific development in C/C++*, 7 semesters of tutorials of *FI:PA166 Advanced Methods of Digital Image Processing,* 6 semesters of tutorials of *FI:PB130 Introduction to Digital Image Processing,* and 7 semesters of tutorials of *FI:PV131 Digital Image Processing.* Additionally, he is teaching the doctoral course *FI:DUVOD Introduction to PhD study,* every semester since 2018, and two seminars *FI:PV162 Image Processing Project* and *FI:PV187 Seminar of digital image processing.* He is consistently receiving high marks for teaching in the university anonymous students evaluation surveys.

According to the submitted materials, the applicant has supervised 12 Bachelor's theses and 5 Master's theses. The IS MU records supervision of 16 theses of both levels, and consultancy of 2 other theses since 2012. These numbers are good, the count is on average 2 theses per year, and show the applicant's readiness for promotion to the Associate Professor level.

The Board has also evaluated applicant's public lecture entitled *The Fundamentals of Cell Tracking*, which took place on November 24, 2020, partly online at FI MU (cf. a separate report). The lecture demonstrated applicant's technical and presentation skills, and his deep knowledge of the area; however, the Board was not completely convinced about the suitability of this lecture for the general public.

Závěr: Pedagogická způsobilost uchazeče **odpovídá** požadavkům standardně kladeným na uchazeče v rámci habilitačních řízení v oboru Informatika.

Hodnocení habilitační práce uchazeče

The applicant has submitted a Habilitation thesis entitled ***Object Tracking in Bioimage Data.*** The thesis consists of 16 pages of original introduction and commentary text, 6 pages of bibliography, and 134 pages containing 12 reprinted papers from the years 2013–2019 (often in a condensed two-column format). All these included papers are co-authored by groups of authors including the applicant, and the thesis specifies in detail the applicant's contribution to each of them. Most of them include foreign co-authors.

The Board has selected and invited the following three reviewers of the Habilitation thesis:

Prof. Ing. Jan Flusser, DrSc. (ÚTIA AV ČR)

Prof. Janne Heikkilä (University of Oulu, Finland)

Prof. Nataša Sladoje (Uppsala University, Sweden)

All of them are renowned international experts in areas closely related to the applicant's thesis, and all their three reports agree that the thesis fulfils the requirements expected of a Habilitation thesis in the field of Informatics.

On the positive side, the Board would especially like to highlight the following parts of the reviews:

(Prof. Heikkilä) Dr. Maška has been one of the organizers of the ISBI Particle Tracking Challenge 2012 (PTC) in collaboration with researchers from two other universities. …... This challenge can be seen as an important step towards open science and reproducible research in a field where proprietary datasets and methods have been extensively used in prior research works. The results of the challenge were published in Nature Methods that is the highest-ranked biochemical research methods journal based on the 2019 ISI impact factor (30.822). This clearly demonstrates the significance of the contribution.

(Prof. Heikkilä) The thesis includes also two other journal papers from the cell tracking area. The first one proposes a cell tracking method for multidimensional fluorescence microscopy images. …... The paper where Dr. Maška is the first author was published in IEEE Transactions on Medical Imaging (IF 9.710). The FLS variant of the method has been occupying the top position in the CTC segmentation benchmark for one of the datasets since 2014, which is quite impressive.

(Prof. Sladoje) Dr. Maška's contribution to the research field is multi-folded. It includes (1) development and application of novel algorithms for robust and fully automatic tracking of particles, cells, and filopodial protrusions in multidimensional bioimage data (2) proposal of novel tools - quality measures and high quality synthetic data simulators - which enable development and performance evaluation of (particle, cell, and filopodia) tracking algorithms, and (3) preparation of rigorous evaluation protocols to be conducted in several community-wide efforts (challenges) to identify potential and limitations of the available approaches, as well as promising directions for future development of the field. In my opinion, such a broad range of contributions, which respond to diverse needs of the bioimage analysis community, is highly beneficial for reaching scientific maturity, expanding own collaborative networks and gaining experience of team-work, while having close and continuous insight in state-of-the-art of the field and its development, and frequently contributing to its own high-quality results.

However, there have also been some negative comments in the reviews, among which the Board cites:

(Prof. Flusser) Úvodní část práce považuji za nedostatečnou. Zákon o VŠ ani směrnice MU sice neuvádí požadovaný rozsah, nicméně z logiky věci by tento komentář měl čtenáři neodborníkovi poskytnout širší úvod do problematiky, shrnutí současného stavu s kategorizací základních přístupů a metod a především ukázat místa, která kandidát svou prací vyplnil. Kvalitní habilitace a doktorské dizertace tohoto typu mívají většinou úvodní část v rozsahu 20 – 40 stran a charakter rozsáhlejšího přehledového článku. Dr. Maška se místo toho omezil fakticky na tři půlstránky, které představují úvody do tří částí práce. Kromě toho pak krátce shrnul vlastní přínos. Čtenář, neznalý podrobných souvislostí, nemá šanci pochopit postavení a význam práce v kontextu současných směrů výzkumu na tomto poli. … Úvod práce by měl mít i jistou pedagogickou úroveň, aby čtenáře srozumitelně vtáhl do tématu. Tuto ambici autor vůbec nenaplnil, či spíše ji ani neměl.

Short English summary: The introductory part of the thesis is not sufficient to introduce a non-expert into the field and to clearly identify the applicant's own contributions. The introductory part does not have a pedagogical value which is somehow expected.

(Prof. Flusser) Nejlepší dojem na mne udělal článek č. 3, který prezentuje zajímavou segmentační metodu doloženou přesvědčivými experimenty a habilitant je první z šesti autorů. Dobrý pocit z tohoto článku však v mých očích snižuje skutečnost, že jde o výsledky zhruba 10 let staré, ke kterým zjevně autor dospěl během svého PhD. studia a/nebo těsně po něm, přičemž dizertační práce autora byla právě na toto téma. To sice zákon ani směrnice univerzity nezakazují, ale podle mne by habilitační práce měla dokumentovat posun, ke kterému došlo během postdoktorandského období, a přerod studenta v hotového vědce a nikoliv „recyklovat" výsledky doktorské dizertace.

Short English summary: I have been mostly impressed by the paper No. 3, but my impression is lowered by the fact that the results are about 10 years old, from the times of the Ph.D. study. A habilitation thesis should also demonstrate applicant's development into a mature scientist during the postdoctoral stage.

After very carefully judging all positive and negative aspects of the three reviews, and taking into an account the fact that all three reviews agreed about fulfillment of the habilitation expectations, the Board has come to its final decision:

Závěr: Úroveň habilitační práce uchazeče **odpovídá** požadavkům standardně kladeným na habilitační práce v oboru Informatika.

Stanovisko habilitační komise k návrhu na jmenování docentem

Výsledek tajného hlasování komise

Hlasování se uskutečnilo: elektronicky

Počet členů komise		5
Počet odevzdaných hlasů		5
z toho	kladných	5
	záporných	0

Návrh komise

Na základě výsledku tajného hlasování následujícího po zhodnocení vědecké / umělecké kvalifikace, pedagogické způsobilosti a úrovně habilitační práce uchazeče předkládá komise Vědecké radě Fakulty informatiky Masarykovy univerzity návrh **jmenovat uchazeče docentem** v oboru Informatika.

V Brně dne 24.02.2021

prof. RNDr. Petr Hliněný, Ph.D. .....