

# IT UNIVERSITY OF COPENHAGEN

Copenhagen, Denmark  
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Professor Jan Trlifaj  
Vice Dean  
Research and International Affairs Department  
Charles University  
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**Subject: Review of the habilitation thesis of Jakub Lokoč**

Dear Professor Trlifaj,

RNDr. Jakub Lokoč, Ph.D., has applied for the position of associate professor at the Faculty of Mathematics and Physics, Charles University. As part of the promotion process, I review the submitted habilitation thesis entitled "Methods for Content-based Interactive Retrieval".

**Relevance of the research topic:** Interactive retrieval of media files (typically images and videos) is a research topic that has been studied for decades, but is currently growing in relevance with the onslaught of media generated every day by both professionals and the public. With this growth of media collections, scalability has increased in importance, both in terms of scalability of media retrieval and in terms of scalability of interaction with users. Coarsely speaking, the first part of the thesis investigates the former aspect of scalability, while the second part of the thesis investigates the latter aspect of scalability. Both aspects, however, are necessary for systems that collaborate with users towards an end goal of satisfying the information needs of the users.

**Research summary:** Following a concise presentation of formal background on feature spaces and media retrieval approaches, the thesis is composed of two distinct, yet related parts. Each part has a first chapter that outlines the theoretical underpinnings of the material, followed by a set of articles containing relevant research contributions.

In the first part of the thesis, Dr. Lokoč focuses on efficient retrieval of media via feature collections, presenting work that was his main focus in the years 2011-2016. All four papers represent a good blend of theoretical contributions and experimental evaluations, with the size of research collections gradually increasing over time. All four papers focus on improving retrieval efficiency, through efficient data representations, indexing, approximations, and result caching. The four papers thus show command over a variety of efficiency aspects, all of which must be combined for a truly efficient retrieval system.

In the second part of the thesis, Dr. Lokoč focuses on the interaction between systems and users in the context of video retrieval, presenting work that was his main focus in years 2014-2019. The work in this part depends on results from the first part, as it is impossible to develop highly interactive media retrieval systems without efficient media retrieval methods. The contribution in this part, however, goes beyond individual research contributions towards research leadership in the community:

- The first two papers in this part contain analysis of the user interactions present in systems competing in the Video Browser Showdown (VBS, <https://videobrowsershowdown.org/>). By performing this analysis and presenting the results to the community, other researchers can better understand user needs and focus their research on system aspects most relevant for actual user interactions. While neither paper presents a new algorithm or a new system, as is traditional in computer science research, these papers nevertheless represent excellent scientific contributions through the results of the detailed analysis.
- The last paper then presents details of the VIRET system, developed by Dr. Lokoč in collaboration with colleagues and students, which has won VBS three times and been highly ranked in both VBS and the Lifelog Search Challenge (LSC, <http://lsc.dcu.ie/>) in other years.

**Evaluation:** The bulk of the habilitation thesis consists of seven research articles, all of which have been accepted and published at major peer-reviewed journals and conferences. The last paper describes a video retrieval system, VIRET, which has long been one of the top systems in the VBS and LSC interactive competitions. While both thesis parts demonstrate well the research capabilities of Dr. Lokoč, the latter part also demonstrates his leadership within the research community, through his participation in the organization of the Video Browser Showdown since 2016. As it is my belief that an associate professor should not only be a research contributor, but more importantly a research leader, this is a highly appreciated contribution to the community.

**Recommendation:** Based on my review, I strongly recommend appointing Dr. Jakub Lokoč as an associate professor at your esteemed institution.

Yours sincerely



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