

Drahomira Herrmannova

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SUMMARY

I am a Research Scientist in the Computational Data Analytics Group at Oak Ridge National Laboratory (ORNL). The focus of my research is on helping scientists work more effectively by applying Artificial Intelligence methods to improve research workflows and enable intelligent access to the content of research publications. My research interests span Text and Data Mining, Natural Language Processing, Machine Learning, and their applications to scientific and other expert literature and data.

Prior to my current appointment, I was a postdoctoral researcher at the Knowledge Media Institute in the UK. One of my research projects at KMI quantified the growing traction of Open Access publishing and has been featured in Physics Today, received the Vannevar Bush Best Paper Award at the Joint Conference on Digital Libraries (JCDL 2019), and is now included in the audit guidance released by Research England for the next UK Research Excellence Framework exercise. Before that, I conducted a two-year internship in the Computational Data Analytics Group at ORNL, where I worked on a number of projects in the areas of information extraction, text mining, and research evaluation. During that time I was also a Computer Science PhD student at the Open University, UK. My doctoral research directly resulted in the development of a new area called semantometrics, which, in contrast to previous citation-based research evaluation methods, utilizes full-text to produce new evaluation methods for use in research assessment. Within this area, I have developed several methods which demonstrate the benefits and suitability of using full-text in automated impact assessment, which led to a research grant and two fully funded PhD scholarships for my university.

I have been a finalist in two international research competitions in the areas of scholarly data mining and text mining, and have been organizing research workshops since 2014 to bring together different communities working on related problems in text mining of research publications.

RESEARCH EXPERIENCE

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|-----------|--|
| 2019–now | Applying AI to scientific literature , Research Scientist (R&D Associate Staff Member), Computational Data Analytics Group, Oak Ridge National Laboratory <ul style="list-style-type: none">– Applying Text and Data Mining, Natural Language Processing, and Machine Learning to scientific literature and data |
| 2018–2019 | Scholarly data mining , Research Associate (Postgraduate Researcher), Knowledge Media Institute, The Open University <ul style="list-style-type: none">– Lead study to analyze the proportion of research outputs around the world that are open access and the effect that national policies have on authors making their publications open access– Developed production-level big data pipeline using Spark for very large collections of research publications (130+ million publications)– Lead effort to create a labelled dataset and develop a model for identifying sentences from research publications which describe the contribution of the publication |

- 2016–2018 **Text-mining research publications**, ORISE Postgraduate Intern/Researcher, Oak Ridge National Laboratory
- Worked with NIEHS scientists to automatically extract study descriptors from research documents, developed an unsupervised method to help identify relevant text segments, and tested a number of supervised classification methods (traditional machine learning as well as deep learning) in terms of their potential to support annotation and extraction
 - Prototyped a novel system for monitoring research performed around the world and for analyzing collaboration patterns in specific disciplines; this prototype led to a collaboration with the U.S. Department of Energy through which it is being expanding into an operational system
 - Developed and applied new research publication evaluation methods combining bibliometrics and altmetrics to enable the Oak Ridge Leadership Computing Facility to better evaluate research publications that make use of the facility
- 2012–2017 **Leveraging text-mining for evaluation of scholarly publications**, PhD Candidate, Knowledge Media Institute, The Open University
- Co-founded semantometrics (<http://semantometrics.org>), a new research direction in scientometrics that, unlike traditional methods, leverages full-text for research evaluation and incorporates semantics into evaluation
 - Developed and implemented several semantometric methods for evaluation of research publications which demonstrate the benefits of using full-text based metrics compared to traditional metrics
 - Evaluated and demonstrated effectiveness of semantometrics methods at scale through funding from Jisc, resulting in Jisc’s funding of several new PhD positions to continue research in semantometrics
- 2016 **Text-mining and enrichment of CORE Open Access collection**, Research Assistant, Knowledge Media Institute, The Open University
- Merged two large (70+ and 120+ million publications) collections to improve search and recommendation of research publications in CORE
 - Developed solutions for data engineering challenges ranging from correct matching of citations between the two collections to efficient data updates
- 2016 **Text-mining research publications to support research publication evaluation**, ORISE Postgraduate Intern/Researcher, Oak Ridge National Laboratory
- Developed new methods for assessing the importance of research publications by exploring knowledge transfer between disciplines, and then tested the methods on a set of publications that used ORNL’s Titan supercomputer
 - Developed the first openly available dataset for validating research evaluation metrics that contains qualitative evaluations
- 2013–2015 **Creating data-driven predictive models for improving student retention at the Open University**, Part-time consultant, Knowledge Media Institute, The Open University
- Developed and tested new machine-learning based methods for early identification of students at risk of dropping out of courses
 - Designed and implemented a dashboard with visualizations for presenting predictions to course tutors

- 2013 **Using Machine Learning for predicting student success in online courses**, Full-time consultant, Knowledge Media Institute, The Open University
- Pilot project in collaboration with Microsoft Research Cambridge
 - Implemented predictive models using Infer.NET, a tool for Bayesian Inference in graphical models, for predicting student outcomes in Open University courses

PROFESSIONAL EXPERIENCE

- 2014–2015 **Text-mining and enrichment of CORE Open Access collection**, Technical Support, Knowledge Media Institute, The Open University
- Developed a new version of an API for text-mining a large research publication collection
 - Developed and tested a new method for characterizing types of research collaboration that focuses on identifying collaborations with potential for high future impact
- 2011–2012 **Development of Open Access publication aggregator and search portal**, Internship, Knowledge Media Institute, The Open University
- Worked on both front- and back-end development of a research publication aggregator and search portal
 - Implemented several parts of the system including a reference extractor, an API for text-mining and a visual search interface
- 2010–2011 **Design, development, testing and maintenance of internal software applications**, Application Development Support, Honeywell, Czech Republic
- Participated in all stages of production software development including design, administration, maintenance and user support
 - Developed software for monitoring internal processes from manufacturing to license management
 - Received a special award for developing a software utility for monitoring license usage which enabled the company to save money by purchasing fewer licenses

EDUCATION

Doctor of Philosophy, Computer Science, awarded 05/2018

The Open University, Knowledge Media Institute, Milton Keynes, United Kingdom

Thesis topic: *Mining Scholarly Publications for Research Evaluation*

Research interests: research evaluation, scientometrics, text-mining, information retrieval

Advisers: Professor Zdenek Zdrahal, The Open University & Dr. Petr Knoth, The Open University

Master of Science, Information Systems, graduated 08/2012

Brno University of Technology, Faculty of Information Technology, Brno, Czech Republic

Thesis topic: *A Relation/Topic-Based Visualisation to Aid Exploratory Search in Large Collections*

Received Dean's prize for excellent diploma thesis and Prize of Zdena Rabova for outstanding study and science results

Bachelor of Science, Information Technology with Cum Laude Honors, graduated 08/2010

Brno University of Technology, Faculty of Information Technology, Brno, Czech Republic

Thesis topic: *Social Network Integration into an Information Portal*

COMMUNITY BUILDING

- 2019 **Organizer of the First Workshop on Mining Scientific Publications (SDP 2020)**
- SDP aims to bring together distributed efforts on mining scientific literature to one place, collaboration with organizers of BIRNDL workshop and CL-SciSumm, LaySumm, and LongSumm shared tasks
 - The workshop will be held alongside the 2020 Conference on Empirical Methods in Natural Language Processing (EMNLP 2020)
- 2014–2018 **Organizer of Workshop on Mining Scientific Publications (WOSP)**
- Focus on text-mining scholarly publications
 - Every year includes a data challenge
 - Receive submissions each year from top institutions in the area
 - Participation by Allen Institute for Artificial Intelligence, Microsoft, Elsevier, Harvard University, University of Cambridge, UC Berkley, Mendeley and others
 - Program committee includes some of the most high-profile researchers in the area
 - WOSP 2018 held as part of Language Resources and Evaluation Conference (LREC) 2018 in Miyazaki, Japan
- 2018 **Organizer of Smoky Mountains Computational Sciences and Engineering Conference (SMC) Data Challenge**
- Worked with scientists at Oak Ridge National Laboratory to develop a challenge focused on big data and scientific datasets
 - Received submissions from top U.S. institutions
 - Data challenge co-located with SMC 2018 Conference in Gatlinburg, TN
- 2017 **Organizer of Workshop on Scholarly Web Mining (SWM)**
- Due to high popularity of WOSP, SWM was founded as a new workshop that focuses on web mining in addition to text-mining scholarly publications
 - Record high attendance with participants from CMU, Cornell University, Peking University, KAIST, Microsoft, Google, Apple, Baidu, Yahoo and others

ACADEMIC SERVICE

- 2020 **Program committee member**, Language Resources and Evaluation Conference (LREC)
- 2019 **Manuscript peer review**, Scientometrics journal special issue on “Bibliometrics and Information Retrieval”
- 2019 **Manuscript peer review**, International Journal on Digital Libraries (IJDL)
- 2019 **Program committee member**, Conference on Computational Natural Language Learning (CoNLL)
- 2019 **Program committee member**, Joint Workshop on Bibliometric-enhanced Information Retrieval and Natural Language Processing for Digital Libraries (BIRNDL)
- 2018–2019 **Program committee member**, Joint Conference on Digital Libraries (JCDL)
- 2018 **Manuscript peer review**, Journal of the Association for Information Science and Technology (JASIST)
- 2018 **Program committee member**, Workshop on Semantics, Analytics and Visualisation: Enhancing Scholarly Dissemination (SAVE-SD), The Web Conference 2018
- 2017 **Manuscript peer review**, Scientometrics Journal
- 2017 **Manuscript peer review**, Open Journal of Web Technologies (OJWT)
- 2014 **Manuscript peer review**, Workshop on Machine Learning and Learning Analytics, Learning Analytics and Knowledge Conference (LAK 2014), Indianapolis, IN, USA.

ACOMPLISHMENTS AND AWARDS

- 2019 **Vannevar Bush Best Paper Award**, Joint Conference on Digital Libraries
- 2016 **Finalist in 2016 WSDM Cup Challenge on assessing query-independent importance of scholarly articles**, Web Search and Data Mining Conference, San Francisco, CA; ranked in the top 8 out of 32 teams, invited to compete in the second round of the challenge and presented at the WSDM Cup Workshop
- 2016 **Best Poster Award**, Joint Conference on Digital Libraries
- 2015 **Jisc Research Grant**, Semantometrics Demonstrator and Study (co-PI), £15,000
- 2013 **Finalist in CrossLink-2 Challenge on automatically finding potential links between documents in different languages**, NTCIR-10 Conference, Tokyo, Japan; our methods achieved the best overall results in the English to Chinese, Japanese, Korean subtask and were one of the top performers in the Chinese, Japanese, Korean to English subtask
- 2012 **Prize of Zdena Rabova**, Brno University of Technology
- 2012 **Dean's Prize** for excellent diploma thesis, Brno University of Technology
- 2011 **Travel Grant**, The BEST of Technology Foresight Summer School, Tampere University of Technology, awarded by Board of European Students of Technology (BEST)
- 2011 **Travel Grant**, Computer Games Development Summer School, Technological Educational Institute of Crete, Greece
- 2011 **Special Award** for creating a utility for license usage monitoring, Honeywell
- 2007–2011 **Scholarship for excellent study results**, Brno University of Technology

INVITED TALKS

- 2018 **Invited speaker** at the Organisation for Economic Co-operation and Development (OECD) workshop in Paris, France, on the topic of Systematic Reviews in the scope of the EDTA Conceptual Framework Level 1
- 2016 **Invited speaker** at Jisc Open Citations Workshop in London, UK, on the topic “Semantometrics: Towards full-text based research evaluation”
- 2016 **Invited speaker** at Jisc Digital Festival Digifest 2016 in Birmingham, UK, on the topic “Towards full-text based research metrics: exploring Semantometrics”

MENTORING

- 2019 Tomas Danis, Erasmus Internship, currently a C++ Software Engineer at think-cell Software, Berlin, Germany
- 2019 Shreyas Shahapur, work experience internship, currently a high school senior
- 2018 Brett Hagan, SULI Internship, currently graduate student at University of Tennessee
- 2018 Derek Shafer, SULI Internship, currently graduate student at Tennessee Technological University

COMMUNITY OUTREACH

- 2018 Oak Ridge Computer Science Girls instructor, developed and taught a class on text-mining
- 2018 Volunteer and co-instructor at “Introduce Your Daughter to AI” Women in Computing @ ORNL event, Oak Ridge National Laboratory, Tennessee
- 2017–2018 Oak Ridge Computer Science Girls volunteer, Oak Ridge, Tennessee
- 2017 DaVinci Art & Science Fair judge, Jefferson Middle School, Oak Ridge, Tennessee
- 2017 Volunteer at “Introduce Your Daughter to Code” Women in Computing @ ORNL event, Oak Ridge National Laboratory, Tennessee

PROFESSIONAL AFFILIATIONS

Association for Computational Linguistics (ACL)

Association for Information Science and Technology (ASIS&T)

ACM Special Interest Group on Information Retrieval (SIGIR)

IEEE Technical Committee on Digital Libraries (TCDL)

FORCE11: The Future of Research Communications and e-Scholarship

PUBLICATIONS

Conference proceedings

Herrmannova, D.; Pontika, N. and Knoth, P. (2019). *Do Authors Deposit on Time? Tracking Open Access Policy Compliance*. Proceedings of the 2019 ACM/IEEE Joint Conference on Digital Libraries (JCDL 2019), Urbana-Champaign, IL. **Best paper award.**

Workshop proceedings

Herrmannova, D.; Young, S. R.; Patton, R. M.; Stahl, C. G.; Kleinstreuer, N. C. and Wolfe, M. S. (2018) *Unsupervised Identification of Study Descriptors in Toxicology Research: An Experimental Study*. Proceedings of the 9th International Workshop on Health Text Mining and Information Analysis (LOUHI 2018) at the 2018 Conference on Empirical Methods in Natural Language Processing (EMNLP 2018), Brussels, Belgium.

Journal article

Herrmannova, D.; Patton, R. M.; Knoth, P. and Stahl, C. G. (2018). *Do Citations and Readership Identify Seminal Publications?* *Scientometrics* 115: 239.

Conference proceedings

Herrmannova, D.; Knoth, P. and Patton, R. M. (2018). *Analyzing Citation-Distance Networks for Evaluating Publication Impact*. Proceedings of the Language Resources and Evaluation Conference (LREC) 2018, Miyazaki, Japan.

Workshop proceedings

Stahl, C. G.; Young, S. R.; **Herrmannova, D.**; Patton, R. M. and Wells, J. C. (2018) *DeepPDF: A Deep Learning Approach to Extracting Text from PDFs*. Proceedings of the 7th International Workshop on Mining Scientific Publications (WOSP) at Language Resources and Evaluation Conference (LREC) 2018, Miyazaki, Japan.

Workshop proceedings

Herrmannova, D.; Knoth, P.; Stahl, C. G.; Patton, R. M. and Wells, J. C. (2018) *Text and Graph Based Approach for Analyzing Patterns of Research Collaboration: An analysis of the TrueImpactDataset*. Proceedings of the 1st Workshop on Computational Impact Detection from Text Data (CIDTD) at Language Resources and Evaluation Conference (LREC) 2018, Miyazaki, Japan.

Thesis

Herrmannova, D. (2018) *Mining Scholarly Publications for Research Evaluation*. PhD Thesis. The Open University.

Workshop proceedings

Herrmannova, D.; Patton, R. M.; Knoth, P. and Stahl, C. G. (2017) *Citations and readership are poor indicators of research excellence: Introducing TrueImpactDataset, a new dataset for validating research evaluation metrics*. Proceedings of the 1st Workshop on Scholarly Web Mining (SWM) at Tenth ACM International Conference on Web Search and Data Mining (WSDM 2017), Cambridge, UK. ACM ICPS.

Workshop proceedings

Patton, R. M.; **Herrmannova, D.**; Stahl, C. G.; Wells, J. C. and Potok, T. E. (2017) *Audience Based View of Publication Impact*. 6th Workshop on Mining Scholarly Publications (WOSP) at 2017 ACM/IEEE-CS Joint Conference on Digital Libraries (JCDL), Toronto, Canada.

Technical report

Herrmannova, D. and Knoth, P. (2016) *Towards full-text based research metrics: Exploring semantometrics: Report of Experiments*. Jisc repository. Jisc Report 6376.

Conference proceedings

Herrmannova, D. and Knoth, P. (2016) *Semantometrics: Towards fulltext-based research evaluation*. Proceedings of IEEE/ACM Joint Conference on Digital Libraries (JCDL 2016), Newark, NJ, USA. **Best poster award.**

Workshop proceedings

Herrmannova, D. and Knoth, P. (2016) *Simple Yet Effective Methods for Large-Scale Scholarly Publication Ranking: KMi and Mendeley (team BletchleyPark) at WSDM Cup 2016*. Proceedings of WSDM Cup 2016 - Entity Ranking Challenge Workshop at International Conference on Web Search and Data Mining (WSDM 2016), San Francisco, CA, USA.

Journal article

Herrmannova, D. and Knoth, P. (2016) *An Analysis of the Microsoft Academic Graph*. D-Lib Magazine, 22, (9/10). Corporation for National Research Initiatives.

Journal article

Herrmannova, D. and Knoth, P. (2015) *Semantometrics in Coauthorship Networks: Fulltext-based Approach for Analysing Patterns of Research Collaboration*. D-Lib Magazine, 21, (11/12). Corporation for National Research Initiatives.

Conference proceedings

Herrmannova, D.; Hlosta, M.; Kuzilek, J. and Zdrahal, Z. (2015) *Evaluating Weekly Predictions of At-Risk Students at The Open University: Results and Issues*. Proceedings of European Distance and E-Learning Network Conference (EDEN 2015). Barcelona, Spain.

Conference proceedings

Herrmannova, D. and Knoth, P. (2015) *Semantometrics: Fulltext-based Measures for Analysing Research Collaboration*. Proceedings of International Society for Scientometrics and Informetrics Conference 2015, Istanbul, Turkey.

Conference proceedings

Kuzilek, J.; Hlosta, M.; **Herrmannova, D.**; Zdrahal, Z. and Wolff, A. (2015) *OU Analyse: analysing at-risk students at The Open University*. Learning Analytics Review, 1-16.

Journal article

Knoth, P. and **Herrmannova, D.** (2014) *Towards Semantometrics: A New Semantic Similarity Based Measure for Assessing a Research Publication's Contribution*. D-Lib Magazine, 20, (11/12). Corporation for National Research Initiatives.

Workshop proceedings

Wolff, A.; Zdrahal, Z.; **Herrmannova, D.**; Kuzilek, J. and Hlosta, M. (2014) *Developing predictive models for early detection of at-risk students on distance learning modules*, Proceedings of the 2nd Workshop on Machine Learning and Learning Analytics at Learning Analytics and Knowledge Conference (LAK 2014), Indianapolis, IN, USA.

Workshop proceedings

Hlosta, M.; **Herrmannova, D.**; Vachova, L.; Kuzilek, J.; Zdrahal, Z. and Wolff, A. (2014) *Modelling student online behaviour in a virtual learning environment*. Workshop on Machine Learning and Learning Analytics at Learning Analytics and Knowledge Conference (LAK 2014), Indianapolis, IN.

Conference proceedings

Knoth, P. and **Herrmannova, D.** (2013) *Simple Yet Effective Methods for Cross-Lingual Link Discovery (CLLD) - KMI @ NTCIR-10 CrossLink-2*. NTCIR-10 Evaluation of Information Access Technologies, Tokyo, Japan.

Book chapter

Wolff, A.; Zdrahal, Z.; **Herrmannova, D.** and Knoth, P. (2013) *Predicting Student Performance from Combined Data Sources*. Educational Data Mining: Applications and Trends, 524, Springer.

Thesis

Herrmannova, D. (2012) *A Relation/Topic-Based Visualisation to Aid Exploratory Search in Large Collections*. Brno University of Technology.

Journal article

Herrmannova, D. and Knoth, P. (2012) *Visual Search for Supporting Content Exploration in Large Document Collections*. D-Lib Magazine, 18, (7/8), Corporation for National Research Initiatives.

MEDIA COVERAGE

- 2019 **Article in Physics Today highlighting the results of a study I lead:**
<https://dx.doi.org/10.1063/PT.6.2.20190418a>
- 2018 **Article about an event for daughters of ORNL staff I helped to run:**
<https://web.archive.org/web/20180717193126/https://www.olcf.ornl.gov/2018/07/17/introduce-your-daughter-to-ai-event-sees-olcf-participation/>
- 2018 **Article about the team of volunteers who helped to prepare and run an event for daughters of ORNL staff titled “Introduce Your Daughter to AI”:**
<https://web.archive.org/web/20180717194636/http://www.techgirlz.org/ornl-the-team-behind-the-artificial-intelligence-how-computers-learn-techshop/>
- 2017 **Article about me on the news page of my alma mater (in Czech):**
<https://web.archive.org/web/20180717193927/http://zvut.cz/lide/lide-f38102/poznatky-pribyvaji-tak-rychle-ze-neni-v-lidskych-silach-informace-tridit-mysli-si-absolventka-fit-vut-drahomira-herrmannova-d157545>
- 2017 **Interview with me about my research (video):**
<http://openminted.eu/evaluating-impact-research/>