

# Bhaskar Mitra

PRINCIPAL APPLIED SCIENTIST · RESEARCH STUDENT

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## Summary

I am a Principal Applied Scientist at Microsoft Artificial Intelligence and Research group in Montreal, Canada. I joined Microsoft in 2006 and Bing—then called Live Search—in 2007. Before moving to Montreal, I have been part of the Microsoft labs in Hyderabad (India), Bellevue (USA), and Cambridge (UK). My research interests include machine learning and information retrieval, and in particular the topic of neural information retrieval. Over the years, I have worked on several research problems related to document ranking, entity ranking, query formulation, and evaluation. I have co-organized multiple workshops and tutorials, served as a guest editor for the special issue of the Information Retrieval Journal, and co-authored a book on the topic of neural information retrieval.

## Education

### University College London

London, UK

PHD IN COMPUTER SCIENCE

2016 - Exp. 2020

- Awarded the Dean's Prize Scholarship for the full course of the program.
- Supervisors: Dr. Emine Yilmaz (primary) & Dr. David Barber (secondary).
- Provisional thesis title: "Deep Neural Networks for Effective and Efficient Retrieval".

### Visvesvaraya Technological University

Belgaum, India

BE IN COMPUTER SCIENCE

2002 - 2006

- Graduated with First Class Honors.

## Industry Experience

### Microsoft Corp.

UK, USA, & India

PRINCIPAL APPLIED SCIENTIST

2006 - PRESENT

- Conducting machine learning and information retrieval research with strong focus on both academic and product impact, and contributing to open source projects such as the Microsoft Cognitive Toolkit (CNTK).
- Leading key research agenda on exploring and shipping neural models for web search and other retrieval tasks in Bing.
- Shipped several techniques for improving search quality of Bing in US, incl. early work on extracting relevance signals from the structured web.
- Shipped significant quality improvements in Bing web search results in international markets as part of the commitments made in the Microsoft Search Alliance with Yahoo! Search in 2010.
- Shipped several features and improvements in the internal experimentation infrastructure at Bing.
- Recipient of multiple internal awards incl. the Gold Star Award (2010 & 2017), the Above and Beyond Awards (2012), and the High-Potential employee program (2007 & 2008).
- Experience of working at multiple international Microsoft offices: India (2006 - 2010), USA (2010 - 2013), and UK (2013 - 2018).

### Amazon.com Inc.

India

INTERN

2006

- Worked on the distributed data store and the query management components of a very early version of the Amazon Payments Web Service.

### Hewlett-Packard Inc.

India

INTERN

2005

- Worked on a HP-UX Kernel Debugger project involving distillation of kernel crash dump data into an AJAX based hypertext interface.

## Honors & Awards

2018	<b>Best Short Paper Award</b> , SIGIR 2018	USA
2018	<b>Ranked 7<sup>th</sup></b> , RecSys Challenge 2018	Canada
2017	<b>Outstanding Reviewer Award</b> , SIGIR 2017	Japan
2016	<b>Dean's Prize scholarship</b> , University College London	UK
2016	<b>Microsoft Service Award</b> , for completing 10 years at Microsoft	UK
2011	<b>Microsoft Service Award</b> , for completing 5 years at Microsoft	USA

2011	<b>Microsoft IDC Innovation Award</b> , Microsoft India Development Center	India
2010	<b>Microsoft IDC Innovation Award</b> , Microsoft India Development Center	India
2006	<b>Semi-finalist</b> , Code4Bill competition, an all India national coding competition organized by Microsoft	India
2001	<b>Gold merit certificate</b> , for securing all India rank 6 and state level rank 1 in the 1st National Cyber Olympiad organized by The National Science Olympiad Foundation of India	India
2001	<b>Ranked 1<sup>st</sup></b> , in Aptitude in The Academic & Achievement Tests jointly conducted by The Council for the Indian School Certificate Examinations and The Institute of Psychological & Educational Measurement	India
2001	<b>High Distinction and Distinction</b> , in Mathematics and Science in The International Assessments for Schools organized by The University of New South Wales and The Educational Testing Centre	India
1996	<b>High Distinction and Distinction</b> , in Mathematics and Science in The International Assessments for Schools organized by The University of New South Wales and The Educational Testing Centre	India

## Publications and Patents

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Google Scholar Metrics. **citations: 1,125; h-index: 13; and i10-index: 16** (as of January 2019).

Latest publications available at: <https://scholar.google.com/citations?user=PFMB5SsAAAAJ>.

### Book

- 2018 **Bhaskar Mitra** and Nick Craswell. *An Introduction to Neural Information Retrieval*. In Foundations and Trends® in Information Retrieval, Now Publishers, Inc.

### CONFERENCE (FULL PAPERS)

- 2018 Hamed Zamani, **Bhaskar Mitra**, Xia Song, Nick Craswell, and Saurabh Tiwary. *Neural Ranking Models with Multiple Document Fields*. In proc. WSDM, ACM.
- 2017 Christophe Van Gysel, **Bhaskar Mitra**, Matteo Venanzi, Roy Rosemarin, Grzegorz Kukla, Piotr Grudzien, and Nicola Cancedda. *Reply with: Proactive recommendation of email attachments*. In proc. CIKM, ACM.
- 2017 **Bhaskar Mitra** Fernando Diaz, and Nick Craswell. *Learning to match using local and distributed representations of text for web search*. In proc. WWW.
- 2016 Fernando Diaz, **Bhaskar Mitra**, and Nick Craswell. *Query expansion with locally-trained word embeddings*. In proc.ACL.
- 2015 **Bhaskar Mitra**. *Exploring Session Context using Distributed Representations of Queries and Reformulations*. In proc. SIGIR, ACM.
- 2014 Kajta Hofmann, **Bhaskar Mitra**, Filip Radlinski, and Milad Shokouhi. *An eye-tracking study of user interactions with query auto completion*. In proc. CIKM, ACM.

### CONFERENCE (SHORT PAPERS)

- 2018 Daniel Cohen, **Bhaskar Mitra**, Katja Hofmann, and W. Bruce Croft. *Cross Domain Regularization for Neural Ranking Models Using Adversarial Learning (Best Short Paper Award)*. In proc. SIGIR, ACM.
- 2018 Corby Rosset, Damien Jose, Gargi Ghosh, **Bhaskar Mitra**, and Saurabh Tiwary. *Optimizing Query Evaluations Using Reinforcement Learning for Web Search*. In proc. SIGIR, ACM.
- 2017 Federico Nanni, **Bhaskar Mitra**, Matt Magnusson, and Laura Dietz. *Benchmark for complex answer retrieval*. In proc. ICTIR, ACM.
- 2017 **Bhaskar Mitra**, Fernando Diaz, and Nick Craswell. *Luandri: a Clean Lua Interface to the Indri Search Engine*. In proc. SIGIR, ACM.
- 2016 Eric Nalisnick, **Bhaskar Mitra**, Nick Craswell, and Rich Caruana. *Improving document ranking with dual word embeddings*. In proc. WWW.
- 2015 **Bhaskar Mitra** and Nick Craswell. *Query Auto-Completion for Rare Prefixes*. In proc. CIKM, ACM.
- 2014 **Bhaskar Mitra**, Milad Shokouhi, Filip Radlinski, and Katja Hofmann. *On user interactions with query auto-completion*. In proc. SIGIR, ACM.

## WORKSHOP

- 2018 Surya Kallumadi, **Bhaskar Mitra**, and Tereza Iofciu. *A Line in the Sand: Recommendation or Ad-hoc Retrieval?*. In proc. RecSys'18.
- 2017 Navid Rekabsaz, **Bhaskar Mitra**, Mihai Lupu, and Allan Hanbury. *Toward Incorporation of Relevant Documents in word2vec*. In proc. Neu-ir'17: Neural information retrieval workshop (SIGIR).
- 2016 **Bhaskar Mitra**, Grady Simon, Jianfeng Gao, Nick Craswell, and Li Deng. *A Proposal for Evaluating Answer Distillation from Web Data*. In proc. Second WebQA Workshop (SIGIR).

## JOURNAL

- 2017 Nick Craswell, W Bruce Croft, Maarten de Rijke, Jiafeng Guo, and **Bhaskar Mitra**. *Neural information retrieval: introduction to the special issue*. In the special issue of the Information Retrieval Journal on neural information retrieval, Springer Netherlands.

## TECHNICAL REPORTS

- 2014 Amit Agarwal, Eldar Akchurin, Chris Basoglu, Guoguo Chen, Scott Cyphers, Jasha Droppo, Adam Eversole, Brian Guenter, Mark Hillebrand, Xuedong Huang, Zhiheng Huang, Vladimir Ivanov, Alexey Kamenev, Philipp Kranen, Oleksii Kuchaiev, Wolfgang Manousek, Avner May, **Bhaskar Mitra**, Olivier Nano, Gaizka Navarro, Alexey Orlov, Marko Padmilac, Hari Parthasarathi, Baolin Peng, Alexey Reznichenko, Frank Seide, Michael L. Seltzer, Malcolm Slaney, Andreas Stolcke, Huaming Wang, Kaisheng Yao, Dong Yu, Yu Zhang, and Geoffrey Zweig. *An introduction to computational networks and the computational network toolkit*. Microsoft Technical Report MSR-TR-2014-112.

## PREPRINTS

- 2018 Payal Bajaj, Daniel Campos, Nick Craswell, Li Deng, Jianfeng Gao, Xiaodong Liu, Rangan Majumder, Andrew McNamara, **Bhaskar Mitra**, Tri Nguyen, Mir Rosenberg, Xia Song, Alina Stoica, Saurabh Tiwary, and Tong Wang. *MS MARCO: A human generated machine reading comprehension dataset*. arXiv preprint arXiv:1611.09268.
- 2017 **Bhaskar Mitra** and Nick Craswell. *Neural Models for Information Retrieval*. arXiv preprint arXiv:1705.01509.
- 2016 **Bhaskar Mitra**, Eric Nalisnick, Nick Craswell, and Rich Caruana. *A dual embedding space model for document ranking*. arXiv preprint arXiv:1602.01137.

## WORKSHOP REPORTS

- 2017 Nick Craswell, W Bruce Croft, Maarten de Rijke, Jiafeng Guo, and **Bhaskar Mitra**. *Report on the Second SIGIR Workshop on Neural Information Retrieval (Neu-IR'17)*. In ACM SIGIR Forum, ACM.
- 2016 Nick Craswell, W Bruce Croft, Jiafeng Guo, **Bhaskar Mitra**, and Maarten de Rijke. *Report on the SIGIR 2016 Workshop on Neural Information Retrieval (Neu-IR)*. In ACM SIGIR Forum, ACM.

## TUTORIALS

- 2018 Tom Kenter, Alexey Borisov, Christophe Van Gysel, Mostafa Dehghani, Maarten de Rijke, and **Bhaskar Mitra**. *Neural networks for information retrieval*. In proc. ECIR, ACM.
- 2018 Tom Kenter, Alexey Borisov, Mostafa Dehghani, Maarten de Rijke, and **Bhaskar Mitra**. *Neural networks for information retrieval*. In proc. WSDM, ACM.
- 2017 Tom Kenter, Alexey Borisov, Christophe Van Gysel, Mostafa Dehghani, Maarten de Rijke, and **Bhaskar Mitra**. *Neural networks for information retrieval*. In proc. SIGIR, ACM.
- 2017 **Bhaskar Mitra** and Nick Craswell. *Neural text embeddings for information retrieval*. In proc. WSDM, ACM.

## PATENTS

- 2016 **Bhaskar Mitra**, Elbio Renato Abib, Fabio Eigi Imada, and Yu Jiao. *Inferring entity attribute values*. US Patent 9,501,503.
- 2014 Rupesh Rasiklal Mehta, Sree Hari Nagaralu, Anjana Das, and **Bhaskar Mitra**. *Utilization of features extracted from structured documents to improve search relevance*. US Patent 8,788,436.

## Professional Activities

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### SERVICES

- Organizer: Deep Learning track at the Text Retrieval Conference (TREC), with Nick Craswell, Emine Yilmaz, and Daniel Campos, 2019.
- Organizer: Microsoft Machine Reading Comprehension (MS MARCO) passage ranking challenge, with Payal Bajaj, Daniel Campos, Nick Craswell, and others, 2018.
- Guest editor: Special Issue of the Information Retrieval Journal on Neural Information Retrieval, with Nick Craswell, W. Bruce Croft, Maarten de Rijke, and Jiafeng Guo, 2017.
- Session chair: Deep learning in practice, Industry track at WWW, 2016.
- Program committee member: WWW, SIGIR, WSDM, CIKM, NAACL, ICTIR, and other conferences.

### INVITED TALKS

- Keynote talk: 5 Lessons Learned from Designing Neural Models for Information Retrieval, at The 10th Recherche d'Information Semantique (RISE) workshop, at The CORIA-TALN-RJC conference (Rennes, France), May 2018.
- Invited panelist: From Research To Production, at ECIR Industry Day, ECIR, March 2018.
- Invited talk, at Search Solutions, London, UK, 2015.
- Invited talk, at The 4th International Alexandria Workshop, Hannover, Germany, 2017.
- Multiple invited talks at Universities (incl. University College London, University of Glasgow, University of Cambridge, and North Eastern University) and industry labs (incl. Microsoft Research and Facebook).

### TUTORIALS

- *Deep Learning for Information Retrieval*, with Nick Craswell, Emine Yilmaz, and Daniel Campos, at ACM SIGIR/SIGKDD Africa Summer School on Machine Learning for Data Mining and Search (AFIRM), 2019.
- *Neural Networks for Information Retrieval*, with Tom Kenter, Alexey Borisov, Christophe Van Gysel, Mostafa Deghani, and Maarten de Rijke, ECIR, 2018.
- *Neural Networks for Information Retrieval*, with Tom Kenter, Alexey Borisov, Christophe Van Gysel, Mostafa Deghani, and Maarten de Rijke, WSDM, 2018.
- *NN4IR: The SIGIR 2017 tutorial on Neural Networks for Information Retrieval*, with Tom Kenter, Alexey Borisov, Christophe Van Gysel, Mostafa Deghani, and Maarten de Rijke, 2017.
- *The WSDM 2017 Tutorial on Neural Text Embeddings for Information Retrieval*, with Nick Craswell, 2017.

## Extracurricular Activities

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- Race crew, Leg 1 of the Clipper Round The World yacht race (sailed for 34 days from Liverpool, UK to Punte del Este, Uruguay), 2017.
- Open Water Certified diver with multiple dives around the world—incl. at Silfra, Iceland in the rift between the North American and Eurasian tectonic plates, 2016.
- Climbed Mt. Kilimanjaro (Uhuru Peak), highest peak in Africa, 2014.
- Multiple trips as a general volunteer on medical brigades to Tena, Ecuador with Timmy Global Health (2012-14, 2016-17).
- Volunteered on lion rehabilitation projects in Antelope Park, Zimbabwe with African Impact, 2014.

## References

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Available on request.