Manohar (Manu) Kaul

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Academic Positions

- **IIT Hyderabad**, India.
  Asst. Professor (since Jul 2015)
  Computer Science Dept.
- **Technische Universität Berlin**, Germany.
  Postdoc./ Senior Researcher (completed July 2015)
  Head of Group: Prof. Volker Markl

Education

- **Aarhus University**, Aarhus, Denmark.
  Ph.D. in Computer Science, Aug, 2014
  "Enabling Advanced Path-Finding on Terrains and in Spatial Networks"
  Supervisor: Prof. C.S. Jensen (csj@cs.aau.dk)
- **Uppsala University**, Uppsala, Sweden.
  Masters in Computer Science, June 2011
  "Frequent Route Based Continuous Moving Object Location and Density Prediction on Road Networks"
  Supervisor(s): Prof. Tore Risch (Tore.Risch@it.uu.se) and
  Asst. Prof. Gyozo Gidofalvi (gyozo.gidofalvi@abe.kth.se)
- **LaTrobe University**, Melbourne, Australia.
  B.Engg. with Honors in Computer Systems Engineering, 1999
  "Intelligent Traffic Shaper to Improve Streaming Video Quality at End Clients"
  Supervisor: Prof. Rajiv Khosla (r.khosla@latrobe.edu.au)

Awards

- **IEEE Senior**
- "VLDB 2016 Travel Fellowship"
- "**Best Paper Award** at MDM 2013"
- "Outstanding Academic Achievement" - *Australian Computer Society (ACS)*
- "Most Outstanding Advanced Features" - Industrial Project Award
- "Golden Key Society Honor" - 2000

Research interests

Machine Learning, Algebraic Topology, Topological Data Analysis (TDA), Geometric Algorithms, Spatial Indexing, and Computational Geometry.

Visiting positions

May'19 – Jul'19 Invited Foreign Researcher
- Dept. of Mathematics and Informatics,
Hebei Normal University, Shijiazhuang, China.
- Dalian University of Technology, Dalian, China.
Host: Prof. Jie Wu (at NUS University, Singapore) (matwuj@nus.edu.sg)

May'18 – Jun'18: Visiting Foreign Researcher
Shinshu University, Matsumoto, Japan.
Host: Prof. Dai Tamaki (dai.tamaki@gmail.com)

May'17 – Sep'17: Visiting Foreign Researcher
Institute of Statistical Mathematics (ISM), Tokyo, Japan.
Host: Prof. Kenji Fukumizu (fukumizu@ism.ac.jp)

Aug'13 – Mar'14: Visiting Ph.D.
Department of Computer Science and Engineering (CSE), HKUST, Hong Kong.
Supervisor: Assoc. Prof. Raymond Chi-Wing Wong (raywong@cse.ust.hk)

Publications with Core Ranking

- **[A*]** Anson Bastos, Abhishek Nadgeri, Kuldeep Singh, Isaiah Onando Mulang, Saeedeh Shekarpour, Johannes Hoffart, and Manohar Kaul *"RECON: Relation Extraction using Knowledge Graph Context in a Graph Neural Network"*, **WWW 2021**.
- **[A*]** Charu Sharma and Manohar Kaul *"Self-Supervised Few-Shot Learning on Point Clouds"*, **NeurIPS 2020**.
- **[-]** Manohar Kaul and Dai Tamaki *"A Weighted Quiver Kernel using Functor Homology"*, **Arxiv:2009.12928**.
- **[A]** Charu Sharma and Manohar Kaul *"Simplicial Complex based Point Correspondence between Images warped onto Manifolds"*, **ECCV 2020**.
- **[A]** Charu Sharma, Jatin Chauhan, and Manohar Kaul *"Learning Representations using Spectral-Biased Random Walks on Graphs"*, **IJCNN 2020**.
- **[A*]** Jatin Chauhan, Deepak Nathani and Manohar Kaul *"Few-shot Learning on Graphs via Super-classes based on Graph Spectral Measures"*, **ICLR 2020**.
- **[A*]** Deepak Nathani, Jatin Chauhan, Charu Sharma, and Manohar Kaul *"Learning Attention-based Embeddings for Relation Prediction in Knowledge Graphs (long paper)"*, **ACL 2019**.
- **[A*]** Charu Sharma, Deepak Nathani, and Manohar Kaul *"Solving Partial Assignment Problems using Random Clique Complexes"*, **ICML 2018**.
- Sumit Bhatia, Bapi Chatterjee, Deepak Nathani, Manohar Kaul, *"Understanding and Predicting Links in Graphs: A Persistent Homology Perspective"*, **ArxIv**.
- **[A]** Manohar Kaul, *"Elementary, dear Watson!"*, **CIDR 2017 (Vision Paper)**.
- Wiktor Pronobis, Danny Panknin, Johannes Kirschnick, Vignesh Srinivasan, Manohar Kaul, Wojciech Samek, Klaus-Robert Muller, Shinichi Nakajima, *"Sharing Hash Codes for Multiple Purposes"*, **Japanese Journal of Statistics and Data Science (JJSD) accepted**.
- **[A]** Chen Xu, Markus Holzemer, Manohar Kaul, Juan Soto, Volker Markl, *"On Fault Tolerance for Distributed Iterative Dataflow Processing"*, **TKDE 2017**.
- Larysa Visengeriyeva, Alan Akbik, Manohar Kaul, Tilmann Rabl, Volker Markl, *"Improving Data Quality by Leveraging Statistical Relational Learning"*, **ICIQ 2016**.
- **[A*]** Chen Xu, Markus Holzemer, Manohar Kaul, Volker Markl, *"Efficient Fault-Tolerance for Iterative Graph Processing on Distributed Dataflow Systems"*, **ICDE 2016**.
- **[A*]** Manohar Kaul, Raymond Chi-Wing Wong, and Christian S. Jensen, *"New Lower and Upper Bounds for Shortest Distance Queries on Terrains"*, **PVLDB 2015**.
- Sanjay Rathee, Manohar Kaul, Arti Kashyap, *"R-Apriori: An Efficient Apriori Based Algorithm on Spark"*, **PIKM PhD Workshop @ CIKM 2015**.
- **[A*]** Qi Wang, Manohar Kaul, Cheng Long and Raymond Chi-Wing Wong, *"TerrainToolkit: A Multi-Functional Tool for Terrain Data"*, **PVLDB 2014**.
- **[A*]** Bin Yang, Chenjuan Guo, Christian S. Jensen, Manohar Kaul and Shuo Shang, *"Multi-Cost Optimal Route Planning Under Time-Varying Uncertainty"*, **ICDE 2014**.
- **[A*]** Manohar Kaul, Raymond Chi-Wing Wong, Bin Yang and Christian Jensen, *"Finding Shortest Paths on Terrains by Killing Two Birds with One Stone"*, **PVLDB 2013**.
- Manohar Kaul, Bin Yang and Christian S. Jensen, *"Building Accurate 3D Spatial Networks to Enable Next Generation Intelligent Transportation Systems"* ***(Best Paper Award)***, **Mobile Data Management (MDM) 2013**.

- **[A]** Bin Yang, Manohar Kaul and Christian Jensen, *"Using Incomplete Information for Complete Weight Annotation of Road Networks"*, **TKDE journal**.
- **[A]** Chenjuan Guo, Yu Ma, Bin Yang, Christian S. Jensen and Manohar Kaul, *"Eco-Mark: Evaluating Models of Vehicular Environmental Impact"*, **ACM SIGSPATIAL GIS 2012**.
- **[A]** Gyozo Gidofalvi, Manohar Kaul, Christian Borgelt and Torben Bach Pedersen, *"Frequent route based continuous moving object location and density prediction on road networks"*, **ACM SIGSPATIAL GIS 2011**.
- Manohar Kaul, R. Khosla and Y. Mitsukura, *"Intelligent packet shaper to avoid network congestion for improved streaming video quality at clients"*, **IEEE CIRA 2003**.

Research Grants

- *Directed Weighted Graph Kernels* from Fujitsu AI, Japan (Rs. 52 Lakhs for 1 yr)
- *Geometric Deep Learning* from GreatFour Systems (approx. Rs. 17 Lakhs for 3 yrs)
- IIT Hyderabad Seed Grant (Rs. 3 Lakhs)
- *NVIDIA GPU Grant* (Free Titan XP GPU)

Talks

- Dec 2020, **"Invited Speaker"** at Topological Data Analysis (TDA) Workshop, NeurIPS 2020. Link:`https://tda-in-ml.github.io/speakers`
- Dec 2020, **"Self-supervised Few-shot Learning on Point Clouds"** at NeurIPS 2020 (virtual).
- Jul 2019, **"Solving Partial Assignment Problems using Random Clique Complexes"** at Computational Topology Workshop, Dalian University of Technology and in Hebei Normal University, China.
- Jul 2019, **"On Graph Kernels and Embeddings"** at Computational Topology Workshop, Dalian University of Technology and in Hebei Normal University, China.
- Jun 2018, **"Solving Partial Assignment Problems using Random Clique Complexes"** at Topology Seminar, Shinshu University, Japan.
- Sep 2017: **"Works using Geometry and Algebraic Topology"** at IBM Research, New Delhi, India.
- Sep 2016, **"New Lower and Upper Distance Bounds for Shortest Distance Queries on Terrains"** at VLDB 2016, New Delhi, India.
- May 2016, **"Moving Object Databases"** at Big Data Workshop held at IIT Mandi, India.
- Nov 2015, **"Distance Bounds for Spatial Queries on Polyhedral Surfaces"** at Department of Computer Science and Engineering, IIT Bombay, India
- Apr 2015, **"Scalable Machine Learning Library Related Research"** at Amazon, Berlin, Germany.
- Apr 2014, **"Finding Better Distance Bounds for Shortest Surface Paths on 3D Terrains"** at Department of Computer Science and Engineering, Chalmers University of Technology, Sweden.
- June 2013, **"Building Accurate 3D Spatial Networks to Enable Next Generation Intelligent Transportation Systems"** at IEEE International Conference on Mobile Data Management (MDM) 2013, Milan, Italy.

Technical Skills

- Programming Languages: C/C++, Perl, Python, BASH Scripting, Erlang, Common Lisp, Haskell, Java, Javascript, Scala
- Database technologies: ORACLE 7/8/9i/10g/11g, Postgres, MySQL, SQL Server

Student Supervision

- Charu Sharma, Ph.D. in Computer Science, IITH (close to completion)

- Anson Bastos, Ph.D. in Computer Science, IITH (in progress)
- Nikhil P. Kumaar, Masters, Thesis: "Scene Graph Generation" (graduated, working at NVIDIA)
- Pratik Shukla, Masters, Thesis: "Text Clustering using Graph Kernels" (graduated, working at Qualcomm)
- Varun Mishra, Masters, Thesis: "Document Simplicial Complexes" (graduated, working at Flipkart)
- Larysa Visengeriyeva, Ph.D. Thesis mentor at Technische Universität Berlin, Germany. (graduated, ML consultant at INNOQ)
- Johannes Kirschnick, Ph.D. Thesis mentor at Technische Universität Berlin, Germany. (graduated, ML scientist at Amazon Berlin)

Teaching

- Computational Topology: Theory and Applications (@ IIT-H) 2019, 2020
- Introduction to Database Management Systems (@ IIT-H) 2017
- Indexing Spatial Data (Elective Course @ IIT-H)
- Introduction to Database Management Systems (@ IIT-H) 2016
- Big Data Analytics Seminar (@ TU Berlin)
- Contract-Based Programming in Q2 (@ Aarhus)
- Web Technology in Q3 (Double TA) (@ Aarhus)

Service

- **PC Reviewer:** *TKDE 2017, MDM 2018, NIPS 2018, NeurIPS 2019, MDM 2019, AAAI 2019, ACL 2019, NeurIPS 2020, ACL 2020, EMNLP 2020, TKDE 2020,AAAI 2021, EACL 2021*.
- **External Reviewer:** *CIKM 2013, ICDE 2014, EDBT 2014*.
- **Session Chair:** *Conformal Prediction for Reliable Machine Learning (CPRML) 2015*.
- **Datasets Contributed:** 3D Road Network Dataset to *UCI Machine Learning Repository* (http://goo.gl/hrtmuR).
- **Conflict Resolution Tool for Conference Submissions:** Used by *VLDB 2014, 2015* (http://cs.au.dk/ mkaul/php/check.html)

Industrial Work Experience ($\approx$ 8 yrs)

- **Integration Architect, ORACLE/British Energy, UK (Nov 08 - Oct 09)**
  - Designed and implemented highly-scalable interfaces between Oracle *Customer Care and Billing (CC & B)* and *Quotation Management/Smart Meter Data Management (QM/MDM)*
  - Designed and implemented bill print functionality in adherence to the product and British Energy business needs.
  - Consulted on technical architecture issues surrounding integration of Oracle *Customer Care and Billing (CC & B)* into British Energy which used SAP systems.
- **Database Architect, Omnifone, UK (Apr 08 - Oct 08)**
  - Performance Tuning of Oracle 10g RAC and Java Persistence Layer
  - Designed the OLTP and Warehouse connection mechanisms.
  - Designed reporting facilities for performance tracking using Oracle Enterprise Manager.
- **Technical Architect, ORACLE (Utilities), UK (May 07 - Jan 08)**
  - Performance Tuning of backend PL/SQL and Crystal Reports
  - Worked on integrating ORACLE's utility billing product to the client's existing products.

- Overlooked migration of data from legacy databases to ORACLE's new billing application.

◇ **Systems Architect, ORACLE, Australia (Apr 06 - May 07)**

- R & D Work for Oracle and Netezza Data Warehouses.
- Architect DDL and Data Extraction Tools and Utilities for migration between CIS+ ORACLE and ANSI based databases. application.

◇ **Technical Designer, ORACLE & TruEnergy, Australia (Oct 05 - Feb 06)**

- Designed Technical and Functional designs on-site catering to client's needs for customizations to ORACLE's Base Billing Product.
- Designed and developed custom J2EE front-end applications to interface and integrate to the existing base product.
- Offered technical consultation with design/implementation issues.
- Walkthrough and demonstrate end solutions to business clients

◇ **Systems Analyst, DESC & Multiservice, USA (Dec 03 - Aug 05)**

◇ **Programmer, Euro Tollroads & Multiservice USA (Mar 99 - Jun 03)**

References

◇ **Prof. Christian S. Jensen**
Ph.D. Supervisor
DAISY, Dept. of Computer Science
Aalborg University, Aalborg, Denmark
e: csj@cs.aau.dk

◇ **Prof. Dai Tamaki**
Professor
Dept. of Mathematics
Shinshu University, Matsumoto, Japan
e: rivulus@shinshu-u.ac.jp

◇ **Prof. Raymond Chi-Wing Wong**
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