

Dr. Ritu Kundu

Post-doctoral Research Associate
School of Computing
National University of Singapore

dcsritu@nus.edu.sg
ritu.ritukundu@gmail.com



RESEARCH INTERESTS

Algorithms in Bioinformatics; specifically, assembly and analysis of third generation sequencing data.
Algorithms and Data structures on sequences for pattern matching, indexing, text-compression etc.
Algorithmic Engineering

EDUCATION

Ph.D. (Computer Science) King's College London
Oct 2015 - July 2018
Thesis: Algorithmic Advances in Handling Uncertainty and Regularity in Strings
Won **King's Outstanding PhD Thesis Prize** (2019)

M.Sc. (Advanced Computing) King's College London
2013 - 2014 C Score: 82
Won **Best Overall Performance** on the MSc programme in Advanced Computing.

M.Sc. (Informatics) University of Delhi
2008 - 2010 CGPA: 8.76/10

B.Sc.(Hon) (Electronics) University of Delhi
2005 - 2008 CGPA: 82.86%
Ranked 1st in the entire university.

WORK EXPERIENCE

Intern King's College London (Informatics Dept.)
Sep 2014 - Dec 2014
Developing an algorithm that can aid medical decision-making in a specific domain. The project required implementing the machine-learning and classification concepts.

Software Developer Ministry Of Home Affairs, Govt. Of India
Nov 2010 Apr 2013 Rewarded for excellent performance in 2011 and 2012
Design and development of internal support software systems, enhancement of a data-mining and analysis suite, and network and system administrative services.

Trainee Engineer(Platform) Vihaan Networks Limited
Jun 2010 Oct 2010
Designing, development, and testing of the Platform Manager for 14-Slot ATCA chassis.

TEACHING

Acted as *Teaching Assistant* at the King's College London for modules -
Algorithm Design and Analysis [2017, 2016, 2015]
Parallel and Distributed Algorithms [2015]
Text Searching and Processing [2018, 2016]

RESEARCH AFFILIATION (SHORT-TERM) Genome Institute of Singapore (**GIS**) [2019]
School of Computational Science and Engineering, **Georgia Tech (Georgia Institute of Technology)** [March 2018]
Department of Computer Science, **University of Helsinki** [January 2018]

AWARDS & HONOURS

King's Outstanding PhD Thesis Prize (sponsored by Elsevier) [2019].

Outstanding Teaching Assistant Award for the 2016-17 academic session [2017].

Prize for the **best overall performance** on the M.Sc. programme in Advanced Computing [2014].

Rewarded for **excellent performance** while working under Ministry Of Home Affairs, Govt. Of India [2012, 2013].

Awarded the **Deepika Wanganoo Memorial prize** for being ranked 1st (B.A.Sc Electronics) in the entire University of Delhi [2008].

Women's Empowerment and Livelihood Award on the basis of all-round excellence [2002].

RESEARCH GRANTS & FUNDING (INDIVIDUAL)

Global Research Grant awarded by the Centre for Doctoral Studies and King's Worldwide [December 2017].

Graduate School Conference Funds awarded by King's College London Graduate School [August 2016].

Small Grant (Scheme 7) awarded by Institute of Mathematics & its Applications (IMA) [July 2016].

Global Research Grant awarded by King's College London Graduate School and King's Worldwide [March 2016].

Doctoral Training Partnership (DTP) awarded by the Engineering and Physical Sciences Research Council (EPSRC) [2015 - 2018].

Short-term research-visit funding:

Travel support for visiting the *University of Helsinki, Finland* [January, 2018].

PGR Travel Funding (to support presenting at *MACIS 2017 (Vienna, Austria)*) from the Department of Informatics (KCL) [Nov 2017]

Participated in the first dedicated meeting of the IEEE Haptic Codecs (HC) Task Group (P1918.1.1) held at *New York University (Abu Dhabi), UAE* (Presented the contribution on *Haptic Codecs for the Tactile Internet (TI)*) [March 2017].

PGR Travel Funding (to support presenting at *LATA 2017 (Umea, Sweden)*) from the Department of Informatics (KCL) [Feb 2017]

Small Travel Fund from the *University of Warsaw, Poland* [Jan 2017]

Sir Murdoch Travel Fund awarded by awarded by *Murdoch University (Perth, Australia)* [September 2016]

Travel grant awarded by *University of Helsinki, Finland* (for the first summer school on Bioinformatics Data Structures) [Aug 2016]

ERASMUS+ funding for *University of Warsaw, Poland* [Feb 2016]

Travel support for visiting *McMaster University, Hamilton, Canada* [April, 2015].

RESEARCH GRANTS (TEAM)

Member of various research teams of the *King's College London* which received the following grants:

2017 - 2018: International Exchanges Scheme with *Freie Universitt Berlin (Germany)* awarded by the Royal Society [Project: *Development of a novel alignment method for antibodies*].

2016 - 2018: International Exchanges Scheme with *National University of Singapore (NUS)* awarded by the Royal Society [Project: *Algorithms for identifying and correcting misassemblies in genomes*].

July 2016: *Research Grant* awarded by the Onassis Foundation (Greece) [Project: *Computational Musicology*].

Feb 2016: *International Strategic Partnership in Research and Education (INSPIRE)* awarded by the British Council.

2016 - 2018: International Exchanges Scheme with *Consiglio Nazionale delle Ricerche (National Research Council, Italy)* awarded by the Royal Society [Project: *Electro acoustics data indexing*].

2015 - 2017: International Exchanges Scheme with *The University of Newcastle (Australia)* awarded by the Royal Society [Project: *Algorithms and Software for Finding Super/Megabubbles in Assembly Graphs*].

2015 - 2017: International Exchanges Scheme with *The University of Helsinki (Finland)* awarded by the Royal Society [Project: *Genome-Scale Algorithmics*].

TALKS / PRE- SENTATIONS

Presented my research work in the following:

Conferences

- 29th International Symposium on Algorithms and Computation (ISAAC 2018)
- 7th International Conference on Mathematical Aspects of Computer and Information Sciences (MACIS 2017)
- 11th International Conference on Language and Automata Theory and Applications (LATA 2017)
- London Stringology Day and London Algorithmic Workshop (LSD & LAW) 2016.
- Mining Humanistic Data Workshop, Artificial Intelligence Applications and Innovations (MHDW, AIAI) 2016.
- 11th Athens Colloquium on Algorithms and Complexity (ACAC 2016)

Seminars

- Georgia Tech (Georgia Institute of Technology) (2018)
- University of Cape Town (2017)
- Stellenbosch University (2017)
- Bangladesh University of Engineering and Technology.
- California State University Channel Islands.
- The University of Hong Kong.

- National Taiwan University.
- National University of Singapore.
- University of Lisbon (Instituto Superior Tecnico).
- University of Helsinki (1st Summer School on Bioinformatics Data Structures)
- Murdoch University (Perth, Australia)

**COMMITTEE
MEMBERSHIP
&
COMMUNITY
SERVICE**

Guest Editor:

LSD & LAW 2017 Special Issue of the Journal of Discrete Algorithms (JDA SI: LSD & LAW) 2017.

Reviewer:

- Special issue of Theoretical Computer Science *devoted to LSD & LAW 2019*
- Algorithms for Molecular Biology [2018]
- Information Processing Letters [2018]
- Special issue of Discrete Applied Mathematics (DAM) on Stringology [2018]
- Special issue of Fundamenta Informaticae *devoted to Matbio 2017*
- 28th International Conference on Language and Automata Theory and Applications (ISAAC) [2017].
- Special issue of Discrete Applied Mathematics (DAM) *devoted to PSC 2015 and 2016*
- 21st International Conference on Research in Computational Molecular Biology (RECOMB) [2017].
- The Prague Stringology Conference 2016 (PSC) [2015].
- 27th International Workshop on Combinatorial Algorithms (IWOCA) [2016].
- 10th International Conference on Language and Automata Theory and Applications (LATA) [2016].
- 6th Conference on Mathematical Aspects of Computer and Information Sciences (MACIS) [2015].

Publicity Chair:

- International Workshop on String Algorithms in Bioinformatics (StringBio) [2018].

Co-lead Organiser:

- EPSRC UK Algorithms Network's first workshop [2018].

Co-chair:

- London Stringology Day and London Algorithmic Workshop (LSD & LAW) [2017].
- Mathematical-Foundations-in-Bioinformatics 2016 (MatBio) 2016 [2016].

Web-administrator:

- International Federation for Information Processing (IFIP) Working Group 10 (String Algorithmics & Applications)[2014-2018].
- StrignMasters[2016-2018].
- IWOCA[2016-2018].
- CCWA Open Problems Garden[2016-2018].

Student Member:

- Network for Algorithms and Complexity in the UK (funded by EPSRC). (ALGOUK) [2017-2018].
- Haptic Codec Task Group (P1918.1.1) of the IEEE Tactile Internet Working Group (P1918.1) [2017].
- Centre for Combinatorics on Words & Applications (CCWA, Murdoch University, Perth, Australia) [2016-2018].

Member, Organising Committee:

- Mathematical-Foundations-in-Bioinformatics 2017 (MatBio) [2017].

- London Stringology Day and London Algorithmic Workshop (LSD & LAW) [2016].

Member, Scientific Committee: Palermo-London StringMasters [2016].

PROJECTS/ SOFTWARE

HyPo: Super Fast & Accurate Polisher for Long Read Genome Assemblies: HyPo is a HYbrid POLisher that utilises short as well as long reads within a single run to polish a long reads assembly of small and large genomes. Hypo generates significantly more accurate polished assembly in about one-third time with about half the memory requirements in comparison to contemporary widely used polishers like Racon.

SUPBUB: Superbubbles: A tool that, in linear time, finds out superbubbles (special graph-structures) in a directed graph. It is being used in the vg (variation graph) toolkit developed by *Richard Durbin's lab at the Wellcome Trust Sanger Institute*.

Suk: Solid (Unique) Kmers Module: A C++ module (library and stand-alone tool) for finding Solid (Unique) Kmers from genomic reads data.

EIDeS: Elastic-Degenerate Strings: A tool that finds out occurrences of degenerate patterns in an elastic-degenerate text.

SLOG: Simple LOGging library: A simple C++ library for logging timing and memory (Max RSS) usage.

lspf: Longest Successor and/or Previous Factor Array: A tool to compute the longest previous and/or successor factor array/s of a given string in linear time.

Clustered Clumps : A tool that finds out clustered-clumps of: degenerate patterns in a solid text; solid patterns in a degenerate text; and degenerate patterns in a degenerate text.

APDS: Approximate Patter-matching in Degenerate Strings: A tool that finds out (in linear time) approximate occurrences of a degenerate pattern in a given input sequence.

degLPF: Longest Previous Factor (LPF) Array in a Degenerate String: A tool that computes the LPF (Longest Previous Factor) Array for a given degenerate sequence. Currently it takes only the files mimicking FASTA format.

WebSlate: A language/environment to create slides that are displayable in a browser.

Packet sniffer: To capture and analyse packets on a LAN with Level 2 switch and present the information in human-readable form.

Digital security lock: Design and implementation of an 8051 micro-controller based digital security lock, including the embedded software in Assembly language.

WEB PRESENCE

Website/Blog: <https://ritukundu.website>

Github: <https://github.com/Ritu-Kundu>

PUBLICATIONS ** The norm in my research-field is to order the names of the authors lexicographically based on their last names.

R. Kundu, J. Casey, and W. Sung, **Hypo: super fast & accurate polisher for long read genome assemblies**, Biorxiv, 2019.

T. Kociumaka, R. Kundu, M. Mohamed, S. P. Pissis, **Longest Unbordered Factor in Quasilinear Time**, in *29th International Symposium on Algorithms and Computation (ISAAC 2018)*, W. Hsu, D. Lee, C. Liao, Eds., Dagstuhl, Germany: Schloss DagstuhlLeibniz-Zentrum fuer Informatik, pp. 70:1–0:13.

R. Kundu and M. Mohamed, **Editorial**, *Journal of discrete algorithms*, vol. 50, p. 1, 2018. .

M. Alzamel, M. Crochemore, C. S. Iliopoulos, T. Kociumaka, R. Kundu, J. Radoszewski, W. Rytter, and T. Wale, **How much different are two words with different shortest periods**, in *Artificial intelligence applications and innovations*, Cham, 2018, p. 168178.

R. Kundu, T. Mahmoodi, **Mining Acute Stroke Patients Data using Supervised Machine Learning**, in *Mathematical Aspects of Computer and Information Sciences: 7th International Conference, MACIS 2017, Proceedings*, Springer, 2017, pp. 364–377.

C. S. Iliopoulos, R. Kundu and S. P. Pissis, **Efficient Pattern Matching in Elastic-Degenerate Texts**, in *Language and Automata Theory and Applications: 11th International Conference (LATA) Proceedings*, Springer, 2017, pp. 131–142.

I. Fontana, G. Giacalone, A. Bonanno, S. Mazzola, G. Basilone, S. Genovese, S. Aronica, S. Pissis, C. S. Iliopoulos, R. Kundu, A. Fiannaca, A. Langiu, G. L. Bosco, M. L. Rosa, R. Rizzo, **Pelagic Species Identification by using a Probabilistic Neural Network and Echo-sounder Data**, in *Artificial Neural Networks and Machine Learning ICANN 2017: 26th International Conference on Artificial Neural Networks, Proceedings*, Springer, Part 1, 2017, pp. 454–455.

A. Bhardwaj, B. Cizmeci, E. Steinbach, Q. Liu, M. Eid, J. AraUjo, A. E. Saddik, R. Kundu, X. Liu, O. Holland, M. A. Luden, S. Oteafy, V. Prasad, **A candidate hardware and software reference setup for kinesthetic codec standardization**, in *2017 IEEE International Symposium on Haptic, Audio and Visual Environments and Games (HAVE)*, pp. 1–6.

M. Crochemore, C. S. Iliopoulos, T. Kociumaka, R. Kundu, S. P. Pissis, J. Radoszewski, W. Rytter, T. Walen, **Near-Optimal Computation of Runs over General Alphabet via Non-Crossing LCE Queries**, in *International Symposium on String Processing and Information Retrieval (SPIRE)*, Springer, 2016, pp. 22–34.

C. S. Iliopoulos, R. Kundu and M. Mohamed, **Efficient Computation of Clustered-Clumps in Degenerate Strings**, in *Artificial Intelligence Applications and Innovations (AIAI) Proceedings*, Springer, 2016, pp. 510–519.

C. S. Iliopoulos, R. Kundu, M. Mohamed, F. Vayani, **Popping Superbubbles and Discovering Clumps: Recent Developments in Biological Sequence Analysis**, in *Algorithms and Computation: 10th International Workshop (WALCOM) Proceedings*, Springer, 2016, pp. 3–14.

M. Crochemore, C. S. Iliopoulos, R. Kundu, M. Mohamed, F. Vayani, **Linear algorithm for conservative degenerate pattern matching**, *Engineering Applications*

of Artificial Intelligence, vol. 51, 2016, pp. 109–114.

L. Brankovic, C. S. Iliopoulos, R. Kundu, M. Mohamed, S. P. Pissis, F. Vayani, **Linear-Time Superbubble Identification Algorithm for Genome Assembly**, *Theoretical Computer Science*, vol. 609, Part 2, 2016, pp. 374–383.

C. Barton, C. S. Iliopoulos, R. Kundu, S. P. Pissis, A. Retha, F. Vayani, **Accurate and efficient methods to improve multiple circular sequence alignment**, in *Experimental Algorithms: 14th International Symposium, (SEA) Proceedings*, Springer, 2015, pp. 247–258.