

# RESUME of SRIKRISHNAN DIVAKARAN

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## Academic Profile

Dr. Srikrishnan Divakaran is a *Theoretical Computer Scientist* with over 25 years of research and teaching experience, as well as over 5 years of industry experience in computing and finance with leading international companies. He has taught a wide range of courses in Computer Science as well as related disciplines like *Combinatorial Optimization, Bioinformatics/Computational Biology and Data Science*, and his research is in the *design and analysis of algorithms for problems with applications in Computational Biology/Bioinformatics, Combinatorial Optimization and Data Science*. Currently, his primary research focus is on problems with applications in Data Science.

Dr. Divakaran has also played a key role in designing (i) the Bioinformatics specialization as a part of Hofstra's Master's degree in Computer Science, (ii) the B.Tech (ICT) program with a specialization in Computational Sciences at DAIICT, and (iii) the B.S. Computer Science (Honors) program at Ahmedabad University. He has also (i) guided many undergraduate students in gaining a better understanding of research through summer internships and summer research projects; and (ii) mentored many groups of students for ACM programming competitions.

## Education

**Ph.D. (Computer Science)**, Rutgers, The State University of New Jersey, NJ, October 2001.

Thesis: *Approximation Algorithms for problems in scheduling with set-ups*.

Advisor: Prof. Michael Saks.

**B.E. (Computer Science)**, Coimbatore Institute of Technology, India, May 1990.

## Employment Summary

2017- present Associate Professor, Ahmedabad University, Ahmedabad, Gujarat  
2009 – 2016 Associate Professor, DAIICT, Gandhinagar, Gujarat  
2002 – 2008 Assistant Professor, Department of Computer Science, Hofstra University, NY  
1996 – 2001 Graduate Assistant, Department of Computer Science, Rutgers University, NJ  
1994 – 1995 Quantitative Analyst, Coopers & Lybrand Consulting, New York, NY  
1990 – 1993 Systems Programmer, Tata Unisys, India

## Key Research Highlights

(2021 - current) Designed and analyzed algorithms for Image registration (IR). This result has applications in (i) correction of MRI images for small amount of subject motion (patient respiration) during imaging; (ii) spatial normalization - integrate several images of a subject into a single image.

(2022 – current) Developed tools for combining satellite photos, unmanned aerial vehicles (UAV), and multi-sensor farm data to create higher-dimensional maps.

(2021 – current) Designed, Analyzed and implemented some of the core algorithms for performing Reverse Image Search, a method that performs a search based solely on an image input. The Scale-invariant feature transform was used to extract local features from a picture, and the feature matching/alignment graph was used to organize the image features for more efficient searches.

(2020- current) Co-supervising and guiding a doctorate student through the design, analysis, and construction of a Deep Neural Network (DNN)-based emulator for the 6S physics-based atmospheric correction model, which is widely used in many remote sensing applications.

(2020-current) Co-supervising and guiding a doctorate student in the construction of Decision Tree (DT) based models for predicting game score of women's Division-I basketball players by assessing their sleep and recovery data, training statistics, and cognitive state.

(2018-2020) Design and development of approximation algorithms and heuristics for various traditional bin packing problems, as well as variants such as irregular and fractional bin packing, and higher-dimensional bin packing.

(2019-2020) Real-time Car Parking: Designed, analyzed, and developed efficient algorithms for assigning parking spots in real-time in metropolitan settings in order to maximize parking spot use. The solution to this challenge was to model it as a multi-dimensional bin packing problem. This problem was attempted by modeling it as a multi-dimensional bin packing problem.

(2019) Developed fast scalable heuristics and rapid approximation strategies for bin packing based on novel methodologies that have been validated through both theoretical and empirical investigation.

(2019) Exploited partial biological annotations to design fast randomized algorithms for tree alignment, a computationally intractable problem that plays a key role in designing tools for evolutionary analysis of biological sequences.

(2016) Designed and analyzed a fast sub-linear time heuristic for discovering a pattern  $P$  in a text  $T$  by recognizing sub-patterns in the pattern string  $P$ .

(2008-2012) Designed and implemented the first constant approximation algorithms for both online and offline variants of the scheduling with setups problem, an important problem in machine scheduling as well as memory/processor scheduling in operating systems.

## Teaching and Service Highlights

(2021-present) Leading the curriculum development for an industry-focused inter-disciplinary M.Tech program in Computer Science and Engineering with a Data Science specialty. This proposed program places significant emphasis on problem solving through project based learning.

(2019-2020) Played a key role in the development of the B.S. Computer Science (Honors) program's curriculum, which emphasized problem solving through project-based learning and interdisciplinarity. Project-based learning is facilitated through studio/workshop courses, as well as inter-disciplinary minors/specializations (Artificial Intelligence and Machine Learning, Bio-computing and Data Sciences) and foundational courses (multi-disciplinary courses on contemporary themes such as "Water," "Democracy and Justice," and "Environment and Climate Change") co-taught by faculty from various disciplines. (2018) Designed and co-taught a multi-disciplinary pilot course on "Water" in studio format as a part of an Independent Study Project (ISP) open to first year undergraduate students across all schools within the university.

(2018) During my time as an Argosy fellow at Olin College of Engineering, I designed, created, and co-taught parts of the project-based courses on "Data Science" and "Software Systems" alongside academics from Olin College.

(2015-2016) As chair of the Admissions Committee, I developed and streamlined the admissions priorities, timeline, resource requirements, and policies for B.Tech (ICT), M.Tech (ICT), Msc-IT, Msc(ICTARD), M.Des., and PhD programs at DAIICT.

(2011-2014) As a member of the vision committee, I was instrumental in creating a study evaluating the scope and feasibility of offering a Computational Science degree at the undergraduate level at DA-IICT. Following that, after receiving approval from specialists in both industry and other prestigious academic institutions, he assisted in the development of a four-year B. Tech. (Honors) programme with a major in ICT and a minor in Computational Science.

(2005-2007) As the graduate director of Computer Science at Hofstra University, I was instrumental in the establishment of a Master of Science in Computer Science with a focus in Bioinformatics, which is offered in collaboration with the Life Sciences programme in the School of Arts and Sciences.

(2006-2008) As part of the First Year Connections Program, I designed, created, and co-taught a problem-solving course (FYC). This FYC programme is part of the School of Arts and Sciences' honours programme, and it is designed to help freshmen interested in majoring in Computer Science, Mathematics, Philosophy, or Psychology acquire rigour and critical thinking skills. This course was part of a series co-taught by teachers from the departments of Computer Science, Mathematics, and Psychology.

## Honors

Argosy Fellowship, Olin College of Engineering (2018).

The paper titled “Approximation Algorithms for problems in scheduling with set-ups” was listed among the top 25 hot papers in Computer Science that were published in the Journal “Discrete Applied Mathematics” (2008).

United States Copyright TX 5-522-339 for “An Approximation Algorithm for a problem in scheduling with set-ups” (2002).

Graduate Fellowship, DIMACS, Center for Discrete Mathematics and Theoretical Computer Science (1999, 2000).

## Publications

### Articles in Books and Journals

S. Divakaran. Explainable Algorithms for Image Registration with Applications in Medical Imaging, Explainable AI in Healthcare (xAI 2022) (under revision), CRC Press, 2022.

S. Divakaran, Data Science: Principles and Concepts in Modeling Decision Trees, Data Science in Agriculture and Natural Resource Management, 55-74, Studies in Big Data, Springer, 2022.

S. Divakaran and M. Saks, An Online Algorithm for a Problem in Scheduling with Set-ups and Release Times, *Algorithmica* 60(2): 301-315, 2011.

S. Divakaran, Approximation algorithms for constrained generalized tree alignment problem, *Discrete Applied Mathematics* 157(7): 1407-1422, 2009.

S. Divakaran and M. Saks, Approximation Algorithms for problems in Scheduling with set-ups, *Discrete Applied Mathematics*, Volume 156(5), 719-729, 2008.

S. Divakaran, Approximation Algorithms for problems in Scheduling with Set-ups, Graduate Dissertations, Rutgers, The State University of New Jersey, 2001, ISBN: 0-493-47085-9.

S. Divakaran and M. Saks, An Online Scheduling Problem with Job Set-ups, Center for Discrete Mathematics & Theoretical Computer Science, 2000-34.

### Conference and Workshop Articles

Srishti Sharma, Srikrishnan Divakaran, Tolga Kaya and Mehul Raval. A Hybrid Approach for Interpretable Game Performance Prediction in Basketball, International Joint Conference on Neural Networks (IJCNN 2022), Padua, Italy, July 18-23, 2022.

M. Shah, M. Raval and S. Divakaran. A Deep Learning Perspective to Atmospheric Correction of Satellite Images, IEEEiGARSS 2022, Kuala Lumpur, Malaysia, July 17-22, 2022.

M. Shah, M. Raval and S. Divakaran. Deep Learning Based Emulator for 6S Atmospheric Correction Model, IEEE InGARSS 2021 (Virtual Symposium), December 6-10, 2021.

S. Divakaran. Introduction to Spatial and Temporal Data Analysis with R, Workshop on Data Science and Natural Resource Management (DSANRM2021), December 15, 2021.

S. Divakaran. Statistics of Sequence Analysis Using BLAST, Workshop on Application of Biostatistics in Biotechnology and Pharmaceutical Sciences, L.M. College of Pharmacy, October 21-23, 2021.

- S. Divakaran, Data Clustering with Applications in Computational Biology, Big Data: Algorithms, Frameworks and Machine Learning Techniques for Problems in Evolving Networks and Computer Vision, Big Data Analytics 2019, December 17-20, 2019.
- S. Divakaran, Algorithms for Exact String Matching, Learning in Data Science: Models, Algorithms and Tools, Summer School, July 17-22, 2017.
- S.Divakaran, Fast Algorithms for Exact String Matching. Winter School of Combinatorics, Charles University, (Filed as [CoRR abs/1509.09228](https://arxiv.org/abs/1509.09228)), 2016.
- S. Divakaran, An Approximation Algorithm for a Multi-dimensional Resource Allocation Problem, Proceedings of the 13<sup>th</sup> International Conference on Combinatorial Optimization, CO2004, Lancaster, UK, pp 15, March 28-31, 2004.
- S. Divakaran, A framework for Request Scheduling in Web Servers, Special Focus on Next Generation Networks Technologies and Applications, DIMACS, Piscataway, New Jersey, December, 2002.
- S. Divakaran and M. Saks, Online Scheduling with release time and set-ups, Proceedings of the 12<sup>th</sup> International Conference on Combinatorial Optimization, CO2002, CNAM Paris, pp 43, April 8-10, 2002.
- S. Divakaran and M. Saks, Approximation Algorithms for Offline Scheduling with set-ups, Proceedings of the 12<sup>th</sup> International Conference on Combinatorial Optimization, CO2002, CNAM Paris, pp 44, April 8-10, 2002.
- M. Rangarajan, S. Divakaran, T. Nguyen and L. Iftode, Multi-threaded HLRC DSM, 1<sup>st</sup> Workshop on Software Distributed Shared Memory, Rhodes, Greece, June 25, 1999.

### Technical Reports

- S. Divakaran, An Optimal Algorithm for 1-D Cutting Stock Problem, CoRR abs/2001.01531 (2020)
- S. Divakaran, A Fast Scalable Heuristic for Bin Packing. CoRR abs/1904.12467, DOI: 10.13140/RG.2.2.12887.52643 (2019)
- S. Divakaran, Fast Approximation Schemes for Bin Packing. CoRR abs/1902.03422, DOI: 10.13140/RG.2.2.28815.64165 (2019)
- S.Divakaran, A Fast Heuristic for Exact String Matching. [CoRR abs/1512.03512](https://arxiv.org/abs/1512.03512) (2015)
- S.Divakaran, Fast Algorithms for Exact String Matching. [CoRR abs/1509.09228](https://arxiv.org/abs/1509.09228) (2015)
- S. Divakaran, An Optimal Offline Algorithm for List Update. [CoRR abs/1404.7638](https://arxiv.org/abs/1404.7638) (2014)
- S. Divakaran, A Fast Template Based Heuristic For Global Multiple Sequence Alignment. [CoRR abs/1302.6030](https://arxiv.org/abs/1302.6030) (2013)
- S. Divakaran, Approximation Algorithms for Constrained Generalized Tree Alignment Problem, DIMACS Technical Report 2007-21.
- S. Divakaran, Approximation Algorithms for a Multi-dimensional Resource Allocation Problem, DIMACS Technical Report 2006-24.
- S. Divakaran and M. Saks, Online Scheduling with release time and set-ups, DIMACS Technical Report 2001-50.
- S. Divakaran and M. Saks, Approximation Algorithms for Offline Scheduling with set-ups, DIMACS Technical Report 2001-49.

## Courses Taught

**Theory**: Discrete Mathematics, Probability and Statistics, Mathematical Statistics, Design and Analysis of Algorithms, Data Structures and Algorithms, Approximation Algorithms, Online Computation and Combinatorial Optimization.

**Bioinformatics/Computational Biology**: Algorithms for Computational Biology, Statistical Methods for Bioinformatics.

**Data Sciences**: Foundations of Data Science, Elements of Statistical Learning.

**Others**: Operating Systems, Distributed Systems

## Software Skills

Proficient (10+ years) in UNIX/LINUX, UNIX internals, C, C++, Java and Python.

Experienced (5+ years) statistical analysis tools/packages (R, MATLAB).

Experienced (5+years) in the use of tools for design and analysis of Machine Learning Models and Algorithms.

Experienced (3+ years) with sequence analysis tools like BLAST, FASTA and ClustalW/X, and model building tools like BALSALike and HMMER.

Experienced (4+ years) with Lex, YACC, shell scripts, Perl, and various types of assemblers.

Experienced with middleware services such as servlets, JSP, EJB, JNDI, JDBC, RMI and JNI.

## Department and University Service

Convener – M.Tech. Computer Science Program Design Committee (2022–present), Member - Undergraduate Curriculum Committee (2018-2021), Convener - Computer Science Curriculum Design Committee (2018-2021), Member - Foundations (Water Theme) (2018-2019), Convener - Admissions Committee (2015-2016), Convener - International Student Cell (2012-2016), Member - Computational Sciences Feasibility Study, Program Design and Curriculum Development Committee (2011-2013), Member - Under Graduate Curriculum Committee (2011-2014), Member - Theoretical Computer Science Seminar Organizer (2010-2012), Member - Vision Committee (2009-2013), Member - CS Graduate Curriculum Committee (2003-2008), Member - Undergraduate Curriculum Committee (2004-2008), Bioinformatics Program Coordinator (2005-2007), Library Liaison for the Computer Science Department (2005-2007), Graduate Director of Computer Science (2006-2007), Member - FYC (First year connections) program committee (2006-2007), Internship Coordinator for Computer Science (2002-2006), and Member - Academic Computing Committee (2004-2005).