

# SAURABH SUNIL SAWLANI

Indian Institute of Technology Madras

**Address:** #709, Ashok Heights, Mahalakshmi Layout, Bangalore-96

**E-mail:** saurabh@cse.iitm.ac.in    **Phone:** (+91) 996-224-7405

---

## RESEARCH INTERESTS

Combinatorics, Graph Theory, Graph Algorithms, Computational Complexity

---

## PUBLICATIONS

Prasun Kumar, Jayalal Sarma M.N., Saurabh Sawlani. “**On Directed Tree Realisations of Degree Sets**”. *Lecture Notes in Computer Science Volume 7748, 2013, pp 274-285* (WALCOM: Algorithms and Computation)

Anant Dhayal, Jayalal Sarma M.N., Saurabh Sawlani. “**Polynomial Min/Max-weighted Reachability is in Unambiguous Logspace**”. Accepted to *Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2014)*.

---

## RESEARCH PROJECTS

**Computational Aspects of Monotone Duality** *Oct 2014 - present*  
with: *Prof. Jayalal Sarma M. N., Prof. Raghavendra Rao B. V. and Anant Dhayal*, IIT Madras

- Studying the time and space complexity of the monotone duality problem.

**Black-White and Reversible Pebbling Problems on Trees** *Aug 2013 - present*  
with: *Prof. Jayalal Sarma M. N. and Balagopal Komarath*, IIT Madras

- Studied various pebbling games and bounds for pebbling numbers on several graph subclasses.
- Computed bounds for fractional pebbling on pyramid graphs.
- Studied the space and time complexity of reversible pebbling on trees.

**Reachability in Min-poly Graphs** *Jan - July 2014*  
with: *Prof. Jayalal Sarma M. N. and Anant Dhayal*, IIT Madras

- Studied the space complexity of the reachability problem with the number of minimum-weight paths bounded.
- Reduced the Single-source Longest Path problem to reachability in directed acyclic graphs, preserving the bound on the number of maximum-weight paths.
- Developed an Unambiguous Logspace algorithm for reachability in graphs with polynomially many minimum (or maximum) weight paths from the source to any vertex.

**Colouring Delaunay Graphs** *Jun - Jul 2013*  
with: *Prof. Satish Govindarajan*, IISc

- Studied vertex colouring on Delaunay graphs.
- Proved that bounding the degree set of a planar graph does not make the problem easier.

**Applications of Degree Sets and Sequences in Complexity Theory,** *Nov 2012 - Jun 2013*  
with: *Prof. Jayalal Sarma M. N.*, IIT Madras

- Studied the space complexity of Directed Graph Reachability using the graph’s degree set as a constraint.
- Studied the effect of degree constraints on the Graph Isomorphism problem.

**Degree Sets and Applications in Graphs** *May - Sep 2012*  
with: *Prof. Jayalal Sarma M. N. and Prasun Kumar*, IIT Madras

- Derived bounds for the number of vertices in asymmetric directed graphs realising degree sets.
- Studied the Graph Extension problem on Degree Sets for different families of graphs.
- Explored computational problems relating to the tree-extension problem.
- Conference paper published at WALCOM 2013 (International Workshop on Algorithms and Computation)

**Weighting Schemes and the NL vs UL Problem**

- Presented part of my paper “Polynomial Min/Max-weighted Reachability is in Unambiguous Logspace”.
- Presented at the *Theory-meet* seminar at IIT Madras.

**Making nondeterminism unambiguous**

- Presented a paper of the same name by Reinhardt and Allender.
- Presented as part of the course *Advanced Complexity Theory*.

**Coding theory in matrix multiplication**

- Presented the paper “A lower bound for matrix multiplication” by Nader Bshouty.
- Presented as part of the course *Modern Techniques in Theory of Computation*.

**Guard placement for efficient point-in-polygon proofs**

- Presented a paper of the same name by Eppstein, Goodrich and Sitchinava.
- Presented as part of the course *Computational Geometry*.

SCHOLASTIC ACHIEVEMENTS

---

- Secured an All-India Rank of 47 in the Graduate Aptitude Test in Engineering (GATE 2013) in Computer Science, among 200,000+ applicants.
- Secured an All-India Rank of 6 in the Joint Entrance Screening Test (JEST 2013) in Theoretical Computer Science.
- Secured an All-India Rank of 273 in IIT - Joint Entrance Examination 2009, among 400,000+ applicants.
- Secured an All-India Rank of 786 in the All India Engineering Entrance Examination 2009, among close to 1 million applicants.
- Recipient of the National Talent Search Examination (NTSE) Scholarship, by the National Council for Educational Research and Training, India since 2007.
- Received a Gold Medal in Mathematics in the International Assessment for Indian Schools conducted by the University of New South Wales in 2007.
- Awarded the ‘Best Outgoing Student’ award at Deeksha Centre for Learning in 2009.

EDUCATION

---

<b><i>Indian Institute of Technology Madras</i></b> , Chennai, India	<i>May 2015</i>
<ul style="list-style-type: none"><li>• Master of Science in Computer Science and Engineering</li><li>• GPA 8.6/10.00</li></ul>	
<b><i>Indian Institute of Technology Madras</i></b> , Chennai, India	<i>May 2013</i>
<ul style="list-style-type: none"><li>• Bachelor of Technology in Electrical Engineering</li><li>• Minor Stream : Mathematics</li><li>• GPA 7.51/10.00</li></ul>	
<b><i>Deeksha Centre for Learning P. U. College</i></b> , Bangalore, India	<i>May 2009</i>
<ul style="list-style-type: none"><li>• Pre-University — Major subjects: Physics, Chemistry, Mathematics, Computer Science.</li><li>• <b>89.9%</b>, Karnataka Pre-University Education Board</li></ul>	
<b><i>V.V.S. Sardar Patel High School</i></b> , Bangalore, India	<i>March 2007</i>
<ul style="list-style-type: none"><li>• 10th Grade</li><li>• <b>97.28%</b>, Karnataka Secondary Education Examination Board</li></ul>	

---

## WORKSHOP

---

### Summer School at Dept. of Computer Science and Automation, IISc Bangalore

*Jul 2012*

- Series of lectures on various topics in Mathematics and Computer Science.
- Topics included Group Theory, Probability Theory, Algorithms, Machine Learning and Natural Language Processing.

---

## COURSES

---

### Theory Courses:

- Modern Techniques in Theory of Computation
- Advanced Data Structures and Algorithms
- Computational Geometry
- Algorithmic Algebra
- Advanced Algorithms
- Advanced Complexity Theory
- Advanced Theory of Computation
- Graph Theory
- Mathematical Logic
- Data Structures in Scientific Computing
- Theory of Computation

### Other Relevant Courses:

- Probability, Statistics and Stochastic Processes
- Computer Organization and Microprocessors
- Communication Networks
- Computational Engineering
- Networks and Systems
- Stochastic Modelling and the Theory of Queues
- Digital Systems
- Calculus I, II
- Complex Variables and Transform Techniques

---

## TEACHING ASSISTANTSHIP

---

*Dept. of Computer Science and Engineering, IIT Madras, Chennai*

- Advanced Theory of Computation *Aug - Nov 2013*
- Languages, Machines and Computation *Jan - May 2013*
- Mathematical Concepts for Computer Science *Aug - Nov 2014*

---

## PROFESSIONAL EXPERIENCE

---

### Unit Test for BSMAC Scheduler for fixed WiMAX systems,

*Jun - Jul 2011*

*Mentor: Arvind Padmanabhan, Soka Telecom Pvt. Ltd., Bangalore*

- The project involved making an algorithm, code and test vectors for scheduling data to various Subscriber Stations from a particular Base Station.
- Apart from C, it involved basic knowledge of makefiles, and kernel-module programming.
- The project also involved using a documentation-software (Doxygen) and creating a documentation template for the companys code-base, which could then be viewed in HTML format.

---

## SKILLS

---

- Programming Languages: C, Java.
- Scientific Tools: Matlab, Mathematica, LaTeX.

---

## LEADERSHIP ROLE

---

- Coordinator for word-games events and for the newsletter teams at the cultural and technical festivals of IIT Madras. (*Shastra 2011* and *Saarang 2012*)

---

## EXTRA-CURRICULAR ACTIVITIES

---

- Member of hostel teams for Soccer and Table Tennis.
- Participated in Group Dance and Dramatics at institute level.
- Recipient of the Rajya Puraskar (Governor's Medal) in Bharat Scouts and Guides.
- Being a word games enthusiast, I have participated and won in several events at institute and national levels.