




### Faculty Details proforma for DU Web-site

Title	Dr.	First Name	Neelima	Last Name	Gupta	
Designation		Associate Professor				
Address		Dept. of Computer Science University of Delhi Delhi-110007.				
Phone No	Office	27667591 ext.103, 101				
	Residence	5/23 University Road, University of Delhi, Delhi – 110007				
Mobile		---				
Email		ngupta@cs.du.ac.in				
Web-Page		<a href="http://people.du.ac.in/~ngupta">http://people.du.ac.in/~ngupta</a>				
Educational Qualifications						
Degree		Institution			Year	
PhD (Computer Science)		Indian Institute of Technology (IIT), Delhi.			1998	
M.Tech		Indian Institute of Technology (IIT), Delhi.			1989	
M. Sc.		Indian Institute of Technology (IIT), Delhi.			1987	
B. Sc.		Hindu College, University of Delhi.			1985	
Any other qualification						
Career Profile						
<ul style="list-style-type: none"> <li>January 2006 – till date: Associate Professor, University of Delhi, Teaching &amp; Research</li> <li>March 2002 – Dec. 2005: Reader, University of Delhi, Teaching &amp; Research</li> <li>Sept 1989 —March 2002: Lecturer, Senior Lecturer, Reader, Hansraj College (Univ. of Delhi), Teaching.</li> <li>Feb 1989 – Sept 1989, Software engineer, HCL Technologies.</li> </ul>						
Administrative Assignments						
<b><u>At post-graduate level</u></b>						
<b>Current:</b>						
<ul style="list-style-type: none"> <li>Coordinator for work related to PhD-Admissions, since 2010.</li> </ul>						
<b>Previous:</b>						
<ul style="list-style-type: none"> <li>Chair, Department from October 2008 to October 2011.</li> <li>Secretary, Departmental Research Council, October 2011 - 2013.</li> <li>Member Apex committee and special Invitee to Standing Committee to design guidelines for the implementation of semester scheme at UG level, 2009-10.</li> <li>Coordinator for Admissions related confidential work for several years.</li> <li>Placement Advisor for several years.</li> </ul>						
<b><u>At undergraduate level</u></b>						
<ul style="list-style-type: none"> <li>Teacher-In-Charge at the Department of Computer Science, Hansraj College for several years.</li> <li>Coordinator in College admission for several years.</li> <li>Convener of Science admissions, 1999.</li> </ul>						
Areas of Interest / Specialization						

My primary areas of interest include ‘algorithms’ and ‘data mining’.

### Approximation Algorithms

Network design problems occur naturally at many places. For example, a bank may want to install a number of ATMs in a city. Each location in the city is associated with an installation cost. The bank would be interested in identifying the locations to install these ATMs in such a way that the total installation cost plus the cost to service its clients is minimized. This is a typical example of a facility location problem where the ATMs serve as the facilities. Many similar examples can be quoted for the problem such as setting up of fire-brigade stations. In case of the problem of setting up of fire-brigade stations, one may also be interested in connecting these stations so that in case one station does not have a wagon to satisfy a client, the same can be obtained from a nearby station. In such a case, one would be interested in identifying the locations where in addition to the installation cost and service cost, the cost of connecting the fire-brigade stations is also taken into account. This is an example of a \lq connected \rq facility location problem.

In another variation of fire-brigade problem, one may specify the maximum number of wagons available at a particular station. This gives rise to what is known as \lq capacitated \rq facility location problem.

These problems are known to be NP-hard. I am working on developing approximation algorithm for these and other network-design problems like Rent-or-Buy. Various approaches like \lq local search \rq and \lq primal-dual \rq have been used for the purpose.

Clustering is a problem which finds application every where in data analysis. Traditional Clustering problems try to optimize the distances from the center/mean of the cluster. They do not take the connectedness of the points under consideration. Connected k center and connected k means are the problems in which one requires that given some relationship data amongst the objects, the objects within a cluster are related. This makes the problem harder. We are looking at the problem of connected k means.

### Network Algorithms

Ad-hoc networks have been proposed to support scenarios where no wired infrastructure exists. They can be set up quickly where the existing infrastructure does not meet application requirements for reasons such as security, cost, or quality. Examples of applications for ad hoc networks range from military operations, emergency disaster relief to community networking and interaction between attendees at a meeting or students during a lecture.

In Mobile Ad hoc Networks (MANET) each node has limited wireless transmission range, so the communication depends on the cooperation of intermediate nodes. Most routing protocols in ad hoc networks rely on implicit trust-your-neighbor relationship to route packets among participating nodes. Lack of infrastructure, central controlling authority and the properties of wireless links make Mobile Ad hoc Networks vulnerable to threats in security. Attacks range from passive eavesdropping in which the attacker may get access to secret information thereby violating the confidentiality to active impersonation, message replay, and message distortion. Attacks may be by an external source, which is not a part of the network and hence does not have valid signatures or could be from a compromised node within the network. Chances of a node being compromised in a hostile environment (e.g., a battlefield) with relatively poor physical protection are non-negligible. Therefore, we should not only consider attacks from outside a network, but also take into account the attacks by compromised nodes within the network. Since the external attackers do not have valid digital signatures, erroneous routing information can be identified using cryptographic schemes. However, an erroneous message signed by a compromised node cannot be distinguished from a correct message from a non-compromised node using digital signatures.

Several types of attacks on ad hoc networks have been discussed in literature. Some of these (blackhole or grey holes attack, rushing attack, wormhole attacks) cripple the network by disrupting the route of the legitimate packets while others (flooding attack) inject too many extra packets in the system thereby consuming system resources like bandwidth, memory/computational power of nodes. We are interested in devising methods to protect the routing protocols in ad hoc networks against various types of attacks or reduce the impact of the attacks.

### Data Mining and Bio-informatics

One of the stages in the drug discovery is to discover the set of genes responsible for the disease. With the help of microarray experiments biologists are able to study the expression of thousands of genes under a large number of conditions simultaneously. The large scale of the data makes it challenging to analyze it to extract any biologically significant information from it. The output of a microarray experiment is the gene expression data. The gene expression data has the expression of thousands of genes under thousands of conditions. One approach to reduce the complexity of the task is to group the genes showing similar expression patterns into clusters wherein each cluster is regulated by one or more transcription factors and is responsible for one biological function.

Standard Clustering algorithms like k-means clustering work well for small data sets but fair poorly when the number of experimental conditions is large as they cluster the genes based on their expressions under all the conditions. However, the genes and hence the cellular processes for which they are responsible, are generally affected by a small subset of conditions. Most of the other conditions, which do not contribute to the cellular process, add to the background noise. Hence we are interested in clustering genes as well as that small subset of conditions under which they are co expressed. Such clusters are called bi-clusters or Transcription Module in the language of biologists. The name TM is derived from the fact that each set of genes is expected to be affected by one or more transcription factors. As a gene may be responsible for several cellular activities it may be included in more than

one bi-clusters. Having clustered genes of similar nature, next question is what makes them behave similarly. Thus one is interested in finding patterns in their genetic composition. These patterns are called motifs. Several algorithms are known to discover motifs in sequences. Earlier, people believed that only one

TF was responsible for the similar expression pattern of several genes. Recently, people have started exploring the possibility of several motifs being responsible for the similarity, and some positive results have been obtained to this effect. Thus an interesting question evolves: If we know the set of motifs occurring on the promoter regions of a set of genes and their locations too, can we find out certain patterns (some combinations of these motifs) which may be causing the genes to behave similarly.

### Subjects Taught

#### Undergraduate Level

1989 – 2002: Systems Analysis and Design, Computer System Architecture, Programming languages from COBOL, Pascal to C, Discrete Structures, Data Structures, Algorithms, Theory of Computation/ Automata Theory, Statistical Techniques

#### Postgraduate Level

2002 – till date: Systems Programming, Data Communication and Computer Networks, Design and Analysis of Algorithms, Algorithms in Bioinformatics, NP Completeness and Approximation Algorithms, Discrete Mathematics.

### Research Guidance

#### Ph.D. Completed

Sandhya Aneja  
Seema Agarwal  
Manisha Bansal

#### Ph.D. under progress

Rahul Johari  
Geeta Gupta  
Parveneh Mansouri  
Sonika Arora  
Aditya Pancholi

### Publications Profile

In refereed/peer reviewed journals/conferences

Preeti Nagrath, Sandhya Aneja, Neelima Gupta and Sanjay Madria. May 2015. "Protocols for Mitigating Blackhole Attacks in Delay Tolerant Networks." Springer journal on Wireless Networks, DOI 10.1007/s11276-015-0959-3. IF = 1.055 (SCI Indexed).

Rahul Johari, Neelima Gupta, Sandhya Aneja. May 2015. "CONCOR: context-aware community-oriented routing for intermittently connected network." EURASIP Journal on Wireless Communications and Networking, DOI 10.1186/s13638-015-0357-7. IF = 0.80 (SCI Indexed).

P. Mansouri, B. Asady, N. Gupta. April 2015. "The Bisection Artificial Bee Colony algorithm to solve Fixed point problems", Elsevier Journal of Applied Soft Computing. (Impact Factor 2.679), Volume 26, pp: 143-148, (SCI Indexed).

Venkatesan T. Chakaravarthy, Neelima Gupta, Aditya Pancholi, Sambuddha Roy. February 2015. "Fast Algorithms for Constrained Graph Density Problems." 9th International Workshop on Algorithms and Computation, 8-19.

Sonika Arora, Venkatesan T. Chakaravarthy, Kanika Gupta, Neelima Gupta, Yogish Sabharwal. December 2014. "Replica Placement on Directed Acyclic Graphs." 34<sup>th</sup> Annual Conference on Foundation of Software Technology and Theoretical Computer Science, 213-225.

Sonika Arora, Neelima Gupta, Samir Khuller, Yogish Sabharwal, Swati Singhal. August 2014. "Facility Location with Red-Blue Demands." OR Letters, 42, 462-465, IF = .624 (SCI Indexed).

Anirudh Chakravorty, Neelima Gupta, Neha Lawaria, Pankaj Kumar, Yogish Sabharwal. December 2013. "Algorithms for the Relaxed Multiple-Organization Multiple-Machine Scheduling Problem", 20th International Conference on High Performance Computing:30-38.

Sonika Arora, Venkatesan T. Chakaravarthy, Neelima Gupta, Koyel Mukherjee, Yogish Sabharwal. December 2013. "Replica Placement via Capacitated Vertex Cover.", 33rd Annual Conference on Foundation of Software Technology and Theoretical Computer Science: 263-274.

Geeta Aggarwal and Neelima Gupta. December 2013. "BEMI Biclustor Ensemble Using Mutual Information", 12th International Conference on Machine Learning and Applications, Florida, USA, IEEE. 321-32.

Rahul Johari, Neelima Gupta, Sandhya Aneja. November 2013 "CACBR: context aware community based routing for intermittently connected network.", 10th ACM International Symposium on Performance Evaluation of Wireless Ad Hoc, Sensor, and Ubiquitous Networks, Barcelona, Spain, 137-140.

Geeta Aggarwal and Neelima Gupta. July 2013. "BiETopti-BiClustering Ensemble using Optimization Techniques", ICDM, NY,USA, 181-192.

Neelima Gupta, Sandhya Aneja. April 2013. Discovering Minimum Exposed Path to Attack in Mobile Ad hoc Networks in optimal  $O(|P|)$  time after pre-processing. International Journal of Next Generation Computing, 4(1).

P. Mansouri, B. Asady, N. Gupta. 2013. The Combination of Bisection Method and Artificial Bee Colony Algorithm for Solving Hard Fix Point Problems. Soft Computing Models in Industrial and Environmental Applications, Advances in Intelligent Systems and Computing, Volume 188, pp 33-41.

P. Mansouri, B. Asady, N. Gupta. April 2012. An Approximation Algorithm for Fuzzy Polynomial Interpolation with Artificial Bee Colony algorithm, Elsevier Journal of Applied Soft Computing (Impact Factor 2.612), Volume 13, Issue 4, 1997-2002.

Sandhya Aneja, Neelima Gupta. 2012. Reliable Distance Vector routing protocol to handle Blackhole and Selfish (RDVBS) nodes in Ad hoc Networks. IJNGC 3(1).

Garima Gupta, Preeti Nagrath, Sandhya Aneja and Neelima Gupta. October 2012. "Reference Based Approach to Mitigate Blackhole Attacks in Delay Tolerant Networks", In proceedings of ACM Q2SWiNET.

M. Bansal, N. Garg, N. Gupta. September 2012. "A 5-Approximation for Capacitated Facility Location", 20th European Symposium on Algorithms, 133-144.

Ankit Aggarwal, L. Anand, Manisha Bansal, Naveen Garg, Neelima Gupta, Shubham Gupta and Surabhi Jain. June 2012. "A 3-approximation for facility location with uniform capacities", Journal of Mathematical Programming (Impact Factor = 1.97).

Sandhya Khurana and Neelima Gupta. 2011. "End-to-end protocol to secure ad hoc networks against wormhole attacks ", In Wiley Journal of Security AND Communication Networks(Impact Factor = .356.), volume 4, issue 5, pp. 994 – 1002.

Neelima Gupta and Seema Aggarwal, 2010. "MIB: Using Mutual Information for Biclustering gene expression data",

Elsevier Journal of Pattern Recognition (Impact Factor 3+), [Volume 43, Issue 8](#), August 2010, Pages 2692-2697.

Neelima Gupta and Sumit Chopra. 2007. “[Optimal, output-sensitive algorithms for constructing the upper envelope of line segments in parallel](#)”, IEEE Journal of Parallel and Distributed Computing (Impact Factor 1.065), pp. 772 – 782.

Neelima Gupta and Sandeep Sen. 2008. “[Faster Output-Sensitive Parallel algorithms for 3D Convex hulls and Vector maxima](#)”, IEEE Journal of Parallel and Distributed Computing (Impact Factor 1.065). Volume 63, Issue 4, Pages 488-500.

Neelima Gupta and Sandeep Sen. 2001. “[Parallel output size sensitive algorithm for Hidden Surface removal for terrains](#) Algorithmica (Impact Factor= 1.239), 31,2001,179-207.

Sandeep Sen and Neelima Gupta. 1999. “[Distribution-sensitive algorithms](#)”. Nordic Journal of computing, 6, 194-211.

Neelima Gupta and Sandeep Sen. 1997. “[Optimal, output-sensitive algorithms for constructing planar hulls in parallel](#)”. Computational Geometry: Theory and Applications (Impact Factor = 1.328), 8, 151-166.

In refereed/peer reviewed conferences:

Manisha Bansal, Naveen Garg and Neelima Gupta, A 5-approximation for capacitated facility location, accepted in European Symposium on Algorithms (ESA) 2012.

Neelima Gupta, Aditya Pancholi and Yogish Sabharwal, Feb 2011. “Clustering with Internal Connectedness”, In proceedings of WALCOM.

Ankit Aggarwal, L. Anand, Manisha Bansal, Naveen Garg, Neelima Gupta, Shubham Gupta and Surabhi Jain, 2010. “A 3-approximation for facility location with uniform capacities”, In Proceedings of IPCO.

Vasudha Bhatnagar, Sharanjit Kaur and Neelima Gupta, June 2009. “Identifying Informative Dimensions in Streaming Clusters”, In Proceedings of IEEE ICIS.

Leena Singhal, Neha Jain, Geeta Gupta and Neelima Gupta, December 2009. “Discovering Maximal Subsequence Patterns in Sequence Database”, International Conference on Methods and Models in Computer Science (ICM2CS09). JNU, Delhi, India

Neelima Gupta and Seema Agarwal, December, 2009. “Modeling Biclustering as an optimization problem using Mutual Information”, International Conference on Methods and Models in Computer Science (ICM2CS09) JNU, Delhi, India

Neelima Gupta and Sandhya Khurana. 2008. “[SEEEP: Simple and Efficient End-to-End Protocol to secure Ad Hoc Networks against Wormhole Attacks](#)”. Proceedings of International Conference on Wireless and Mobile Communications, ICWMC, IEEE.

Sandhya Khurana and Neelima Gupta. 2008. “[FEEEPVR: First End-to-End Protocol to secure Ad Hoc Networks of Variable Range against Wormhole Attacks](#)”. Proceedings of International Conference on

Emerging Security Information, Systems and Technologies, SECURWARE , IEEE.

Neelima Gupta and Seema Aggarwal, MIB: Using Mutual Information for Biclustering High Dimensional Data, IADIS, European Conference on Data Mining 2008.

Neelima Gupta and Seema Aggarwal. 2008 “[MIBiClus: Mutual Information based Biclustering Algorithm](#)” Proceedings of World Academy of Science, Engineering and Technology, Vol 30,

Neelima Gupta and Seema Aggarwal. 2008. “[MIB: Using Mutual Information for Biclustering High Dimensional Data](#)” IADIS, European Conference on Data Mining.

Neelima Gupta and Seema Aggarwa. 2008. “[SISA: Seeded Iterative Signature Algorithm for Biclustering Gene Expression data](#)”. IADIS, European Conference on Data Mining.

Sandhya Khurana, Neelima Gupta and Nagendra Aneja. 2007. “[Minimum Exposed Path to the Attack \(MEPA\) in Mobile Ad hoc Networks](#)”. International Conference on Networking,, IEEE.

Sandhya Khurana, Neelima Gupta and Nagendra Aneja. 2006. “[Reliable Ad-hoc On-demand Distance Vector Routing Protocol](#)” International Conference on Networking,, IEEE

Ashwini Garg, Ashish Mangla, Neelima Gupta and Vasudha Bhatnagar. 2006. “[PBIRCH: A Scalable Parallel Clustering algorithm for Incremental Data](#)”. IDEAS, Tenth International Database Engineering and Applications Symposium, IEEE.

Neelima Gupta, Sumit Chopra and Sandeep Sen. 2001. “[Optimal, output-sensitive algorithms for constructing the upper envelope of Line Segments in parallel](#)”. Proceedings of Foundations of Software Technology and Theoretical Computer Science (FSTTCS), Bangalore India,

Neelima Gupta and Sandeep Sen. 1999. “Efficient parallel output size sensitive algorithms”. WOPA, held as part of ACMs third Federated Computing Research Conference, USA.

Sandeep Sen and Neelima Gupta. 1998. “Distribution sensitive algorithms”. SWAT, 6th Scandinavian Workshop on Algorithm Theory, Stockholm, Sweden, [Lecture Notes in Computer Science](#) Springer 1998.

Neelima Gupta and Sandeep Sen. 1998. “An improved output-size sensitive parallel algorithm”. International Parallel Processing Symposium / 9th IEEE Symposium on Parallel and Distributed Processing IPPS/SPDR,

Neelima Gupta and Sandeep Sen. 1996. “Faster Output-Sensitive Parallel Convex hulls for  $d \leq 3$ : Sublogarithmic algorithms for small outputs”. Proc. Of 12<sup>th</sup> Annual ACM Symposium on Computational Geometry,

Conference Organization/ Presentations



July 2013 –June 2014

Member, Organizing Committee, ACM India Annual Event, (Co-chair, Research Scholar Day), IIT Delhi.

Previous

Organized a MEGA EVENT under the ACM Delhi-NCR Chapter, April 2013.

Member, Organizing Committee, The Legacy of Srinivasa Ramanujan , 17-22 December, 2012, University of Delhi, Delhi, India.

Organized Alan Turing Centenary Celebrations Event under ACM Delhi NCR Chapter on September 28<sup>th</sup>, 2012.

Organized Teachers Training Program in Algorithms, March 2013, University of Delhi, New Delhi.

Organized a MEGA EVENT under the ACM Delhi-NCR Chapter, March 2012.

Organized, International Workshop on Ad hoc Networks, July 2011, March 2012.

Co-organized, International Workshop on Algorithms and Computation, 18-20 Feb 2011, in collaboration with IIT Delhi.

Invited Talk on “collaborative attacks on ad hoc networks”, international conference on mobile data management held in Kansas City, USA, May 23-26 2010.

Indocrypt 2009, New Delhi, India, December 13-16, 2009. Co-organized with DRDO.

Organized Teachers Training Program in Algorithms, April 2009, University of Delhi, New Delhi.

Organized a “Workshop on Bio-informatics”, September 2008, University of Delhi, New Delhi.

Organized a “Workshop on Bio-informatics”, in conjunction with FSTTCS, December 2008, IIT Delhi, New Delhi.

Member, Organizing Committee, International Conference on Information Systems Security (ICISS-2007), University of Delhi, India.

Member, Organizing Committee, 13<sup>th</sup> International Conference on Management of Data (COMAD), December 2006, IIT Delhi

Member, Organizing Committee, 10<sup>th</sup> International Database Engineering and Applications Symposium”, New Delhi, December 2006

Member, Organizing Committee, VLDB Delhi Summer School on Frontiers in Database Technology, June 2004, IIT Delhi.

Invited Talk: Presented a position paper titled “Collaborative Attacks in Ad hoc Networks” 2009. Indo-US Cybersecurity, Cybercrime and Cyber-forensics Conference at Kochi – India, August 19-21.

Invited Talk: Presented a position paper titled “Collaborative Attacks in Ad hoc Networks” , 2010, Workshop on Research Directions in Situational aware Self-managed Proactive Computing in Wireless Ad hoc Networks (In conjunction with 11<sup>th</sup> International Mobile Data Management Conference) on May 23, 2010 in Kansas City, USA.

**Research Projects (Major Grants/Research Collaboration)**

Principal Investigator, University Research Grant for project titled “Analysis of Gene Expression Data” March 2007 - March 2010.

Principal Investigator, University Research Grant for project titled “Analysis of Gene Expression Data using Cluster Ensemble Techniques” March 2010 and continued till date.

**Awards and Distinctions**

NBHM scholarship from 1985 -1987

GATE scholarship from 1987 – 1989

Declined University Scholarship for scoring second rank in University in favour of NBHM

**Association With Professional Bodies:**

Member, ACM SIGACT

Member, ACM SIGCOMM

Member, ACM SIGKDD

Member, IEEE



**Other Activities**

Member, Technical program committee (TPC), IEEE DaWaK, 2014.  
Member, Technical program committee (TPC), IEEE DaWaK, 2013.  
Reviewer, Elsevier Journal of Information Processing Letters.  
Member, Advisory Committee, MCA course curriculum, LBSIM.  
Member, Syllabus Committee, CBSE.  
Coordinator, ACM Delhi-NCR Chapter North Zone.  
Organized a MEGA EVENT under the ACM Delhi-NCR Chapter, March 2012.  
Member, Technical program committee (TPC), IEEE Symposium on Reliable Distributed Systems 2012.  
Visiting faculty, Indian Institute of Technology (IIT) Delhi (June 2005 - July 2005).  
External Reviewer, ESA 2007.  
“Data Security and Privacy” and “Intrusion Detection” tracks co-chair in Indo-US Bilateral workshop on Cyber-security, Cybercrime and Cyber-forensics 2009.  
Reviewer, IEEE Journal of Parallel and Distributed Computing.  
Reviewer, Elsevier Journal of Theoretical Computer Science  
Member, Technical program committee (TPC), IEEE Symposium on Reliable Distributed Systems 2010.  
Member, Technical program committee (TPC), IEEE Symposium on Reliable Distributed Systems 2009.  
Member, Technical program committee (TPC), International Conference on Contemporary Computing 2009.  
Member, Technical program committee (TPC), INDOCRYPT 2009.  
International Advisory Committee, ICM2CS 2009.