CURRICULUM VITAE

Prof. Adrijit Goswami
Department of Mathematics
Indian Institute of Technology Kharagpur

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RESEARCH AREAS

Operations Research, Data Mining, Cryptography and Network Security

RESEARCH STATEMENT

Operations Research: I am particularly working on inventory management. Due to the role of social media, information technology, changing marketplace bring a challenge for inventory management in different industries. In this regard, we invent to invent novel strategies for better customer service within minimum cost and shortest time for different inventory management problems. In particular we investigate solution to inventory management considering the fuzziness of data records, fuzzy stochastic variables such as demand and using hesitant fuzzy set.

Data Mining: In the field of data mining, I focus on developing efficient algorithms to discover hidden patterns from large volumes of data and searching novel models to use the discovered information. The specific areas are frequent pattern mining, association rule mining, web usage mining, and data mining techniques under fuzzy environment. Also, I am working in concise representation of patterns in different pattern mining framework that reduces the number of patterns and eliminates the redundant patterns.

Cryptography and Network Security: In this field we are working on remote user authentication, access control in wireless sensor networks and hierarchical access control. We mainly explore some novel schemes to solve access control problems and user authentication problems in wireless sensor networks and addressing key management issue in hierarchical access control. More specifically, we are proposing schemes for user authentication and key agreement for medical information system.

EDUCATION

Undergraduate

1979-83		BSC	1983	Mathematics

Graduate

1983-85	Jadavpur University, Kolkatta,West Bengal	MSC	1985	Mathematics
1987-92	Jadavpur University, Kolkatta,West Bengal	Ph.D.	1992	Mathematics, Operations Research, Thesis Supervisor: Prof S.K. Chowdhury **Thesis Title: Some Problems on Inventory Control**

APPOINTMENTS and POSITIONS

Academic

Current

2007 – present	Professor of Mathematics, Department of Mathematics, Indian Institute of Technology Kharagpur (IITKGP)
2014 – 2016	Chairman, JEE(Advanced), IITKGP
2014 – present	Local Coordinator, GIAN, IIT Kharagpur

Past

1992 - 1995	Visiting Lecturer, Department of Mathematics, IITKGP
1995 - 2000	Assistant Professor, Department of Mathematics, IITKGP
2000 – 2007	Associate Professor, Department of Mathematics, IITKGP

Non-Academic

1998 – 2000	Assistant Warden, Patel hall, IITKGP
2002 – 2004	Warden, LLR hall, IITKGP
2004 – 2006	Organizing Vice Chairman, IITJEE, IITKGP
2009 – 2013	Chairman, Hall Management Center, IITKGP

PROFESSIONAL MEMBERSHIPS

- Life term member of Operation society of India
- Life term member of ISTAM

MEMBER, EDITORIAL BOARD

- Member, Editorial Board : International Journal of Fuzzy Systems and Rough Systems
- Member, Editorial Board : International Journal of Mathematics in Operational Research (IJMOR)
- Associate Editor : International Journal of Applied and Computational Mathematics

PROJECTS

- Project Title : GIAN IMPLEMENTATION (GIA)
    - Principal Investigator : Prof. A. N. Samanta
    - Role: Co-Principal-Investigators
    - Funding Period: 01/12/2015 –15/02/2018
  - Total amount: Rs. 5000000/-
  - Sponsor: MHRD
  - Status: Ongoing
- Project Title : DEVELOPMENT OF GIAN PORTAL (DVG)
    - Principal Investigator: Prof. A. N. Samanta
    - Role: Co-Principal-Investigators
    - Funding Period: 16/02/2015 – 15/02/2018
    - Total amount: 15000000/-
    - Sponsor: MHRD
    - Status: Ongoing
- Project Title : CREATION OF GIAN ARCHIVAL FACILITY (DVG-2)
    - Principal Investigator: Prof. A. Goswami
    - Role: Principal-Investigators
    - Funding Period: 01/07/2016 – 30/06/2019
    - Total amount: Rs. 5000000/-
    - Sponsor: MHRD
    - Status: Ongoing

PROFESSIONAL ACTIVITIES

Teaching:

1992 - Present Mathematics I, Mathematics – II, Transform Calculus, Partial Differential Equation, Operations Research, Optimization Techniques, Multi Objective Programming, Programming Languages, Design and Analysis of Algorithms, Object oriented System Design, Systems Programming, Data

	Structure and Algorithm, File Organization and Database Systems, Data Mining
2011 - 2012	Introduced a lecture series in Operation Research as a NPTEL course, IITKGP, India.

Ph.D. Supervising (Completed)

1. Sampa Bose (Nee Pal), Ph.D (obtained 1995) – Some Problems on Inventory Management.
2. O. P. Vyas, Ph.D (obtained 2000) – Empirical Study of QoS and Congestion Control Mechanism in ATM Networks.
3. P. K. Panigrahi, Ph.D (obtained 2002) – Some Aspects of Fuzzy Object Oriented Database Systems.
4. Awadhesh Kumar Sharma, Ph.D (obtained 2005) – Some Studies on Fuzzy Multidatabases.
5. Sujit Kumar De, Ph.D (obtained 2005) – Some Problems in Inventory Management under Fuzzy Environment.
6. R. Bala Venkata Subramanyam Ph.D (obtained 2007) – Some Aspects of Fuzzy Data Mining Techniques for Quantitative Databases.
7. Gour Chandra Mahata Ph.D (obtained 2007) - Mathematical Modeling in Inventory Replenishment Policies under Fuzzy Environment: Some Problems.
8. Lakshmi Narayan De, Ph.D (obtained 2011) – Some Studies on Probabilistic Model Related to Inventory Management.
9. Om Prakash, Ph.D (obtained 2013) – Some Deterministic and Probabilistic Models in Production Planning and Inventory Control.
10. Ravi Shankar Kumar, Ph.D (obtained 2013) – Mathematical Modeling of Inventory Control Problems in Fuzzy Random Environment.
11. Arindum Mukhopadhyay, Ph.D (obtained 2015) – A mathematical Study of Some Inventory and Supply Chain Models.
12. Odelu Vanga, Ph.D (obtained 2016) – Design and Analysis of Hierarchical Access Control and Key Authentication Protocols for Distributed Computer networks.

Ph.D. Supervising (Ongoing)

1. Jayakrushna Sahoo, Area of Research: Computer Science (Data Mining): Thesis Submitted (Title: Mining concise representation of association rules with and without using utility constraint).
2. Dipana Jyoti Mohanty Area of Research: Operations Research
3. Ramalingeswara Rao Thottempudi Area of Research: Theoretical Computer Science
4. Snigdha Karmakar Area of Research: Operations Research
5. Arjun Paul Area of Research: Operations Research
6. Chayanika Rout Area of Research: Operations Research

Postdoctoral Mentee

1. Ravi Shankar Kumar, PDF(Obtained 2016)

SERVICE

Internal Faculty Advisory Board, Department of mathematics, IITKGP, 2009-2012.
Faculty In charge, Departmental Time tabling, Dept. of mathematics, IITKGP, 2014 – 2016.
Faculty In Charge, Departmental Computer Labs, Dept. of mathematics, IITKGP, 2011-2013.
Vice Chairman, West Bengal Joint Entrance Examination 2013 , 2014.

PUBLICATIONS

1) S.A. Sanyal, **A.Goswami**, D.R. Poddar, S.K. Chowdhury, "A microprocessor controlled programmable switching module for phased array applications", *Proceeding of IEEE*, Vol. 76, No. 5, 639—638 (1988).

2) **A.Goswami**, K.S. Chaudhuri, "EOQ model for an inventory with linear trend in demand and finite rate for replenishment considering shortages", *International Journal of Systems Science*, 181—187 (Tayler and Francis, UK) (1991).

3) **A.Goswami**, K.S. Chaudhuri, "On an inventory model with time-dependent demand rate, production rate, and unit cost of production allowing shortages", *ASME Periodicals, Modeling Simulation and Control* **,** *C*, 27 (2), 27— 42 , France (1991).

4) **A.Goswami**, K.S. Chaudhuri, "An EOQ model for deteriorating items with shortages and a linear treand in demand", *Journal of the Operational Research Society*, 42 (12), 1105—1110, UK (1991).

5) **A.Goswami**, K.S. Chaudhuri, "An EOQ model for incremental discount pricing systems with two price break points", *ASME Periodicals, Modeling Simulation and Control, C*, 29 (2), 1—15, France (1992).

6) **A.Goswami**, K.S. Chaudhuri, "Variations of order – level inventory models for deteriorating items", *International Journal of Production Economics*, 27, 111—117, Netherlands, Elsevier Publication (1992).

7) **A.Goswami**, K.S. Chaudhuri, "An EOQ model for items with two levels of storage for a linear trend in demand", *Journal of the Operational Research Society*, 43 (2), 157—167, (UK) (1992).

8) **A. Goswami**, "An EOQ model for deteriorating items with shortages and a linear trend in demand: response", *Journal of the Operational Research Society*, 43 (9), 932—932 (UK) (1992).

9) S. Pal, **A. Goswami**, K.S. Chaudhuri, "A deterministic inventory model for deteriorating items with stock–dependent demand rate", *International Journal of Production Economics*, 32, 291—299, Netherlands, Elsevier Publication (1993).

10) **A. Goswami**, "On an incremental quantity discount policy", *Bulletin of Calcutta Mathematical Society*, 86, 127—134 (1994).

11) S. Bose, **A. Goswami**, K.S. Chaudhuri, "An EOQ model for deteriorating items with linear time–dependent demand rate and shortages under inflation and time discounting", *Journal of the Operational Research Society*, 46, 771—782, (UK) (1995).

12) B.C. Giri, S. Pal, **A. Goswami**, K.S. Chaudhuri, "An inventory model for deteriorating items with stock-dependent demand rate", *European Journal of Operations Research*, 95(3), 604—610 (1996).

13) B.C. Giri, **A. Goswami**, K.S. Chaudhuri, "An EOQ model for deteriorating items with time varying demand and costs", *Journal of the Operational Research Society*, 47, 1398—1405, (UK) (1996).

14) J. Ray, **A. Goswami**, K.S. Chaudhuri, "On an inventory model with two levels of storage and stock-dependent demand rate", *International Journal of Systems Science*, 29 (3), 249—254 (1998).

15) S.K. Das, **A. Goswami**, S.S. Alam, "Multiobjective transportation problem with interval cost, source and destination parameters", *European Journal of Operations Research*, 117, 100—112 (1999).

16) S. De, **A. Goswami**, "A replenishment policy for items with finite production rate and fuzzy deterioration rate", *Opsearch***,** 38 (4), 419— 430 (2001).

17) S. De, **A. Goswami**, "EOQ model with constant demand and fuzzy lead time", *Book: Applicable Mathematics: Its perspectives and challenges*, 336—346 (2001), Narosa Publication.

18) S. De, P. K. Kundu, **A. Goswami**, "An economic production quantity inventory model involving fuzzy demand and fuzzy deterioration rate", *Journal of Applied Mathematics and Computing*, 12, (1-2), 251—260 (2003).

19) P.K. Panigrahi and **A. Goswami**, "Algebra for fuzzy object oriented database language", *International Journal of Computers and Applications*, 26 (1), 54—64 (2004).

20) G.C. Mahata, **A. Goswami**, D.K. Gupta, "A joint economic lot size model for purchaser and vendor in fuzzy sense", *International Journal of Computer and Mathematics with Applications*, 50, 1767—1790 (2005).

21) **A. Goswami**, "Mining maximally general classification rules from databases: a rough set approach", *Book: Modelling and Simulation: Life Sciences, Materials and Technology*, 188—199 (2005), Narosa Publication.

22) R.B.V. Subramanyam and **A. Goswami**, "A fuzzy data mining algorithm for incremental mining of quantitative sequential patterns", *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, 13 (6), 633– 652 (2005).

23) S.K. De and **A. Goswami**, "An EOQ model with fuzzy inflation rate and fuzzy deterioration rate when a delay in payment is permissible", *International Journal of Systems Science*, 37 (5), 323– 335 (2006).

24) G.C. Mahata and **A. Goswami**, "Production lot-size model with fuzzy production rate and fuzzy demand rate for deteriorating items under permissible delay in payments", *Opsearch*, 43 (3), 358–375 (2006).

25) R.B.V. Subramanyam and **A. Goswami**, "Mining fuzzy quantitative association rules", *Expert Systems, The Journal of Knowledge Engineering*, 23(4), 212–225 (2006).

26) R.B.V. Subramanyam and **A. Goswami**, "Mining frequent fuzzy grids in dynamic databases with weighted transactions and weighted items", *Journal of Information and Knowledge Management*, 5 (3), 243–257 (2006).

27) G.C. Mahata and **A. Goswami**, "An EOQ model for deteriorating items under trade credit financing in the fuzzy sense", *Production Planning and Control*, 18 (8), 681–692 (2007).

28) L.N. De and **A. Goswami**, "Lot streaming in a multistage flow shop with a random horizon considering shortages", *Advanced Modeling and Optimization***,** 9 (1), 15–27 (2007).

29) G.C. Mahata, **A. Goswami**, D. K. Gupta, "Economic production lot-size model with deteriorated and imperfect products in fuzzy sense", *The Journal of Fuzzy Mathematics*, 16 (1), 51– 67 (2008).

30) A.K. Sharma, **A. Goswami**, D.K. Gupta, "An algorithm for discovery of fuzzy inclusion dependencies in fuzzy databases", *Journal of Uncertain Systems*, 2 (3), 212–222 (2008).

31) R.B.V. Subramanyam, **A. Goswami**, B. Prasad, "Mining fuzzy temporal patterns from process instances with weighted temporal graphs", *International Journal of Data Analysis Techniques and Strategies*, 1 (1), 60–77 (2008).

32) S.K. De, P.K. Kundu, **A. Goswami**, "Economic ordering policy of deteriorated items with shortage and fuzzy cost coefficients for vendor and buyer", *International Journal of Fuzzy Systems and Rough Systems*, 1 (2), 69–76 (2008).

33) G.C. Mahata and **A. Goswami**, "An EOQ model with fuzzy lead time, fuzzy demand and fuzzy cost coefficients", *International Journal of Mathematical, Physical and Engineering Sciences*, 3 (1), 15–22 (2009).

34) G.C. Mahata and **A. Goswami**, "Fuzzy EOQ models for deteriorating items with stock dependent demand and non-linear holding costs", *International Journal of Applied Mathematics and Computer Sciences*, 5 (2), 94—98 (2009).

35) B.S. Sirisha, V.K.J. Jeevan, R.V. Raja Kumar, **A. Goswami**, "A personalized information support system for searching portals and e-resources", *Program: Electronic library and information systems,* 43 (1), 77—93 (2009).

36) L.N. De and **A. Goswami**, "Probabilistic EOQ model for deteriorating items under trade credit financing", *International Journal of Systems Science*, 40 (4), 335—346 (2009).

37) G.C. Mahata and **A. Goswami**, "A fuzzy replenishment policy for deteriorating items with ram type demand rate under inflation", *International Journal of Operational Research*, 5 (3), 328—348 (2009).

38) **A. Goswami**, G.C. Mahata, O. Prakash, "Optimal retailer's replenishment decisions in the EPQ model for deteriorating items with two level of trade credit financing", *International Journal of Mathematics in Operational Research*, 2 (1), 17—39 (2010).

39) G.C. Mahata and **A. Goswami**, "The optimal cycle time for EPQ inventory model of deteriorating items under trade credit financing in the fuzzy sense", *International Journal of Operations Research*, 7 (1), 26—40 (2010).

40) A.K. Sharma, **A. Goswami**, D.K. Gupta, "An extended SQL for fuzzy multidatabases", *International Journal of Engineering Science and Technology*, 2 (5), 896—906 (2010).

41) A.K. Sharma, **A. Goswami**, D.K. Gupta, "Integration of fuzzy databases: problems & solutions", *International Journal of Computer Applications*, 2 (3), 0975—8887 (2010).

42) R.S. Kumar, S.K. De, **A. Goswami**, "Fuzzy EOQ models with ramp type demand rate, partial backlogging and time dependent deterioration rate", *International Journal of Mathematics in Operational Research*, 4 (5), 473—502 (2012).

43) B.K. Sett, B. Sarkar, **A. Goswami**, "A two-warehouse inventory model with increasing demand and time varying deterioration", *Scientia Iranica*, 19 (6), 1969—1977 (2012).

44) V. Odelu, A.K. Das, **A. Goswami**, "A novel linear polynomial-based dynamic key management scheme for hierarchical access control", *International Journal of Trust Management in Computing and Communications*, 1 (2), 156—174 (2013).

45) O. Prakash, A.R. Roy, **A. Goswami**, "Manufacturing inventory model with discrete random machine breakdown and discrete stochastic corrective and preventive repair time", *International Journal of Procurement Management,* 6 (4), 394—406 (2013).

46) A. Mukhopadhyay and **A. Goswami**, "Application of uncertain programming to an inventory model for imperfect quantity under time varying demand", *Advanced Modeling and Optimization*, 15 (3), 565—582 (2013).

47) G.C. Mahata and **A. Goswami**, "Fuzzy inventory models for items with imperfect quality and shortage backordering under crisp and fuzzy decision variables", *Computers & Industrial Engineering*, 64 (1), 190—199 (2013).

48) V. Odelu, A.K. Das, **A. Goswami**, "A new key management scheme for a user hierarchy based on a hybrid cryptosystem", *SmartCR*, 3 (1), 42—54 (2013).

49) V. Odelu, A.K. Das, **A. Goswami**, "An effective and secure key-management scheme for hierarchical access control in e-medicine system", *Journal of medical systems*, 37 (2), 1—18 (2013).

50) A.K. Das and **A. Goswami**, "A secure and efficient uniqueness-and-anonymity-preserving remote user authentication scheme for connected health care", *Journal of medical systems*, 37 (3), 1—16 (2013).

51) A. Mukhopadhyay and **A. Goswami**, "Economic production quantity (EPQ) model for three type imperfect items with rework and learning in setup", *An International Journal of Optimization and Control: Theories & Applications (IJOCTA)*, 4(1), 57—65, (2013).

52) R.S. Kumar and **A. Goswami**, "Fuzzy stochastic EOQ inventory model for items with imperfect quality and shortages are backlogged", *Advanced Modeling and Optimization*, 15 (2), 261—279 (2013).

53) A.K. Das, **A. Goswami**, V. Odelu, "An efficient access control scheme in user hierarchy based on polynomial interpolation and hash function", *International Journal of Communication Networks and Distributed Systems*, 12 (2), 129—151, (2014).

54) R.S. Kumar, M.K. Tiwari, **A. Goswami**, "Two-echelon fuzzy stochastic supply chain for the manufacturer–buyer integrated production–inventory system", *Journal of Intelligent Manufacturing*, 1—14 (2014), http://dx.doi.org/10.1007/s10845-014-0921-8.

55) S.K. De, **A. Goswami**, S.S. Sana, "An interpolating by pass to Pareto optimality in intuitionistic fuzzy technique for a EOQ model with time sensitive backlogging", *Applied Mathematics and Computation*, 230, 664—674 (2014).

56) A.K. Das, V. Odelu, **A. Goswami**, "A robust and effective smart-card-based remote user authentication mechanism using hash function", *The Scientific World Journal*, 2014, 1—16 (2014), doi:10.1155/2014/719470.

57) A.K. Das and **A. Goswami**, "An enhanced biometric authentication scheme for telecare medicine information systems with nonce using chaotic hash function", *Journal of medical systems*, 38 (6), 1—19 (2014).

58) V. Odelu, A.K. Das, **A. Goswami**, "A secure effective key management scheme for dynamic access control in a large leaf class hierarchy", *Information Sciences*, 269, 270—285 (2014).

59) S. K. De, S.S. Sana, **A. Goswami**, "An EOQ model for phase inventory with induced demand and periodic cycle time", *Journal of Industrial Engineering*, 2014, 1—14 (2014), doi:10.1155/2014/605178.

60) A. Mukhopadhyay and **A. Goswami**, "Economic production quantity models for imperfect items with pollution costs", *Systems Science & Control Engineering: An Open Access Journal*, 2 (1), 368—378 (2014).

61) V. Odelu, A. K. Das, **A. Goswami**, "A secure and efficient time-bound hierarchical access control scheme for secure broadcasting", *International Journal of Ad Hoc and Ubiquitous Computing (Inderscience)*, In Press (2014).

62) A. Mukhopadhyay and **A. Goswami**, "Stockout aversion in retailing supply chain using newsvendor models", *International Journal of Mathematics in Operational Research*, 8 (2), 185-202, (2016).

63) V. Odelu, A. K. Das, **A. Goswami**, "A secure effective dynamic group password-based authenticated key agreement scheme for the integrated EPR information system," *Journal of King Saud University - Computer and Information Sciences (Elsevier)*, 28 (1), 68-81, (2016).

64) O. Prakash, A.R. Roy, **A. Goswami**, "Stochastic manufacturing system with process deterioration and machine breakdown", *International Journal of Systems Science*, 45 (12), 2539—2551 (2014).

65) R.S. Kumar and **A. Goswami**, "A continuous review production–inventory system in fuzzy random environment: Minmax distribution free procedure", *Computers & Industrial Engineering*, 79, 65—75 (2015).

66) R.S. Kumar and **A. Goswami**, "EPQ model with learning consideration, imperfect production and partial backlogging in fuzzy random environment", *International Journal of Systems Science*, 46 (8), 1486—1497, (2015).

67) V. Odelu, A.K. Das, **A. Goswami**, "An efficient ECC-based privacy-preserving client authentication protocol with key agreement using smart card", *Journal of Information Security and Applications*, In Press (2015), doi:10.1016/j.jisa.2015.01.001.

68) J. Sahoo, A.K. Das, **A. Goswami**. "An efficient approach for mining association rules from high utility Itemsets", *Expert Systems with Applications (Elsevier)*, 42(13), 5754-5778 (2015), http://dx.doi.org/10.1016/j.eswa.2015.02.051.

69) A. Mukhopadhya and **A. Goswami**, "An inventory model with shortages for imperfect items using substitution of two products", *International Journal of Operational Research*, In Press (2015).

70) B. Sarkar, B.K. Sett, **A. Goswami**, S. Sarkar, "Mitigation of High-Tech Products with Probabilistic Deterioration and Inflations", *American Journal of Industrial and Business Management*, 5, 73—89 (2015).

71) B. Sarkar, B.K. Sett, G. Roy, **A. Goswami**, "Flexible setup cost and deterioration of products in a supply chain model", *International Journal of Applied and Computational Mathematics*, 2 (1), 25-40, (2016), http://dx.doi.org/10.1007/s40819-015-0045-7.

72) J. Sahoo, A.K. Das, **A. Goswami**, "An effective association rule mining scheme using a new generic basis", *Knowledge and Information Systems*, 43, 127—156 (2015).

73) V Odelu, AK Das, **A. Goswami**, "An Effective and Robust Secure Remote User Authenticated Key Agreement Scheme Using Smart Cards in Wireless Communication Systems", *Wireless Personal Communications*, 85(4), 2571-2598, (2015). http://dx.doi.org/10.1007/s11277-015-2721-7.

74) V Odelu, A.K. Das, **A. Goswami**, "A secure and scalable group access control scheme for Wireless Sensor Networks", *Wireless Personal Communications*, 85 (4), 1765–1788,(2015), http://dx.doi.org/10.1007/s11277-015-2866-4.

75) A. K. Das and **A. Goswami**, "A robust anonymous biometric-based remote user authentication scheme using smart cards", *Journal of King Saud University - Computer and Information Sciences* (Elsevier), 27(2), 193-210 (2015).

76) V. Odelu, A.K. Das, **A. Goswami**, "A secure and efficient ECC-based user anonymity preserving single sign-on scheme for distributed computer networks", *Security and Communication Networks*, 8(9), 1732-1751 (2015), http://dx.doi.org/10.1002/sec.1139.

77) R.S. Kumar, K. Kondapaneni, V. Dixit, **A Goswami**, L.S. Thakur, M.K. Tiwari, "Multi-objective modeling of production and pollution routing problem with time window: A self-learning particle swarm optimization approach", *Computers & Industrial Engineering*, In Press(2015), http://dx.doi.org/10.1016/j.cie.2015.07.003.

78) A.K. Das, V Odelu, **A Goswami**, "A Secure and Robust User Authenticated Key Agreement Scheme for Hierarchical Multi-medical Server Environment in TMIS", *Journal of Medical Systems*, 39(9), 1-24 (2015).

79) R.S. Kumar, **A. Goswami**, "A fuzzy random EPQ model for imperfect quality items with possibility and necessity constraints", *Applied Soft Computing*, 34, 838-850 (2015).

80) V. Odelu, A. K. Das, and **A. Goswami**. "An efficient biometric-based privacy-preserving three-party authentication with key agreement protocol using smartcards," *Security and Communication Networks*, 8(18), 4136-4156, (2015), DOI: 10.1002/sec.1330.

81) V. Odelu, A. K. Das, and **A. Goswami**. "A Secure Biometrics-Based Multi-Server Authentication Protocol using Smart Cards," *IEEE Transactions on Information Forensics and Security*, 10 (9), 1953 – 1966 (2015), DOI: 10.1109/ TIFS.2015.2439964.

82) D. J. Mohanty, R. S. Kumar and **A. Goswami**, "An improved inventory model with random review period and temporary price discount for deteriorating items", *International Journal of System Assurance Engineering and Management*, 7 (1), 62-72, (2016).

83) S. Karmakar, S. K. De, **A. Goswami**, "A deteriorating EOQ model for natural idle time and imprecise demand: hesitant fuzzy approach", *International Journal of Systems Science: Operations & Logistics*, 1-14, (2015) , DOI: 10.1080/23302674.2015.1087070

84) RS Kumar, A Choudhary, SAKI Babu, SK Kumar, **A Goswami**, MK Tiwari, "Designing multi-period supply chain network considering risk and emission: a multi-objective approach", *Annals of Operations Research*, 1-35, in press (2016), doi:10.1007/s10479-015-2086-z .

85) A Mukhopadhyay, **A Goswami**, "An EOQ model with shortages and selling price dependent time varying demand", *International Journal of Supply Chain and Inventory Management*, 1 (2), 133-153, (2016).

86) V Odelu, AK Das, **A Goswami**, "SEAP: Secure and efficient authentication protocol for NFC applications using pseudonyms", *IEEE Transactions on Consumer Electronics* 62 (1), 30-38, (2016).

87) DJ Mohanty, RS Kumar, **A Goswami**, "A two-warehouse inventory model for non-instantaneous deteriorating items over stochastic planning horizon", *Journal of Industrial and Production Engineering*, 1-17, In Press, (2016), doi: 10.1080/21681015.2016.1176964

88) J Sahoo, AK Das, **A Goswami**, "An efficient fast algorithm for discovering closed+ high utility itemsets", *Applied Intelligence*, 45(1), 44–74, (2016), doi:10.1007/s10489-015-0740-4.