# Dr. Mihaela Cardei

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Director, Wireless and Sensor Network Laboratory
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## Research Interest

Wireless Networking, Wireless Sensor Networks, Combinatorial Optimization in Wireless Networks, Network Protocols and Algorithm Design.

## Education

Ph.D. in Computer Science, University of Minnesota, Minneapolis, MN, 2003
M.S. in Computer Science, University of Minnesota, Minneapolis, MN, 1999
M.S. in Computer Science, Politehnica University of Bucharest, Romania, 1996
B.S. in Computer Science, Politehnica University of Bucharest, Romania, 1995

## Honors and Awards

Researcher of the Year (Assistant Professor level), Florida Atlantic University, 2006-2007.
Best paper award, The 2nd IEEE Intl. Conf. on Mobile Ad-hoc and Sensor Systems (IEEE MASS), Nov. 2005.
FAU Faculty Travel Award: Mar. 2005 and Aug. 2005.
Doctoral Dissertation Fellowship**,** Graduate School, University of Minnesota, 2002-2003.
Academic Merit Award, Dept. Computer Science & Engineering, University of Minnesota, 1999.
Government Scholarship**,** Politehnica University of Bucharest, Romania, 1991 – 1995.

## Professional Experience

Associate Professor, FAU, Computer Science & Engineering, Aug. 2008 – present
Assistant Professor, FAU, Computer Science & Engineering, Aug. 2003 – Aug. 2008
Teaching Assistant, University of Minnesota, Sep. 1997 – May 2000
Intern, Honeywell Laboratories, Minneapolis, Apr. 1999 – Oct. 1999
Development Engineer, CoManage Corporation, Sep. 2000 – Jun. 2001

## Grant Awards

- NSF CAREER *Optimization Problems in Wireless Sensor Network Design and Applications*, National Science Foundation (NSF), PI, 06/01/06-06/01/11, $400,000.

- NSF CISE Instrumentation: *Wireless and Sensor Networking Laboratory*, National Science Foundation (NSF) & Division of Research at FAU, PI, 09/01/04-09/01/07, $85,851.

- Secure Telecommunication Networks, *Secure Routing Protocols for Ad Hoc Wireless Networks*, DoD Defense-wide RTDE grant, investigator, 09/01/04-08/31/06, $37,000.

- New Project Development Program, *Wireless Sensor Networks Design and Experimentation*, Division of Research at FAU, PI, 01/01/06-12/31/06, $15,000.

- NSF MRI: Acquisition of a NUMA-based Supercluster for High Performance Computing, National Science Foundation (NSF), co-PI, 08/01/05-07/31/09, $459,065.

- Secure Telecommunication Network, *Global Information Grid Simulation*, DoD Defense-wide RTDE grant, investigator, 01/09/08-01/09/09, $35,000.

# Teaching

Graduate Courses:
- COT 6930: Wireless Networks (Fall'03, Summer'04, Summer'05)
- COT 6405: Analysis of Algorithms (Fall'04, Fall'05)
- COT 6930: Algorithms for Bioinformatics (Spring'07)
- COT 6930: Wireless Networks Design and Optimization (Spring'08)

Undergraduate Courses:
- CDA 4500: Introduction to Data Communications (Spring'04, Fall'04, Fall'05)
- COT 4400: Design and Analysis of Algorithms (Spring'05, Spring'06, Fall'06, Spring'07, Summer'07, Summer'09, Fall'09)
- COT 4420: Introduction to Forma Languages and Automata (Fall'07, Fall'08, Fall'09)
- STA 4821: Stochastic Models for CS (Spring'09)

# Student Supervision

Current Ph.D. Students:
- Yinying Yang, Ph.D. candidate, started Summer 2006.
- Mirela Marta, Ph.D. candidate, started Fall 2006.
- Wael Awada, Ph.D. student, started Spring 2008.
- Arny Ambrose, Ph.D. student, started Spring 2009.

Current MS Students:
- Anupama Sahu, started Summer 2009.
- Pedro Heshike, started Fall 2009.

Former Ph.D. Students:
- Shuhui Yang, co-advisor with Dr. Jie Wu, Summer 2007, "Connected Dominating Set in Wireless Ad Hoc Networks: Variations with Applications"

- Ali Abu-el Humos, co-advisor with Dr. Bassem Alhalabi, Summer 2005, "Low Latency and Energy Efficient MAC Protocols for Wireless Sensor Networks"

Former MS Students:
- Arny Ambrose, Fall 2008, "Scheduling for Composite Event Detection in Wireless Sensor Networks"
- Mohammad Pervaiz, Summer 2006, "Range Assignment Problem and Security in Wireless Networks"
- Wael Awada, Spring 2006, "Energy-efficient Target Coverage in Heterogeneous Wireless Sensor Networks"

## Professional Organizations

Member, Institute of Electrical and Electronics Engineers (IEEE)
Member, ACM

## Professional Activities

- Panelist, National Science Foundation, 2003, 2005, 2008.
- Organizer of the *Wireless Networking Seminar* at the University of Minnesota, 2001-2003.
- Participate in organizing the *Doctoral Dissertation Fellows Seminar* (2002-2003), event conducted by the Graduate School at the University of Minnesota.
- Co-editor of *Theoretical and Algorithmic Aspects of Sensor, Ad Hoc Wireless, and Peer-to-Peer Networks*, special issue in the Journal of Parallel and Distributed Computing (JPDC), Vol 65, No 2, Feb. 2005.
- Local arrangement chair for *IEEE MASS'04.*
- Publicity co-chair and workshop co-chair for *The Second International Conference on Quality of Service in Heterogeneous Wired/Wireless Networks (QShine'05).*
- Technical program co-chair for *The International Conference on Systems and Networks Communications (ICSNC)* 2006.
- Poster chair for *ACM MobiHoc* 2008.
- Session chair for IEEE WoWMoM 2008.
- TPC member for *IEEE WLN'04*, *AHSP'05, ICETE'05, IEEE WLN'05, ACM SE'06, InterSense'06, SAWN'06, WINSYS'06, IASTED WSN'06, ICWMC'06, IEEE MASS'06, WASA'06, IEEE WLN'06, IEEE MASS'07, IWCMC'07, IEEE IPCCC'07, ICWMC'07, WINSYS'07, WTASA'07, WLN'07, ICSNC'07*, *IASTED SN'08, IEEE ICC'08, IEEE WoWMoM'08*, *ICWMC'08*, *ICSNC'08*, *WASA'08*, *WLN'08*, *MSN'08*, *WINSYS'08*, and *IEEE ICC'09, IEEE DCOSS'09, IEEE WoWMoM'09, ICCCN'09, WASA'09*, *IEEE MASS'09, IEEE LCN'09*, *InVeNET'09, ACS/IEEE AICCSA'09*.

## Florida Atlantic University Services

Graduate Marshal for Spring 2007 FAU Commencement Ceremony
CSE PhD QE Coordinator (Sept 2009 - present)

Advisor of the MS Information Technology & Management Program (Sept 2009 - present)
Member of the CSE Dept. Graduate Programs and Research Committee (2007 – 2009)
Member of the CSE Dept. Executive Committee (2006 – 2007)
Member of the CSE Dept. TA/GA Committee (2005 – 2007)
Member of the FAU University Faculty Senate (2005 – 2006)
Member of the CSE Dept. Labs/Equipment Committee (2003 – 2005, 2008 – 2010)

# Publications

## Conference Papers

1. M. Marta, Y. Yang, and M. Cardei, Energy-efficient Composite Event Detection in WSNs, *International Conference on Wireless Algorithms, Systems and Applications (WASA'09)*, Aug. 2009.

2. Y. Yang and M. Cardei, Sensor Deployment for Composite Event Detection in Mobile WSNs, *International Conference on Wireless Algorithms, Systems and Applications (WASA'08)*, Oct. 2008.

3. M. Marta and M. Cardei, Using Sink Mobility to Increase Wireless Sensor Networks Lifetime, *IEEE Intl. Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM'08)*, Jun. 2008.

4. M. Cardei, Y. Yang, and J. Wu, Non-Uniform Sensor Deployment in Mobile Wireless Sensor Networks, *IEEE Intl. Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM'08)*, Jun. 2008.

5. S. Yang, J. Wu, and M. Cardei, Efficient Broadcast in MANETs Using Network Coding and Directional Antennas, *IEEE INFOCOM 2008*, Apr. 2008.

6. J. Wu, S. Yang, and M. Cardei, On Maintaining Sensor-Actor Connectivity in Wireless Sensor and Actor Networks, *IEEE INFOCOM 2008*, Apr. 2008.

7. Y. Yang and M. Cardei, Movement-Assisted Sensor Redeployment Scheme for Network Lifetime Increase, *ACM/IEEE Intl. Symposium on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWIM'07)*, Oct. 2007.

8. M. Cardei, J. Wu, and S. Yang, Fault-Tolerant Topology Control for Heterogeneous Wireless Sensor Networks, *IEEE Intl. Conf. on Mobile Ad-hoc and Sensor Systems (MASS'07)*, Oct. 2007.

9. M. Cardei, M. O. Pervaiz, and I. Cardei, Energy-Efficient Range Assignment in Heterogeneous Wireless Sensor Networks, *International Conference on Wireless and Mobile Communications (ICWMC'06)*, Jul. 2006.

10. W. Awada and M. Cardei, Energy-Efficient Data Gathering in Heterogeneous Wireless Sensor Networks, *IEEE Intl. Conf. on Wireless and Mobile Computing, Networking and Communications (WiMob'06)*, Jun. 2006.

11. S. Yang, F. Dai, M. Cardei, and J. Wu, On Multiple Point Coverage in Wireless Sensor Networks, *The 2nd IEEE Intl. Conf. on Mobile Ad-hoc and Sensor Systems (MASS'05)*, Nov. 2005 (***Best Paper Award***).

12. M. Lu, J. Wu, M. Cardei, and M. Li, Energy-Efficient Connected Coverage of Discrete Targets in Wireless Sensor Networks, *International Conference on Computer Networks and Mobile Computing (ICCNMC'05)*, Aug. 2005.

13. M. Cardei, J. Wu, M. Lu, and M. O. Pervaiz, Maximum Network Lifetime in Wireless Sensor Networks with Adjustable Sensing Ranges, *IEEE Intl. Conf. on Wireless and Mobile Computing, Networking and Communications (WiMob'05)*, Aug. 2005.

14. J. Wu, M. Cardei, F. Dai, and S. Yang, Extended Dominating Set in Ad Hoc Networks Using Cooperative Communication, NETWORKING 2005, May 2005.

15. M. Cardei, M. Thai, Y. Li, and W. Wu, Energy-Efficient Target Coverage in Wireless Sensor Networks, *IEEE INFOCOM 2005*, Mar. 2005, Miami, USA.

16. M. Cardei, J. Wu and S. Yang, Topology Control in Ad hoc Wireless Networks with Hitch-hiking, *The First IEEE International Conference on Sensor and Ad hoc Communications and Networks (SECON04)*, Oct. 2004, Santa Clara, USA.

17. M. Cardei, J. Wu and S. Yang, Low Power Hitch-hiking Broadcast in Ad Hoc Wireless Networks, *NSF International Workshop on Theoretical Aspects of Wireless Ad Hoc, Sensor and Peer-to-Peer Networks (TAWN04)*, Jun. 2004, Chicago, USA.

18. X. Cheng, M. Cardei, J. Sun, and D.-Z. Du, Energy Efficient Topology for Ad Hoc Wireless Networks, *NSF International Workshop on Theoretical and Algorithmic Aspects of Sensor, Ad Hoc Wireless and Peer-to-Peer Networks*, Feb. 2004, Florida, USA.

19. M. Cardei, X. Cheng, X. Cheng, and D.-Z. Du, Connected domination in ad hoc wireless networks, *Sixth International Conference on Computer Science and Informatics (CS&I 2002)*, Mar. 2002, North Carolina, USA.

*20.* M. Cardei, X. Cheng, X. Cheng, and D.-Z. Du, A Tale on Guillotine Cut, *Proceedings of Novel Approaches to Hard Discrete Optimization*, pp. 41-54, Apr. 2001, Ontario, Canada.

21. M. Cardei, I. Cardei, R. Jha, and A. Pavan, Hierarchical Feedback Adaptation for Real-Time Sensor-based Distributed Applications, *The 3rd IEEE International Symposium on Object-oriented Real-time distributed Computing (ISORC)*, Mar. 2000, California, USA.

22. I. Cardei, R. Jha, M. Cardei, and A. Pavan, Hierarchical Architecture For Real-Time Adaptive Resource Management, *The IFIP/ACM International Conference on Distributed Systems Platforms and Open Distributed Processing*, Apr. 2000, New York, USA.

## Journal Articles

1. Y. Yang, M. Fonoage, and M. Cardei, Improving Network Lifetime with Mobile Wireless Sensor Networks, under review.

2. Y. Yang and M. Cardei, Adaptive Energy Efficient Sensor Scheduling for Wireless Sensor Networks, under review.

3. Y. Yang and M. Cardei, Delay-Constrained Energy-Efficient Routing in Heterogeneous Wireless Sensor Networks, under review.

4. Y. Yang, A. Ambrose, and M. Cardei, Coverage for Composite Event Detection in Wireless Sensor Networks, Wireless Communications and Mobile Computing, Wiley InterScience, under review.

5. M. Marta and M. Cardei, Improved Sensor Network Lifetime with Multiple Mobile Sinks, *Elsevier Journal of Pervasive and Mobile Computing*, article in press, doi:10.1016/j.pmcj.2009.01.001.

6. M. Lu, J. Wu, M. Cardei, and M. Li, Energy-Efficient Connected Coverage of Discrete Targets in Wireless Sensor Networks, *International Journal of Ad Hoc and Ubiquitous Computing (IJAHUC)*, Vol. 4, No. 3/4 , pp. 137-147, 2009.

7. M. Cardei, S. Yang, and J. Wu, Algorithms for Fault-Tolerant Topology in Heterogeneous Wireless Sensor Networks, *IEEE Transactions on Parallel and Distributed Systems*, Vol. 19, No. 4, pp. 545-558, Apr. 2008.

8. I. Cardei and M. Cardei, Energy-Efficient Connected-Coverage in Wireless Sensor Networks, *International Journal of Sensor Networks (IJSNet)*, Vol. 3, No. 3, 2008.

9. S. Yang, F. Dai, M. Cardei, J. Wu, and F. Patterson, On Connected Multiple Point Coverage in Wireless Sensor Networks, *Intl. Journal of Wireless Information Networks (IJWIN)*, Vol. 13, No. 4, pp. 289-301, Oct. 2006.

10. I. Cardei, M. Cardei, L. Wang, B. Xu, and D.-Z. Du, Optimal Relay Location for Energy Constrained Wireless Ad-hoc Networks, *Journal of Global Optimization*, Vol. 36, No. 3, pp. 391-399, Nov. 2006.

11. M. Cardei, J. Wu, and M. Lu, Improving Network Lifetime using Sensors with Adjustable Sensing Ranges, *International Journal of Sensor Networks (IJSNet)*, Vol. 1, No. 1/2, pp. 41-49, 2006.

12. J. Wu, M. Cardei, F. Dai, and S. Yang, Extended Dominating Set and Its Applications in Ad Hoc Networks Using Cooperative Communication, *IEEE Transactions on Parallel and Distributed Systems*, Vol. 17, No. 8, Aug. 2006.

13. M. Cardei, J. Wu, and S. Yang, Topology Control in Ad hoc Wireless Networks using Cooperative Communication, *IEEE Transactions on Mobile Computing*, Vol. 5, No. 6, pp. 711-724, Jun. 2006.

14. M. Cardei, Energy-efficient Scheduling and Hybrid Communication Architecture for Underwater Littoral Surveillance, *Computer Communications Journal (Elsevier)*, Vol. 29, No. 17, pp. 3354-3365, 2006.

15. M. Cardei and J. Wu, Energy-Efficient Coverage Problems in Wireless Ad Hoc Sensor Networks, *Computer Communications Journal (Elsevier)*, Vol. 29, No. 4, pp. 413-420, Feb. 2006.

16. M. Cardei and D.-Z. Du, Improving Wireless Sensor Network Lifetime through Power Aware Organization, *ACM Wireless Networks*, Vol. 11, No. 3, pp. 333-340, May 2005.

17. M. X. Cheng, M. Cardei, J. Sun, X. Cheng, L. Wang, Y. Xu, and D.-Z. Du, Topology Control of Ad Hoc Wireless Networks for Energy Efficiency, *IEEE Transactions on Computers*, Vol. 53, No. 12, Dec. 2004.

*18.* I. Cardei, S. Varadarajan, A. Pavan, L. Graba, M. Cardei, and M. Min, Resource Management for Ad-hoc Wireless Networks with Cluster Organization, *Cluster Computing*, Vol. 7, No. 1, pp. 91-103, Jan. 2004.

19. H. Qiao, L. Kang, M. Cardei, and D.-Z. Du, Paired-domination of Trees, *Journal of Global Optimization*, Vol. 25, No. 1, pp. 43-54, Jan. 2003.

*20.* M. Cardei, D. MacCallum, X. Cheng, M. Min, X. Jia, D. Li, and D.-Z. Du, Wireless Sensor Networks with Energy Efficient Organization, *Journal of Interconnection Networks*, Vol. 3, No. 3-4, pp. 213-229, Dec. 2002.

*21.* J. Kim, M. Cardei, I. Cardei, and X. Jia, A Polynomial Time Approximation Scheme for the Grade of Service Steiner Minimum Tree Problem, *Journal of Global Optimization*, Vol. 24, No. 4, pp.439-450, Dec. 2002.

22. A. Pavan, R. Jha, L. Graba, S. Cooper, I. Cardei, M. Cardei, V. Gopal, S. Parthasarathy, and S. Bedros, Real-Time Adaptive Resource Management, *IEEE Computer*, Jul. 2001.

## Special Issue

1. J. Wu and M. Cardei (eds.), Theoretical and Algorithmic Aspects of Sensor, Ad Hoc Wireless, and Peer-to-Peer Networks, special issue in *Journal of Parallel and Distributed Computing (JPDC)*, Vol. 65, No. 2, Feb. 2005.

## Book & Book Chapters

1. M. I. Fonoage and M. Cardei, Low Rate Wireless Personal Area Networks using IEEE 802.15.4, *Encyclopedia of Wireless and Mobile Communications*, B. Furht (ed.), accepted.

2. Y. Yang and M. Cardei, Sensor Scheduling and Redeployment Mechanisms in Wireless Sensor Networks, in *Biomedical and Environmental Sensing, Computing and Communications*, J. I. Agbinya and S. K. Lal (eds.), River Publishers, accepted.

3. A. Srinivasan, J. Teitelbaum, J. Wu, M. Cardei, and H. Liang, Reputation-and-Trust-Based Systems for Ad Hoc Networks, in *Algorithms and Protocols for Wireless, Mobile Ad Hoc Networks*, A. Boukerche (ed.), Wiley, 2008, ISBN: 978-0-470-38358-2.

4. M. Cardei and Y. Yang, Heterogeneous Wireless Sensor Networks, *Encyclopedia of Wireless and Mobile Communications*, B. Furht (ed.), CRC Press, Taylor & Francis Group, 2008, ISBN: 1420043269.

5. J. Ibriq, I. Mahgoub, M. Ilyas, and M. Cardei, Key Management Schemes in Wireless Sensor Networks, *Encyclopedia of Wireless and Mobile Communications*, B. Furht (ed.), CRC Press, Taylor & Francis Group, 2008, ISBN: 1420043269.

6. B. Wu, J. Wu, and M. Cardei, A Survey of Key Management in Mobile Ad Hoc Networks, *Handbook of Research on Wireless Security*, Y. Zhang, J. Zheng, and M. Ma (eds.), Idea Group Inc., Jan. 2008, ISBN: 978-1-59904-899-4.

7. M. O. Pervaiz, M. Cardei, and J. Wu, Security in Wireless Local Area Networks, in *Security in Distributed and Networking Systems*, Y. Xiao and Y. Pan (eds.), World Scientific Publishing Co., Computer and Network Security, Aug. 2007, ISBN: 978-981-270-807-6.

8. M. O. Pervaiz, M. Cardei, and J. Wu, Routing Security in Ad Hoc Wireless Networks, accepted to appear in *Network Security*, S. Huang, D. MacCallum, and D.-Z. Du (eds.), Springer, Mar. 2008, ISBN: 978-0-387-73820-8.

9. A. A. Humos, M. Cardei, B. Alhalabi, and S. Hsu, Medium Access Control Protocols for Wireless Sensor Networks, *Wireless Sensor Networks and Applications*, Y. Li, M. Thai, and W. Wu (eds.), Springer, Signals and Communication Technology, 2007, ISBN: 978-0-387-49591-0.

10. B. Wu, J. Chen, J. Wu, and M. Cardei, A Survey of Attacks and Countermeasures in Mobile Ad Hoc Networks, in *Wireless/Mobile Network Security*, Y. Xiao, X. Shen, and D. -Z. Du (eds.), Springer, Network Theory and Applications, Vol. 17, 2006, ISBN: 0-387-28040-5.

11. M. Cardei, I. Cardei, and D.-Z. Du (eds.), *Resource Management in Wireless Networking*, Springer, Network Theory and Applications, Vol. 16, 2005, ISBN: 0-387-23807-7.

12. M. Cardei and J. Wu, Coverage in Wireless Sensor Networks, in *Handbook of Sensor Networks*, M. Ilyas and I. Mahgoub (eds.), CRC Press, 2004, ISBN: 0-8493-1968-4.

13. M. Cardei, I. Cardei, and D.-Z. Du, Energy Efficient Approaches in Wireless Networking, in *Ad Hoc Wireless Networking*, X.Cheng, X. Huang and D.-Z. Du (eds.), Kluwer Academic Publishers, Network Theory and Applications, Vol. 14, 2004, ISBN: 1-4020-7712-2.

## Technical Report

*1.* M. Cardei, D. MacCallum, S. Chen, I. Cardei, and D.-Z. Du, Approximation Solutions for the Resource Management Problem Using the General Cover Problem, TR01-047, Computer Science Department, University of Minnesota.