

Mate Boban

CONTACT INFORMATION

NEC Laboratories Europe
Kurfürsten-Anlage 36
69115 Heidelberg
Germany

p: +49 6221 4342 232
f: +49 6221 4342 155
mate.boban@neclab.eu
www.mateboban.net

RESEARCH INTERESTS

Intelligent Transportation Systems; vehicular networks; wireless networks and communications; network measurements, modeling, and large-scale simulation; network protocol and application design and evaluation.

EDUCATION

Carnegie Mellon University, Pittsburgh, PA USA

Ph.D. in Electrical and Computer Engineering

Dec. 2012

– Thesis title: *Realistic and Efficient Channel Modeling for Vehicular Networks*

University of Zagreb, Croatia

Diploma in Informatics, Summa Cum Laude

Nov. 2004

PROFESSIONAL EXPERIENCE

NEC Laboratories Europe

Research Scientist

Sept. 2013 – present

Working on Intelligent Transportation System projects. Current research focus on leveraging wireless communications and networking to prevent road accidents and improve traffic efficiency. Involved in following EU and national projects as WP leader and researcher: DRIVE C2X (FP7), TEAM (FP7), CONVERGE (BMBF). Actively contributing to research and standardization within CAR 2 CAR Communication Consortium (C2C-CC) and ETSI TC ITS.

Carnegie Mellon University, Dept. of Electrical and Computer Engineering

Postdoctoral Fellow

Dec. 2012 – Aug. 2013

Lead a project on designing a wireless communication framework for Smart Grid. Collaborated with industrial partners on optimizing urban traffic flow through vehicular networking and mobile communications. Advised junior graduate students.

Carnegie Mellon University, Dept. of Electrical and Computer Engineering and
University of Porto, Dept. of Electrical and Computer Engineering

Research Assistant

Mar. 2009 – Nov. 2012

Developed, implemented, and experimentally validated an efficient vehicle-to-vehicle channel model that, for the first time, incorporated vehicular obstructions into large-scale channel modeling. Implemented the model in Matlab and showed it can scale to networks of thousands of vehicles. Designed and performed five measurement campaigns with over a hundred hours worth of on-the-road experiments to evaluate various aspects of vehicular communications. Mentored junior graduate students, including supervision of an MSc thesis. Teaching assistant on three courses in wireless networking, probability, and mobile communications.

Apple Inc., Cupertino, CA, USA

Exploratory Design Intern

May 2011 – Aug. 2011

Designed and implemented experimentally validated indoor WiFi channel model. Designed a coverage optimization tool to improve the WiFi performance of Apple products. Performed WiFi channel measurements with different products to validate and improve the channel model and coverage tool.

Carnegie Mellon University, Dept. of Electrical and Computer Engineering

Fulbright Visiting Scholar

Aug. 2007 – Jan. 2009

Investigated the level of QoS available to unicast applications in infrastructureless vehicular networks. Determined the achievable performance in terms of connection duration, packet delivery ratio, end-to-end delay, and jitter in highway and urban environments. Based on the results, proposed techniques for improving the performance of real-time applications in vehicular environments. Performed experiments to evaluate the effectiveness of the proposed techniques. Wrote a proposal for accepted bilateral research project.

University of Zagreb, Faculty of Organization and Informatics, Croatia

Lecturer/Research Associate

May 2005 – Aug. 2007

Taught networking and communications courses; created assignments, labs, seminars, and homeworks. Collaborated on three international research and industry-related projects dealing with wireless networking, e-learning, and event brokerage. In a team of four, wrote a proposal for accepted EU project. In a team of two, deployed and maintained Faculty's e-learning system. Designed wired and wireless network for Faculty's new building.

CET / Maneco Computers Ltd., Bosnia and Herzegovina

Software Developer

Sep. 2004 – May 2005

Intern

Summer, [2001, 2002, 2003]

Developed distributed warehouse support system for the company's three branches. Implemented and administered company's Content Management System. In a team of two, designed PC Configurator: web-based tool for customers to configure and order personal computers online.

University of Freiburg, Department of Telematics, Germany

Research Intern

Jul. 2004 – Sep. 2004

Designed and implemented communication and message delivery module for service discovery in mobile hospitals. Performed simulations to validate the protocol. Implemented a load-balancing algorithm for fair distribution of service requests to medical devices.

SKILLS

Technical

- Programming Languages: Java, MATLAB, Visual Basic.NET, SQL
- Developed GEMV², an open source V2V radio propagation simulator in Matlab, available at <http://vehicle2x.net/>
- Extensive experience in wireless networking and communications: experimentation, modeling and simulation, network application design and implementation
- Experienced in manipulation and visualization of large geographical datasets
- Software Tools: various network simulators (NS2, NS3, JiST/SWANS), Eclipse, L^AT_EX

Languages

English: fluent; German: intermediate; Portuguese: basic; Croatian: native

Journal Papers

- [1] B. Aygun, M. Boban, A. Wyglinski, “ECPR: Environment-and Context-aware Combined Power and Rate Distributed Congestion Control for Vehicular Communications”, submitted, 2015
- [2] H.-M. Lin, H.-M. Tsai, and M. Boban: “Scooter-to-X Communications: Antenna Placement, Human Body Shadowing, and Channel Modeling,” submitted, 2015
- [3] M. Boban, P. M. d’Orey: “Exploring the Practical Limits of Cooperative Awareness in Vehicular Communications”, submitted, 2015
- [4] W. Viriyasitavat, M. Boban, H.-M. Tsai, A. Vasilakos, “Channel and Propagation Models for Vehicular Communications: Survey and Research Challenges”, *IEEE Vehicular Technology Magazine*, Vol. 10, No. 2, June 2015
- [5] M. Boban, J. Barros, and O. Tonguz, “Geometry-based vehicle-to-vehicle channel modeling for large-scale simulation,” *IEEE Transactions on Vehicular Technology*, Vol. 63, No. 9, November 2014
- [6] M. Boban, R. Meireles, O. Tonguz, J. Barros, and P. Steenkiste, “TVR – Tall Vehicle Relaying in Vehicular Networks,” *IEEE Transactions on Mobile Computing*, Vol. 13, No. 5, May 2014
- [7] M. Boban, T. T. V. Vinhoza, O. Tonguz, J. Barros, “Seeing is Believing – Enhancing Message Dissemination in Vehicular Networks Through Visual Cues,” *IEEE Communications Letters*, Vol. 16, No. 2, Feb. 2012
- [8] M. Boban, T. T. V. Vinhoza, M. Ferreira, J. Barros, and O. Tonguz, “Impact of Vehicles as Obstacles in Vehicular Ad Hoc Networks,” *IEEE Journal on Selected Areas in Communication*, Vol. 29, No. 1, Jan. 2011
- [9] O. Tonguz and M. Boban, “Multiplayer Games over Vehicular Ad Hoc Networks: a New application,” *Ad Hoc Networks* (Elsevier), Vol. 8, No. 5, Jul. 2010
- [10] M. Boban, O. Tonguz, J. Barros, “Unicast Communication in Vehicular Ad Hoc Networks: a Reality Check,” *IEEE Communications Letters*, Vol. 13, No. 12, Dec. 2009

Conference and Workshop Papers

- [1] M. Boban, P. M. d’Orey: “Measurement-based Evaluation of Cooperative Awareness for V2V and V2I Communication”, *6th IEEE Vehicular Networking Conference, VNC 2014 (Best Paper Award)*
- [2] M. Boban: “Demo: Visualization of Vehicular Communication: Insights Into Power, Effective Range, Clustering, and Neighborhood Size”, *6th IEEE Vehicular Networking Conference, VNC 2014*
- [3] B. Tomas, H.-M. Tsai, M. Boban: “Simulating Vehicular Visible Light Communication: Physical Radio and MAC Modeling”, *6th IEEE Vehicular Networking Conference, VNC 2014*
- [4] P. M. d’Orey, M. Boban, “Empirical Evaluation of Cooperative Awareness in Vehicular Communications”, *IEEE 79th Vehicular Technology Conference (VTC2014-Spring), 2014 (Best Paper Award)*
- [5] M. Boban, W. Viriyasitavat, and O. Tonguz, “Modeling Vehicle-to-Vehicle Line of Sight Channels and its Impact on Application-Layer Performance”, *The Tenth ACM International Workshop on Vehicular Inter-NETworking, Systems, and Applications, ACM VANET 2013*
- [6] J. Almeida, S. Shintre, M. Boban, and J. Barros, “Low-complexity Secret Key Distribution for Vehicular Networks”, *9th Conference on Telecommunications, ConfTele 2013*
- [7] J. Almeida, S. Shintre, M. Boban, and J. Barros, “Probabilistic Key Distribution in Vehicular Networks with Infrastructure Support”, *IEEE GLOBECOM 2012*

- [8] M. Boban, R. Meireles, J. Barros, O. Tonguz, and P. Steenkiste, "Exploiting the Height of Vehicles in Vehicular Communication", in *3rd IEEE Vehicular Networking Conference, VNC 2011*
- [9] R. Meireles, M. Boban, P. Steenkiste, O. Tonguz, and J. Barros, "Experimental Study on the Impact of Vehicular Obstructions in VANETs", *2nd IEEE Vehicular Networking Conference, VNC 2010*
- [10] M. Boban, G. Misek, and O. Tonguz, "What is the Best Achievable QoS for Unicast Routing in VANETs?," *IEEE GLOBECOM, 3rd IEEE Workshop on Automotive Networking and Applications, AutoNet 2008*

Book Chapter

- M. Boban and W. Viriyasitavat, "Channel Models for Vehicular Communication" in *Vehicular Ad Hoc Networks - Standards, Solutions, and Research*, editors: C. Campolo, A. Molinaro, R. Scopigno, Springer, 2015
- M. Boban and T. T. V. Vinhoza, "Modeling and Simulation of Vehicular Networks: Towards Realistic and Efficient Models," in *Mobile Ad-Hoc Networks: Applications*, editor: Xin Wang, InTech Publishers, Jan. 2011

Technical Reports

- M. Boban, W. Viriyasitavat, and O. Tonguz: "Modeling Vehicle-to-Vehicle Line of Sight Channels and its Impact on Application-Level Performance Metrics," Carnegie Mellon University T-SET – U.S. DOT University Transportation Center, 2013

Ph.D. Thesis

- "Realistic and Efficient Channel Modeling for Vehicular Networks," Dept. of Electrical and Computer Engineering, Carnegie Mellon University, December 2012

HONORS AND AWARDS

- Best Paper Award at IEEE VNC 2014 *Dec. 2014*
- Best Paper Award (1 out of 375 papers) at IEEE VTC2014-Spring *May 2014*
- Carnegie Mellon | Portugal Ph.D. Scholarship *Sept. 2009 – Dec. 2012*
- Predoctoral Research Award – Croatian Science Foundation *Jul. 2008 – Jul. 2009*
- Fulbright Fellowship – U.S. Department of State *Aug. 2007 – Jan. 2009*
- Scholarship for gifted students – Croatian Government *Oct. 2000 – Jun. 2004*
- Best student award – University of Zagreb *2000/2001 and 2002/2003*

TEACHING EXPERIENCE

Carnegie Mellon University, Department of Electrical and Computer Engineering
Teaching Assistant

- Emerging Topics in Wireless Networks (18-859) *Spring 2012*
 - Lead students in semester-long individual project assignments; held one-on-one weekly project meetings with students; number of students taking the course: 10
- Applied Stochastic Processes (18-751) *Fall 2010*
 - Gave weekly recitations, created and graded homeworks, quizzes and exams; gave one lecture; number of students taking the course: 30

University of Porto, Faculty of Engineering
Teaching Assistant

- Mobile Communications (EEC0043-2S) *Spring 2011*

- Created and administered eight three-hour labs; graded homeworks and labs; number of students taking the course: 15

University of Zagreb, Faculty of Organization and Informatics

Lecturer

Computer Networks and Data Communications (two-semester course) *Academic years 2005/06 and 2006/07*

- Created fifteen new two-hour lab assignments; created and implemented the first blended (mixed in-class and online) e-learning course at the Faculty, which became de facto standard for teaching; average number of students taking the course: 180

Computer Networks I & II (one-semester courses) *Spring 2007*

- Taught seminars, created and administered lab assignments; average number of students taking the course: 140 and 30, respectively

STUDENT
MENTORING

Student: Boris Tomas
PhD Thesis co-supervisor

Student: Bengi Aygun
Supervised Bengi's internship on vehicular communication at NEC Laboratories Europe

Students: Ben Pheil and Mike Michalak
Supervised Ben and Mark (CMU ECE graduate students) on Intelligent Transportation Systems research project

Students: Mark Minisce and Benjamin Peters
Advised Mark and Ben within ITLAB: Junior Summer Institute fellowship program at CMU

Student: Renan Antonioli
Supervised Renan's final M.Sc. project at U. Porto titled "Testing and protocol validation using IEEE 802.11p radios"

Students: Geoff Misek and Adrienne D. White
Class Project Leader (18-759): Evaluation of QoS in vehicular networks

TALKS AND
PRESENTATIONS

Invited Talks

- University of Coimbra, Centre for Informatics and Systems - GEMV²: Geometry-based Efficient propagation Model for V2V communication *Sept. 2014*
- Academia Sinica - Vehicle-to-Vehicle Channel Modeling for Large-Scale Simulation *Dec. 2013*
- National Taiwan University, Department of Computer Science and Information Engineering - Vehicle-to-Vehicle Channel Modeling for Large-Scale Simulation *Dec. 2013*
- ITS America High-Tech Transportation Showcase on Capitol Hill in Washington, D.C. The event featured U.S. Secretary of Transportation and Members of Congress. *Jun. 2013*
- Technische Universität Berlin, Telecommunication Networks Group - Impact of Vehicles as Obstacles in Vehicular Networks: Experiments, Modeling, and Applications *Dec. 2011*
- University of Porto, Faculty of Engineering - Impact of Vehicles as Obstacles in Vehicular Networks *Nov. 2011*
- University of Zagreb, Faculty of Organization and Informatics - Routing in Ad Hoc Networks *Jan. 2010*
- Seminar on Formal Methods and Applications, University of Zagreb - The Role of Wireless Networks in Vehicular Traffic *Jan. 2009*

Conference & Workshop Presentations

- IEEE Vehicular Networking Conference 2014

- IEEE GLOBECOM 2012
- IEEE Vehicular Networking Conference 2011
- 13th RTCM Seminar, 2011
- IEEE Vehicular Networking Conference 2010
- Second Euro-NF Plenary Meeting, 2009
- CMU-Portugal Conference 2009
- IEEE GLOBECOM 2008, AutoNet Workshop
- CARNet User Conference – CUC 2006
- Information and Intelligent Systems Conference – IIS 2005

PROFESSIONAL
ACTIVITIES

Technical Program Committee

- IEEE Vehicular Technology Conference 2015 Fall (VTC2015-Fall) 2015
- IEEE Vehicular Technology Conference 2015 Spring (VTC2015-Spring) 2015
- IEEE International Conference on Communications (ICC) 2015
- IEEE Wireless Communications and Networking Conference (WCNC) 2013 - 2015
- IEEE International Symposium on Wireless Vehicular Communications (WIVVEC) 2014
- ACM Workshop on Visible Light Communication Systems (VLCS) 2014, 2015
- IEEE ICC International Workshop on 5G Technologies 2014
- IEEE GLOBECOM International Workshop on Ultra-Low Latency and Ultra-High Reliability in Wireless Communications (ULTRA) 2014, 2015
- IEEE International Conference on Connected Vehicles and Expo (ICCVE) 2013, 2014
- IEEE/IFIP Wireless Days 2013, 2014
- IEEE Consumer Communications and Networking Conference (CCNC) 2011
- IEEE Workshop on Mobile Networks for Vehicular Environments, Infocom-MOVE 2008

Reviewer

- *Journals & Magazines:* IEEE Trans. Mobile Comput. (2013 -); IEEE Trans. Veh. Technol. (2013-); IEEE Veh. Technol. Mag. (2012 -); Elsevier Ad Hoc Networks (2012 -); IEEE Trans. Commun. (2011 -); Elsevier Transp. Res. C (2011 -); IEEE J. Sel. Areas Commun. (2010); IEEE Trans. Intell. Transp. Syst. (2010 -); IEEE Commun. Mag. (2009 -); IEEE Commun. Lett. (2009 -); IEEE/ACM Trans. Netw. (2009 -)
- *Conferences:* IEEE WCNC 2013 - 2015, IEEE ICCVE 2013 & 2014, IEEE/IFIP WD 2013, IEEE CCNC 2011, IEEE VTC–Spring 2009, 2010, 2014; IEEE ITW 2009; CECIIS 2008, 2010 & 2011; IEEE SECON 2008; ACS/IEEE AICCSA 2008

REFERENCES

Available upon request