

# CURRICULUM VITAE

last update: 11/11/2020

**Name and Degree:** doc. Mgr. Milan Krbálek, Ph.D.

**Birth:** 13<sup>th</sup> April 1971, Hlinsko, Czech Republic

**Grade:** Associate Professor

**ORCID iD:** 0000-0003-3218-6463

**Research iD:** A-1661-2016

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**Affiliation:** Department of Mathematics  
Faculty of Nuclear Sciences and Physical Engineering  
Czech Technical University, Prague, Czech Republic

**Affiliation II:** Institute of Computer Aided Engineering and Computer Science  
Faculty of Civil Engineering  
Brno University of Technology

**Education:**

1994 – 1999	University of Hradec Králové, Master Degree
1999 – 2003	Faculty of Nuclear Sciences and Physical Engineering, Doctoral Degree
2011	Faculty of Nuclear Sciences and Physical Engineering, Associated Professor

**Scientific Status:**

2011 – present Country Representative of World Conference of Transport Research (WCTR)

**Scientific Group:**

2010 – present GAMS — Group of Applied Mathematics and Stochastics

## Scientific Fellowships:

2019 – present	Massey University of New Zealand, Auckland, New Zealand
2017 – present	Hochschule Munich, Munich, Germany
2015 – present	Julich Supercomputing Centre, Julich, Germany
1999 – present	Institute of Economy and Traffic, Technical University of Dresden, Germany
2013 – present	Nanyang Technological University, Singapore, Singapore
1999 – present	Max Planck Institute for Physics of Complex Systems, Dresden, Germany
2016 – present	Technical University, Munich, Germany
2001 – present	Joint Institute of Nuclear Research, Dubna, Russia
2008 – present	Université Paris-Sud 11, Paris, France
2014 – present	AGH University Krakow, Krakow, Poland
1999 – present	Institute of Physics, Czech Academy of Science, Czech Republic
1999 – present	University of Hradec Králové, Czech Republic
2005 – present	Brno University of Technology, Faculty of Civil Engineering, Czech Republic
2013 – present	Institute of Information Theory and Automation, Czech Republic

## Research Topics:

Mathematical Modeling of Socio-Physical Dynamics  
Vehicular Headway Modeling  
Analytical Computations for Physics of Traffic  
Numerical Models of Traffic Flows  
Asymmetric Simple Exclusion Model  
Merging, Weaving, and Intersection Capacities  
Models for Pedestrian Flows  
Models for Crowd Under the Panic Conditions  
Theory of Balanced Distributions  
Balanced Particle Systems  
Random Matrix Theory

## Scientific Evaluation:

Web of Science	<b>298</b> (with self-citations, last update: 6/8/2020)
Web of Science	<b>181</b> (without self-citations, last update: 6/8/2020)
H-index (Web of Science)	<b>10</b> (with self-citations, last update: 6/8/2020)
Number of WOS Publications	<b>29</b> (last update: 6/8/2020)

### Top Projects:

2020 – 2024	AdMath4Traffic – Advanced mathematical-physical methods for modeling of traffic flow microstructure (supported by Technology Agency of the Czech Republic TA ČR)
2018 – 2020	Automated inspection system for a car engine space (in collaboration with Škoda Auto)
2015 – 2017	Detection of stochastic universalities in non-equilibrium states of socio-physical systems by means of Random Matrix Theory (supported by Czech Science Foundation GA ČR)

### Scientific Collaborators:

Prof. RNDr. Petr Šeba, DrSc.	Random Matrix Theory & Theory of Chaos & Parking Problems & New Aspects in Physics of Traffic
Prof. Dr. Dirk Helbing	Quantitative Sociodynamics & Physics of Traffic & Local Thermodynamical Gases
Prof. Vyaceslav Borisovic Priezhev	Generalizations of Asymmetric Simple Exclusion Model
Prof. Ingrid Rotter	Classical and Quantum Chaos
Dr. Peter Wagner	Physics of Traffic & Cellular Models
Prof. Cecile Appert-Rolland	Advanced Statistical Analysis of Traffic Data
Ing. Jiří Apeltauer, Ph.D.	Vehicular Headway Modeling & Merging and Weaving & Intersection Capacities
Ing. Pavel Hrabák, Ph.D.	TASEP & Models for Pedestrian Flows
Doc. Ing. Tomáš Hobza, Ph.D.	Vehicular Headway Modeling & Random Matrix Theory
Ing. Marek Bukáček	Pedestrian dynamics

### Teaching Activities:

FNSPE, CTU Prague	Mathematical Analysis (Calculus), Equations of Mathematical Physics, Seminar on Calculus, Mathematical Modeling of Vehicular Systems, Random Matrix Theory in Applications, Mathematics for Particle Systems, Theory of Deterministic Chaos
University of Hradec Králové	Theoretical Physics, Theory of Electricity and Magnetism, Theory of Relativity, Mathematics for Physicists

## Reviewed Articles in the Impacted Scientific Periodicals:

- 2019 M. Krbálek, J. Apeltauer, and František Šeba  
*Traffic Flow Merging – Statistical and Numerical Modeling of Microstructure*  
Journal of Computational Science **32C** (2019), 99–105
- 2019 O. Kollert, M. Krbálek, T. Hobza, and M. Krbálková  
*Statistical rigidity of vehicular streams – theory versus reality*  
Journal of Physics Communications **3** (2019), 035020
- 2018 M. Bukáček, P. Hrabák, and M. Krbálek  
*Microscopic Travel Time Analysis of Bottleneck Experiment*  
Transportmetrica A: Transport Science **14/5-6** (2018), 375
- 2018 M. Krbálek, J. Apeltauer, T. Apeltauer, and Z. Szabová  
*Three methods for estimating a range of vehicular interactions*  
Physica A **491** (2018), 112
- 2018 M. Krbálek, P. Hrabák, and M. Bukáček,  
*Pedestrian headways — Reflection of territorial social forces*  
Physica A **490** (2018), 38
- 2017 M. Krbálek  
*Quantitative analysis of interaction range in vehicular flows*  
Transportation Research Procedia **25** (2017), 1268
- 2016 M. Krbálek and P. Hrabák  
*Time-headway distribution for periodic totally asymmetric exclusion process with various updates*  
Physics Letters A **380/9-10** (2016), 1003
- 2016 M. Bukáček, P. Hrabák, and M. Krbálek  
*Individual Microscopic Results Of Bottleneck Experiments*  
Traffic and Granular Flow '15 (2016), 105
- 2015 M. Krbálek and J. Šleis  
*Vehicular headways on signalized intersections: theory, models, and reality*  
J. Phys. A: Math. Theor. **48** (2015), 015101
- 2014 M. Bukáček, P. Hrabák, and M. Krbálek  
*Experimental Study of Phase Transition in Pedestrian Flows*  
Transportation Research Procedia **2** (2014), 105

- 2014 M. Bukáček, P. Hrabák, and M. Krbálek  
*Cellular Model of Pedestrian Dynamics with Adaptive Time Span*  
Lecture Notes in Computer Science **7385** (2014), 669
- 2013 P. Hrabák, M. Bukáček, and M. Krbálek  
*Cellular Model of Room Evacuation Based on Occupancy and Movement Prediction: Comparison with Experimental Study*  
Journal of Cellular Automata **8** (2013), 383
- 2013 Milan Krbálek  
*Theoretical predictions for vehicular headways and their clusters*  
J. Phys. A: Math. Theor. **46** (2013), 4451011
- 2012 P. Hrabák, M. Bukáček, and M. Krbálek  
*Cellular Model of Room Evacuation Based on Occupancy and Movement Prediction*  
Lecture Notes in Computer Science **7495** (2012), 709
- 2011 M. Krbálek and P. Hrabák  
*Inter-particle gap distribution and spectral rigidity of totally asymmetric simple exclusion process with open boundaries*  
J. Phys. A: Math. Theor. **44** (2011), 175203
- 2011 M. Krbálek and K. Kittanová  
*Lattice thermodynamic model for vehicular congestions*  
Procedia Social and Behavioral Sciences **20** (2011), 398
- 2011 M. Krbálek and P. Hrabák  
*Distance- and time-headway distribution for totally asymmetric simple exclusion process*  
Procedia Social and Behavioral Sciences **20** (2011), 406
- 2010 M. Krbálek  
*Analytical derivation of time spectral rigidity for thermodynamic traffic gas*  
Kybernetika **46-6** (2010), 1108
- 2009 M. Krbálek and P. Šeba  
*Spectral rigidity of vehicular streams (Random Matrix Theory approach)*  
J. Phys. A: Math. Theor. **42** (2009), 345001
- 2008 M. Krbálek  
*Inter-vehicle gap statistics on signal-controlled crossroads*

- 2007 J. Phys. A: Math. Theor. **41** (2008), 205004  
M. Krbálek  
*Equilibrium distributions in a thermodynamical traffic gas*  
J. Phys. A: Math. Theor. **40** (2008), 5813
- 2005 M. Krbálek  
*Dopravní systémy jako termodynamické plyny*  
Československý časopis pro fyziku **5** (2005), 432
- 2004 M. Krbálek and D. Helbing  
*Determination of interaction potentials in freeway traffic  
from steady-state statistics*  
Physica A **333** (2004), 370
- 2003 M. Krbálek and P. Šeba  
*Headway statistics of public transport in Mexican cities*  
J. Phys. A: Math. Gen. **36** (2003), L1
- 2001 M. Krbálek, P. Šeba, and P. Wagner  
*Headways in the traffic flow - remarks from a physical perspective*  
Phys. Rev. E **64** (2001), 066119
- 2000 M. Krbálek and P. Šeba  
*Statistical properties of the city transport in Cuernavaca (Mexico)  
and random matrix ensembles*  
J. Phys. A: Math. Gen. **33** (2000), L229

#### Other Reviewed Articles, Thesis, and Papers:

- 2019 F. Šeba, M. Krbálek  
*Super-Poissonian Statistics In Traffic Flow*  
APLIMAT 2020 - Proceedings (2020), 930–941
- 2019 M. Krbálek  
*Chůze v davu: impulzy bez doteku*  
Vesmír **9** (2019), 500–502
- 2018 M. Krbálek and M. Krbálková  
*3s-Unification for Vehicular Headway Modeling*  
Proceedings of SPMS 2018, Dobřichovice (2018)

- 2017 M. Krbálek, J. Apeltauer, and T. Apeltauer  
*Vliv třídy rozdělení časových odstupů na kapacitu neřízených křižovatek*  
Silnice Železnice **4** (2017), 90
- 2017 Milan Krbálek  
*Actively-Followed Vehicles*  
Proceedings of SPMS 2017, Dobřichovice 2017, ISBN 978-80-01-06338-5
- 2016 M. Krbálek, J. Apeltauer, and T. Apeltauer  
*Analýza mikrostruktury dopravního proudu s využitím standardních empirických dat*  
Silnice Železnice **5** (2016), 98
- 2015 M. Krbálek, J. Apeltauer, T. Apeltauer, and M. Všečetka  
*Analýza mikrostruktury dopravního proudu metodami teorie náhodných matic*  
Silnice Železnice **3** (2015), 30
- 2015 Milan Krbálek  
*Matematický siloměr na detekci sociálních interakcí*  
Rozhledy matematicko-fyzikální  
Jednota českých matematiků a fyziků, 90/1-2 (2015), 30-38
- 2011 Milan Krbálek  
*Socio-physical modeling of traffic stream dynamics,*  
*Habilitation Thesis, FNSPE, Czech Technical University*
- 2010 Milan Krbálek  
*Discrete thermodynamical modelling of traffic streams*  
Proceedings of World Conference on Transport Research 2010  
Lisbon, Portugal
- 2010 Milan Krbálek  
*Time clearance distribution and associated spectral rigidity of thermodynamic traffic gas*  
Proceedings of Conference SPMS 2010, Děčín, Czech Republic
- 2007 Milan Krbálek  
*Dopravní systémy jako termodynamické plyny*  
Československý časopis pro fyziku **55** (2005), 432-435
- 2003 Milan Krbálek

*Traffic systems - particle gases in thermal equilibrium  
(Random Matrix Theory approach), Doctoral Thesis*  
FNSPE, Czech Technical University

2000 Milan Krbálek and Petr Šeba  
*Description of the traffic systems by the random matrix theory*  
Proceedings of the Nostradamus 2000 Conference, Zlín, Czech Republic

#### Textbooks:

2019 Milan Krbálek  
*Matematická analýza III (čtvrté vydání)*  
Česká technika - nakladatelství ČVUT, Praha 2019

2017 Milan Krbálek  
*Funkce více proměnných*  
Česká technika - nakladatelství ČVUT, Praha 2017

2014 Milan Krbálek  
*Teorie míry a Lebesgueova integrálu*  
Česká technika - nakladatelství ČVUT, Praha 2014

2012 Milan Krbálek  
*Úlohy matematické fyziky*  
Česká technika - nakladatelství ČVUT, Praha 2012

2010 Milan Krbálek  
*Matematická analýza IV – cvičení*  
Česká technika - nakladatelství ČVUT, Praha 2010

2009 Milan Krbálek  
*Matematická analýza IV (druhé rozšířené vydání)*  
Česká technika - nakladatelství ČVUT, Praha 2009



2008

Milan Krbálek

*Úlohy matematické fyziky - cvičení*

Česká technika - nakladatelství ČVUT, Praha 2008

**Commercial Interview:**

*DVTV (with Emma Smetana): Brain as the main cause of vehicular platoons*

*& BBC: Buses on Quantum Schedules*

**Popular Articles:**

*The Times (London), Discovery (USA), Science News (Washington), MF Dnes (Czech Republic), Quanta Magazine (New York), Vesmír (Czech Republic)*

**Personal Interests:**

Running & Hiking & Cycling & Photographing & Music & Caribbean Rums  
& Graphical Design & Takamine – Santa Fè