

# Jakub Mareček: Curriculum Vitae

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WORK EXPERIENCE     ◇ **Research Staff Member**, IBM Research (August 2012 – present)

Lead for a number of projects in power system optimisation and control. Highlights:

- Methods for polynomial optimisation problems, which solve alternating-current optimal power flow problem exactly. Custom solvers for semidefinite programming (SDP) and methods of switching from solving a convexification to Newton’s method on the non-convex problem, which preserve convergence guarantees associated with the convexification. Presented in invited talks at Newton Institute, Cambridge, UK, Fields Institute, Toronto, Canada, and elsewhere. Related papers in IEEE Transactions on Power Systems, IEEE Transactions in Smart Grid, Optimization Methods and Software, etc.
- Solvers for transmission-constrained unit commitment problem for the operator of one of Europe’s largest transmission systems. One paper submitted.
- Methods for the synchronisation of forecasting and optimisation, e.g., in unit commitment. A patent application filed.
- Solvers for investment planning in power distribution systems. One paper published.

PI for “Variety, Veracity, VaLue: Handling the Multiplicity of Urban Sensors” (VaVeL), a EUR 3.99M H2020 project within the Big Data call (ICT-16-2015). Highlights<sup>1</sup>:

- Closed-loop analyses of information provision in urban transportation. A number of novel approaches and proofs of their asymptotic stability (in probability).
- Design and analysis of traffic control systems, with two patent applications pending.
- Architecture and development of stream-processing systems in intelligent traffic management. An incident-management system runs at Dublin City Council’s Traffic Control Room already.

A wide variety of further work included<sup>1</sup>:

- Prototypes of distributional forecasting, risk assessment, and decision support components for disruption management in airlines. One patent application filed.
- Prototypes of distributional forecasting in railways. One US patent application filed.
- The architecture and numerous algorithms for a library for optimisation under uncertainty in Java. Single-handedly developed 180 out of the first 200 classes of an early prototype. One patent application filed.
- Solvers for pressure management in water distribution at Dublin City Council.

Used Python, Java (incl. Android SDK, JNI), C/C++, Matlab, AMPL, Spark, ...

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<sup>1</sup>All details listed have been cleared for publication. Customers, where identified, have agreed to be named. Much else remains IBM confidential.

- ◇ **Visiting Scientist**, Czech Technical University (Sep 2017 – present)  
While remaining 100% at IBM, I work with researchers in the Artificial Intelligence Center within the Faculty of Electrical Engineering of Czech Republic's foremost engineering institution.
- ◇ **Adjunct Lecturer**, University College Dublin (Sep 2015 – Sep 2017)  
While remaining 100% at IBM:
  - Teaching MIS40530 *Numerical Algorithms and their Analysis*. A refreshed version of the course is based on *Complexity and Real Computation* by Blum, Cucker, Shub, and Smale.
  - Supervising MSc students within MSc in Business Analytics.
  - Affiliated with the lab of Robert Shorten in the School of Electrical, Electronic and Communications Engineering.
- ◇ **Post-doc**, The University of Edinburgh (Jan 2012 – Jun 2012)  
Work on first-order methods for large-scale optimisation in the Edinburgh Research Group in Optimization, headed by Prof. Jacek Gondzio:
  - Co-developed distributed methods for the minimisation of composite functions, with strong bounds on the rate of convergence taking into account non-trivial scheduling of the workload.
  - Tests on training sparse support vector machines (SVM) with almost 100 GB of genomic data and sparse regression (Lasso) on a 3 TB data-set.Used C++, boost, MPI, and OpenMP. EPSRC funding for 2 years.
- ◇ **Research Software Engineer**, IBM T. J. Watson Research Center (Nov 2011 – Jan 2012)  
Work on question generation and answering in the group of Dr. Jan Kleindienst. Specifically, work on integer linear programming in semantic role labelling. Legally, a consulting software engineer at IBM's Prague office. Used Python.
- ◇ **Researcher**, The University of Toronto (Jul–Sept 2011)  
Invited participant in a Summer Thematic Program on the Mathematics of Constraint Satisfaction at Fields Institute for Research in Mathematical Sciences, organised by Profs. Guruswami, Hell, Valeriotte, and Willard.
- ◇ **Logistics of Small Things Fellowship**, The University of Nottingham (Feb–Apr 2011)  
Work on stochastic control in a scanning probe microscope under development in Nottingham Nanotechnology and Nanoscience Centre in the School of Physics and Astronomy. Supervised by Dr. Richard Woolley and Dr. Andrew J. Parkes. Used Python and Matlab.
- ◇ **Industrial Mathematics Internship**, ARM Ltd. (Oct 2009 – Apr 2010)  
Developed a scheduler for an embedded multi-core fine-grained multi-threading processor compliant with OpenCL (*ARM Mali*). Established EXP-Hardness of some of the problems involved. Developed heuristics for decoding signal in wireless communications with multiple antennas (MIMO over QAM in LTE, LTE Advanced, and WiFi N). Used C++ and Matlab.
- ◇ **Research Associate** (Part-time), The University of Nottingham (Mar–Jul 2007)  
Research associate in the group of Prof. Ronald A. Carter, working with Prof. Svenja Adolphs, Prof. Norbert Schmitt, and their students. Developed tools facilitating research in corpus linguistics in one of the top corpus linguistics teams world-wide. Helped set up the SRIF *Corpus Lab* in the School of English and led tutorials on the use of corpora. Used Python.
- ◇ **Teacher** (Part-time), Masaryk University (Nov 2003–Jun 2006)  
Taught English to Deaf students at my *alma mater*. Developed an intensive course using Moodle, custom-compiled corpora, tools in Python, and XSL transformations. Responsible for teaching English to the Deaf funded by the European Social Fund (EUR 500K).

- ◇ **Software Developer and Co-founder**, Aponia Software s. r. o. (until Oct 2003)  
Developed *Pocket Translator 2004*, an award-winning and very well selling dictionary interface for Microsoft Windows Mobile (Pocket PC), Microsoft Embedded Visual C++. The first contributor towards *Be on Road*, an in-car sat-nav product developed and sold for over 10 years. Employee number 1 in what became one of the largest vendors of in-car sat-nav in Central Europe around 2006.
- ◇ **Programmer**, BrnoCity s. r. o. (May 2000 – Feb 2001)  
Developed several web-based applications, including a web-based email client and a message handling module for a CRM system, in a team of five. Used Perl, PHP and Java with Oracle 8i and MySQL.

SUPERVISION ◇ **Mentor to PhD Students** on Internships at IBM Research

Cunlu Zhou at the University of Notre Dame (2018):  
Alternative Methods in Semidefinite Programming

Jing Xu at the University of Pennsylvania (2017):  
Robust Parameter Estimation in Gaussian Mixture Models

Alan Liddel at the University of Notre Dame (2016) and  
Jie Liu at the Lehigh University (2016):  
Hybrid Methods for Polynomial Optimisation

Martin Takáč at the University of Edinburgh (2014) and  
Wann-Jiun Ma at the University of Notre Dame (2014):  
First-Order Methods for Semidefinite Programming

Tim McCoy at the University of Notre Dame (2013):  
Homotopy Methods in Power Systems

◇ **Business Analytics MSc Dissertations**, University College Dublin

Yang Yun and Jinxin Wang (2015, w/ Mike O'Neill)  
Smart Traffic Regulation

Catherine Kerr and Terri Hoare (2014, 1.1, w/ Paula Carroll):  
Reconciling the Output of Multiple Stochastic Classifiers

◇ **Computer Science MSc Dissertations**, Czech Technical University

Jiří Kulovaný (2013, w/ Zdeněk Hanzálek):  
Dynamic Data Structures for Multi-criteria Shortest Paths and Multi-dimensional Packing

◇ **Operational Research MSc Dissertations**, The University of Edinburgh

Man Ho Cheng (2016, w/ Andreas Grothey):  
A convergent hierarchy of MISOCP relaxations of ACOFP

Wenjia Chen (2015, w/ Andreas Grothey):  
Behaviour-consistent Real-time Traffic Routing under Information Provision and Pricing

Thomas Facer (2013, "Distinction", w/ Coralia Cartis at the University of Oxford):  
Scheduling Multi-type Branching Processes

Rui Wang (2013, w/ Coralia Cartis at the University of Oxford):  
Copositive Programming in Optimisation under Uncertainty

Guanglei Wang (2012, "Distinction", w/ Adam Ouorou at Orange Labs):  
Robust Network Design with Multiple Virtual Networks

Thibaud Du Pouget De Nadaillac (2011, "Distinction", w/ Paul Keating at Air New Zealand): Load Planning for Civilian Passenger Aircraft, A MIP Approach

Yin Wang (2011, w/ Ian Walker at Cisco):  
Forecasting Methods in Sales

- TEACHING
- ◇ **Adjunct Lecturer**, University College Dublin  
Autumn 2015: MIS40530 Numerical Algorithms and their Analysis  
(compulsory graduate course, based on *Complexity and Real Computation* by Blum, Cucker, Shub, and Smale; 55 students incl. part-time students)
  - ◇ **Stream Lecturer**, The University of Edinburgh  
Spring 2012: Mathematical Computation and Communication Skills, Maple stream  
(compulsory 3rd-year undergraduate course on algorithm design and Maple programming, 56 students)
  - ◇ **Teaching Assistant**, The University of Nottingham  
Spring 2007: Q34180 Text, Talk and Corpus Analysis  
Autumn 2008: G52ADS Algorithms and Data Structures  
Spring 2010: G53COM Computability
  - ◇ **Tutor of English**, Masaryk University  
Spring 2004: English for the Deaf I  
Autumn 2004: English for the Deaf I  
Spring 2005: English for the Deaf II  
Autumn 2005: English for the Deaf III, English for the Deaf I  
Spring 2006: English for the Deaf III, English for the Deaf I
  - ◇ **Various Roles**, DDM Junior (Sept 1999 – Jul 2007)  
Taught C++ programming to gifted high-school students. Member of jury of speed coding competitions organised by Czech Republic's Dept. of Education.
- FURTHER ACADEMIC ACTIVITIES
- ◇ **Programme Committee Memberships**, AAAI Conference on Artificial Intelligence (AAAI 2019), Artificial Intelligence and Statistics (AISTATS 2017, 2018, 2019), International Conference on Automated Planning and Scheduling (ICAPS 2017, 2018), International Conference on Machine Learning (ICML 2018), Mining Urban Data (MUD 2018), Workshop on KNOWledge Discovery from Mobility and Transportation Systems (KNOWMe 2017, KNOWMe 2018), Viennese Conference on Optimal Control and Dynamic Games (VC 2018).
  - ◇ **Other Positions of Trust**, Advisory board for the doctoral programme in power-systems engineering ("oborová rady doktorského studijního oboru"), Czech Technical University, Work Group 1 (Reliable, economic and efficient smart grid system) of the European Technology and Innovation Platform Smart Networks for Energy Transition (ETIP SNET).
  - ◇ **Refereeing**, Journal submissions referee for Computers & Operations Research, Data Mining and Knowledge Discovery, European Journal of Operational Research, IEEE Transactions on Automatic Control, IEEE Transactions on Circuits and Systems I: Regular Papers, IEEE Transactions on Control of Network Systems, IEEE Transactions on Control Systems Technology, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Power Systems, IEEE Transactions on Intelligent Transportation Systems, IET Image Processing, Information Systems Journal, INFORMS Interfaces, INFORMS Journal on Computing, INFORMS Manufacturing and Service Operations Management, Journal of Heuristics, Journal of Scheduling, Optimization Methods and Software, Parallel Computing,

SIAM Journal on Optimization, Sustainable Energy, Grids and Networks, Transportation Research Record, etc.

- ◇ **Reviewing**, International Conference on Artificial Intelligence and Statistics (AISTATS), International Conference on Autonomous Agents and Multiagent Systems (AAMAS), IEEE Conference on Decision and Control (CDC), IEEE Conference on Control Technology and Applications (CCTA), European Conference on Artificial Intelligence (ECAI), etc. International Conference on Machine Learning (ICML), International Conference on Learning Representations (ICLR), International Symposium on Computer Architecture (ISCA), International Symposium on Wireless Communications Systems (ISWCS), The Neural Information Processing Systems (NIPS), Transportation Research Board Annual Meeting (TRB), International Conference on Very Large Databases (VLDB), etc.
- ◇ **Reviews**, Book and paper reviews for Mathematical Reviews, Springer Briefs, The Computer Journal, Interfaces, and SIGACT Newsletter.
- ◇ **Grant Application Reviews**, COST Association, European Union Framework Programme for Research and Innovation, IBM Shared University Research Grant Proposals, Irish Research Council, The National Research Council of Romania.
- ◇ **Panelist**, Grand Challenges in the Sharing Economy, Institute for Mathematics and its Applications, Minneapolis, USA, July 25, 2017
- ◇ **Contests**, lead organiser of an international timetabling competition in 2017; Minor involvement in the organisation of the 2nd International Timetabling Competition (ITC 2007, Track 3); Member of jury for a number of programming contests organised by Ministerstvo školství, mládeže a tělovýchovy in Brno, the Czech Republic (2001–2005)
- ◇ **Conference Organisation**, Invited to organise a stream on “Energy, environment and climate” at EURO INFORMS Annual Conference, Rome, Italy (2013), which has attracted 44 talks; session chair at the International Symposium of Mathematical Programming, Berlin, Germany (2012); assistant to Dr. Hana Rudová organising the 6th International Conference on Practice and Theory of Automated Timetabling, Brno, the Czech Republic (2006)
- ◇ **Affiliation**, Associate member, Edinburgh Research Group on Optimization (2012–present)

#### FUNDING

- ◇ Co-applicant and IBM PI for VaVeL (*Variety, Veracity, VaLue: Handling the Multiplicity of Urban Sensors*), a EUR 3.9M H2020 project within the “Big Data” call (ICT-16-2015).
- ◇ Formerly a work group (“Big data”) lead and IBM negotiator for ENABLE-S3 (*European Initiative to Enable Validation for Highly Automated Safe and Secure Systems*), an EUR 68M H2020 project within an “ECSEL” call (H2020-ECSEL-2015-2-IA-two-stage).
- ◇ IBM Co-PI in the final year of Insight, a EUR 3.9M FP7 project within the “Intelligent Information Management” call (ICT-2011.4.4). Evaluated “Excellent” throughout.
- ◇ PDRA on “Mathematics for Vast Digital Resources”, a GBP 517K EPSRC project within the 2010 “Mathematics Underpinning Digital Economy and Energy” call.
- ◇ Logistics of Small Things Fellowship at Nottingham Nanotechnology and Nanoscience Centre funded by EPSRC (2011).

#### AWARDS ETC.

- ◇ Part of a team receiving the 5th Annual Award for Outstanding Public Project, which “honors the most innovative, effective, and influential achievements in the intelligent transportation systems (ITS) industry”, ITS Ireland (2016)
- ◇ Outstanding reviewer award at the Thirtieth Annual Conference on Neural Information Processing Systems (NIPS16), IEEE Transactions on Power Systems Outstanding Reviewers for 2016, ...
- ◇ Several Invention Achievement and Plateau awards, one High Value Patent Application Award, IBM Research (2014–present)

- ◇ Invitations for longer stays at Institute for Pure and Applied Mathematics at the University of California, Los Angeles (2018), Fields Institute at the University of Toronto (2011, 2015), the Institute for Mathematics and its Applications (IMA) at the University of Minnesota (2014, 2016, 2017), Newton Institute at the University of Cambridge (2013), dozens of seminar talks at leading universities, etc.
- ◇ Dean's award for excellence ("cena děkana"), Faculty of Informatics, Masaryk University (2009)
- ◇ Masaryk U. Scholarship for Excellent Students ("na podporu vynikajících studentů"; 2008) for overall GPA within the top percentile of graduates of the programme
- ◇ Masaryk U. Faculty of Informatics Extraordinary Scholarship ("zvláštní stipendium"; 2006)
- ◇ Several "top-product" awards for Pocket Translator, the Windows Mobile dictionary interface I have developed while at Aponia Software (2003)

- INVENTION DISCLOSURES ◇ **Deep Learning for Partial Differential Equation (PDE) Based Models** with Fearghal O'Donncha, Philipp Haehnel, Julien Monteil, US Patent Application, filed on September 4, 2018.
- ◇ **Real-time Pollution Control at Intersections** with Jonathan Epperlein, Julien Monteil, US Patent Application, serial no. 16/011,942, filed on June 19, 2018.
  - ◇ **Adaptive Headlights for the Trajectory of a Vehicle** with 9 co-inventors US Patent Application, serial no. 15/971,200, filed on May 4th, 2018.
  - ◇ **Testing Embedded Systems and Application using Hardware-in-the-loop as a Service** with 9 co-inventors US Patent Application, serial no. 15/883,290, filed on January 30, 2018.
  - ◇ **Disruption Control in Complex Schedules** with Randall Cogill, Martin Mevissen, Robert Shorten, Sergiy Zhuk, US Patent Application, serial no. 15/874,402, filed on January 18, 2018.
  - ◇ **Multi-modal Dialogue Broker** with 5 co-inventors US Patent Application, serial no. 15/823,754, filed on November 28th, 2017.
  - ◇ **Identification and Control of Traffic at one or more Traffic Junctions** with Jonathan Epperlein, Rahul Nair, US Patent Application, serial no. 15/581,918, filed on April 28th, 2017.
  - ◇ **Cognitive Journey Companion System** with 9 co-inventors US Patent Application, serial no. 15/469,808, filed on March 27th, 2017.
  - ◇ **Monitoring Resource Consumption Based on Fixed Cost for Threshold Use and Additional Cost for Use Above the Threshold** with Bei Chen, Vincent Lonij, US Patent Application, serial no. 15/180,196, filed on June 13th, 2016.
  - ◇ **System, Method, and Recording Medium for Yield Management of Events** with Robert Shorten, Fabian Wirth, Jia Yuan Yu, US Patent Application, serial no. 14/934,468, filed on November 6th, 2015.
  - ◇ **Estimating the Cost of Data Mining Services** with Pascal Pompey, Dimitrios Mavroeidis, Michael Wurst, US Patent Applications, serial nos. 14/725,409 and 15/149,216, and world-wide patent application number PCT/IB2016/052951, filed on May 29th, 2015.
  - ◇ **Synchronization of Iterative Methods for Solving Optimization Problems with Concurrent Methods for Forecasting in Stream Computing** with Martin Mevissen, Pascal Pompey, Mathieu Sinn, US Patent Application, serial no. 14/694,055, filed on April 23rd, 2015.
  - ◇ **Disruption Forecasting in Complex Schedules** with Randall Cogill, Martin Mevissen, Paulito Palmes, Robert Shorten, Fabian Wirth, US Patent Applications, serial nos. US 14/657,378 and 14/746,282, filed on March 13, 2015.

- ◇ **Managing Resource Access Using Multiple Service Categories** with Robert Shorten, Fabian Wirth, and Jia Yuan Yu, US Patent Application, serial no. 14/543,228, filed on November 17, 2014.
  - ◇ **Optimization of Mixed Criticality Systems**, US Patent Application, serial no. 14/286,004, filed on May 23, 2014. US Patent, serial no. 9,946,972, granted on April 17, 2018.
- BOOKS
- ◇ **Numerical Algorithms for Machine Learning**, joint work with Seán McGarraghy. Under contract with Springer. Expected publication: 2018.
  - ◇ **Mathematical Optimization in the Decision Support Systems for Efficient and Robust Energy Networks**, with a number of co-authors. To be published by Springer.
- JOURNAL PAPERS
- ◇ **Hybrid Methods in Solving Alternating-Current Optimal Power Flows**, joint work with Alan C. Liddell Jr., Martin Takáč, and Jie Liu, *IEEE Transactions on Smart Grid* (2017) 8 (6): 2988–2998. arXiv:1510.02171.
  - ◇ **A Low-Rank Coordinate-Descent Algorithm for Semidefinite Programming Relaxations of Optimal Power Flow**, joint work with Martin Takáč, *Optimisation Method and Software* (2017) 32 (4): 849–871. arXiv:1506.08568.
  - ◇ **Matrix Completion under Interval Uncertainty**, joint work with Peter Richtárik and Martin Takáč, *European Journal on Operational Research* (2017) 256 (1): 35–43. arXiv:1408.2467.
  - ◇ **Optimal Power Flow as a Polynomial Optimization Problem**, joint work with Bissan Ghaddar and Martin Mevissen, *IEEE Transactions on Power Systems* (2016) 31(1): 539–546. arXiv:1404.3626.
  - ◇  **$r$ -Extreme Signalling for Congestion Control**, joint work with Robert Shorten and Jia Yuan Yu, *International Journal of Control* (2016) 89(10): 1972–1984. arXiv:1404.2458.
  - ◇ **Signalling and Obfuscation for Congestion Control**, joint work with Robert Shorten and Jia Yuan Yu, *International Journal of Control* (2015) 88(10): 2086–2096. arXiv:1406.7639.
  - ◇ **Space-Indexed Formulations of Packing Boxes into a Larger Box**, joint work with Sam D. Allen and Edmund K. Burke, *Operations Research Letters* (2012) 40(1): 20–24.
  - ◇ **A Branch-and-Cut Procedure for the Udine Course Timetabling Problem**, joint work with Edmund K. Burke, Hana Rudová, and Andrew J. Parkes, *Annals of Operations Research* (2012) 194(1): 71–87.
  - ◇ **A Supernodal Formulation of Vertex Colouring with Applications in Course Timetabling**, joint work with Edmund K. Burke, Hana Rudová, and Andrew J. Parkes, *Annals of Operations Research* (2010) 179(1): 105–130. arXiv:0710.3603
  - ◇ **Decomposition, Reformulation, and Diving in University Course Timetabling**, joint work with Edmund K. Burke, Hana Rudová, and Andrew J. Parkes, *Computers and Operations Research* (2010) 37(3): 582–597. arXiv:0903.1095
- INVITED CHAPTERS
- ◇ **Distributed Block Coordinate Descent for Minimizing Partially Separable Functions**, joint work with Peter Richtárik and Martin Takáč, in M. Al-Baali, L. Grandinetti, and A. Purnama (eds.), *Recent Developments in Numerical Analysis and Optimization*: 261–288. Springer Proceedings in Mathematics & Statistics, vol. 134. Springer, 2015. arXiv:1406.0238.
  - ◇ **Exploiting Packing Components in General-Purpose Integer Programming Solvers** in J. D. Pintér and G. Fasano (eds.), *Optimized Packings and Their Applications*: 207–223. Springer Optimization and its Applications, vol. 105. Springer, 2015. arXiv:1412.2526.
  - ◇ **Penalising Patterns in Timetables: Novel Integer Programming Formulations**, joint work with Edmund K. Burke, Hana Rudová, and Andrew J. Parkes, in Stefan Nickel and Jörg Kalcsics (eds.), *Operations Research Proceedings*: 409–414. Springer, 2008.
- EXTENDED ABSTRACTS
- ◇ **Regulating the Searching Behaviour of Parked Vehicles Attempting to Locate Moving, Missing Entities** joint work with Matheus Souza, Wynita M. Griggs, and Robert N. Shorten. The 21st IEEE International Conference on Intelligent Transportation Systems, 2018.

- ◇ **Parameter Estimation in Gaussian Mixture Models with Malicious Noise, without Balanced Mixing Coefficients**, joint work with Jing Xu, the 56th Annual Allerton Conference on Communication, Control, and Computing, 2018. arXiv:1711.08082.
- ◇ **The Use of Presence Data in Modelling Demand for Transportation** joint work with Jonathan Epperlein, Jaroslaw Legierski, Marcin Luckner, Rahul Nair. Abstract at Mining Urban Data 3 collocated with ACM SIGKDD 2018. arXiv:1802.03734.
- ◇ **Matrix Completion under Interval Uncertainty: Highlights**, joint work with Peter Richtárik and Martin Takáč, *ECML/PKDD*, the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, 2018.
- ◇ **A Coordinate-Descent Algorithm for Tracking Solutions in Time-Varying Optimal Power Flows**, joint work with Jie Liu, Andrea Simonetto and Martin Takac, the 20th Power Systems Computation Conference, 2018. arXiv:1710.07119.
- ◇ **On Classical Control and Smart Cities**, joint work with Andre R. Fioravanti, Robert N. Shorten, Matheus Souza and Fabian R. Wirth, the 56th IEEE Conference on Decision and Control, 2017. arXiv:1703.07308.
- ◇ **Resource Allocation with Population Dynamics**, joint work with Jonathan Epperlein, the 55th Annual Allerton Conference on Communication, Control, and Computing, 2017. DOI 10.1109/ALLERTON.2017.8262886
- ◇ **INSIGHT: Dynamic Traffic Management Using Heterogeneous Urban Data**, joint work with 24 co-authors, *ECML/PKDD*, the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, 2016. DOI 10.1007/978-3-319-46131-1\_5
- ◇ **MINLP in Transmission Expansion Planning**, joint work with Martin Mevissen and Jonas Christoffer Villumsen, *PSCC*, the 19th Power Systems Computation Conference, 2016. arXiv:1603.04375
- ◇ **Online Problems in Timetabling: Bus Priority at Signalised Junctions**, joint work with Randy Cogill, Martin Mevissen and Hana Rudová, *PATAT*, the International Conference on the Practice and Theory of Timetabling, 2016.
- ◇ **Distributional Robustness in Congestion Control**, joint work with Robert Shorten and Jia Yuan Yu, the 11th European ITS Congress, 2016. arXiv:1705.09152
- ◇ **Pricing Vehicle Sharing with Proximity Information**, joint work with Robert Shorten and Jia Yuan Yu, IEEE International Conference on Big Data and Smart City, 2016. arXiv:1601.06672 doi:10.1109/ICBDSC.2016.7460378
- ◇ **Coordinate Descent for Certain Problems in Semidefinite Programming**, *ISMP*, the International Symposium on Mathematical Programming, 2015.
- ◇ **Traffic Management using RTEC in OWL 2 RL**, joint work with Bernard Gorman and Jia Yuan Yu, *ISWC*, the International Semantic Web Conference, 2014.
- ◇ **Heterogeneous Stream Processing and Crowdsourcing for Urban Traffic Management: Highlights**, joint work with 13 co-authors, Nectar track of *ECML/PKDD*, the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, 2014.
- ◇ **Intelligent Synthesis and Real-time Response using Massive Streaming of Heterogeneous Data (INSIGHT) and its anticipated effect on Intelligent Transport Systems (ITS) in Dublin City, Ireland**, joint work with 10 co-authors, the 10th *ITS European Congress*, 2014.
- ◇ **Heterogeneous Stream Processing and Crowdsourcing for Urban Traffic Management**, joint work with 13 co-authors, *EDBT*, the International Conference on Extending Database Technology, 2014.
- ◇ **Semidefinite Programming in Timetabling II: Algorithms**, joint work with Andrew J. Parkes, *PATAT*, the International Conference on the Practice and Theory of Timetabling, 2012.



- ◇ **Fully Dynamic Data Structures for Taskgraph Scheduling Policies with Applications in OpenCL Accelerators**, joint work with 5 co-authors, *MISTA*, the Multidisciplinary International Scheduling Conference, 2011.
  - ◇ **Semidefinite Programming Relaxations in Timetabling**, joint work with Edmund K. Burke and Andrew J. Parkes, *PATAT*, the International Conference on the Practice and Theory of Timetabling, 2010.
  - ◇ **Some Probabilistic Results on Width Measures of Graphs**, *GROW*, the Graph Classes, Optimization, and Width Parameters, 2009. arXiv:0908.1772.
  - ◇ **A Primal Heuristic for Integer Linear Programming with Automated Aggregations**, *ISMP*, the International Symposium on Mathematical Programming, 2009. Extended into a chapter in my dissertation.
  - ◇ **A Branch-and-Cut Procedure for the Udine Course Timetabling Problem**, joint work with Edmund K. Burke, Hana Rudová, and Andrew J. Parkes, *PATAT*, the International Conference on the Practice and Theory of Timetabling, 2008.
  - ◇ **Zykov Revisited: Engineering an Exact Solver for Graph Colouring**, joint work with Edmund K. Burke and Andrew J. Parkes, *CO*, the International Conference on Combinatorial Optimization, 2008.
  - ◇ **Where is the Symmetry in Graph Colouring?**, joint work with Edmund K. Burke and Andrew J. Parkes, *CO*, the International Conference on Combinatorial Optimization, 2008.
  - ◇ **Penalising Patterns in Timetables: Novel Integer Programming Formulations**, joint work with Edmund K. Burke, Hana Rudová, and Andrew J. Parkes, in *GOR*, the Annual International Conference of the German Operations Research Society, 2007
- VIEWS & REVIEWS
- ◇ **Review of “Integer Programming”**, joint work with Adam N. Letchford, *Interfaces* (2015) 45(5): 481–482
  - ◇ **Review of “An Introduction to Traffic Flow Theory”**, *Interfaces* (2015) 45(1): 108–109
  - ◇ **Review of “Handbook of Networks in Power Systems”**, *Interfaces* (2014) 44(2): 241–251
  - ◇ **Review of “Theoretical Aspects of Local Search”**, *ACM SIGACT News* (2009) 40(2): 27–30
  - ◇ **Review of “Handbook of Approximation Algorithms and Metaheuristics”**, *The Computer Journal* (2010) 53(8): 1338–1339
  - ◇ **Review of “Production Planning Using Mixed Integer Programming”**, *The Computer Journal* (2009) 52(6): 724–725
  - ◇ **Review of “The Traveling Salesman Problem: A Computational Study”**, *Interfaces* (2008) 38(4): 344–344
- WORK IN PROGRESS
- ◇ **On-Line Learning of Linear Dynamical Systems: Exponential Forgetting in Kalman Filters**, joint work with Marko Kozdoba, Tigran Tchraikian, and Shie Mannor.
  - ◇ **Pursuit of Low-Rank Models of Time-Varying Matrices Robust to Sparse and Measurement Noise**, joint work with Albert Akhriev and Andrea Simonetto.
  - ◇ **Robust Spectral Filtering and Anomaly Detection**, joint work with Tigran Tchraikian, arXiv:1808.01181.
  - ◇ **On the Ergodic Control of Ensembles**, joint work with Andre R. Fioravanti, Robert N. Shorten, Matheus Souza and Fabian R. Wirth, arXiv:1807.03256.
  - ◇ **A Two-Step Pre-Processing for Semidefinite Programming** joint work with Vyacheslav Kungurtsev. arXiv:1806.10868.
  - ◇ **Transmission-Constrained Unit Commitment** joint work with Claudio Gambella, Martin Mevissen, Jose Maria Fernandez Ortega, Sara Pezic Djukic, Mustafa Pezic. arXiv:1806.09408.
  - ◇ **Entropy-Penalized Semidefinite Programming** joint work with Mikhail Krechetov, Yury Maximov, Martin Takac. arXiv:1802.04332.

- ◇ **Kuramoto Model as Algebraic Systems**, joint work with Tianran Chen, Dhagash Mehta and Matthew Niemerg.
- ◇ **Integer Programming Ensemble Classifiers for Temporal Relations**, joint work with Paula Carroll, Terri Hoare, and Catherine Kerr, revised. arXiv:1412.1866.
- ◇ **Power Flow as an Algebraic System**, joint work with Tim McCoy and Martin Mevissen. arXiv:1412.8054.
- ◇ **Adjustably Robust Optimal Power Flows with Demand Uncertainty via Path-Based Flows**, joint work with Guanglei Wang and Adam Ouorou. arXiv:1601.06739
- ◇ **A Lift-and-Branch-and-Bound Procedure for Mixed-Integer Polynomial Optimisation** joint work with Martin Mevissen, available on request.
- ◇ **Block-Coordinate Descent for the Semidefinite Programming Relaxations in the Sparse Hierarchy**, joint work with Wann-Jiun Ma and Martin Mevissen, available on request.
- ◇ **Unified Framework and Toolkit for Optimization under Uncertainty**, joint work with many co-authors.
- ◇ **Outer Approximations for Quadratic Equality Constraints**, joint work with Guanglei Wang, available on request.
- ◇ **A Cutting Surface Method for Integer Least Squares with Application in MIMO Signal Decoding**, available on request.
- ◇ **A Semidefinite Programming Relaxation of Integer Least Squares with Applications in MIMO Signal Decoding**, joint work with Florian Jarre, available on request.
- ◇ **A Programming Language for Optimisation with Semi-Automated Reformulations**, joint work with Edmund K. Burke and Andrew J. Parkes, available on request.

SELECTED  
RECENT  
TALKS

- ◇ **Recommender Systems and their Effects**,  
Department of Cybernetics, the Czech Technical University, April 26th, 2017; Mining Urban Data, ACM SIG KDD Annual Conference, London, August 20th, 2018; (presenting joint work with many co-authors; invited talk)
- ◇ **On Classical Control and Smart Cities**,  
The 56th IEEE Conference on Decision and Control, 2017 (presented by Fabian R. Wirth);  
The 14th Viennese Conference on Optimal Control and Dynamic Games, July 3–6, 2018 (presenting joint work with Andre R. Fioravanti, Robert N. Shorten, Matheus Souza, and Fabian R. Wirth; invited talk in an invited session)
- ◇ **When to switch from a convex relaxation of POP to Newton’s method on the non-convex problem**,  
The 23rd International Symposium on Mathematical Programming, Bordeaux, France, July 1-6th, 2018 (presenting joint work with Martin Takac)
- ◇ **MINLP in Transmission Expansion Planning**,  
The 19th Power Systems Computation Conference, Genoa, Italy, June 20–24, 2016 (presenting joint work with Martin Mevissen and Jonas Christoffer Villumsen); 28th European Conference on Operational Research, Poznan, Poland, July 3–6, 2016 (presenting joint work with Martin Mevissen, Bissan Ghaddar, and Jonas Christoffer Villumsen; delivered by Martin Mevissen)
- ◇ **Adjustably Robust Optimal Power Flows with Demand Uncertainty via Path-Based Flows**,  
Center for Optimisation under Uncertainty Research, 27th April, 2016 (presenting joint work with Guanglei Wang and Adam Ouorou, invited)
- ◇ **Probabilistic Analyses in Bi-level Optimisation under Uncertainty**,  
The First International Workshop on Bi-level Programming, San Nicolas de los Garza, Nuevo Leon, Mexico, 7–11th March, 2016 (4-hr invited tutorial based on joint work with Jia Yuan Yu and Robert Shorten); IBM Research, Ireland, 1st April, 2016 (invited tutorial based on joint work with Jia Yuan Yu and Robert Shorten)

- ◇ **Information Provision in Urban Traffic Management,**  
Sustainability Summit 2015, Dublin, Ireland, 3rd November, 2015 (presenting joint work with Jia Yuan Yu and Robert Shorten, invited); Center for Optimisation under Uncertainty Research, 24th February, 2016 (presenting joint work with Jia Yuan Yu and Robert Shorten, invited); Insight Centre for Data Analytics, National University of Ireland, Galway, 26th February 2016 (presenting joint work with Jia Yuan Yu and Robert Shorten, invited); ITS Ireland, Dublin, Ireland, 19th April, 2016 (presenting joint work with Jia Yuan Yu and Robert Shorten, invited); ITS Europe, Glasgow, UK, 7th June, 2016 (presenting joint work with Jia Yuan Yu and Robert Shorten); AI Center, Czech Technical University, Prague, October 20th, 2016 (presenting joint work with many coauthors, invited); Informatics Colloquium, Masaryk University Brno, May 2nd, 2017 (presenting joint work with many coauthors, invited); School Seminar, FIT, Brno University of Technology, October 16, 2017 (presenting joint work with many coauthors, invited); 14th Viennese Conference on Optimal Control and Dynamic Games, July 3–6, 2018 (presenting joint work with many coauthors, invited); I
- ◇ **Inequality-Constrained Matrix Completion,**  
Insight Plenary Meeting, Dublin, January 8, 2015; VaVeL Plenary Meeting, Dublin, October 7, 2016; Center of Optimization under Uncertainty Research (COUR), IBM, October 26, 2016; European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, Dublin, Ireland, September 13th, 2018 (in all cases, presenting joint work with Martin Takáč and Peter Richtárik)
- ◇ **Coordinate Descent (for Certain Problems in Semidefinite Programming),**  
Fields Institute, Toronto, Canada, February 11, 2015 (invited); The 22nd International Symposium on Mathematical Programming, Pittsburgh, PA, 12-17th July, 2015 (presenting joint work with Bissan Ghaddar, Wann-Jiun Ma, Martin Mevissen, Martin Takáč, “invited”)
- ◇ **The Mixed-Integer Polynomial Optimisation Problem,**  
The 17th British-French-German Conference on Optimization, London, UK, 15-17 June 2015 (“invited”)
- ◇ **Reformulation: The Impact, the Automation, and Computational Complexity of Thereof**  
The University of Nottingham, UK, April 29, 2015 (invited)
- ◇ **Mixed-Criticality Robustness,**  
Stochastic Programming Workstream within IBM’s Decision Making under Uncertainty Strategic Initiative, August 13, 2014
- ◇ **Modelling Uncertainty**  
**(in Transmission System Investment Planning with Transmission Switching),**  
PGMO-COST Workshop on Validation and Software, Ecole Polytechnique, Paris, France, October 27th 2014 (invited; presenting joint work with Martin Mevissen, Mathieu Sinn, and Jonas Villumsen)
- ◇ **Polynomial Optimisation in Power Systems at IBM Research,**  
Isaac Newton Institute for Mathematical Sciences, Cambridge, UK, August 8, 2013 (presenting joint work with Tim McCoy and Martin Mevissen); Presentation to executives of a major TSO, October 23rd, 2013 (presenting joint work with Martin Mevissen); IBM-RTE Workshop on Semidefinite Programming for Optimal Power Flow Problems, Dublin, Ireland, April 23, 2014 (presenting joint work with Bissan Ghaddar, Martin Mevissen, and Martin Takáč, invited); 20th Conference of the International Federation of Operational Research Societies, Barcelona, Spain, 13-18 July, 2014 (delivered by Martin Mevissen; presenting joint work with Bissan Ghaddar, invited); PGMO-COST Workshop on Validation and Software, Ecole Polytechnique, Paris, France, October 27th 2014 (delivered by Bissan Ghaddar; presenting joint work with Martin Mevissen, invited); Mixed-Integer Nonlinear Optimization Methods for Energy Systems Engineering, RWTH Aachen University, March 10th, 2015 (presenting joint work with Bissan Ghaddar and Martin Mevissen, invited); School of Mathematics, Cardiff University, October 9th, 2015 (presenting joint work with Bissan

Ghaddar and Martin Mevissen, invited); Alan Turing Institute, Edinburgh, January 29th, 2016 (presenting joint work with Bissan Ghaddar, Jie Lie, Martin Mevissen, and Martin Takac, invited); Institute for Mathematics and its Applications, Minneapolis, MN, May 9-13th, 2016 (poster); School of Mathematics, University of Edinburgh, Edinburgh, September 5th, 2016 (presenting joint work with Bissan Ghaddar, Jie Lie, Martin Mevissen, and Martin Takac, invited); FEE, Czech Technical University, Prague, October 17th, 2016 (presenting joint work with many coauthors, invited); CMP, Czech Technical University, Prague, November 22nd, 2016 (presenting joint work with many coauthors, invited); Institute for Mathematics and its Applications, Minneapolis, MN, July 25, 2017 (invited); School of Mathematics, the University of Birmingham, Birmingham, UK, January, 2018 (presenting joint work with many coauthors, invited);

- ◇ **Improving the Reliability of Smart Grids by Optimal Switchgear Investment and Operations,**  
EURO-INFORMS Joint International Conference, Rome, Italy, July 1–4, 2013; Stochastic Programming Workstream in IBM’s Decision Making under Uncertainty Strategic Initiative, July 26, 2013; in both cases, presenting joint work with Martin Mevissen. 20th Conference of the International Federation of Operational Research Societies, Barcelona, Spain, July 13–18th, 2014 (delivered by Jonas Villumsen; presenting joint work with Martin Mevissen, Mathieu Sinn, and Jonas Villumsen).
- ◇ **Optimizing the Operations of Power Distribution Systems,**  
INFORMS Business Analytics, San Antonio, Texas, April 7–9, 2013 (poster); EURO-INFORMS Joint International Conference, Rome, Italy, July 1–4, 2013; COST Workshop on Mixed Integer Nonlinear Programming, Institute Henri Poincaré (IHP), Paris, France, September 30 – October 2nd (delivered by Martin Mevissen); (presenting joint work with Martin Mevissen and in the case of some talks, also Mathieu Sinn, Olivier Verscheure, Ellen Diskin, and John Byrne)
- ◇ **Risk-averse Routing,**  
2014 SIAM Conference on Optimization, San Diego, CA, May 19-22, 2014 (presenting joint work with Albert Akhriev and Jia Yuan Yu, delivered by the latter)
- ◇ **Data Structures for Stochastic Scheduling,**  
Midsummer Combinatorial Workshop XVIII, Charles University, Prague, the Czech Republic, August 2, 2012
- ◇ **A Distributed Coordinate Descent Method for Composite Function Minimisation, (with Applications in Training Sparse Support Vector Machines),**  
Agents Lab Seminar, Department of Computer Science and Engineering, Czech Technical University, Prague, June 20, 2012 (invited); International Symposium of Mathematical Programming, ISMP 2012, Berlin, August 19–24, 2012 (delivered by Martin Takáč); Theoretical Foundations of Big Data Analysis, The Simons Institute for the Theory of Computing at UC Berkeley, November 1st, 2013 (delivered by Martin Takáč); IMA New Directions Short Course Topics in Control Theory, The University of Minnesota, June 4th, 2014
- ◇ **The Many Approaches to Integer Programming,**  
School of Computer Science, The University of Nottingham, November 15, 2011; ERGO (Edinburgh Research Group in Optimization) Seminar, School of Mathematics, The University of Edinburgh, March 21, 2012; IBM Research, Dublin, Ireland, May 29, 2012 (invited)
- ◇ **Optimisation in Natural Language Processing,**  
IBM T. J. Watson Research Center, Prague, the Czech Republic, November 30, 2011, and a half-day workshop at the same location, December 23rd, 2010 (invited)
- ◇ **Recent Trends in Convex Programming, with Applications,**  
Working Seminar on Formal Models, Discrete Structures, and Algorithms, Brno, the Czech Republic, November 15, 2011 (invited); Automated Scheduling, Optimisation and Planning Seminar, Nottingham, November 15, 2011; IBM T. J. Watson Research Center, Prague,

the Czech Republic, December 2, 2011 (invited); Charles University, Prague, the Czech Republic, June 19, 2012 (invited)

- ◇ **Semidefinite Programming Relaxations in Timetabling (and Matrix-Free Implementations of Augmented Lagrangian Methods for Solving them)**, *Part I: Relaxations*: Automated Scheduling, Optimisation and Planning Seminar, Nottingham, May 25, 2010; International Conference on the Practice and Theory of Automated Timetabling, PATAT 2010, Belfast, August 10–13, 2010; XpressMP, Fair Isaac Corp., Birmingham, UK, December 1, 2010 (invited); *Part II: Algorithms*: Applied Mathematics, SINTEF, Oslo, NO, February 11th, 2011 (invited); Optimisation and Linear Algebra Seminar, School of Mathematics, University of Birmingham, Birmingham, UK, February 17th, 2011 (invited); School of Mathematics, University of Edinburgh, Edinburgh, UK, April 7th, 2011 (invited); LANCS Workshop on Modelling and Solving Complex Optimisation Problems, Lancaster, UK, April 11–13, 2011; School of Mathematics, University of Southampton, Southampton, UK, July 13th, 2011 (invited); International Conference on the Practice and Theory of Automated Timetabling, PATAT 2012, Son, Norway, August 28–31, 2012; *Both Parts*: International Symposium of Mathematical Programming, ISMP 2012, Berlin, August 19–24, 2012
- ◇ **Signal Decoding in Multi-Antenna Systems Using Second-Order Cone Programming**, Research and Development, ARM Ltd., April 8, 2010 (invited); European Conference on Operational Research, EURO XXIV, Lisbon, July 11–14, 2010 (invited); Mixed Integer Programming Workshop, MIP 2010, GeorgiaTech, July 26–29, 2010 (poster); Nonlinear Methods in Combinatorial Optimization, EURO Summer Institute 2010, Klagenfurt, AT, August 30, 2010
- ◇ **OpenCL Scheduling**, Media Processing Group, ARM Ltd., November 17, 2009 (invited); Research and Development, ARM Ltd., April 8, 2010 (invited); Multidisciplinary International Scheduling Conference, MISTA 2011, Phoenix, Arizona, August 9–12, 2011
- ◇ **Some Probabilistic Results on Width Measures of Graphs**, Workshop on Graph Classes, Optimization, and Width Parameters, GROW 4, Bergen, Norway, October 15, 2009; Student Conference on Operational Research, SCOR 2010, Nottingham, April 9–11th, 2010
- ◇ **A Primal Heuristic for Integer Linear Programming with Automated Aggregations**, International Symposium of Mathematical Programming, ISMP 2009, Chicago, August 23–28, 2009

EDUCATION ◇ **The University of Nottingham** (Nottingham, UK)

November 2011: PhD in Computer Science. Thesis on *general-purpose integer linear programming solvers*, which exploit variable aggregations, graph colouring components, and precedence-constrained packing components, supervised by Prof. Edmund K. Burke and Dr. Andrew J. Parkes. Further work included the design of semidefinite programming relaxations for timetabling problems and linear programming relaxations for packing boxes into a larger box.

September 2006 – June 2007: Visiting postgraduate student in the Automated Scheduling, Optimisation, and Planning research group in the School of Computer Science.

◇ **Masaryk University** (Brno, the Czech Republic)

July 2009: Mgr. in Applied Informatics. Thesis on *integer programming approaches to course timetabling* supervised by Dr. Hana Rudová, Dr. Andrew J. Parkes, and Prof. Edmund K. Burke. Within the top percentile of students by GPA upon completion of 120/120 credits.

September 2006 – July 2009: Masters student of Theoretical Computer Science, supervised by Dr. Petr Hliněný. Studies terminated upon completion of 138/120 credits.

June 2006: Bc. in Applied Informatics with Databases and Natural Language Processing.

Final year project with Dr. Petr Hliněný introduced a new *polylogarithmic algorithm for optimisation* of a linear function over an arbitrary discrete set in 3D.

September 2003 – June 2006: Undergraduate student of English Language and Literature with focus on Linguistics. Final year project redesigning *English or Czeenglish?*, the English usage textbook, supervised by Dr. Jarmila Fictumová.

OTHER  
ACTIVITIES

- ◇ **Sport Trekking and Running**, e.g., Lowe Alpine Marathon 2012 (12:57:24, 15th place), Orlen Warsaw Marathon 2013 (3:12), Brněnský masakr 2013 (7:15, 20th place within age group), Dublin Half Marathon 2014 (1:31) and 2015 (1:29), Tatranská Šelma 2018 (09:34).
- ◇ **Python Evangelism** since 2001. Among other engagements, I have translated into Czech, updated, and set in type *Learning Python* by Lutz and Ascher, the first Python textbook to be published in the Czech language.