Mihail Mihaylov, Ph.D.

Blockchain Architect

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Nationality:	Belgian, Bulgarian
Born:	1985 in Bulgaria
Degree:	Doctor of Computer Science
Expertise:	Smart Grid, Blockchain, Smart Contracts, AI, IoT
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RESEARCH

Throughout my career I carried out applied research in numerous projects having the following main responsibilities:

- I am developing **NRGcoin** (www.nrgcoin.org) – a blockchain-based incentive mechanism for boosting green energy in **smart grids**, using real data.
- I applied **data mining** techniques on real-world **nurse rostering** data from Belgian hospitals to improve the quality of the automatic generation of personnel schedules and facilitate manual configuration of automated planning software.
- I collaborated with an independent research institute and developed techniques for **distributed timetabling** and geographical exam scheduling to facilitate course providers in planning their courses and exams.
- I developed intelligent **reinforcement learning** algorithms for emergent coordination and self-organization of **decentralized systems** and applied them in wireless sensor networks.

EDUCATION

2008 – 2012 — **Ph.D. in Artificial Intelligence** at Vrije Universiteit Brussel, Brussels, Belgium. (graduated with Highest Distinction)
Thesis title: "*Decentralized Coordination in Multi-agent Systems*"
Focus: machine learning, wireless sensor networks, game theory, decentralized algorithms, multi-agent systems, collective behavior

2007 – 2008 — **M.Sc. in Artificial Intelligence** at Maastricht University, Maastricht, The Netherlands (graduated with Distinction)
Thesis title: "*Computational Mechanism Design for Wireless Sensor Networks*" (received Leo Coolen Award for thesis)
Focus: mechanism design, wireless sensor networks, game theory, data mining, machine learning, probabilistic robotics, intelligent search techniques, optimization algorithms

2003 – 2007 — **B.Sc. in Computer Engineering** at Universität Duisburg-Essen, Duisburg, Germany
Thesis title: "*Mathematical Methods to Ascertain Flow-Curve Functions With the Help of Neural Networks*"
Focus: Software development and testing, usability engineering, logical devices and digital systems, neural networks, regression analysis, basic electronic devices, design theory, physics

07.2019 – present **Blockchain architect** at *i.LECO*, Belgium.
Fields: Blockchain, Smart Grids, Renewable energy, Smart Contracts
Responsibilities: help enable intelligent Local Energy Communities tackle the challenges of the energy transition through innovative mechanisms and software.

07.2017 – 06.2019 **Senior research engineer** at *Enervalis*, Belgium.
Fields: Blockchain, Smart Grids, Renewable energy, Smart Contracts
Responsibilities: realization of the NRGcoin concept – deployment in real homes, research on Smart Grids and Blockchain Technology.

10.2015 – 06.2017 **Post-doctoral researcher** at *Vrije Universiteit Brussel*, Belgium.
Fields: Smart Grids, Renewable energy, Blockchain, Simulations
Responsibilities: research on Smart Grids and Blockchain Technology, publishing scientific papers, developing proposals, guiding students.

10.2013 – 09.2015 **Senior research scientist** at *Sensing & Control*, Barcelona, Spain.
Fields: Smart Grids, Renewable energy, Auctions, Simulations
Responsibilities: research on intelligent energy trading in Smart Grids (project SCANERGY), publishing scientific papers, developing proposals, advancing position of company in the energy market.

09.2012 – 09.2013 **Post-doctoral researcher** at *KAHO Sint-Lieven*, Ghent, Belgium.
Fields: Data mining, Nurse rostering, Combinatorial optimization
Responsibilities: writing proposals and scientific papers, reviewing publications, supervising master theses, giving lectures and exercises, providing input to and participating in numerous projects.

09.2010 – 07.2012 **Teaching Assistant** at *Vrije Universiteit Brussel*, Belgium.
Responsibilities: Preparing exercises for the "Multi-agent Learning" course and evaluating assignments.

04.2008 – 07.2012 **Ph.D. researcher** at *Vrije Universiteit Brussel*, Belgium.
Topic: "Decentralized Coordination in WSNs"
Responsibilities: conducting research, supervising master theses and bachelor projects, writing papers, reviewing publications, presenting at conferences, writing Ph.D. thesis.

04.2006 – 07.2006 **Teaching Assistant** at *Universität Duisburg-Essen*, Germany.
Responsibilities: leading programming exercises in "Fundamentals of Computer Engineering 2" course.

03.2006 – 06.2006 **Software Developer** at *EIDOLOGIC GmbH*, Duisburg, Germany.
Responsibilities: training neural networks and applying regression learning on real material data, developing visualization software for clients.

VOLUNTEERING

07.2017 – 08.2019 **Voluntary researcher** at *Vrije Universiteit Brussel*, Belgium.

11.2015 – present **Co-organizer** of P2P.Gent Bitcoin Meetup, Gent, Belgium.

11.2013 – 09.2015 **Organizer** of Barcelona Bitcoin Community, Barcelona, Spain.

07.2012 – 09.2013 **Voluntary researcher** at *Vrije Universiteit Brussel*, Belgium.

SPECIALTIES

- Smart Grids (renewable energy, policies, auctions, markets)
- Simulations of complex multi-agent systems (Matlab, Repast, OMNeT++)
- Developing and writing proposals for funding (FP7, Horizon 2020)
- Blockchain (technology, ideology, protocol, currencies, applications, trading)
- Reinforcement Learning (theory, applications)
- Collective Intelligence (emergent behaviour, decentralized coordination)
- Wireless Sensor Networks (hardware, communication/routing protocols)
- Software development (Java , C#, C++, Python)

TECHNICAL SKILLS

- Repast Simphony, Matlab, OMNeT++, Arena,
- Java, C#, C++, Python, Android
- Eclipse, NetBeans, Visual Studio
- LaTeX, Microsoft Office package
- Arduino, Raspberry Pi, soldering, basic electronics

LANGUAGES

- English (fluent)
- Dutch (very good)
- German (outdated)
- Spanish (deteriorating)
- Bulgarian (native)

SOFT SKILLS

- Multicultural awareness
- Design of posters and presentations
- Public speaking at international events
- Experienced in working independently and in a team
- Managing small team

INTERESTS

- Decentralized systems
- Bitcoin & Blockchain
- Renewable energy
- Industrial applications
- Machine intelligence

REFERENCES

Ann Nowé, Vrije Universiteit Brussel, Belgium, ann.nowe@vub.be
Karl Tuyls, University of Liverpool, United Kingdom, k.tuyls@liverpool.ac.uk
Greet Vanden Berghe, KU Leuven, Belgium, greet.vandenberghe@cs.kuleuven.be
Narcís Avellana, Sensing & Control Systems, Spain, narcis.avellana@sensingcontrol.com
Stefan Lodeweyckx, i.LECO, Belgium, stefan.lodeweyckx@ileco.energy

PUBLICATIONS

Journals and Lecture notes:

1. **M. Mihaylov**, R. Rădulescu, I. Rázo-Zapata, S. Jurado, L. Arco, N. Avellana, and A. Nowé, "Comparing stakeholder incentives across state-of-the-art renewable support mechanisms," in *Renewable Energy*, vol 131, pp. 689-699, 2019.
2. **M. Mihaylov**, I. Rázo-Zapata, and A. Nowé, "NRGcoin - A Blockchain-based Reward Mechanism for Both Production and Consumption of Renewable Energy," in *Transforming Climate Finance and Green Investment with Blockchains*, Elsevier, 2018.
3. S. Jurado, À. Nebot, F. Mugica and **M. Mihaylov**, "Fuzzy Inductive Reasoning Forecasting Strategies Able to Cope with Missing Data: A Smart Grid Application," in *Applied Soft Computing*, vol. 51, pp. 225-238, 2017.

4. S. De Clercq, K. Bauters, S. Schockaert, **M. Mihaylov**, A. Nowé, M. De Cock, "Exact and Heuristic Methods for Solving Boolean Games," Autonomous Agents and Multi-Agent Systems, vol. 31(1), pp. 66-106, 2017.
5. **M. Mihaylov**, I. Razo-Zapata, R. Rădulescu, S. Jurado, N. Avellana and A. Nowé, "Smart Grid Demonstration Platform for Renewable Energy Exchange," in *Lecture Notes in Computer Science: Advances in Practical Applications of Scalable Multi-agent Systems*, vol. 9662, 2016.
6. **M. Mihaylov**, P. Smet, W. Van Den Noortgate, G. Vanden Berghe, "Facilitating the Transition from Manual to Automated Nurse Rostering," *Health Systems (to appear)*, 2015.
7. S. De Clercq, K. Bauters, S. Schockaert, **M. Mihaylov**, A. Nowé, M. De Cock, "Exact and Heuristic Methods for Solving Boolean Games," *Autonomous Agents and Multi-Agent Systems (to appear)*, 2015.
8. P. Smet, T. Wauters, **M. Mihaylov**, and G. Vanden Berghe, "The shift minimisation personnel task scheduling problem: a new hybrid approach and computational insights," *Omega – The International Journal of Management Science*, vol. 46, pp. 64-73, 2014.
9. **M. Mihaylov**, K. Tuyls, and A. Nowé, "A Decentralized Approach for Convention Emergence in Multi-Agent Systems," *Autonomous Agents and Multi-Agent Systems*, vol. 28 (5), pp. 749-778, 2014.
10. K.-H. Phung, B. Lemmens, **M. Mihaylov**, L. Tran, and K. Steenhaut, "Adaptive Learning Based Scheduling in Multichannel Protocol for Energy-Efficient Data-Gathering Wireless Sensor Networks," *International Journal of Distributed Sensor Networks*, vol. 2013, Article ID 345821, 11 pages, 2013.
11. **M. Mihaylov**, Y.-A. Le Borgne, K. Tuyls, and A. Nowé, "Reinforcement Learning for Self-Organizing Wake-Up Scheduling in Wireless Sensor Networks," *Communications in Computer and Information Science*, vol. 271, pp. 382-397, 2013.
12. **M. Mihaylov**, Y.-A. Le Borgne, K. Tuyls, and A. Nowé, "Decentralised reinforcement learning for energy-efficient scheduling in wireless sensor networks," *International Journal of Communication Networks and Distributed Systems*, vol. 9, pp. 207-224, 2012.
13. **M. Mihaylov**, Y.-A. Le Borgne, K. Tuyls, and A. Nowé, "Decentralized Learning in Wireless Sensor Networks," in *Lecture Notes in Computer Science (Springer Berlin/Heidelberg)*, vol. 5924, 2010.

Conferences and workshops:

1. J. Hemelhof, **M. Mihaylov** and A. Nowe, "Improving Zero-Intelligence Plus for Call Markets," in *Proc. of the 31th Benelux Conference on Artificial Intelligence (BNAIC)*, Burssels, Belgium, 2019.
2. J. Devriese, T. Degrande, **M. Mihaylov**, S. Verbrugge, and D. Colle, "Techno-economic analysis of residential thermal flexibility for demand side management," presented at the *58th International FITCE Congress & 10th CTTE Conference*, Ghent, Belgium, 2019.
3. I. Razo-Zapata, **M. Mihaylov** and E. Proper, "Exploring the Application of Multilayer Networks in Enterprise Architecture: A Case Study in the Smart Grid," in *Proc. of the 18th IEEE Conference on Business Informatics* (CBI), Paris, France, 2016.
4. **M. Mihaylov**, I. Razo-Zapata, R. Rădulescu, and A. Nowé, "Boosting the Renewable Energy Economy with NRGcoin," in *Proc. of the 4th International Conference on ICT for Sustainability (ICT4S)*, Amsterdam, The Netherlands, 2016.
5. I. Razo-Zapata, **M. Mihaylov** and A. Nowé, "Integration of Load Shifting and Storage to Reduce Gray Energy Demand," in *Proc. of the 5th International Conference on Smart Cities and Green ICT Systems (SMARTGREENS)*, Rome, Italy, 2016.
6. **M. Mihaylov**, S. Jurado, N. Avellana, I. Rázo-Zapata, K. Van Moffaert, A. Cañadas, M. Bezunartea, L. Arco, I. Grau and A. Nowé, "SCANERGY: a Scalable and Modular System for Energy Trading Between Prosumers," in *Proceedings of the 14th International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, Istanbul, Turkey, 2015.
7. **M. Mihaylov**, S. Jurado, N. Avellana, K. Van Moffaert, I. Magrans de Abril and A. Nowé, "NRGcoin: Virtual Currency for Trading of Renewable Energy in Smart Grids," in *Proc. of the 11th International Conference on the European Energy Market (EEM)*, Krakow, Poland, 2014.
8. **M. Mihaylov**, S. Jurado, K. Van Moffaert, N. Avellana, and A. Nowé, "NRG-X-Change: A Novel Mechanism for Trading of Renewable Energy in Smart Grids," in *Proc. of the 3rd International Conference on Smart Grids and Green IT Systems (SmartGreens)*, Barcelona, Spain, 2014.
9. S. De Clercq, K. Bauters, S. Schockaert, **M. Mihaylov**, M. De Cock, and A. Nowé, "Decentralized computation of Pareto optimal pure Nash equilibria of Boolean games with privacy concerns," in *Proc. of the 6th International Conference on Agents and Artificial Intelligence (ICAART)*, Angers, France, 2014.
10. **M. Mihaylov**, T. Wauters, and G. Vanden Berghe, "Geoxam: Decision Support Tool for Geographically Distributed Exam Scheduling," in *Proc. of the 25th Benelux Conference on Artificial Intelligence (BNAIC),* Ghent, Belgium, 2013.

11. **M. Mihaylov**, T. Wauters, and G. Vanden Berghe, "Geographically Distributed Exam Timetabling," in *Proc. of the Multidisciplinary International Scheduling Conference: Theory and Applications (MISTA)*, Ghent, Belgium, 2013.
12. **M. Mihaylov**, P. Smet, and G. Vanden Berghe, "Automatic Constraint Weight Extraction for Nurse Rostering: A Case Study," in *Proc. of the 27th Annual Conference of the Belgian Operational Research Society (ORBEL)*, Kortrijk, Belgium, 2013.
13. **M. Mihaylov**, K. Tuyls, and A. Nowé, "Simple Decentralized Algorithm for Coordination Games," in *Proc. of the 21st Annual Belgian-Dutch Conference on Machine Learning (BENELEARN)*, Ghent, Belgium, 2012.
14. K.-H. Phung, B. Lemmens, **M. Mihaylov**, D. Di Zenobio, K. Steenhaut, L. Tran, "Multi-agent Learning for Multi-channel Wireless Sensor Networks," in *Proc. of the 3rd IEEE International Workshop on SmArt COmmunications in NEtwork Technologies (SaCoNet)*, Ottawa, Canada, 2012.
15. **M. Mihaylov**, Y.-A. Le Borgne, K. Tuyls, and A. Nowé, "Distributed Cooperation in Wireless Sensor Networks," in *Proc. of the 10th International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, Taipei, Taiwan, 2011.
16. **M. Mihaylov**, Y.-A. Le Borgne, K. Tuyls, and A. Nowé, "Self-Organizing Synchronicity and Desynchronicity using Reinforcement Learning," in *Proc. of the 3rd International Conference on Agents and Artificial Intelligence (ICAART)*, Rome, Italy, 2011.
17. **M. Mihaylov**, Y.-A. Le Borgne, K. Tuyls, and A. Nowé, "DESYDE: Decentralized (De)synchronization in Wireless Sensor Networks," in *Proc. of the 23rd Benelux Conference on Artificial Intelligence (BNAIC)*, Ghent, Belgium, 2011.
18. K. Van Moffaert, B. Van Vreckem, **M. Mihaylov**, and A. Nowé, "A Learning Approach to the School Bus Routing Problem," in *Proc. of the 23rd Benelux Conference on Artificial Intelligence (BNAIC)*, Ghent, Belgium, 2011.
19. **M. Mihaylov**, Y.-A. Le Borgne, K. Tuyls, and A. Nowé, "DESYDE: Decentralized (De)synchronization in Wireless Sensor Networks," in *Proc. of the 20th Annual Belgian-Dutch Conference on Machine Learning (BENELEARN)*, The Hague, The Netherlands, 2011.
20. V. Naessens, **M. Mihaylov**, S. De Jong, K. Verbeeck, and A. Nowé, "Carebook: Assisting elderly people by social networking," in *Proc. of the 1st International Conference on Interdisciplinary Research on Technology, Education and Communication (ITEC)*, Kortrijk, Belgium, 2010.
21. **M. Mihaylov**, Y.-A. Le Borgne, A. Nowé, and K. Tuyls, "Decentralized Reinforcement Learning for Wake-up Scheduling," in *Proc. of the 7th European Conference on Wireless Sensor Networks - Posters and Demos*, Coimbra, Portugal, 2010.
22. **M. Mihaylov**, K. Tuyls, and A. Nowé, "Decentralized Learning in Wireless Sensor Networks," in *Proc. of the 21st Benelux Conference on Artificial Intelligence (BNAIC)*, Eindhoven, The Netherlands, 2009.
23. **M. Mihaylov**, K. Tuyls, and A. Nowé, "Decentralized Learning in Wireless Sensor Networks," in *Proc. of the Adaptive and Learning Agents Workshop (ALA)*, Budapest, Hungary, 2009.
24. **M. Mihaylov**, A. Nowé, and K. Tuyls, "Collective Intelligent Wireless Sensor Networks," in *Proc. of the 20th Benelux Conference on Artificial Intelligence (BNAIC)*, Enschede, The Netherlands, 2008.

Theses:

1. **M. Mihaylov**, "Decentralized Coordination in Multi-Agent Systems," *Ph.D. thesis*, Vrije Universiteit Brussel, Brussels, Belgium, 2012.
2. **M. Mihaylov**, "Computational Mechanism Design for Wireless Sensor Networks," *master thesis*, Maastricht University, Maastricht, The Netherlands, 2008.
3. **M. Mihaylov**, "Mathematical Methods to Ascertain Flow-Curve Functions With the Help of Neural Networks," *bachelor thesis*, Universität Duisburg-Essen, Duisburg, Germany, 2007.