Klaus Lichtenegger

CONTACT INFORMATION:

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BORN

July, 18th, 1979 in Schladming, Austria

EDUCATION

FH Joanneum – University of Applied Sciences, Graz, Österreich

- Hochschuldidaktische Weiterbildung (HDW) **March 2020 – June 2021**
  planning, implementation and reflection on university-level teaching

Karl-Franzens-Universität, Graz, Austria

- PhD in physics **October 2005 – July 2010**
  completed with honors; PhD thesis: *Aspects of Confinement in a Functional Approach to Coulomb Gauge QCD* (Supervision Prof. R. Alkofer), Institut of Physics
- Environmental System Sciences **October 1998 – November 2005**
  (Focus on physics) completed with honors; diploma thesis: *Stochastic Cellular Automata Models in Disease Spreading and Ecology* (Supervision Prof. W. Schappacher), Institute of Mathematics and Scientific Computing
- further eduction in mathematics, system sciences and teacher education (partly during educational leaves)

Graz University of Technology, Graz, Austria

- Applied Physics **October 1997 – November 2004**
  diploma thesis *Application of Molecular Dynamics Simulations in the Nanoscale Regime* (Supervision Prof. W. von der Linden), Institute of Theoretical Physics and Computational Physics
- further eduction in control engineering, chemical engineering and heat engineering (partly during educational leaves)

Stiftsgymnasium der Benediktiner, Admont, Austria

- A-Levels with honors, completed 1997 (Subjects: German, English, Mathematics, Latin, Computer Science) with final thesis *Chaosmathematik und fraktale Geometrie*

LANGUAGES

- German$^{\text{native}}$, English$^{\sim\text{C1-2}}$, French$^{\sim\text{A1}}$; Latin, Esperanto

IT EXPERIENCE

- *Operating Systems*: Windows/DOS, Linux, (Mac)OS X
- *Programming Languages*: (Visual) C/C++, Fortran 90, (Visual) Basic, Python (focus on numerical computation and machine learning), Julia
- *Markup & DB Languages*: HTML, TEX, LATEX (incl. PSTricks und TikZ), SQL
- *Mathematics und simulation*: MATLAB/Simulink, GAMS, R, various CAS
- *Applications*: MS & Libre Office, MS Teams, GIMP, Audacity, Moodle, ...

Professional Experience

Research, Development, Design and Consultancy

- *Senior Researcher* **October 2023 – present**
  at BEST Bioenergy and Sustainable Technologies in the Area for automation and control, responsible for projects in the field of renewable energy systems and digital services
- *Senior Lecturer* **March 2019 – September 2023**
  involved both in teaching (for *Data Science and Artificial Intelligence* and *Business Informatics*; see below) and research at FH JOANNEUM University of Applied Sciences
- *Senior Researcher* **October 2011 – September 2019**
  at bioenergy2020+ in the fields of modelling, simulation, data analysis and optimization for renewable thermal, hybrid energy systems and microgrids
- *Visiting Scholar* **October 2007 – January 2008**
  at the *department of physics* of New York University (NYU)
- *Researcher* **February 2006 – January 2009**
  (as part of the PhD programme) at Graz University in the FWF-funded doctoral school *Hadrons in Vacuum, Nuclei und Stars* and in the Graz Advanced School of Science (GASS)

Main Teaching Activities

- *FH JOANNEUM – University of Applied Science*, **since October 2018**
  as external lecturer (Oct. 18 – Feb. 19; since Oct. 23) and as Senior Lecturer (Mar. 19 – Sept. 23), courses including *Mathematical Methods of Data Analysis*, *Computational Intelligence*, *Predictive Analytics*, *Introduction to Data Science*, *Information and Encoding*, *Optization and Numerics*, *Methods and Tools of AI*, *Advanced Topics of AI*
- *Applied Marketing University, Wieselburg, Austria*, **since May 2018**
  externel lecturer for *Energy Storage and Distribution* (with A. Stimmer, Austrian PowerGrid), *Summer School Mathematics*, *Modelling and Simulation*
- *TU Graz und K.-F.-Univ. Graz*, **October 2009 – September 2011**
  University lecturer for exercises/tutorial in calculus/analysis, linear algebra, ordinary differential equations and vector analysis for students of (Applied) Physics with the joint study programme NAWI Graz
- *BFI/Future 2000*, **November 2005 – March 2006**
  lecturer for mathematics – preparation for A-levels in continuing education
- *Graz University of Technology*, **October 2001 – January 2006**
  tutor, later teaching assistant for real und complex analysis in computer science, software development and applied physics

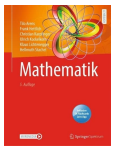
Further Activities

- *Scientific Advisor* **September, 2021 – May, 2023**
  of the Scientific Computing Conference at FH Joanneum in Graz
- *Co-Organizer* **November, 2009 – August, 2010**
  of the 25th International Conference for Physics Students (ICPS) in Graz
- *Key Organizer* **September, 2005 – June, 2007**
  of the lecture series *Quanten, Felder, Schwarze Löcher* (modern physics for the public) at Graz University of Technology
- *Head of the Physics Students Council* **July, 2003 – November, 2004**
  at Graz University of Technology and representative of the Local Comittee Graz in the International Association of Physics Students (IAPS)

Selected Textbooks

- K. Lichtenegger: *Klima, Energie und die große Transformation – Hintergründe, Zusammenhänge und Strategien für den Kurswechsel*, a big-picture view on climate crisis, the energy system and economic transformation, ISBN 978-3-662-71186-6; 518 pages, Springer, Berlin Heidelberg 2025

- T. Arens, F. Hettlich, Ch. Karpfinger, U. Kockelkorn, K. Lichtenegger, H. Stachel: *Mathematik*, Springer Spektrum, Berlin Heidelberg, 5th ed. 2022, ISBN 978-3662643884; 1696 pages. A textbook for university-level applied mathematics, www.matheweb.de



- C. Albert, K. Lichtenegger: *Physikalische Rezepte Mechanik: Schritt für Schritt durch 27 klassische Aufgaben*, a practical introduction to theoretical mechanics, ISBN-13: 978-3662572962; 225 pages, Springer Spektrum, Berlin Heidelberg 2018

- K. Lichtenegger: *Schlüsselkonzepte zur Physik – von den Newton-Axiomen bis zur Hawking-Strahlung*, a collection of essays about fundamental concepts of physics, ISBN 978-3-8274-2385-6; 428 pages, Spektrum Springer, Berlin Heidelberg 2015

- K. Lichtenegger, T. Traub [editors]: *Quanten, Felder Schwarze Löcher – ein Streifzug durch die moderne Physik*, topics of modern physics explained for the general readership, ISBN: 978-3-85125-179-1, Verlag d. Technischen Universität Graz, Graz, 2011

Selected R&D Projects: Short title (Funding) Timespan, Topic

- IEA SHC Task 68 (Technology Cooperation Program) **2022-25**
  Efficient solar district heating, https://task68.iea-shc.org/
  (Task Manager 04/24-03/25, for final year)

- DISTEL (Zukunftsfonds Land Stmk) **2023-25**
  Next-level Model Predictive Control in Conjunction with AI

- ReWaste F (COMET) involved **2021-23**
  Improvement of recycling rates and quality with means of digitalization

- BSAIO (Digital Pro Bootcamps) **2020-22**
  Boosting Sustainability with Artificial Intelligence and Optimization: courses on AI and optimization for practitioners, follow-up coaching of practical projects

- Fit4BA (COIN) **2018-23**
  competence build-up for Big Data and Artificial Intelligence by tackling practical tasks from business and community partners

- Ship2Fair (Horizon2020) **2018-23**
  Optimizing use of solar thermal energy in agriculture and food industry by means of model-predictive optimization, ship2fair-h2020.eu/

- OptEnGrid (Energieforschung) **2017-21**
  improved planning and operation of trans-sectorial energy systems with means of mathematical optimization

- The Green P (Stadt der Zukunft) **2016-17**
  study of potential dual use of traffic areas for additional production of biomass, using algae cultivation

- Solar Predictive Control (Energieforschung) **2015-18**
  predictive control for large-scale solar thermal plants

- BiNe2+ (Energieforschung) **2015-17**
  analysis and energy management for bi-directional heating grids

Selected Scientific Journal Articles & Proceedings

- L. Emberger, G. Nair, K. Lichtenegger et al., *Open data in the solar thermal community: Status, barriers, and opportunities*, Solar Energy Advances, Vol. 5 (2025) 100114
- D. Muschick, S. Zlabinger, A. Moser, K. Lichtenegger, M. Gölles, *A multi-layer model of stratified thermal storage for MILP-based energy management systems*, Applied Energy 314 (2022) 118890
- V. Unterberger, K. Lichtenegger, V. Kaisermayer et al., *An adaptive short-term forecasting method for the energy yield of flat-plate solar collector systems*, Applied Energy 293 (2021) 116891
- M. Mansoor, M. Stadler, M. Zellinger, K. Lichtenegger, H. Auer, A. Cosic, *Optimal planning of thermal energy systems in a microgrid with seasonal storage and piecewise affine cost functions*, Energy 215 A (2021)
- K. Lichtenegger, A. Leitner, T. Märzinger et al., *Decentralized heating grid operation: A comparison of centralized and agent-based optimization*, Sustainable Energy, Grids and Networks **21** (2020) 100300
- V. Unterberger, K. Lichtenegger, P. Innerhofer et al., *Evaluation of the Potential for Efficiency Increase by the Application of Model-Based Control Strategies in Large-Scale Solar Thermal Plants*, Int. J. of Contemp. Energy **4** (2018) 1
- K. Lichtenegger, M. Zellinger, F. Schipfer, *Green P – Nutzung von Verkehrsflächen zur Biomasseproduktion*, Biobased Future **7** (2017)
- K. Lichtenegger, D. Wöss, C. Halmdienst et al.: *Intelligent heat networks: First results of an energy-information-cost-model*, Sustainable Energy, Grids and Networks **11** (2017) p. 1-12
- K. Lichtenegger, T. Hadzibeganovic: *The interplay of self-reflection, social interaction and random events in the dynamics of opinion flow in two-party democracies*, Int. J. Mod. Phys. C **27**, 5 (2016) 1650065
- W. Emhofer, K. Lichtenegger, W. Haslinger et al.: *Ventilation of carbon monoxide from a biomass pellet storage tank – a study of the effects of variation of temperature and cross-ventilation on the efficiency of natural ventilation*, Ann. Occup. Hyg. **59** (2015) 1: 79-90
- K. Lichtenegger, W. Schappacher: *Seeing About Soil – Management Lessons from a Simple Model for Renewable Resources*, Int. J. Mod. Phys. C **25**, 8 (2014) 1450032
- K. Lichtenegger, W. Schappacher, B. Hebenstreit, C. Schmidl, E. Höftberger: *Towards a Stochastic Cellular Automata Model of Log Wood Combustion*, J.o.Phys: Conf. Ser. **490**, 1 (2014), 012015
- K. Lichtenegger, W. Schappacher: *A Carbon-Cycle-Based Stochastic Cellular Automata Climate Model*, Int. J. Mod. Phys. C **22**, 6 (2011) 607-621
- K. Lichtenegger, W. Schappacher: *Phase Transition in a Stochastic Forest Fire Model and Effects of the Definition of Neighborhood*, Int. J. Mod. Phys. C **20**, 8 (2009) 1247-1269, `arXiv:0902.3680 [nlin.CG]`

For a list of publications, see also https://orcid.org/0000-0002-6742-2641

Inventions

- Patent 520 338: *Wärmespeicher und Verfahren zur Bestimmung der Position einer Thermokline* (thermocline detection for heat storage tanks)

Thesis Supervision

- Supervision (primary, secondary or supportive) of master's theses in *Electrical/Energy Engineering*, *Regenerative Energie Systems and Technical Energy Management*, *Applied Physics*, *Data Science and Artificial Intelligence* and *Global Strategic Management*; support in PhD thesis supervision