Luciano Melodia

Curriculum vitae
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Professions

2023–25 Student Assistant at the chairs Algebra and Geometry,
Representation Theory and Operator Algebras,
Applied Analysis and
Applied Mathematics at Friedrich-Alexander Universität Erlangen-Nürnberg.

- Tutor in *Mathematics for Engineers A4*.
- Tutor in *Analysis 2*.
- Tutor in *Analysis 3*.
- Tutor in *Topology and Applications*.
- Tutor in *Topology*.
- Tutor in *Linear Algebra 1*.
- Lecture representation of Prof. Li on the *Tietze Extension Theorem*.
- Lecturer for mathematical proof sessions.
- Lecturer for exercise sessions.
- Supervision and correction of written exams.

2025 Lecturer in Mathematics at Paukkammer Erlangen.

2024–25 Tutor in Mathematics:

- Computer Science, 1 student, Friedrich-Alexander Universität Erlangen-Nürnberg.
- Chemical and Biological Engineering, 1 student, Friedrich-Alexander Universität Erlangen-Nürnberg.
- Physics, 1 student, Friedrich-Alexander Universität Erlangen-Nürnberg.
- Abitur, 13 students, Bavarian Gymnasium.
- Secondary school, 2 students, Bavarian Mittelschule.
- Secondary school, 3 students, Bavarian Realschule.
- Elementary school, 1 student, Bavarian Grundschule.

2021–22 Werkstudent at Corscience GmbH & Co. KG, Erlangen.

- Deep convolutional networks trained on multiple GPUs for automatic detection of calibration spikes in ECG data. Achieved an accuracy of over ≈ 0.99 on ten-fold cross validation with a data set of about 10^6 real world samples tested with 5σ significance, which is state of the art.
- Residual networks for detection of ECG curves in documents. Achieved an intersection over union of ≈ 0.98 on ten-fold cross validation with a data set of about 10^7 artificially enlarged using generative neural networks tested with 3σ significance, which is state of the art.
- Image segmentation using matrix factorisation techniques to isolate ECG curves. Achieved an intersection over union of ≈ 0.99 tested with 6σ significance, which is state of the art.

2019–21 Researcher at Siemens Energy AG, Erlangen.

- Programming with CUDA v.11.0, Tensorflow 2.4, CuDNN v.8.0.4. in Python v.3.8 and v.3.9.
- Operating systems: Ubuntu 20.04, Solus 4, Archlinux 5.11, Windows 11.
- Research published:
  - *Luciano Melodia* and Richard Lenz: Homological Time Series Analysis of Sensor Signals from Power Plants. Machine Learning for Irregular Time Series. Machine Learning and Principles and Practice of Knowledge Discovery in Databases. In Michael Kamp, Irena Kopr-

inska, Adrien Bibal et al. (ed.): Communications in Computer and Information Science. Springer Nature, Switzerland.
  - *Luciano Melodia* and Richard Lenz: Estimate of the Neural Network Dimension Using Algebraic Topology and Lie Theory. Image Mining. Theory and Applications VII. Pattern Recognition and Information Forensics. In Alberto Del Bimbo, Rita Cucchiara, Stan Sciaroff et al. (ed.): Lecture Notes in Computer Science. Springer Nature, Switzerland.
  - *Luciano Melodia* and Richard Lenz: Persistent Homology as a Stopping Criterion for Voronoi Interpolation. Proceedings of the International Workshop on Combinatorial Image Analysis. In Tibor Luki, Reneta Barneva, Valentin Brimkov et al. (ed.): Lecture Notes in Computer Science. Springer, Cham.

2018–21 Researcher Chair of Evolutionary Information Systems (Computer Science 6), Friedrich-Alexander Universität Erlangen-Nürnberg.

- Correction of written exams and assistance in oral exams.
- Preparation and execution of electronic exams.
- Participation in the Data Science program.
- Planning and implementation of the
  - lecture *Knowledge Discovery in Databases*.
  - seminar *Persistent Homology in Data Analytics*.
  - seminar *Topological Data Analysis*, (score 1.14).
  - seminar *New Technologies in Data Management*.
  - exercise lessons in *Process Oriented Information Systems*, (score 1.18).
  - exercise lessons in *Computer Science for Engineers*.
  - exercise lessons in *Conceptual Modeling*.
- Supervision of thesis:
  - Bachelor of Science:
    * B.Sc. Computer Science, Hahn (2021): *Classification of Sensor Signals from Power Plants*.
    * B.Sc. Computer Science, Schäfer (2021): *Learning Validation Models from Sensors of a Power Plant*.
  - Master of Science:
    * M.Sc. Computer Science, Sauerhammer (2021): *A Classification Dashboard for Sensor Signals from Power Plants*.
    * M.Sc. Mechanical Engineering, Seidel (2020): *Classification of Microbes using Time Series Gas Sensor Array Data*.
    * M.Sc. Medical Engineering, Siddiqui (2020): *Extraction of Fetal and Maternal Heartbeats from ECG Signals*.

2015–18 Data Scientist at mb Support GmbH, Regensburg.

- Construction of a fully automated document scanning pipeline for industrial use for massive digitization of paperpiles (up to 6×10^7 documents). Engineering of the scanning street, OCR recognition with a tested benchmark result of CER 1% using Googles Cloud Vision APIs and self trained recurrent neural networks. Integration of the system with a full user interface including the software ergonomic engineering for *openviva C2*.
- Software ergonomic engineering and integration of the *Asterisk*s telecommunication API into *openviva C2*. About 5×10^3 lines of code in PL/SQL and Python.
- Statistical data and market analysis using large deep neural networks, large deep convolutional networks and regression techniques.

2013–15 Research assistant Chair of German Linguistics, Universität Regensburg.

- Examination correction, correction of books and texts.
- Implementation of the *punc.Space* web platform with a custom search engine written in Javascript for realtime online usage with up to 10^3 lines of code.
- Maintenance of the university website.

- Organization and conduct of conferences.

2012–15 Chef in event gastronomy at Apostelkeller, Regensburg.

- Cooking according to a fixed menu for up to 140 guests.
- Waitressing and stock management.

2012–15 Staff-based services at Trademarketing Service GmbH, Salzgitter.

- Goods management and ordering.
- Goods receipt.

2012–14 Translator at Anatol GmbH & Co. KG, Regensburg.

- Italian – German translation.
- Polish – German translation.
- English – German translation.

2010 Volunteer at Alten- und Pflegeheim St. Josef, Regensburg.

Academic Work

Teaching

- Department of Mathematics,
  Friedrich-Alexander Universität Erlangen-Nürnberg
  - 2025 Exercises in *Mathematics for Engineers A4*.
  - 2025 Exercises in *Analysis II*.
  - 2025 Exercises in *Analysis III*.
  - 2024 Exercises in *Topology and Applications*.
  - 2024 Exercises in *Linear Algebra I*.
  - 2023 Exercises in *Topology*.
- Department of Computer Science,
  Friedrich-Alexander Universität Erlangen-Nürnberg
  - 2021 Lecture on *Knowledge Discovery in Databases*.
  - 2021 Exercises in *Process Oriented Information Systems*.
  - 2021 Seminar on *New Technologies in Data Management*.
  - 2021 Exercises in *Computer Science for Engineers*.
  - 2020 Seminar on *Persistent Homology in Data Analytics*.
  - 2020 Seminar on *Topological Data Analysis*.
  - 2020 Exercises in *Process Oriented Information Systems*.
  - 2020 Exercises in *Computer Science for Engineers*.
  - 2020 Seminar on *New Technologies in Data Management*.
  - 2019 Exercises in *Computer Science for Engineers*.
  - 2019 Exercises in *Process Oriented Information Systems*.
  - 2019 Seminar on *New Technologies in Data Management*.
  - 2018 Exercises in *Computer Science for Engineers*.
  - 2018 Seminar on *New Technologies in Data Management*.
  - 2018 Exercises in *Conceptual Modeling*.

Conferences

- Mathematics:
  - 2020 Topological Data Analysis and Beyond.
  - 2020 International Workshop on Combinatorial Image Analysis.
  - 2020 International Conference on Practical Mathematical Discourse.
- Computer Science:
  - 2024 Learning on Graphs.
  - 2023 Learning on Graphs.
  - 2023 International Conference on Advances in Databases, Knowledge, and Data Applications.
  - 2022 Learning on Graphs.
  - 2022 International Conference on Learning Representations.
  - 2021 Machine Learning for Irregular Time Series.
  - 2021 International Conference on Pattern Recognition.
  - 2020 European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases.
  - 2019 European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases.
  - 2019 Symposium on Principles of Database Systems.
- Linguistics:
  - 2017 Kolloquium zum Sprachmanagement.
  - 2013 Destandardisierung und Standardvarietät.

Service

- Awards:
  - 2024 Top reviewer award at Learning on Graphs.

  - 2024 Oskar-Karl-Forster scholarship fellow.
- Reviewer:
  - 2024 Learning on Graphs.
  - 2024 International Conference on Advances in Databases, Knowledge, and Data Applications.
  - 2023 Learning on Graphs.
  - 2023 International Conference on Advances in Databases, Knowledge, and Data Applications.
  - 2022 Learning on Graphs.
  - 2022 International Conference on Advances in Databases, Knowledge, and Data Applications.
  - 2022 Reviewer for the Workshop Geometrical and Topological Representation Learning at International Conference on Learning Representations.
  - 2021 Reviewer for the Workshop Topological Data Analysis and Beyond at Neural Information Processing Systems.
  - 2021 International Conference on Advances in Databases, Knowledge, and Data Applications.
  - 2020 International Conference on Advances in Databases, Knowledge, and Data Applications.
- Memberships:
  - 2019 – 20 Member of the Gesellschaft für Informatik e.V.
  - 2017 – 18 Member of the Computational Intelligence and Machine Learning Group, Universität Regensburg.
- 2024 Student Representative for the Department of Mathematics at Friedrich-Alexander Universität Erlangen-Nürnberg.
- 2016 Student Representative for the Department of Language, Literature and Cultural Sciences at Universität Regensburg.

Papers

2021 *Luciano Melodia* and Richard Lenz: Homological Time Series Analysis of Sensor Signals from Power Plants. Machine Learning for Irregular Time Series. Machine Learning and Principles and Practice of Knowledge Discovery in Databases. In Michael Kamp, Irena Koprinska, Adrien Bibal et al. (ed.): Communications in Computer and Information Science. Springer Nature, Switzerland.

2021 *Luciano Melodia* and Richard Lenz: Estimate of the Neural Network Dimension Using Algebraic Topology and Lie Theory. Image Mining. Theory and Applications VII. Pattern Recognition and Information Forensics. In Alberto Del Bimbo, Rita Cucchiara, Stan Sciaroff et al. (ed.): Lecture Notes in Computer Science. Springer Nature, Switzerland.

2020 *Luciano Melodia* and Richard Lenz: Persistent Homology as a Stopping Criterion for Voronoi Interpolation. Proceedings of the International Workshop on Combinatorial Image Analysis. In Tibor Luki, Reneta Barneva, Valentin Brimkov et al. (ed.): Lecture Notes in Computer Science. Springer, Cham.

2015 *Luciano Melodia*: On the Use of the Paradigm *brauchen* with and without *zu* with Infinitives. In Kateřina Šichová, Reinhard Krapp, Paul Rössler et al. (ed.): Standard Varieties of German – Case Studies from Social Practice, Logos, Berlin.

Theses

2024 *Luciano Melodia*: Algebraic and Topological Persistence. Library of the Friedrich-Alexander Universität Erlangen-Nürnberg. Bachelor thesis in Mathematics.

2018 *Luciano Melodia*: Deep Learning Estimation of Absorbed Radiation Dose for Nuclear Medicine Diagnostics. Library of the Universität Regensburg, Master Thesis in Information Science.

2015 *Luciano Melodia*: Entwicklung einer Interpunktionsplattform mit linguistischen Moduln für das Information Retrieval. Library of the Universität Regensburg, Bachelor Thesis in German Philology.

Notes

2025 *Luciano Melodia*: Spektrale Sequenzen - Leray-Serre spektrale Sequenz. Graduate Seminar on Spectral Theory in Mathematical Physics, Friedrich-Alexander Universität Erlangen-Nürnberg.

2024 *Luciano Melodia*: Beschränkte Fremdholmoperatoren und deren Fremdholmindex auf separablen Hilberträumen. Graduate Seminar on Spectral Flow in Functional Analysis, Friedrich-Alexander Universität Erlangen-Nürnberg.

2023 *Luciano Melodia*: Notes on Simplicial and Singular Homology. Graduate Seminar on Topics in Topology. Friedrich-Alexander Universität Erlangen-Nürnberg.

2022 *Luciano Melodia*: Natürliche Transformationen, Äquivalenzen von Kategorien, darstellbare Funktoren und das Lemma von Yoneda. Undergraduate Seminar on Sheaf Theory. Friedrich-Alexander Universität Erlangen-Nürnberg.

Education

2024 – 26 • Master of Science in Mathematics, Friedrich-Alexander Universität.
  – Minor: Digital Humanities.
2021 – 24 • Bachelor of Science in Mathematics, Friedrich-Alexander Universität.
  – Topic: Algebraic and Topological Persistence (grade 1.0).
  – Minor: Computer Science.
2015 – 18 • Master of Arts in Information Science, Universität Regensburg.
  – Topic: Deep Learning for Radiation Dose Calculation (grade 1.3).
2012 – 15 • Bachelor of Arts in German Philology, Universität Regensburg.
  – Topic: Information Retrieval and Punctuation (grade 1.7).
  – Majors: Italian Philology, Information Science, Media Informatics.
2012 – 13 • Studienbegleitende IT-Ausbildung (grade 1.7), Rechenzentrum Universität Regensburg.
2012 • Abitur, Albertus-Magnus-Gymnasium, Regensburg.

Certificates

• Udemy:
2021 – The Rust Programming Language.
2020 – The Python Mega Course: Build 10 Real World Applications.
• Imperial College London:
2018 – Mathematics for ML - Multivariate Calculus.
2018 – Mathematics for ML - Linear Algebra.
• Shanghai Jiao Tong University:
2018 – Discrete Mathematics.
• Wesleyan University:
2018 – Introduction to Complex Analysis.
• Coursera:
2018 – Exploratory Data Analysis.
2018 – Intermediate R - Practice Course.
2018 – Intermediate R.
2018 – Introduction to R.
2018 – Supervised Learning in R - Regression.
2018 – Supervised Learning in R - Classification.
2018 – Text Mining - Bag of Words.
2018 – Deep Learning in Python.
2018 – Introduction to Machine Learning.
2018 – Intro to Python for Data Science.
2018 – Machine Learning Toolbox.
2018 – Credit Risk Modeling in R.
2018 – Data Visualization in R.
2018 – Data Visualization with ggplot2 II.
2018 – Data Visualization with ggplot2 I.
• Others:
2016 – Beer Sommelièr, Sperber Bräu.

Interests

Coding Python, JavaScript.
Software GUDHI, Dionysus, Keras.

Languages	German, English (C2), Italian (C2), Polish (B2), Spanish (A2).
Hobbies	Cooking, Reading.
Sports	Functional training.

References

Prof. Dr. Kang Li
Department of Mathematics
Friedrich-Alexander University Erlangen-Nürnberg
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Prof. Dr. Richard Lenz
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