Luciano Melodia

Curriculum vitae
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Professions

2023–25	**Student Assistant at Algebra and Geometry, Representation Theory and Operator Algebras and Applied Analysis FAU[1].**

- Tutor in „Analysis III".
- Tutor in „Topology and Applications".
- Tutor in „Topology".
- Lecture representation of Prof. Li (Tietze Extension Theorem).
- Tutor in „Linear Algebra I".
- Conducting proof lessons.
- Conducting exercise lessons.
- Examination, supervision and correction.

2025 — Lecturer in Mathematics and German at Paukkammer Erlangen.

2024–25 — Private tutor in Mathematics:

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

2021–22 — Working student at Corscience GmbH & Co. KG, Erlangen.

- Automatic detection of calibration spikes in ECG data.
- Detection of multiple ECG curves on documents.
- Image segmentation using machine learning.

2019–21 — Researcher at Siemens Energy AG, Erlangen.

- Programming with CUDA v.11.0, Tensorflow 2.4, CuDNN v.8.0.4.
- Programming in Python v.3.8 and v.3.9.
- Work with Ubuntu 20.04, Solus 4, Archlinux 5.11.
- Implementation and use of convolutional nets, LSTM nets, residual nets, autoencoders, topological autoencoders, and Boltzmann machines for processing time series.

2018–21 — Researcher Chair of Computer Science 6, FAU.

- Correction of written exams and assistance in oral exams.
- Self-directed preparation and execution of e-exams.
- Corrections to module descriptions for the Data Science program.
- Planning and implementation of the
  - lecture „Knowledge Discovery in Databases".
  - seminar „Persistent Homology in Data Analytics".
  - seminar „Topological Data Analysis".

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[1] Friedrich-Alexander University Erlangen-Nürnberg.

- seminar „New Technologies in Data Management“.
- exercise lessons in „Process Oriented Information Systems“.
- 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.
- Implementation of a document pipeline for mass digitization of handwritten documents using neural networks and incorporation into the database application openVIVA.
- Integration of the telecommunication interface ASTERISK.
- Induction of new employees into openVIVA.
- Statistical data and market analysis.

2013–15   Research assistant Chair of German Linguistics, Regensburg University.
- Examination correction, correction of books and texts.
- Website maintenance.
- Organization and conduct of conferences.
- Implementation of the punc.space web platform.

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

- Department of Mathematics,
  Friedrich-Alexander Universität Erlangen-Nürnberg
    - 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

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

- Awards:
    - Top reviewer award at Learning on Graphs 2024
    - Oskar-Karl-Forster scholarship fellow 2024
- Reviewer:
    - Learning on Graphs 2022 – 24
    - International Conference on Advances in Databases, Knowledge, and Data Applications 2020 – 24

- – Reviewer for the Workshop Geometrical and Topological Representation Learning at ICLR 2022
- – Reviewer for the Workshop Topological Data Analysis and Beyond at NeuRIPS 2021
- Memberships:
  - – Member of the Gesellschaft für Informatik e.V. 2019 – 20
  - – Member of the Computational Intelligence and Machine Learning Group, CIML University Regensburg 2017 – 18
- Student Representative for the Department of Mathematics at Friedrich-Alexander University Erlangen-Nürnberg 2024
- Student Representative for the Department of Language, Literature and Cultural Sciences at Regensburg University 2016

Papers

2021   **Luciano Melodia** and <u>Richard Lenz</u>: 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 <u>Michael Kamp</u>, <u>Irena Koprinska</u>, <u>Adrien Bibal</u> et al. (ed.): Communications in Computer and Information Science. Springer Nature, Switzerland.

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

2020   **Luciano Melodia** and <u>Richard Lenz</u>: Persistent Homology as a Stopping Criterion for Voronoi Interpolation. Proceedings of the International Workshop on Combinatorial Image Analysis. In <u>Tibor Lukić</u>, <u>Reneta Barneva</u>, <u>Valentin Brimkov</u> 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 <u>Kateřina Šichová</u>, <u>Reinhard Krapp</u>, <u>Paul Rössler</u> et al. (ed.): Standard Varieties of German – Case Studies from Social Practice, Logos, Berlin.

Theses

2024   **Luciano Melodia**: Algebraic and Topological Persistence. Bachelor thesis. Friedrich-Alexander Universität Erlangen-Nürnberg.

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

Notes

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. Seminar paper. Friedrich-Alexander Universität Erlangen-Nürnberg.

2022   **Luciano Melodia**: Natürliche Transformationen, Äquivalenzen von Kategorien, darstellbare Funktoren und das Lemma von Yoneda. Seminar paper. 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.
	– Minor: Computer Science.
2015 – 18	• Master of Arts in Information Science, Regensburg University.
	– Topic: Deep Learning for Radiation Dose Calculation.
2012 – 15	• Bachelor of Arts in German Philology, Regensburg University.
	– Topic: Information Retrieval and Punctuation.
	– Majors: Italian Philology, Information Science, Media Informatics.
2012 – 13	• Web Developer, Rechenzentrum Regensburg University.
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 (native), English (C2), Italian (C2), Polish (B2).
Hobbies	Cooking, Reading.
Sports	Functional training.

References

Prof. Ph.D.	Kang Li
	Department of Mathematics
	Friedrich-Alexander University Erlangen-Nürnberg
	Professor for Representation Theory and Operator Algebras
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	Department of Computer Science
	Friedrich-Alexander University Erlangen-Nürnberg
	Professor for Evolutionary Data Management
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Prof. Dr. rer. nat.	Elmar Lang
	Department of Biophysics
	Professor for Computational Intelligence
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	Professor for German Linguistics
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