

Luciano Melodia

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Education

Friedrich-Alexander Universität Erlangen-Nürnberg <i>M.Sc. Mathematics, Digital Humanities</i>	<i>Oct 2024 – March 2026</i>
<ul style="list-style-type: none"> ◦ Thesis: Universal Coefficients for Homology of Ample Groupoids ◦ Topics: Algebraic Topology, Tensor Categories, Homological Algebra 	
Friedrich-Alexander Universität Erlangen-Nürnberg <i>B.Sc. Mathematics, Computer Science</i>	<i>Oct 2021 – Sept 2024</i>
<ul style="list-style-type: none"> ◦ Thesis: Algebraic and Topological Persistence ◦ Topics: Applied Topology, Persistent Homology 	
Universität Regensburg <i>M.A. Information Science</i>	<i>April 2015 – March 2018</i>
<ul style="list-style-type: none"> ◦ Thesis: Deep Learning Estimation of Absorbed Radiation Dose for Nuclear Medicine Diagnostics ◦ Topics: Machine Learning, Deep Learning, Matrix Factorization 	
Universität Regensburg <i>B.A. German Philology, Italian Philology, Media Informatics, Information Science</i>	<i>Oct 2012 – March 2015</i>
<ul style="list-style-type: none"> ◦ Thesis: Development of a Punctuation Platform with Linguistic Modules for Information Retrieval ◦ Topics: Natural Language Processing, Information Retrieval, Electronic Corpora 	
Universität Regensburg <i>Studienbegleitende IT-Ausbildung</i>	<i>Oct 2012 – April 2013</i>
Albertus-Magnus-Gymnasium Regensburg <i>Abitur</i>	<i>Sept 2004 – May 2012</i>

Experience

Student Assistant <i>Algebra and Geometry</i> <i>Applied Analysis</i> <i>Applied Mathematics</i> <i>Representation Theory and Operator Algebras</i> <i>Representation Theory and Mathematical Physics</i>	<i>Friedrich-Alexander Universität Erlangen-Nürnberg April 2023 – March 2026</i>
<ul style="list-style-type: none"> ◦ 2026, 2023 Tutor in Topology ◦ 2026, 2024 Tutor in Analysis 3 ◦ 2025 Tutor in Mathematics for Engineers A4 (stochastic) ◦ 2025 Tutor in Analysis 2 ◦ 2024 Tutor in Topology and Applications ◦ 2024 Tutor in Linear Algebra 1 ◦ Lecture on the Tietze Extension Theorem ◦ Lecturer for mathematical proof sessions ◦ Lecturer for exercise sessions ◦ Supervision and correction of written exams 	
Tutor <i>Private</i>	<i>Erlangen Jan 2024 – Dez 2025</i>
Preparation for	
<ul style="list-style-type: none"> ◦ mathematics, 2 students, undergraduate studies ◦ computer science, 1 student, undergraduate studies 	

- chemical and biological engineering, 1 student, undergraduate studies
- physics, 1 student, undergraduate studies
- Abitur, 13 students, bavarian Gymnasium
- secondary school, 2 students, bavarian Mittelschule
- secondary school, 3 students, bavarian Realschule
- elementary school, 1 student, bavarian Grundschule

Werkstudent

Corscience GmbH & Co. KG

Erlangen

Aug 2021 – Aug 2022

- Deep convolutional networks trained on multiple GPUs for automatic detection of calibration spikes in ECG data; achieved an accuracy of over ninety-nine percent on ten-fold cross validation with a data set of about one million real world samples tested with sigma five significance, which is state of the art
- Residual networks for detection of ECG curves in documents; achieved an IOU of approximately ninety-eight percent on ten-fold cross validation with a data set of about ten million artificially enlarged samples using generative neural networks tested with sigma three significance, which is state of the art
- Image segmentation using matrix factorisation techniques to isolate ECG curves. Achieved an IOU of approximately ninety-nine percent tested with sigma six significance, which is state of the art

Staff Applied Research Scientist

Siemens Energy AG

Chair for Evolutionary Data Management

Friedrich-Alexander

Universität

Erlangen-Nürnberg

Sept 2018 – Dez 2021

- Development of a novel interpolation technique based on the topology of power plant signals to augment reliably data for large scale machine learning training. Validation was performed using theoretical guarantees and practical tests involving handwriting and signals from four different power plants. This novel method has been published at the International Workshop on Combinatorial Image Analysis. The code is open source: Package SIML [🔗](#) [📄](#).
- A novel technique has been developed to estimate roughly the number of parameters in hidden-layer neural networks for signal data. The results were presented at the International Conference on Pattern Recognition. These results have been validated using tailored toy datasets and real power plant signals from a total of four different power plants. Therefore, the technique can be scaled up for big data. Cost savings from reducing training time and current have been estimated to 25.000€ per year. The neural networks achieved close-to-perfect accuracy in classifying the signal data. The code is open source: Package NTOPL [🔗](#) [📄](#).
- These results were then used to train a classifier for the KKS (Kraftwerkskennzeichensystem). The aim was to classify each stage of the power plant's hierarchical labelling system down to the level of a sensor. First, the data was enriched using reliable Voronoi interpolation. We then used this estimate to create a trainable, tractable neural network. Finally, we designed a neural network that takes preprocessed signals and their Betti zero and Betti one curves as input. We achieved an accuracy of over 93% for the coarsest KKS stage and up to 54% for the physical entity using data from four power plants over multiple years. These results have been published in the proceedings of the European Conference on Principles and Practice of Knowledge Discovery in Databases. The code is open source: Package Twirlflake [🔗](#) [📄](#).
- Correction of written exams
- Assistance in oral exams
- Preparation and execution of electronic exams
- Participation in the data science program
- Supervision and execution of
 1. 2021 lecture on Knowledge Discovery in Databases (evaluation Ø1.56)
 2. 2020 seminar on Persistent Homology in Data Analytics
 3. 2020 seminar on Topological Data Analysis (evaluation Ø1.14)
 4. 2019, 2020, 2021 exercises in Process Oriented Information Systems (evaluation Ø1.18)
 5. 2018, 2019, 2020, 2021 seminar on New Technologies in Data Management
 6. 2018, 2019, 2020, 2021 exercises in Computer Science for Engineers
 7. 2018 exercises in Conceptual Modeling

- Supervision of theses:
 1. M.Sc. Sauerhammer (2021): A Classification Dashboard for Sensor Signals from Power Plants
 2. M.Sc. Seidel (2020): Classification of Microbes using Time Series Gas Sensor Array Data
 3. M.Sc. Siddiqui (2020): Extraction of Fetal and Maternal Heart-beats from ECG Signals
 4. B.Sc. Hahn (2021): Classification of Sensor Signals from Power Plants
 5. B.Sc. Schäfer (2021): Learning Validation Models from Sensors of a Power Plant
- 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

Data Scientist

mb Support GmbH

Regensburg

June 2015 – March 2018

- Industrial document-digitization pipeline for mass paper-pile scanning; scanning-street engineering; one-percent character-error-rate OCR via Google Cloud Vision and custom recurrent neural networks; ergonomic user-interface integration for Openviva C2; Industrial scanning throughput benchmark: capacity for approximately sixty million documents in continuous operation
- Asterisk telecommunication-API integration into Openviva C2 with ergonomic design, roughly five thousand lines of PL/SQL and Python
- Statistical data and market analysis with deep neural and convolutional networks and regression methods

Research Assistant

Chair for German Linguistics

Universität Regensburg

Oct 2013 – Sept 2015

- Proofreading of books and papers
- Correction of exams
- Organisation of conferences
- Maintenance of the university website
- Implementation of a scientific social network featuring a custom JavaScript-written search engine for real-time online usage, comprising approximately a thousand lines of code

Chef

Apostelkeller

Regensburg

Sept 2012 – Dez 2015

- Cooking with menu for up to 140 guests
- Waitressing
- Stock management

Service Staff

Trademarketing Service GmbH

Regensburg

Nov 2012 – Mai 2015

- Goods management, receipt and ordering.

Translator

Anatol GmbH & Co. KG

Regensburg

Oct 2012 – Aug 2014

- Translation between Italian – German – Polish – English

Volunteer

Alten- und Pflegeheim St. Josef

Regensburg

Aug 2010

Publications

Homological Time Series Analysis of Sensor Signals from Power Plants.

2021

Luciano Melodia, Richard Lenz

10.1007/978-3-030-93736-2_22 [↗](#)

Estimate of the Neural Network Dimension Using Algebraic Topology and Lie Theory.

2021

Luciano Melodia, Richard Lenz

10.1007/978-3-030-68821-9_2 [↗](#)

Persistent Homology as a Stopping Criterion for Voronoi Interpolation. <i>Luciano Melodia</i> , Richard Lenz 10.1007/978-3-030-51002-2_3 ↗	2020
Zur Verwendung des Paradigmas <i>brauchen</i> mit und ohne <i>zu</i> mit Infinitiv. <i>Luciano Melodia</i> ISBN 978-3-8325-3808-8 ↗	2015

Conferences

Learning on Graphs, LOG ↗ ◦ Reviewer, Program Committee	2022-24
Advances in Databases, Knowledge, and Data Applications ↗ ◦ Reviewer, Program Committee	2020-24
Geometrical and Topological Representation Learning, Workshop at ICLR ↗ ◦ Reviewer, Program Committee	2022
International Conference on Pattern Recognition ↗ ◦ Author, full paper	2021
International Workshop on Combinatorial Image Analysis ↗ ◦ Author, full paper	2020
International Conference on Practical Mathematical Discourse ↗ ◦ Guest talk, Introduction to Persistent Homology	2020
Topological Data Analysis and Beyond, Workshop at NeuRIPS ↗ ◦ Reviewer, Program Committee	2020
Symposium on Principles of Database Systems, SIGMOD/PODS ↗	2020
European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, ECML/PKDD ↗ ◦ Author, full paper	2019-2020
Sprachmanagement & Orthografie ↗	2015
Destandardisierung und Standardvarietät ↗ ◦ Author, full paper	2013

Awards, Grants and Service

Top Reviewer Award from Learning on Graphs ↗	2024
Oskar-Karl-Forster Scholarship Fellow ↗	2024
Student Representative for the Department of Mathematics at Friedrich-Alexander Universität Erlangen-Nürnberg	2024
Member of the Gesellschaft für Informatik e.V. ↗	2019-20
Member of the Computational Intelligence and Machine Learning Group ↗	2017-18
Student Representative for the Department of Language, Literature and Cultural Sciences at Universität Regensburg	2016

Addendum

Programming: Python, Rust, C++

Web Technologies: HTML5, CSS3, Javascript, PHP

Typesetting: L^AT_EX

Operating Systems: Arch Linux, Ubuntu, Mac OS, Windows

Languages: German native, English C2, Italian C2, Polish B2, Spanish A2

Sports: Boxing, Muay Thai, Weng Chun, Table Tennis

Hobbies: Cooking, Novels

References

- Prof. Dr. Karl-Herrmann Neeb  *2025-26*
 - Department of Mathematics
 - Friedrich-Alexander Universität Erlangen-Nürnberg
 - Professor for Lie Groups and Representation Theory

✉ neeb@math.fau.de
☎ +49 9131 85-67037

Prof. Dr. Catherine Meusburger  *2024-26*
 - Department of Mathematics
 - Friedrich-Alexander Universität Erlangen-Nürnberg
 - Professor for Representation Theory and Mathematical Physics

✉ catherine.meusburger@fau.de
☎ +49 9131 85-67034

Prof. Dr. Kang Li  *2022-26*
 - Department of Mathematics
 - Friedrich-Alexander Universität Erlangen-Nürnberg
 - Professor for Representation Theory and Operator Algebras

✉ kang.li@fau.de
☎ +49 9131 85-67060

Prof. Dr. Richard Lenz  *2018-21*
 - Department of Computer Science
 - Friedrich-Alexander Universität Erlangen-Nürnberg
 - Professor for Evolutionary Data Management

✉ richard.lenz@fau.de
☎ +49 9131 85-27899

Prof. Dr. em. Elmar Lang  *2018-21*
 - Department of Biophysics
 - Universität Regensburg
 - Professor for Computational Intelligence

✉ elmar.w.lang@ur.de

Prof. Dr. Paul Rössler  *2013-16*
 - Department of German Philology
 - Universität Regensburg
 - Professor for German Linguistics

✉ paul.roessler@ur.de
☎ +49 941 943-3444