Annachiara Korchmaros

Leipzig, Germany
✉ *annachiara@bioinf.uni-leipzig.de*
🖝 *http://akorchmaros.com/*

Research Experience

May 2022 - present
Career break for maternity leave

Leipzig University - Leipzig, Germany
Postdoctoral Researcher
Interdisciplinary Center for Bioinformatics
- Estimating horizontal gene transfers
- Developing a pipeline for gene history reconstruction
- Studying Fitch graphs completion problems
- Studying best match graphs, their generalization, and applications to phylogenetics
- Studying geometric configurations of 3D DNA structure of diploid organisms
- Tutoring Ph.D. students

December 2019 - May 2021

Aalto University - Espoo, Finland
Postdoctoral Researcher
Department of Mathematics and Systems Analysis
- Studied the structure of 2-colored best match graphs
- Estimated neuronal manifold dimension
- Reconstructed 3D DNA structure of diploid organisms using methods from Algebraic geometry.
- Studied phylogenetics networks

August 2018 - August 2019

Child Mind Institute - New York, US
Data Analyst
Center for the Developing Brain
- Studied how to improve the reliability of fMRI
- Investigated the impact of functional alignment on the reliability of fMRI
- Manually cleaned brain image databases
- Explored new strategies to improve current software packages
- Biweekly presented research findings to other teams

Dec - May 2017

Georgia Institute of Technology - Atlanta, US
School of Biology, Giboson Lab
- Implemented a linear regression model to estimate the average cell-type specific gene expressions in blood given cell counts and total gene expressions
- Analyzed and cleaned microarray datasets from different platforms

February - April 2016

Georgia Institute of Technology - Atlanta, US
School of Biology, Lachance Lab
- Managed human genome datasets of admixed individuals
- Studied risk scores with MATLAB

Education

May 2017

Georgia Institute of Technology, Atlanta, GA
M.S. in Bioinformatics
Overall GPA - 3.91

February 2015

University of Basilicata, International PhD program "Doctoral Seminar JÁNOS BOLYAI" (Associated universities: University of Campania, University of Perugia, University of Szeged)
PhD. in Mathematics
110/110 Summa Cum Laude
Thesis: Permutations and Sorting Problems
Associated Institutes: University of Campania, University of Perugia, University of Szeged

September 2011	**University of Perugia, Perugia, Italy**
	MSc. in Mathematics
	110/110 Summa Cum Laude
	Thesis: Alignments of DNA Sequences Studied within Tropical Mathematics
February 2009	**University of Perugia, Perugia, Italy**
	BSc. in Mathematics
	110/110 Summa Cum Laude
	Thesis: An Introduction to Algebraic Curves

Conferences and Seminars

July 2024	**Workshop for Women in Algebraic Statistic**
	St John's College, University of Oxford
	Contributed Talk
	"Graph families used to estimate gene and species trees"
June 2024	**Combinatorics 2024**
	Italian Institute of Mathematics (IndaM)
	Contributed Talk
	"Two-quasi best match graphs"
February 2024	**Geometry of Complex Systems and Bioinformatics meeting**
	Interdisciplinary Center for Bioinformatics
	Invited Speaker
	"Dimension, linearity, and shape of neural manifolds"
February 2024	**39th TBI Winterseminar in Bled**
	Bompfünewerer Consortium
	Contributed Talk
	"Xenology graph completion problem"
December 2023	**Mathematics in Biology Day**
	MPI Leipzig
	Invited Speaker
	"A graph theoretic approach to estimate gene family histories"
October 2023	**19th Herbstseminar der Bioinformatik**
	Bioinformatics Group and Computational EvoDevo Group in Leipzig
	Contributed Talk
	"Orthology Pipeline: Project and Realization"
July 2023	**Hybrid: SIAM Conference on Applied Algebraic Geometry (AG23)**
	SIAM Activity Group on Algebraic Geometry
	Invited Minisymposium Speaker
	"How to 3D-reconstruct the genome from partially phased data"
June 2023	**10th Slovenian Conference on Graph Theory**
	Faculty of Mathematics and Physics of University of Lubiana
	Contributed Talk
	"Vertex colored digraphs explained by phylogenetic trees"
February 2023	**38th TBI Winterseminar in Bled**
	Bompfünewerer Consortium
	Contributed Talk
	"Quasi Best Match Graphs"
October 2022	**18th Herbstseminar der Bioinformatik**
	Bioinformatics Group and Computational EvoDevo Group in Leipzig
	Contributed Talk
	"How merging colors characterizes 3-BMGs"
August 2022	**European Women in Mathematics General Meeting 2022**
	European Women in Mathematics
	Invited Minisymposium Speaker
	"3 questions on higher-dimensional neuronal manifolds"

August 2022	**28th Nordic Congress of Mathematicians** Nordic Mathematical Associations Invited Minisymposium Speaker "Shape & Linearity of neuronal manifolds"
May 2022	**Combinatorics 2022** Italian Institute of Mathematics (IndaM) Contributed Talk "Best match graphs and generalizations"
January 2020	**Algebra and Discrete Mathematics Seminar** Department of Mathematics and Systems Analysis of Aalto University Contributed Talk "Colored Best Match Graphs"
May 2015	**Georgia Tech Combinatorics Seminars** Department of Mathematics of Georgia Institute of Technology Contributed Talk "Combinatorial Properties of Block Transpositions in Symmetric Groups"
June 2014	**Combinatorics 2014** Italian Institute of Mathematics (IndaM) Contributed Talk "Block transposition diameter of the symmetric group"
March 2014	**45th Southeastern International Conference on Combinatorics, Graph Theory and Computing (SEICCGTC)** National Security Agency and Institute of Combinatorics and its Applications Contributed Talk "On the block transposition diameter of permutations"

Publications, Posters, and Preprints

1. **M. Hellmuth; A. Korchmaros; J. A. R. Rafael; B. Schmidt; P. F. Stadler**
Partial Fitch Graphs: Characterization, Satisfiability and Complexity
bioRxiv doi:10.1101/2024.04.30.591842 (2024)

2. **A. Korchmaros**
Configurations in the Euclidean space related to the 3D genome reconstruction problem from partially phased data
arXiv doi:2403.00407 (2024)

3. **J. A. R. Rafael; A. Korchmaros; K. Aviña-Padilla; A. López-Sánchez; A. Arlette España; M. Hellmuth; P. F. Stadler; M. H. Rosales**
REvolutionH-tl: Reconstruction of Evolutionary Histories tool
RECOMB-CG (2024), 89-109

4. **D. Cifuentes; J. Draisma, O. Henriksson; A. Korchmaros; K. Kubjas**
3D genome reconstruction from partially phased Hi-C data
Bull. Math. Biology 86.4 (2024), 1-30

5. **A. Korchmaros; D. Schaller; M. Hellmuth; P. F. Stadler**
Quasi-Best Match Graphs
Discrete Appl. Math. 331 (2023), 104-125

6. **A. Korchmaros**
The structure of 2-colored best match graphs. Discrete Appl. Math. 304 (2021), 397-416

7   **X. Wang; X. Li; J. Cho; B. Russ; N. Rajamani; A. Omelchenko; L. Ai; A. Korchmaros; P. Garcia-Saldivar;Z. Wang; N. Kalin; C. Schroeder; C. Craddock; A. Fox; A. Evans; A. Messinger; M. Milham; T. Xu**

U-Net Model for Brain Extraction on Non-human Primates
Neuroimage 226 (2021), 117549

8   **J. Cho; A. Korchmaros; J. Vogelstein; M. Milham; T. Xu**

Impact of concatenating fMRI data on reliability for functional connectomics
Neuroimage 235 (2021), 118001

9   **J. Cho; A. Korchmaros; J. Vogelstein; M. Milham; T. Xu**

Developing a gradient flow framework to guide the optimization of reliability for the study of individual differences
Poster presented at: Organization of Human Brain Mapping 2020; June 2020; Virtual Conference

10   **A. Korchmaros; J. Cho; A. Heinsfeld; J. Haxby; M. Milham; T. Xu**

Beyond the test-retest reliability: the impact of the intra- and inter-individual variation
Poster presented at: Organization of Human Brain Mapping 2019; June 2019; Rome, Italy

11   **A. Korchmaros; I. Kovács**

Automorphism groups of Cayley graphs generated by block transpositions and regular Cayley maps
Discrete Math. 340 (2017), 3125–3139

12   **C. Bocci; A. Korchmaros**

Tropical properties of alignment matrices
Adv. Appl. Discrete Math. 11 (2013), no. 1, 23–46

Organization

October 2023 - present   **G. Scholz**

Graph Theory Seminar
Bioinformatics Center in Leipzig

August 2021   **M. Panizzut; L. Lamberti**

Minisymposium on Algebraic Geometry of Biomedical Data
SIAM Conference on Applied Algebraic Geometry

Skills

Programming Languages
MATLAB, R, Python, Julia, and Shell scripting

Software
FSL, Git, Macualay2, Magma, and JMP