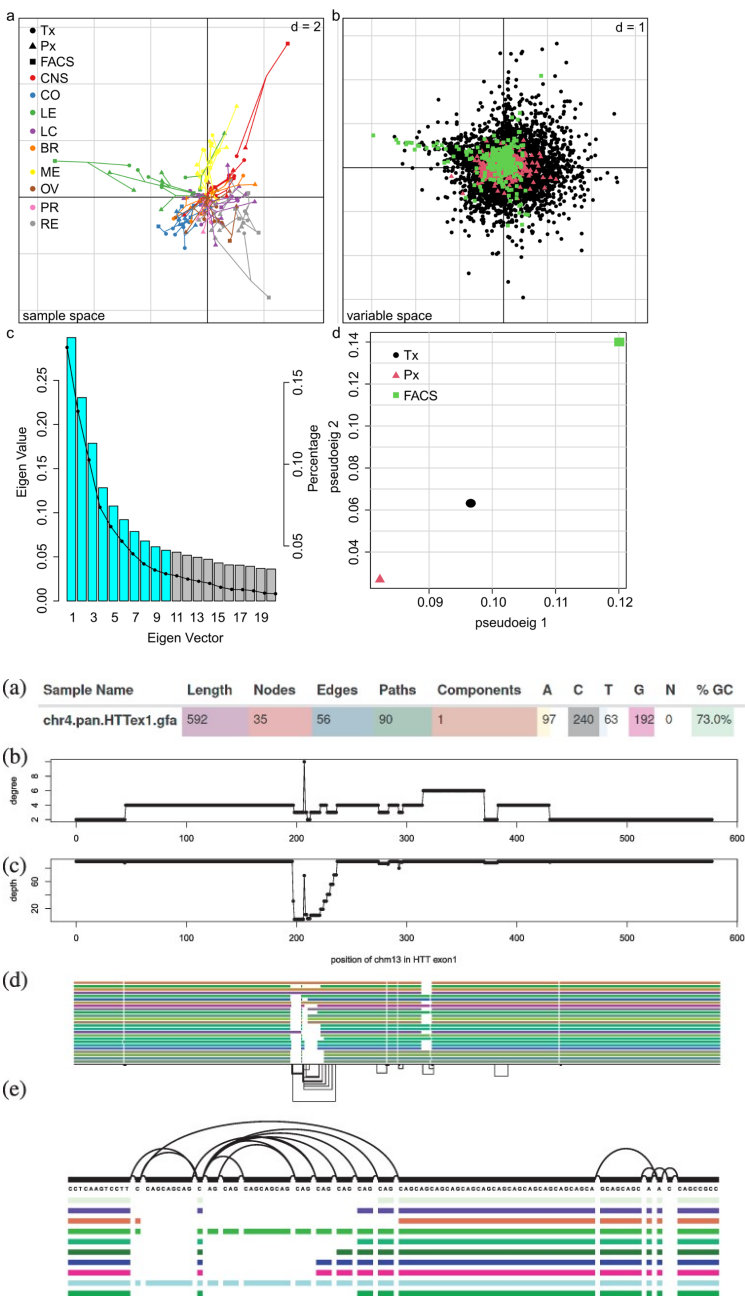


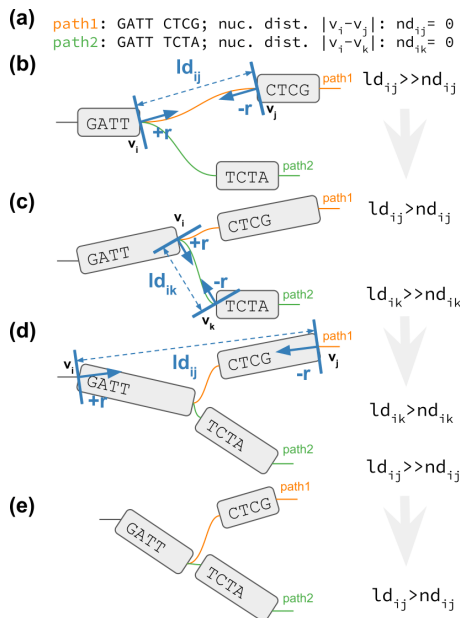
Simon Heumos

Personal Details



I am finalizing my Ph.D. at the Quantitative Biology Center, Tübingen, with expertise in pangenomics and multiomics. I develop methods to analyze (pan)genomic variation, manage interdisciplinary projects, and create efficient tools like nf-core/pangenome for large-scale pangenomic analysis. I provide guidance to biomedical researchers on experimental design, data analysis, and multiomics integration. I also spearhead hackathons and workshops to foster innovation and knowledge-sharing within the bioinformatics community. Outside of work, I enjoy an active lifestyle and watching Sesame Street for a good laugh.





[Chat](#) |
 [Publications](#) |
 [Code](#) |
 [ResearchGate](#) |
 [ORCID](#) |
 [Linkedin](#) |
 [X](#) |
 [nf-core/pangenome](#)



Employment

1 Jun. 2019 to 30 Jun. 2024 (5 years)

PhD student at the [Quantitative Biology Center \(QBiC\)](#) (Tübingen, Germany).

Reporting to Prof. Sven Nahnsen.

- Pangenome graph software & research:
 - Developed [nf-core/pangenome](#), a cluster-efficient pipeline for constructing pangenome graphs without bias or exclusion, improving execution speed by 2-3 ([Heumos et al. 2024, Bioinformatics](#)) ([nf-core/pangenome](#))
 - Co-developed ODGI, the de-facto standard for pangenome graph analysis ([Guarracino*, Heumos* et al. 2022, Bioinformatics](#)) ([ODGI](#))
 - Designed and co-developed PG-SGD, a pangenome graph layout algorithm that achieved 10x faster performance and reduced memory usage by 2x, cutting layout calculation time from over a week to one day for human pangenomes ([Heumos*, Guarracino* et al. 2024, Bioinformatics](#)) ([PG-SGD](#))
 - Major contributor to the PanGenome Graph Builder ([*Garrison, *Guarracino, Heumos et al. 2024, Nature Methods](#)) ([PGGB](#))
 - Evaluating pangenome graphs ([PGGE](#))
 - Supporting efforts for efficient pangenome graph indices ([Balaz et al. 2024, LATIN2024: Theoretical Informatics](#))
 - Contributed to a [Pangenome Graphs](#) review ([Eizenga et al. 2020, Annual Review of Genomics and Human Genetics](#))
 - As an associate member of the Human Pangenome Reference Consortium I contributed to building the first draft human pangenome reference ([Liao*, Asri*, Ebler* et al. 2023, Nature](#))

- Industry collaboration with Computomics GmbH on coding a pangenome browser [Pantograph](#). Development of pangenome graph browser using React, MobX-State-Tree, JavaScript ( [Genome Graph Browser](#)).
- Experimenting towards an interface between RDF/SPARQL and pangenome graphs together with Jerven Bollemann and Toshiyuki T. Yokoyama winning an ISMB 2020 [Best Poster Award: Semantic Variation Graphs: Ontologies for Pangenome Graphs](#)
- Multiomics analysis of the NCI-60 tumor cell panel ([Heumos*](#), [Dehn*](#) et al. 2022, [Cancer Cell International](#)) ( [QMSFC](#)):
 - Crawling and integrating multiomics data from resources like TCGA
 - Differential expression analysis of RNA-Seq data
 - Integrative analysis of transcriptomic microarray data (Affymetrix)
 - Curation, quality control, differential expression analysis of Fluorescence Activated Cell Sorting (FACS) data
 - Proteomics and phosphoproteomics data curation, and differential expression analysis
 - Reverse Phase Protein Array (RPPA) differential expression analysis
- Organizer, tutor, and chair of international hackathons and workshops
- Managing virtual machines and users in QBiC's deNBI cloud instances
- Organization of retreats
- Mentoring undergraduates
- Learning ONT sequencing and base calling at PANGAIA's Winter Wet Lab school

 1 Jun. 2017 to 30 May 2019 (2 years)

 Research assistant at the [Quantitative Biology Center \(QBiC\)](#) (Tübingen, Germany).

 Reporting to Dr. Stefan Czemmel

 [Employer's reference](#)

- Member of bioinformatics support and project management team (BioPM)
- Bridge function to the infrastructure and scientific software team
- Counseling of biomedical researchers on experimental design, data analysis, and paper writing
- FACS data analysis
- Proteomics LFQ data analysis
- Germline variants analyses on whole-genome sequencing (WGS) data: Quality control, read trimming and mapping, variant calling, and functional prediction
- Compilation of highly standardized and reproducible bioinformatics pipelines
- Excellent customer service when performing data processing and statistical analysis of big biomedical data
- Initiation and maintenance of a QBiC report template for analysis results
- Driving force behind standardized SOPs to improve QBiC's infrastructure
- Shaped research grant application at the Ministry for Economics and Energy (BMWi) titled

PANTOGRAPH acquiring 190,000€ for researching pangenome graph visualization

- Supervision of student projects
- After 1 year: Vice coordinator of the BioPM team

📅 1 Nov. 2016 to 31 Mar. 2017 (6 months)

🏢 Master student at the **Computomics GmbH** (Tübingen, Germany)

👤 Reporting to Björn Geigle and Dr. Jörg Hagmann

📖 Thesis *Interactive Visualization of Genome Variation Graphs*

📄 Evaluation: 1.0

🏆 ISMB 2017 Best Poster Prize *Interactive pangenome visualization using variant graphs*

🔧 Tooling: Interactive full-stack web application with Node.js, nbind to make C++ VG accessible in JavaScript, Pug, D3, HTML, CSS (🔗 [AG](#))

📅 1 Jun. 2015 to 31 Sep. 2016 (1 year, 2 months)

🏢 Research student at the **Max Planck Institute for the Science of Human History** (Jena, Germany)

👤 Reporting to Dr. Alexander Herbig in the **Computational Pathogenomics** research group

- Development of bioinformatics programs for the analysis of paleogenetic NGS data (🔗 [GenConS](#))
(📖 [Fellows Yates et al. 2017, Scientific Reports](#))

📅 1 Sep. 2014 to 31 May 2015 (11 months)

🏢 Research student at the **Institute for Archaeological Sciences** (Tübingen, Germany)

👤 Reporting to Dr. Alexander Herbig in the Paleogenetics research group

- Performance of system administration tasks and development of bioinformatics programs for the analysis of paleogenetic NGS data

📅 1 Jul. 2014 to 30 Aug. 2014 (1 year, 1 month)

🏢 Research student at the **MFT Services** (Tübingen, Germany)

👤 Reporting to Dr. Günter Jäger in the Medical Genetics research group

- Analysis of RNA-Seq data

📅 1 Jun. 2013 to 31 Mar. 2014 (10 months)

🏢 Research student at the **Centre for Bioinformatics** (Tübingen, Germany)

👤 Reporting to Prof. Kay Nieselt in the Integrative Transcriptomics research group

- Analysis of RNA-Seq data and extension of an in-house developed Java tool for the analysis of RNA-Seq data

📅 1 Aug. 2010 to 31 Aug. 2010 (1 month)


📅 1 Aug. 2011 to 31 Aug. 2011 (1 month)

📅 1 Aug. 2012 to 31 Aug. 2012 (1 month)

🔧 Temporary shipping assistant at **WALDNER** (Wangen, Germany)

- Packaging small part materials and transporting them to the loading area

📅 1 Jul. 2009 to 31 Mar. 2010 (9 months)

 Alternative service as an ambulance man at the [DRK Rettungsdienst Bodensee-Oberschwaben gGmbH](#) (Ravensburg, Germany)

- Operations took place both in the ambulance and in the patient transport vehicle


 1 Feb. 2007 to 31 Jul. 2010 (3 years, 5 months)














 Side job at the [PEKANA Naturheilmittel GmbH](#) (Kisslegg, Germany)










- Assistant for office, shipping, and pharmaceutical packaging tasks

Publications















*first authorship














 Journal	 Title	 Contribution	 Links
Bioinformatics, 2024	Cluster-efficient pangenome graph construction with nf-core/pangenome	Pipeline conception, software development, testing, documentation, design and conduction of experiments, paper writing	 Paper
SC24: International Conference for High Performance Computing, Networking, Storage and Analysis, 2024	Rapid GPU-Based Pangenome Graph Layout	Guidance on algorithm implementation, feedback of the cache optimized CPU and GPU implementations, read & criticized & edited manuscript	 Paper
PLOS Computational Biology, 2024	nf-core/airrflow: an adaptive immune receptor repertoire analysis workflow employing the Immcantation framework	Software development, paper editing	 Paper
Nature Methods, 2024	Building pangenome graphs	Software development, documentation, testing, contributed to Figure 1, wrote Section A1, made Figure A1, and contributed to paper writing and editing	 Paper

 Journal	 Title	 Contribution	 Links
Bioinformatics, 2024	*Pangenome graph layout by Path-Guided Stochastic Gradient Descent	Algorithm implementation leader, testing, documentation, design and conduction of experiments, paper writing	 Paper
LATIN 2024: Theoretical Informatics, 2024	Wheeler Maps	Advisor for the integration of a wheeler maps implementation with real life pangenome graphs, built and provided initial pangenome graphs for testing the implementation, manuscript editing	 Paper
Acta Neuropathologica, 2023	Integrative proteomics highlight presynaptic alterations and c-Jun misactivation as convergent pathomechanisms in ALS	Paper editing, LFQ proteomics analysis	 Paper
Nature, 2023	A draft human pangenome reference	Paper editing, pangenome graph creation and visualization	 Paper
Cancer Cell International, 2022	*Multiomics surface receptor profiling of the NCI-60 tumor cell panel uncovers novel theranostics for cancer immunotherapy	Data curation and quality control, performed the MCIA, RNAseq analysis and T CPA data exploration, wrote methods sections of the software tools and steps I applied, generated visualizations for Figures 1-3, and manuscript editing	 Paper
Bioinformatics, 2022	*ODGI: understanding pangenome graphs	Paper and documentation writing, performance evaluation, testing, implemented several tools	 Paper
Frontiers in Plant Science, 2022	A Perspective on Plant Phenomics: Coupling Deep Learning and Near-Infrared Spectroscopy	Experimental counseling, data management	 Paper
Frontiers in Immunology, 2020	Specific Induction of Double Negative B Cells During Protective and Pathogenic Immune Responses	Data curation	 Paper
Bioinformatics, 2020	Efficient dynamic variation graphs	Implementation of some ODGI subcommands (pathindex, server, panpos), optimization of one (bin), documentation writing for ODGI	 Paper









 Journal	 Title	 Contribution	 Links
Annual Review of Genomics and Human Genetics, 2020	Pangenome Graphs	I made Table 1 and contributed to Sections 4.4 and 6.1 and Figure 2, paper editing	 Paper
Frontiers in Immunology, 2019	Platelets Aggregate With Neutrophils and Promote Skin Pathology in Psoriasis	FACS data analysis	 Paper
Frontiers in Immunology, 2019	PSM Peptides From Community-Associated Methicillin-Resistant <i>Staphylococcus aureus</i> Impair the Adaptive Immune Response via Modulation of Dendritic Cell Subsets <i>in vivo</i>	Statistical analysis counseling, paper editing	 Paper
Nature Scientific Reports, 2017	Central European Woolly Mammoth Population Dynamics: Insights from Late Pleistocene Mitochondrial Genomes	 GenConS software development and testing, wrote section about GenConS, paper editing	 Paper

Talks & Posters




 Time	 Conference	 Title	 Links
30 June 2024 to 4 July 2024	International Genome Graph Symposium 2024	Cluster efficient pangenome graph construction with nf-core/pangenome	 Talk  Certificate
8 Apr. 2024	HPRC HUGO24 Workshop Rome	Building and Analyzing Pangenome Graphs	 Talk
22 Mar. 2024	M3 Workshop	Cluster efficient pangenome graph construction with nf-core/pangenome	 Talk
7 Nov. 2023	nf-core community , virtual	Cluster scalable pangenome graph construction with nf-core/pangenome	 Bytesize:nf-core/pangenome  Youtube  Talk
19 Oct. 2023	Nextflow Summit 2023	Cluster scalable pangenome graph construction with nf-core/pangenome	 Youtube  Talk
23 Jun. 2023	TÜBMI 2023	Pangenome Graphs	 Poster

 Time	 Conference	 Title	 Links
8 Jul. 2022	Biomedical Data Science Symposium	Pangenome Graphs	 Poster
6 July 2022	International Genome Graph Symposium 2022	Graph layout by path-guided stochastic gradient descent	 Talk (Due to a car accident, Erik Garrison hold the talk.)
8 Jul. 2022	VIZBI 2022	Graph Layout by Path-Guided Stochastic Gradient Descent	 Abstract  Poster  VIZBI Posters  Lightning Talk
21 Oct. 2021	Institute for Medical Biometry and Bioinformatics	Exploring pangenome graphs and possible applications	 Talk
21 Sept. 2021 to 24 Sept. 2021	AGI2021 Congress	A pangenome for the expanded BXD family of mice	 Abstract  Poster
6 Sept. 2021 to 8 Sept. 2021	German Conference on Bioinformatics 2021	ODGI: scalable tools for pangenome graphs	 Abstract  Talk
21 Jul. 2021	TüBiT 2021	The PanGenome Graph Builder	 Poster
11 May 2021 to 14 May 2021	The Biology of Genomes 2021	The PanGenome Graph Builder	 Abstract  Poster
28 Sep. 2020 to 1 Oct. 2020	EG VCBM 2020	Graph Layout by Path-Guided Stochastic Gradient	 Abstract  Poster
21 Sep. 2020 to 23 Sep. 2020	T2T-HPRC-Virtual Conference 2020	Graph Layout by Path-Guided Stochastic Gradient	 Abstract  Poster
13 Jul. 2020 to 16 Jul. 2020	ISMB 2020	Pantograph: Scalable Interactive Graph Genome Visualization	 Abstract  Poster
13 Jul. 2020 to 16 Jul. 2020	ISMB 2020	Semantic Variation Graphs - A Pangenome Ontology	 Abstract  Poster  Best Poster Prize  Citation
9 Dec. 2019 to 12 Dec. 2019	SWAT⁴HCLS	Semantic Genome Graphs	 Poster
1 Sept. 2019	Japan DBCLS Biohackathon 2019 Symposium	VG Browser: Interactive Visualization of Genome Variation Graphs	 Talk











Awards












 Time	 Place	 Description	 Links
4 Jul. 2024	International Genome Graph Symposium 2024	Student Travel Award 700 CHF (720.32 EUR)	 Travel Award
16 Jul. 2020	ISMB 2020	Best Poster Award <i>Semantic Variation Graphs: Ontologies for Pangenome Graphs</i>	 Bio-Ontologies COSI – Best Poster Award
24 Jul. 2017	ISMB 2017	Best Poster Award <i>Interactive pangenome visualization of variant graphs</i>	 Best Poster Award
8 Oct. 2012	iGEM 2012	Bronze Award	 MISSING

\$ Grants

















 Time	 Sponsor	\$ Amount	 Description
4 July 2024	Ministry of Economics and Energy (BMWi)	190,000 EUR	Research grant <i>Pantograph</i> together with Computomics GmbH to research pangenome graph visualization.



















Invitations

 Time	 Place	 Description	 Links
18 May 2024 to 22 May 2024	MemPanG24 Pangenomics, University of Tennessee Health and Science Center, Memphis, USA	Invited Organizer, instructor, and chair	 Webpage  Material  Certificate
8 Apr. 2024	HPRC Pangenomics Workshop at HUGO 2024, Aula Multimediale Rettorato, Sapienza University of Rome, Rome, Italy	Invited Instructor	 Material  Slides  Certificate







 Time	 Place	 Description	 Links
30 May 2023 to 2 Jun. 2023	MemPanG23 Pangenomics, University of Tennessee Health and Science Center, Memphis, USA	Invited Organizer, instructor, and chair	 Webpage  Material  Certificate
7 Nov. 2023	nf-core community, virtual	Invited talk nf-core bytesize talks 2023 <i>Cluster scalable pangenome graph construction with nf-core/pangenome</i>	 Bytesize:nf-core/pangenome  Youtube  Slides
21 October 2021	Institute for Medical Biometry and Bioinformatics	Invited talk <i>Exploring pangenome graphs and possible applications</i>	 Slides

> Hackathons

 Time	 Info	 What	 Links
18 Mar. 2024 to 20 Mar. 2024	nf-core hackathon, virtual	Co-team leader group pipelines, finalizing nf-core/pangenome	 nf-core/pangenome
16 Oct. 2023 to 18 Oct. 2023	nf-core hackathon, Barcelona, Spain	Progressing nf-core/pangenome	 projects  nf-core/pangenome
27 Mar. 2023 to 29 Mar. 2023	nf-core hackathon, virtual	Progressing nf-core/pangenome	 projects  nf-core/pangenome
16 Mar. 2022 to 18 Mar. 2022	nf-core hackathon, virtual	Progressing nf-core/pangenome	 nf-core/pangenome
9 Dez. 2021 to 10 Dez. 2021	Pangenomics BioHacking, Online, Virtual in Milano	Expert for pangenome graph construction and participant	 nf-core/pangenome matrix  Certificate
8 Nov. 2021 to 12 Nov. 2021	ELIXIR Europe Biohackathon, Barcelona, Spain	Progressing nf-core/pangenome	 nf-core/pangenome
22 Mar. 2021 to 24 Mar. 2021	nf-core hackathon, virtual	Starting nf-core/pangenome	 Projects  HackMD  nf-core/pangenome

 Time	 Info	 What	 Links
9 Nov. 2020 to 13 Nov. 2020	ELIXIR Europe Biohackathon , virtual	Project leader <i>Federated Interoperable Annotated Variation Graphs</i>	 Projects  Federated Interoperable Annotated Variation Graphs
2 Aug. 2020 to 14 Aug. 2020	Crusco Biohackathon, Lavello, Italy	Progressing PG-SGD with Andrea Guarracino and Erik Garrison	 1D PG-SGD  2D PG-SGD
5 Apr. 2020 to 11 Apr. 2020	COVID-19 Biohackathon , virtual	Co-Project leader Pangenome Browser and co-project leader Pangenome Ontology	 COVID-19 Biohackathon 2020  Pangenome Browser  Semantic Variation Graphs
21 Nov. 2019 to 26 Nov. 2019	Computomics GmbH , Tübingen, Germany	Progressing Pantograph, playing around with pangenome graphs and SPARQL	 Graph-Genome
1 Sep. 2019 to 7 Sep. 2019	NBDC DBCLS BioHackathon 2019 , Fukuoka, Japan	Co-Project leader Pantograph, playing around with SequenceTubeMap and SPARQL	 Hackathon Wiki  Project Overview  Graph-Genome  MatrixTubeMap  A SPARQLing MatrixTubeMap  Certificate










Programming Languages

 Start	 Language	 Projects
1 Oct. 2010	Scheme	Learning to code during my first three semesters BSc Bioinformatics
1 Apr. 2011	Java	BSc thesis <i>TOPAS - TOolkit for Processing and Annotating Sequence data</i> ( TOPAS)
1 Apr. 2011	Bash	Contributing to the PanGenome Graph Builder ( PGGB). Implementing the PanGenome Graph Evaluation tool ( PGGE).






📅 Start	💻 Language	📁 Projects
1 Oct. 2012	R	Performing multiomics analysis (🔗 QMSFC).
1 Oct. 2012	Python	Implementing an ODGI MultiQC module (🔗 ODGI MultiQC Module). Supervision of graph genome browser implementation (🔗 Pantograph).
5 Nov. 2016	Javascript	Supervision of graph genome browser implementation (🔗 Pantograph). Interactive full-stack web application with Node.js, nbind to make C++ VG accessible in JavaScript, Pug, D3, HTML, CSS (🔗 AG)
5 Nov. 2016	C++	Main contributor to 🔗 ODGI , 🔗 smoothxg .
1 Nov. 2020	Nextflow	Sole developer of 🔗 nf-core/pangenome .
26 Jan. 2021	Rust	GAF alingment evaluation tool (🔗 rs-peanut)

👥 Teaching













📅 Time	📖 Course	✍️ Role	🔗 Links
18 May 2024 to 22 May 2024	MemPanG24 Pangenomics, University of Tennessee Health and Science Center , Memphis, USA	Organizer, instructor, and chair , created new material and tutorials, held lessons, assisted the participants, tested the VMs	🔗 Webpage 🔗 Material 📄 Certificate
8 Apr. 2024	HPRC Pangenomics Workshop at HUGO 2024, Aula Multimediale Rettorato, Sapienza University of Rome , Rome, Italy	Instructor , updated material and tutorials, held lessons, assisted the participants	🔗 Material 🔗 Slides 📄 Certificate
22 Mar. 2024	M3 Pangenome Workshop, M3 Research Center, University of Tübingen , Tübingen, Germany	Speaker , live demonstration of nf-core/pangenome	📄 Slides

 Time	 Course	 Role	 Links
30 May 2023 to 2 Jun. 2023	MemPanG23 Pangenomics, University of Tennessee Health and Science Center , Memphis, USA	Organizer, instructor, and chair , created new material and tutorials, held lessons, assisted the participants	 Webpage  Material  Certificate
17 Apr. 2023 to 29 Jul. 2023	Biomedical Data Management, University of Tübingen, Quantitative Biology Center (QBiC) , Tübingen, Germany	Tutor , managed seminar, hold tutorials, exam assistant	NA
19 Apr. 2022 to 30 Jul. 2022	Grundlagen der Bioinformatik, University of Tübingen, Quantitative Biology Center (QBiC) , Tübingen, Germany	Tutor , hold tutorials, revised and updated practical lessons, exam grader	 Teaching
21 Mar. to 25 Mar. 2022	Advanced Bioinformatics: Data Mining and Data Integration for Life Science (1.5 CFU/ECTS), Master's degree, Utrecht Bioinformatics Center , Utrecht, Netherlands)	Tutor , assisting students in the practical lessons	 Webpage
20 Apr. 2020 to 25 Jul. 2020	Data Management for Quantitative Biology, University of Tübingen, Quantitative Biology Center (QBiC) , Tübingen, Germany	Tutor , managed seminar, hold tutorials, exam assistant	NA







Mentoring

 Time	 University	 Thesis	 Links
1 Oct. 2023 to 31 Mar. 2024	Master's degree in Bioinformatics, University of Tübingen, Quantitative Biology Center (QBiC) , Tübingen, Germany	Joining medical data and pangenome graphs using the semantic web	 OXIQLE
1 May 2023 to 30 Aug. 2023	Bachelor's degree in Bioinformatics, University of Tübingen, Quantitative Biology Center (QBiC) , Tübingen, Germany	Die Konstruktion eines <i>Lodderomyces elongisporus</i> Pangenomgraphen	NA

Courses

 Time	 Place	 Title	 Links
1 Feb. 2023 to 8 Feb. 2023	Comenius University in Bratislava, Faculty of Natural Sciences (wet lab), and Faculty of Mathematics, Physics and Informatics (analysis), Bratislava, Slovakia	PANGAIA Winter Wet Lab School	 PANGAIA WWL School 2023  Invitation
8 Jul. 2022	University of Tübingen, Quantitative Biology Center (QBiC), Tübingen, Germany	Biomedical Data Science Symposium	 Biomedical Data Science Symposium 2022
11 Apr. 2019 to 12 Apr. 2019	University of Tübingen, Quantitative Biology Center (QBiC), Tübingen, Germany	Nextflow Workshop	 Nextflow Workshop April 2019
12 Nov. 2017 to 14 Nov. 2017	EMBL Heidelberg, Germany	EMBO EMBL Symposium: From Single- to Multiomics: Applications and Challenges in Data Integration	 Certificate
25 Sep. 2017 to 29 Sep. 2017	Leibniz Institute of Plant Biochemistry, Halle (Saale)	Joint CIBI user meeting 2017 on OpenMS, MetFrag and SeqAn	 Certificate
18 Sep. 2017	University of Tübingen, Quantitative Biology Center (QBiC), Tübingen, Germany	2 nd Annual European Bioinformatics Core Community Workshop	 Certificate
5 Oct. 2012 to 8 Oct. 2012	Vrije Universiteit, Amsterdam, Netherlands	iGEM 2012 European Regional Jamboree	 Wiki

Misc

 Time	 Info	 What	 Links
13 Jun. 2024 to Present	United Kingdom Research and Innovation	Reviewer for UK Research and Innovation	 Funding Service
15 Jun. 2022 to Present	Oxford Bioinformatics	Reviewer for Oxford Bioinformatics	NA
12 Oct. 2020 to Present	Human Pangenome Reference Consortium	Associate Member of the Human Pangenome Reference Consortium	 Collection