# Xenofon **Giannoulis**

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## Work Experience

### Research Scientist
*Helmholtz Munich, Germany*

Helmholtz Pioneer Campus — *June 2020 - December 2024*

- Applied advanced machine learning models to uncover key insights into mitochondria-nuclear interactions.
- Created an ensemble model combining RNAseq and eQTL data, leading to the identification of key genes in biological networks.
- Designed the first comprehensive catalog of mtDNA variation effects on gene expression regulation across 48 human tissues.
- Applied causal inference techniques (e.g., mediation analysis, partial correlation) to enhance model interpretability.
- Integrated diverse databases and open-source tools for cross-referencing and validating analytical findings.
- Replicated findings to elucidate the molecular basis of mitonuclear communication in neuropsychiatric diseases.
- Presented findings at several high-profile international conferences, sharing novel insights with the global scientific community.

### Research Fellow
*LMU, Munich, Germany*

Ludwig Maximilian University - Data Science for Social Good — *August 2023 - September 2023*

- Developed an end-to-end machine learning web application, aimed at enhancing the fire brigade's efficiency during emergency.
- Integrated routing algorithms for statistical mapping and geolocation data to build a user-friendly, interactive UX map.
- Deployed the application on Amazon Web Services (AWS) using a dockerized container.
- Collaborated with Bavaria's civil protection to create a strategy for the coverage of fire water extraction points.
- Presented and elucidated all aspects of the project to Germany's federal parliament.

### Higher Education Instructor
*TUM Munich, Germany*

Technical University of Munich - Department of Medicine (ME1660) — *October 2022 - March 2023*

- Participated as a tutor in lectures and provided support to students.
- Enhanced student learning by optimising the course materials and methods for the workshop in Jupyter Lab.
- Topics covered: UNIX, quality control, association testing, meta-analysis, polygenic risk scores.

### Quantitative Analytics Intern
*Helmholtz Munich, Germany*

Institute of Translational Genomics — *October 2019 - April 2020*

- Analyzed genome-wide association data from 250 patients undergoing total joint replacement surgery across four cohorts.
- Processed data obtained from three different Illumina Array Exome Sequencing Chips, created at two separate centers.
- Developed a quality control pipeline for evaluating pre-processed data, identifying biases, and ensuring accuracy during merging.
- Imputed data using Haplotype Reference Consortium on Michigan server.

## Technical Skills

**Statistics** — Expert in complete statistical analysis, including multiple correction, permutations, and hypothesis testing.
Developed and optimized ML models (linear mixed models, clustering, decision trees, graph neural networks).
Applied predictive modeling to enhance sensitivity of associations in population-scale data.
Employed causal inference techniques to effectively control for confounders in observational data.
Performed thorough data analysis, covering univariate analysis, multicollinearity checks, and outlier detection.
Expertise in securing data integrity through optimized feature engineering and stratified sampling.

**Genetics** — GWAS, eQTLs, iQTLs, WGS, Illumina, RNAseq, Limix, LDAK, PLINK, edgeR, ComBat-seq, Bioconductor, variant calling, statistical colocalization, mendelian randomization, mediation & pathway analysis.

**Programming** — Strong data analysis and visualization skills with R, proficient in Linux environments and Bash scripting.
Oracle Certified Professional, MySQL 5.6 Developer.
Familiar with style of writing Python, JavaScript, HTML, CSS, and XML commands.
Developed microservices with Flask intergrating geolocation data using Leaflet, OpenStreetMap, and OSMnx.
Emphasis on version control and documentation: Anaconda, Github, LaTeX, RMarkdown, Obsidian.

**Languages** — Greek (Native), English (Fluent), German (Intermediate).

# Education

**Technical University of Munich (TUM)** — *Munich, Germany*
Ph.D. / Dr.rer.nat. in Experimental Medicine — *Expected December 2024*

**Thessaly University** — *Lamia, Greece*
MSc. in Informatics and Computational Biomedicine — *April 2020*

**Piraeus University** — *Athens, Greece*
Ptychion (4-year BSc.) in Statistics and Actuarial Science — *February 2018*

# Professional Certificates

TUM ProLehre Media & Didactics | Courses on Teaching in Higher Education — *TUM, DE - April 2023*
- Psychology of learning, assessment methods, reflection, evaluation, and advising.

Essential Data Science GmbH - Data Science for Researchers — *Virtual - March 2021*
- Methodological and theoretical foundations and applications of various data science-related topics.

HIDA | Machine Learning Summer School — *Virtual - September 2020*
- Supervised and unsupervised Machine Learning walk-through hosted by Helmholtz Data Science Academy.

HMGU | Advanced Graphics with R — *Munich, DE - March 2020*
- Technical Visualization seminar by the Core Facility of Statistical Consulting.

HMGU | Multivariate Statistics — *Munich, DE - January 2020*
- Factor analysis and clustering systems seminar by the Core Facility of Statistical Consulting.

Oracle MySQL Certified Developer - 1z0-882 — *Oracle University, DE - July 2019*
- Database administrator, application development, configuration.

# Selected Contributions

Poster, European Human Genetics Conference (ESHG 2024) — *Berlin - June 2024*
- Interplay between mitochondrial and nuclear DNA in gene expression regulation.

Poster, Biology of Genomes (CSHL 2024) — *New York - May 2024*
- Tissue-specific mitochondrial regulation of gene expression.

Poster, American Dairy Science Association (ADSA 2023) — *Texas - Oct. 2023*
- HydroXplorer: A Fire Hydrant Range Finder Application.

Co-organizer, Munich School of Data Science Retreats — *Munich - June 2023*
- Oversaw speaker invitations and agenda to promote collaboration among diverse PhD candidates.

Poster, Research in Computational Molecular Biology (RECOMB 2023) — *İstanbul - April 2023*
- Tissue-specific apparent mtDNA heteroplasmy and its relationship with ageing and mtDNA gene expression.

Speaker, Munich School of Data Science (MUDS) — *Munich - Nov. 2021*
- Statistical methods to detect novel genetic variants.

Leader, EU-Funded STARS Initiative — *Munich - March 2021*
- Created an educational escape room for 30 institutions in four countries.

# Upcoming Scientific Publications

Understanding Mitochondrial-Nuclear DNA Interaction in Gene Expression Regulation: A Multi-Tissue Analysis.
**Xenofon Giannoulis**, Simon Wengert, Florin Ratajczak, Matthias Heinig, Na Cai.

Tissue-Specific mtDNA Heteroplasmy Linked to Aging and Gene Expression.
Simon Wengert, **Xenofon Giannoulis**, Peter Kreitmaier, Holger Prokisch, Paolo Casale, Matthias Heinig, Na Cai.