

MitoBench: An interactive visual workbench for population genetics on mitochondrial DNA



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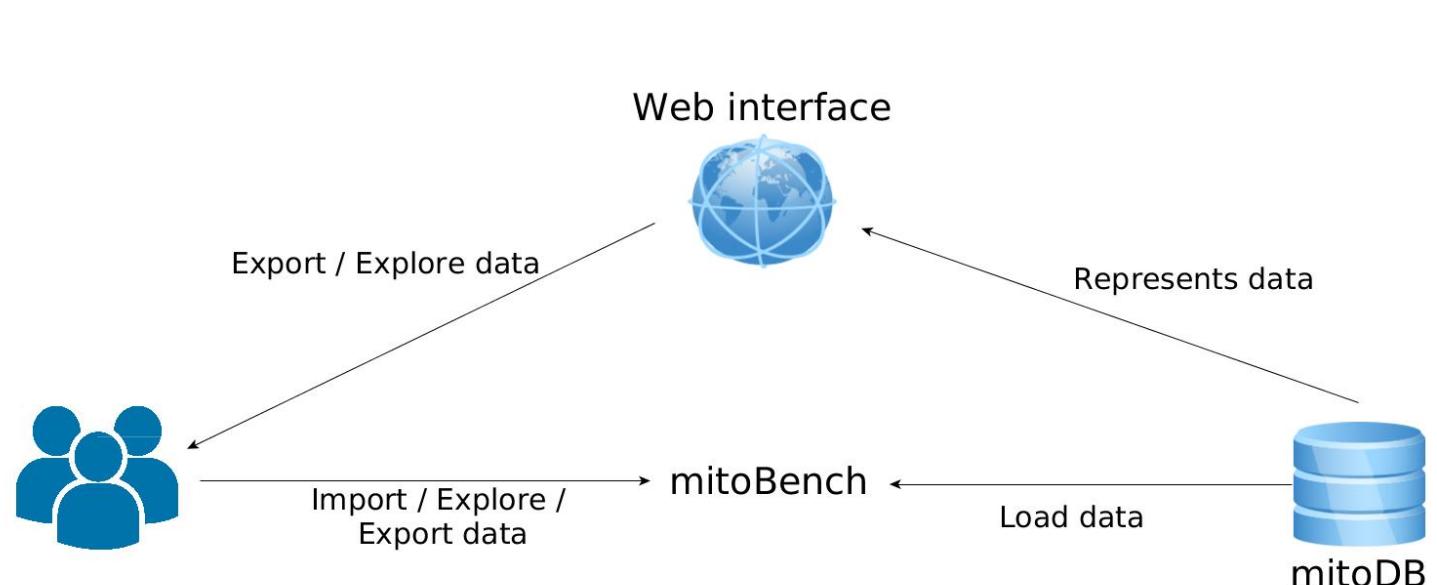
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Motivation & Goals

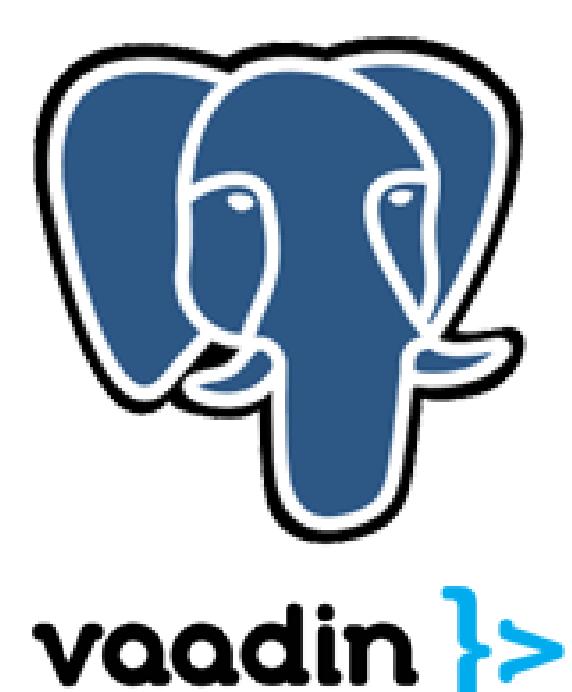
- Especially in the research field of ancient DNA, mtDNA is often the only proxy available to study extinct populations and their relationship with modern populations
- Tools for the analysis typically rely on different file formats → require manual interaction with the data for downstream analysis
- mitoBench: workbench to interactively analyze and visualize mitochondrial genomes and ease file conversions

Workflow



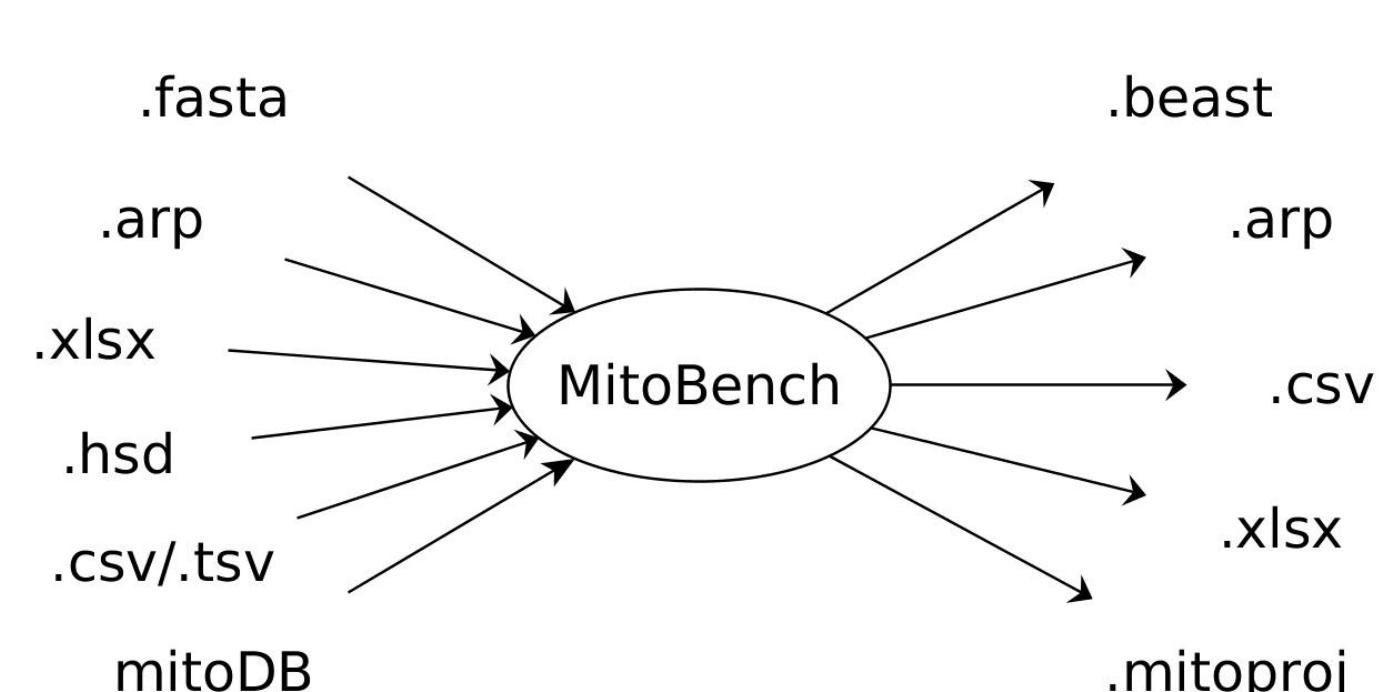
MitoDB

- Web-Frontend with Vaadin Java Framework
- Backend with PostgreSQL, providing sequence information and meta-data (SQL)
- Curated data upload with metadata
- Retrieval possible through WebUI and mitoBench



MitoBench

Data import and export



Data representation

ID	MTSequence	Haplogroup	Time Period	continent	country	country_region	culture_type	dating_lower
J2C880	GATCA...	T1a2	Pre-Ptolemaic Period	Africa	Egypt	Beni Suef	Ancient	-669
egypt.5A1j29	GATCA...	X1c	Egypt Modern	Africa	Egypt	Other	Modern	2015
egypt.6A4b6	GATCA...	H3w	Egypt Modern	Africa	Egypt	Other	Modern	2015
egypt.530586	GATCA...	L37a1	Ethiopia Modern	Africa	Ethiopia	Other	Modern	2015
egypt.530587	GATCA...	R0a1	Egypt Modern	Africa	Egypt	Other	Modern	2015
egypt.530583	GATCA...	M1a5	Ethiopia Modern	Africa	Ethiopia	Other	Modern	2015
egypt.530582	GATCA...	R0a2	Ethiopia Modern	Africa	Ethiopia	Other	Modern	2015
egypt.530601	GATCA...	R0a2g	Ethiopia Modern	Africa	Ethiopia	Other	Modern	2015
egypt.530602	GATCA...	L07b	Ethiopia Modern	Africa	Ethiopia	Other	Modern	2015
egypt.530603	GATCA...	L32	Ethiopia Modern	Africa	Ethiopia	Other	Modern	2015
egypt.530600	GATCA...	L2a1d1	Ethiopia Modern	Africa	Ethiopia	Other	Modern	2015
egypt.7A1j39	GATCA...	I6b	Egypt Modern	Africa	Egypt	Other	Modern	2015
J2C879	GATCA...	U3b	Roman Period	Africa	Egypt	Beni Suef	Ancient	-235
J2C878	GATCA...	T1a7	Ptolemaic Period	Africa	Egypt	Beni Suef	Ancient	-235
egypt.8A1j34	GATCA...	H20c	Egypt Modern	Africa	Egypt	Other	Modern	2015

Data grouping

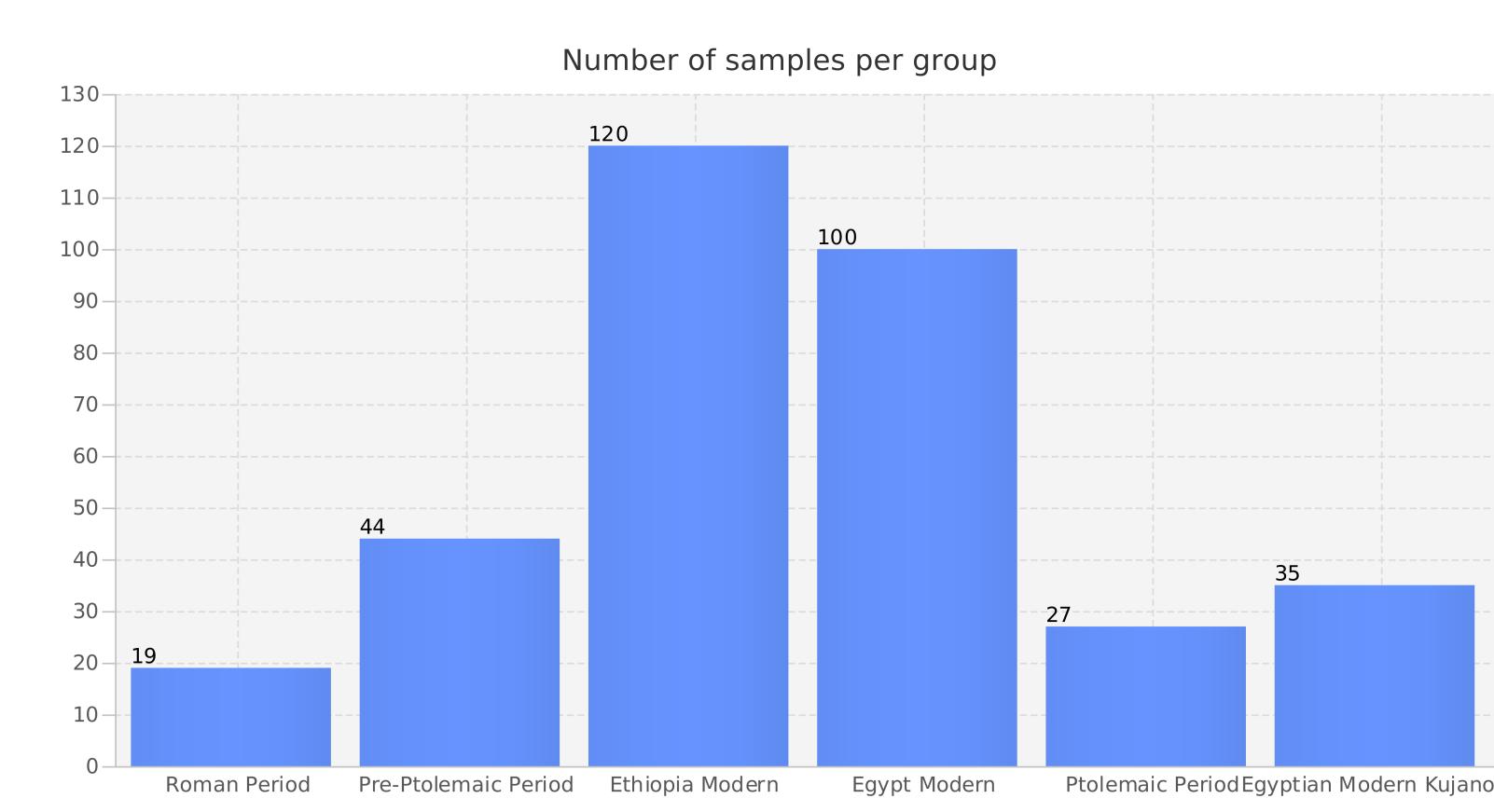
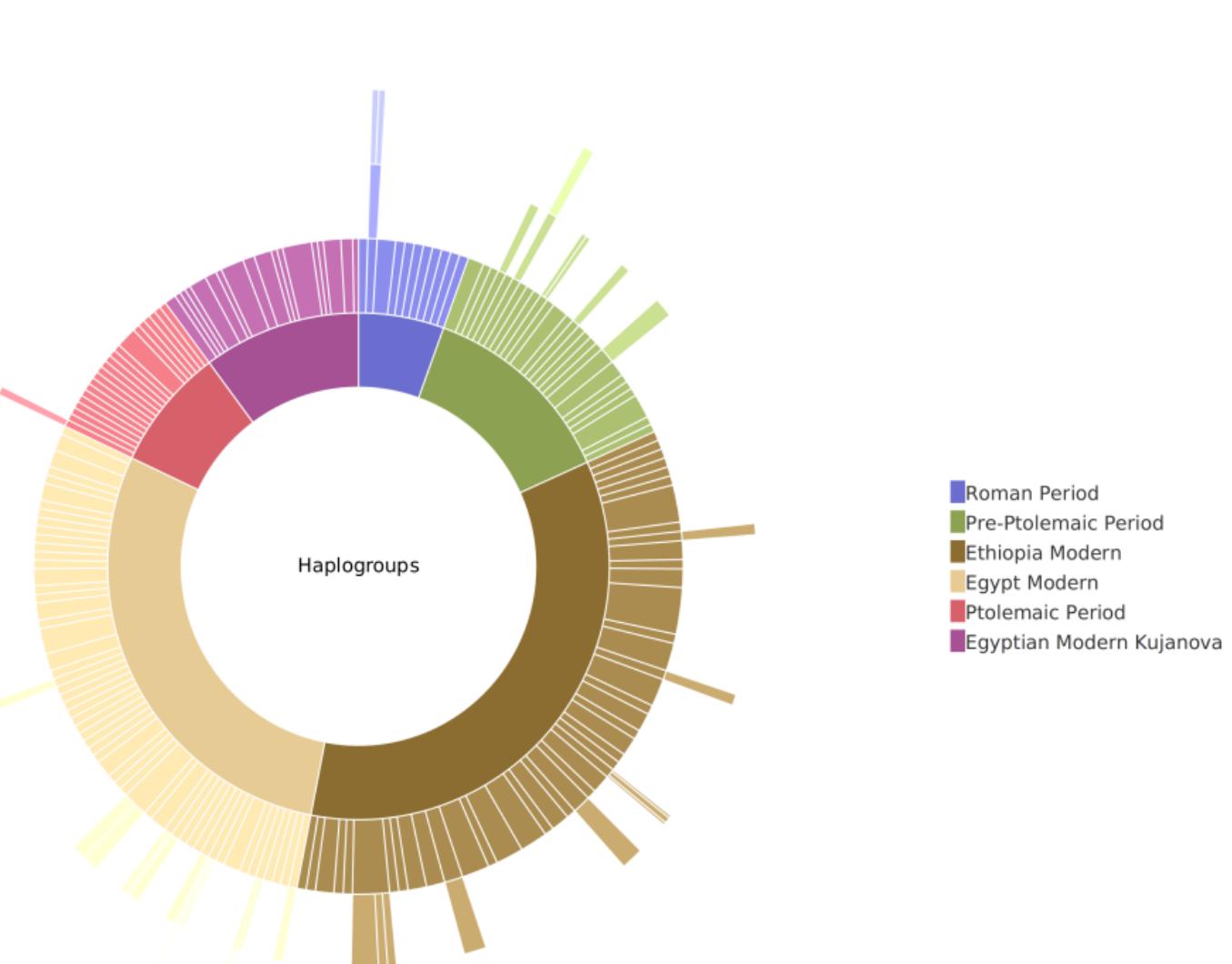
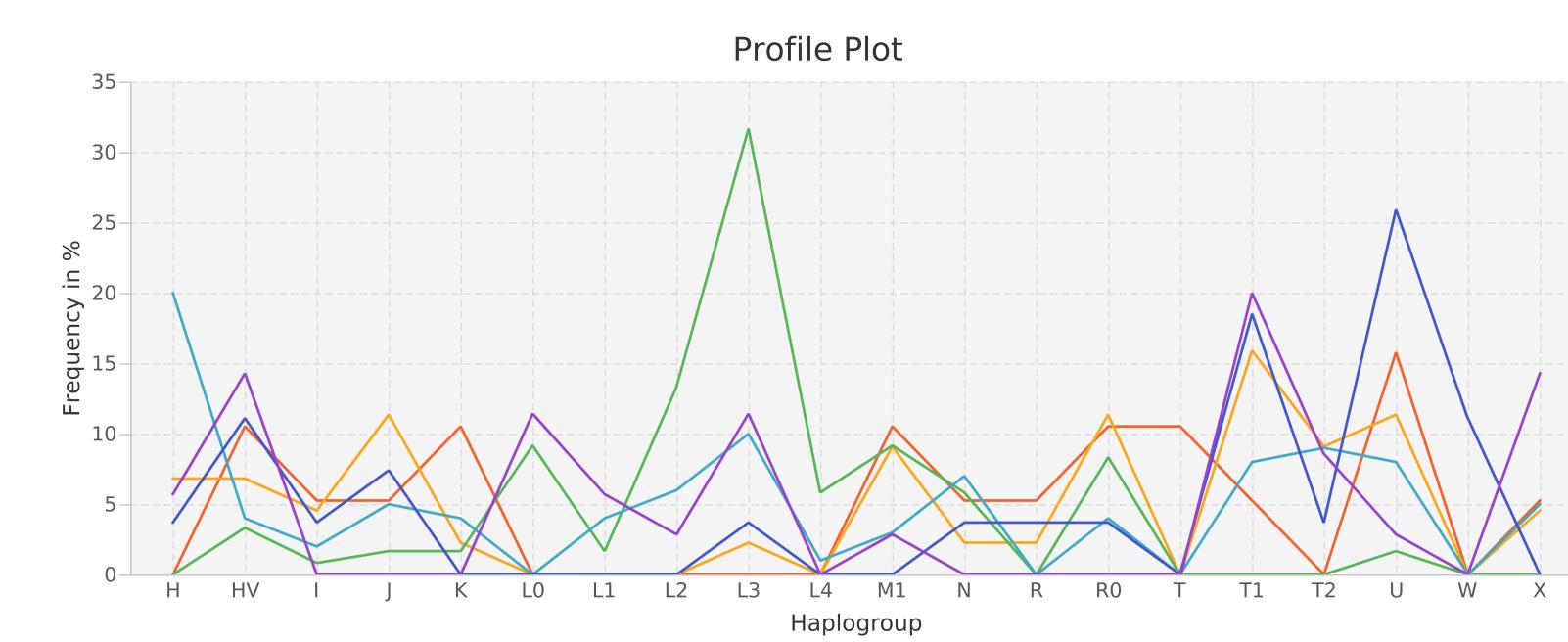
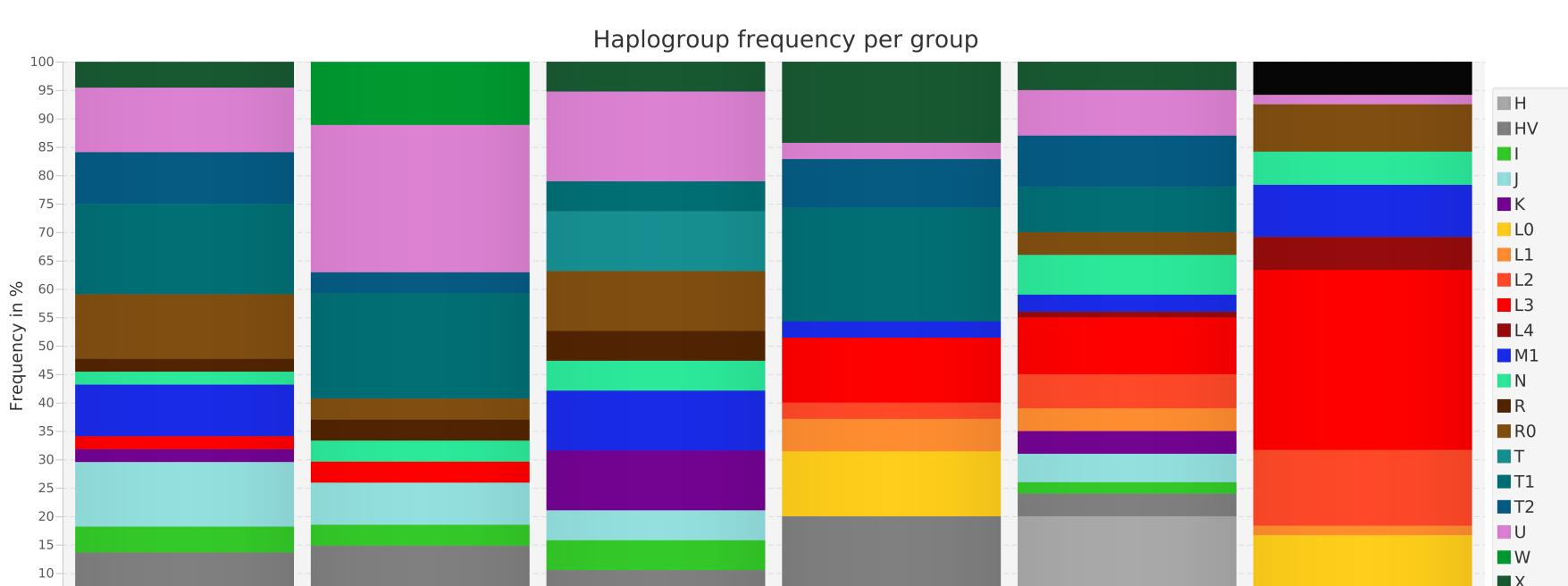
- Interested in behaviour of different groups → Group data by feature
- Internal grouping (columns not sorted)

Data filtering / Statistics

- Haplogroup filtering / frequencies
- Mutation filtering / frequencies

Haplogroups based on [PhyloTree_{mt}](#)

Data visualizations



Conclusion

mitoBench

- Easy file handling and file conversion
- Combination, manipulation and visualization of mitochondrial data
- Data filtering
- Statistics

mitoDB

- Collection of mitochondrial data plus meta information
- Curated database
- Accessible via mitoBench and web interface

Outlook

mitoBench

- Providing methods for downstream analysis (e.g. F_{ST} calculations, Founder Analysis)
- More visualizations (e.g. using maps for geographical information)

mitoDB

- Workspace: Potentially some analysis inside the WebUI
- Export/import functionality

Looking for more information?



Poster guide

References