Pennsieve A Collaborative Platform for Translational Neuroscience and Beyond

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Background

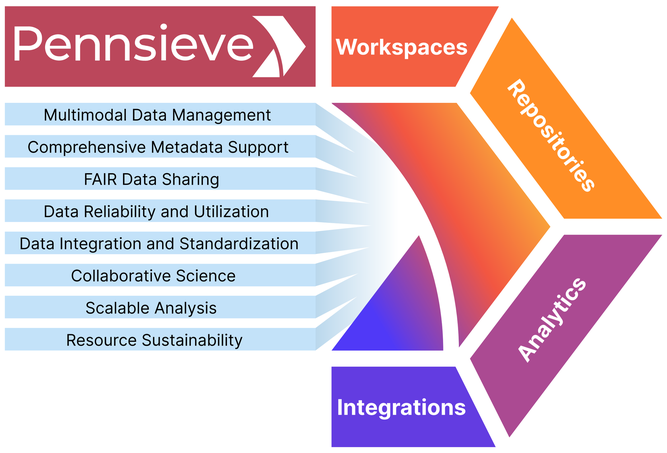
- The current neuroscience data landscape is highly fragmented and generally organized into proprietary formats and modality-specific archives[1].
- This fragmentation inadvertently creates data silos that hinder large-scale research efforts and diminish the potential for scientific discovery[2].
- As neuroscience transitions from primarily closed to open science, the adoption of FAIR (Findable, Accessible, Interoperable, and Reusable) principles has become crucial for reproducible research[3].
- **We introduce Pennsieve, an open-source, cloud-based scientific data management platform focused on integrating complex datasets, fostering collaboration, and FAIR scientific data publishing.**

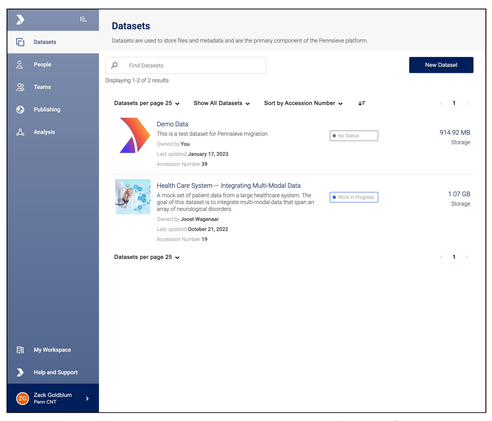
Check out Pennsieve!

Find our pre-print here: https://arxiv.org/abs/2409.10509

Methods

- Pennsieve serves as a data management infrastructure for the global scientific community.
- It is built around shared workspaces, public data repositories, scalable analytics, and integrations that facilitate collaborative research at scale.



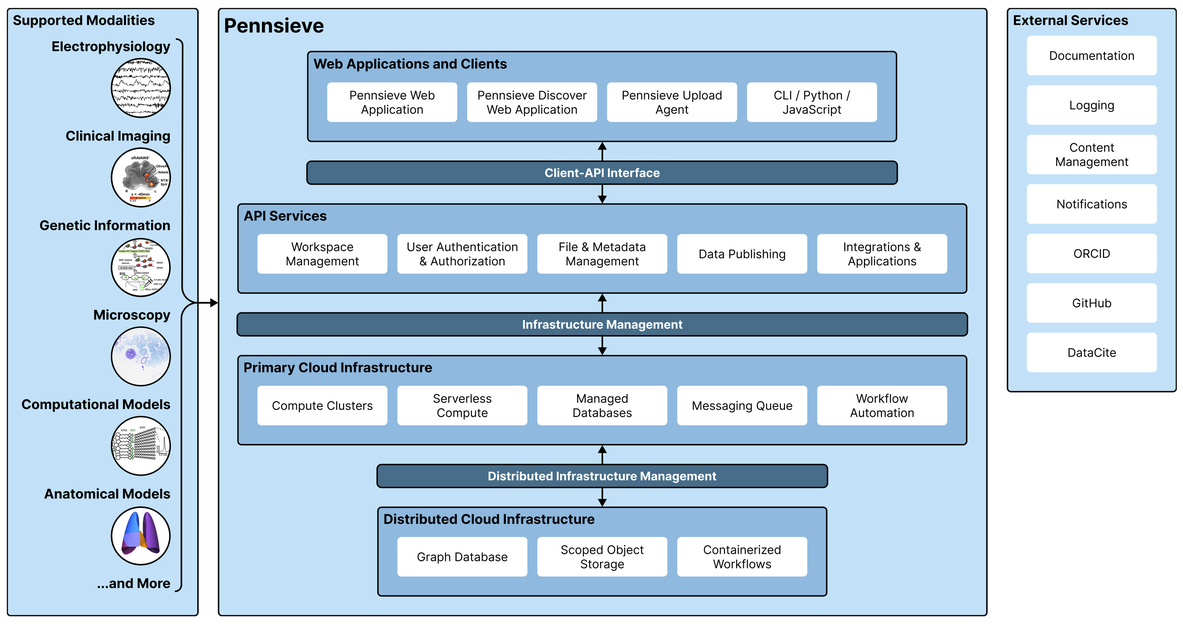


Pennsieve's web application interface.

Pennsieve Discover

Pennsieve Discover is the the platform's dedicated public data repository for FAIR scientific data publishing.

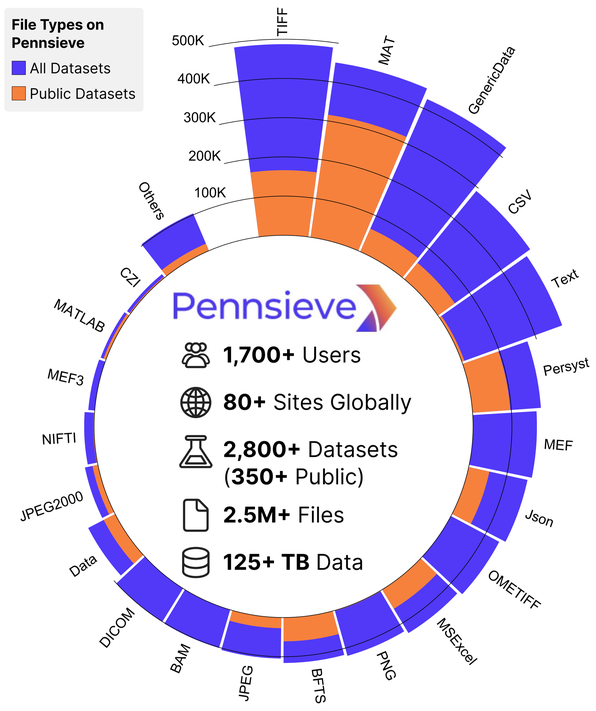
- Researchers use Pennsieve to create and manage datasets within collaborative workspaces while maintaining data privacy.
- Multimodal data management allows users to integrate diverse data types (clinical, imaging, timeseries, multiomics, and others) alongside custom metadata schemas.
- It features tools for data annotation, visualization, and analysis.
- Pennsieve supports the full data lifecycle: from initial data upload and curation to public sharing via the Pennsieve Discover portal.



- Pennsieve's multi-tenant structure supports multiple consortia through dedicated web applications and programmatically via APIs.
- Its cloud architecture ensures scalability, availability, and security.

Results & Impact

- Pennsieve stores over **125 TB** of scientific data, with **35 TB** publicly available across **350+** high-impact datasets.
- Leveraged by **100+** daily users that download over **80 GB** of data each week from Pennsieve's public services.



Pennsieve is utilized by more than **1,700** users across **80+** research sites worldwide.

- Pennsieve forms the core for several major neuroscience research programs:
  - NIH SPARC Initiative
  - NIH HEAL RE-JOIN Initiative
  - NIH HEAL Initiative's PRECISION Human Pain Network
- Supports large-scale, inter-institutional projects at clinical sites through the University of Pennsylvania.
- Also empowers individual research labs and specialized projects (e.g., Epilepsy.Science, PedQuEST, SEED Project).

Conclusion

- Pennsieve is one of the largest, fully-maintained data resources for the global neuroscience community.
- Its flexible infrastructure supports research across several scales, from individual labs to large consortia.
- Pennsieve's core focus on long-term platform and data sustainability makes it an enduring platform that can address evolving challenges in the data lifecycle across multiple scientific domains.
- Future developments will focus on supporting sustainable, distributed analytics and integrations with other platforms to expand Pennsieve's impact within the larger data ecosystem.

References & Acknowledgments

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