Ensembl-based Genomics Services for Animal Breeding, Aquaculture, and Biodiversity

Challenge

- Domestic animal and biodiversity genomics are rapidly expanding fields generating massive amounts of sequence data.
- Current methods for, pangenome construction, and functional analysis are fragmented and computationally intensive.
- Breeding programs and biodiversity projects require high-resolution, actionable genomic insights to inform trait selection, disease resistance, and environmental adaptation.
- Industrial partners often face data accessibility, confidentiality, scalability and sustainability issues with 'in-house' genomic tools.

Technology *(TRL7 and above)*

- **Ensembl Infrastructure & Web Applications**
  - The team develops the core infrastructure, regulatory annotation pipelines, and web applications for the Ensembl genome browser, a globally recognized platform.
  - Supports genome annotation, functional genomics, and comparative analyses across species.
- **Genome Annotation & Comparative Genomics**
  - Multi-genome and pangenome workflows for domestic animals, aquaculture, and biodiversity species.
  - Includes gene tree construction and homology analyses to study evolutionary relationships, species-, breed- and population- specific genomic variation, including structural variants.
  - Integrates genomic data with climate information to explore how genetic variation impacts environmental adaptation and associated traits.
- **Data Portals & Submission Tools**
  - User-friendly web portals for project specific metadata validation, standardized data submission, and integration with public archives (e.g., FAANG, Earth BioGenome Project).
  - Incorporates AI-supported data querying and provides visualization tools to facilitate exploration of complex functional genomics datasets.
- **Potential to Provide Industry-Deployable & Confidential Pipelines**
  - On-site deployment for secure integration of proprietary breeding or biodiversity datasets.
  - Customizable annotation, regulatory, and comparative workflows tailored to customer needs.

Internal EMBLEM Reference

2026-019

Key Inventors

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Applications

- **Precision animal breeding:** trait optimization, disease resistance, structural variant analysis.
- **Biodiversity genomics:** evolutionary insights, conservation studies, comparative genomics.
- **Digital agriculture & AI:** digital twins, phenotype and trait prediction.
- **Bioengineering:** genome editing, functional validation, high-content CRISPR screens.
- **Industrial partnerships:** secure integration of private datasets with Ensembl-based annotation pipelines.

Benefits

- Rapid, high-resolution genome annotation across species and populations.
- Secure, on-site analysis of proprietary datasets.
- Actionable insights for breeding, disease resistance, and welfare.
- Flexible deployment via web interfaces, local servers, or partner-controlled infrastructure.
- Support for digital agriculture, AI-assisted phenotyping, and genome editing.

Keywords

#Animal Genomics
#Biodiversity
#Genome Annotation
#Ensembl
#Pangenomes
#Functional Genomics
#Digital Agriculture
#Regulatory Annotation
#Comparative Genomics
#Data Portals
#Variant Effect Prediction

Data Resources

- Aquatic Symbiosis Genomics Data Portal
- Darwin Tree of Life Data Portal
- European Reference Genome Atlas Data Portal
- Functional Annotation of Animal Genomes (FAANG) Data Portal
- Ensembl Compara
- Ensembl Beta
- TreeFam
- TreeFam search

Further Reading

- [1] doi:10.1093/nar/gkae1071
- [2] doi:10.1093/gigascience/giaf119
- [3] doi:10.1016/j.aquaculture.2024.740589

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Intellectual Property

☒ Know-how based

☒ Copyright

Commercial Opportunity

We provide a professional pipeline for genome annotation, functional genomics, and comparative analysis in animal health, agriculture, aquaculture, and biodiversity, with regulatory annotation, pangenome analyses, and AI-enabled visualization, deployable on-site for secure handling of proprietary data.

Seeking:

☒ Development partner

☒ Commercial partner

☒ Academic partner

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