# SecureMLlib: Privacy-Preserving Distributed Machine Learning

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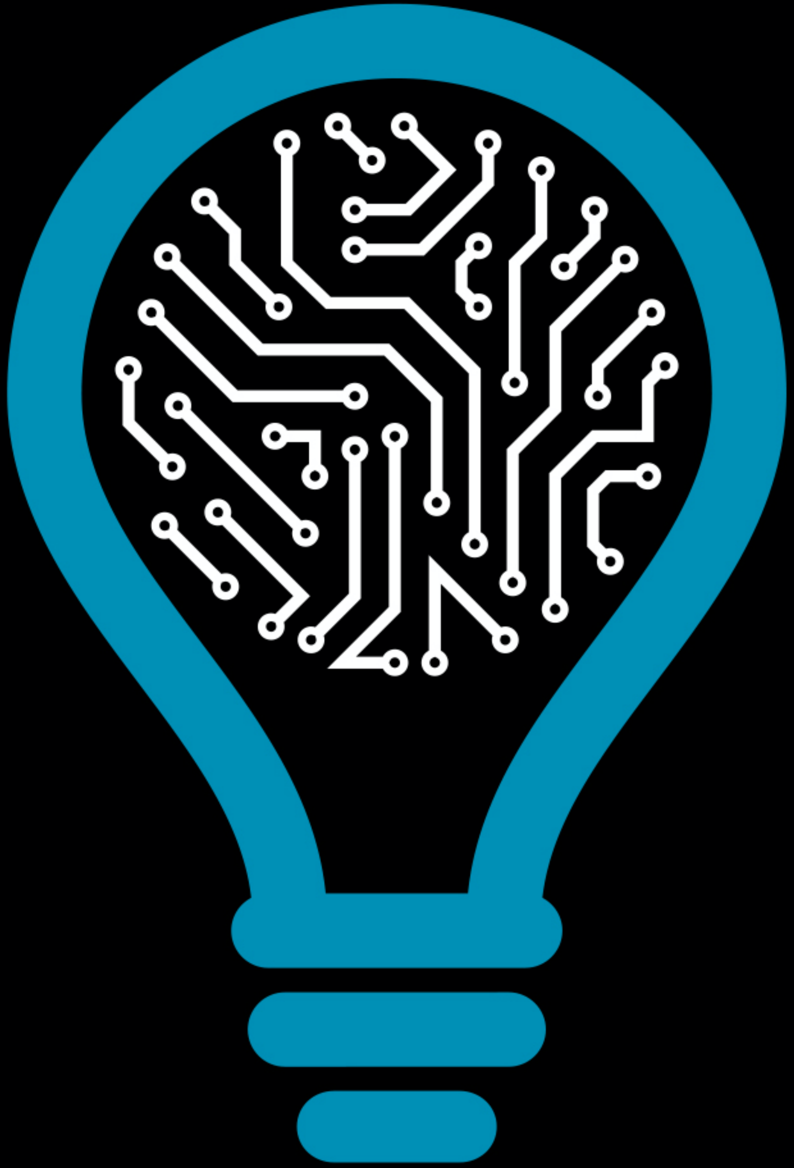
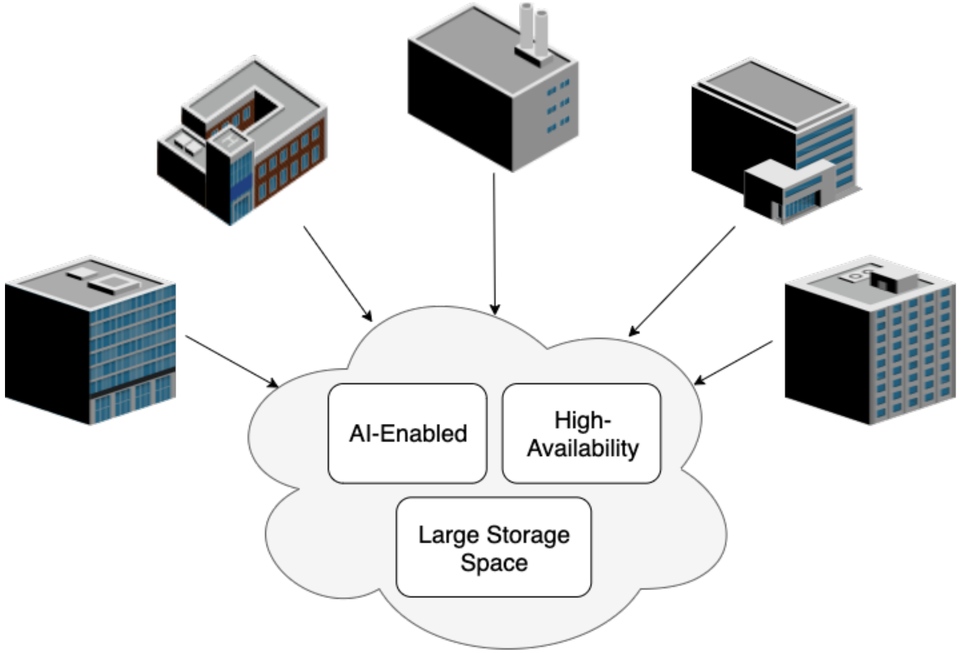
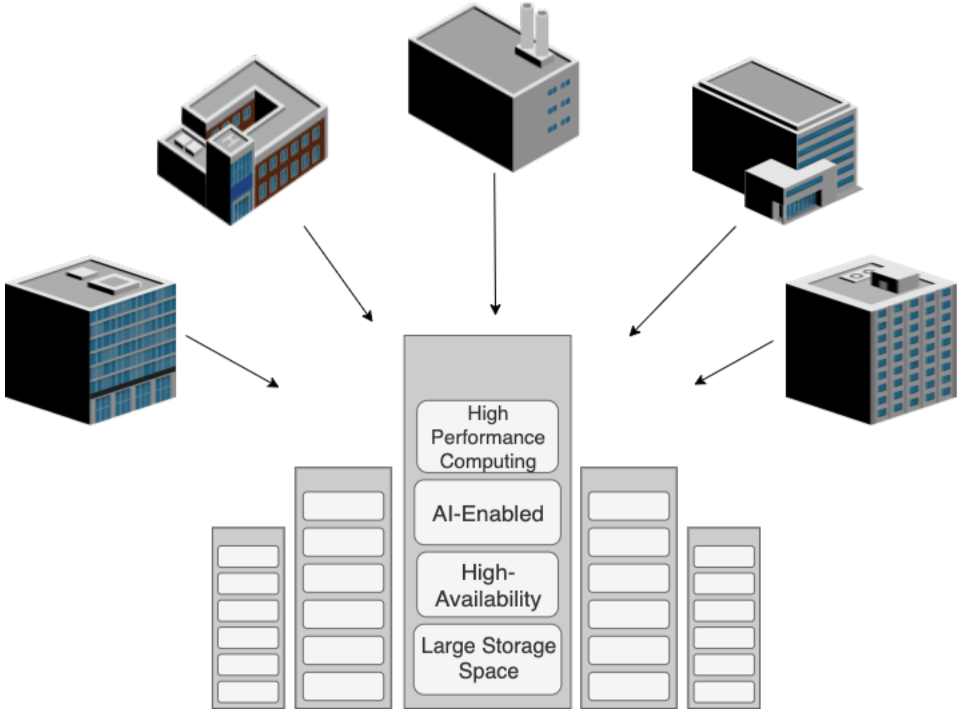


Improving Practice Through Theory

# Big Data & AI

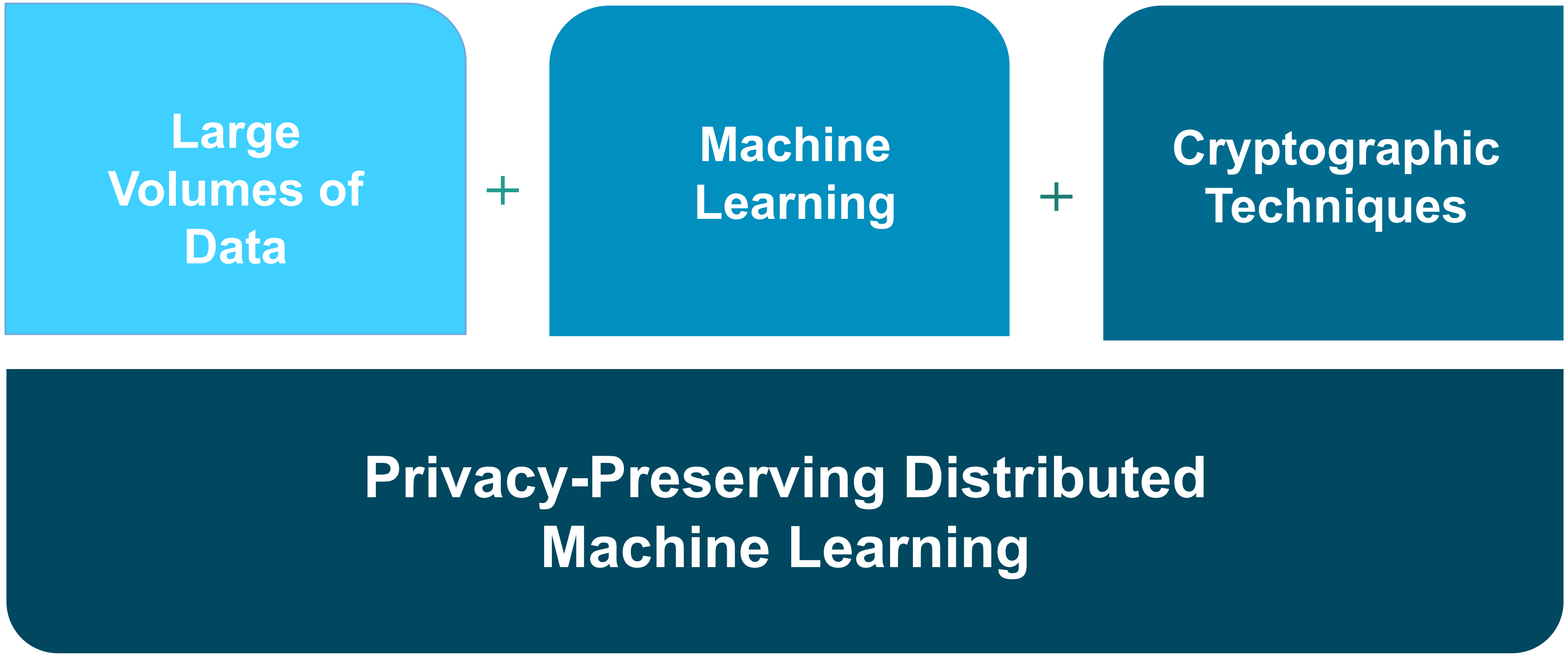
- The **exponential growth** of digital information is raising **novel** and **tougher** challenges for **large-scale data analytics**;
    - Outsourcing of computation to AI-based infrastructures;





# Big Data & AI

- **Legislations**, such as GDPR or HIPAA, are **blocking** how **data** could be leveraged by new **AI algorithms**;
- **Private data should be kept private**;

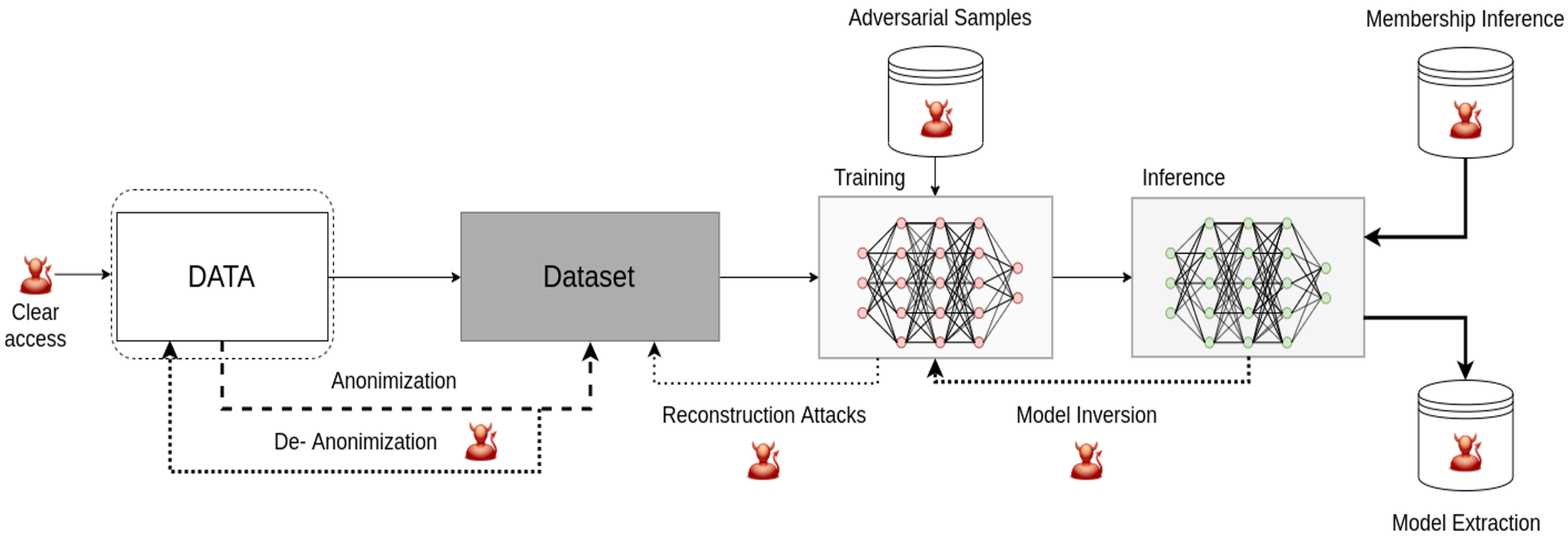


Large Volumes of Data + Machine Learning + Cryptographic Techniques

Privacy-Preserving Distributed Machine Learning

# Machine Learning Pipeline

Several threats and attacks end jeopardising the normal functioning of the machine learning pipeline.



We should tackle the challenge step by step.

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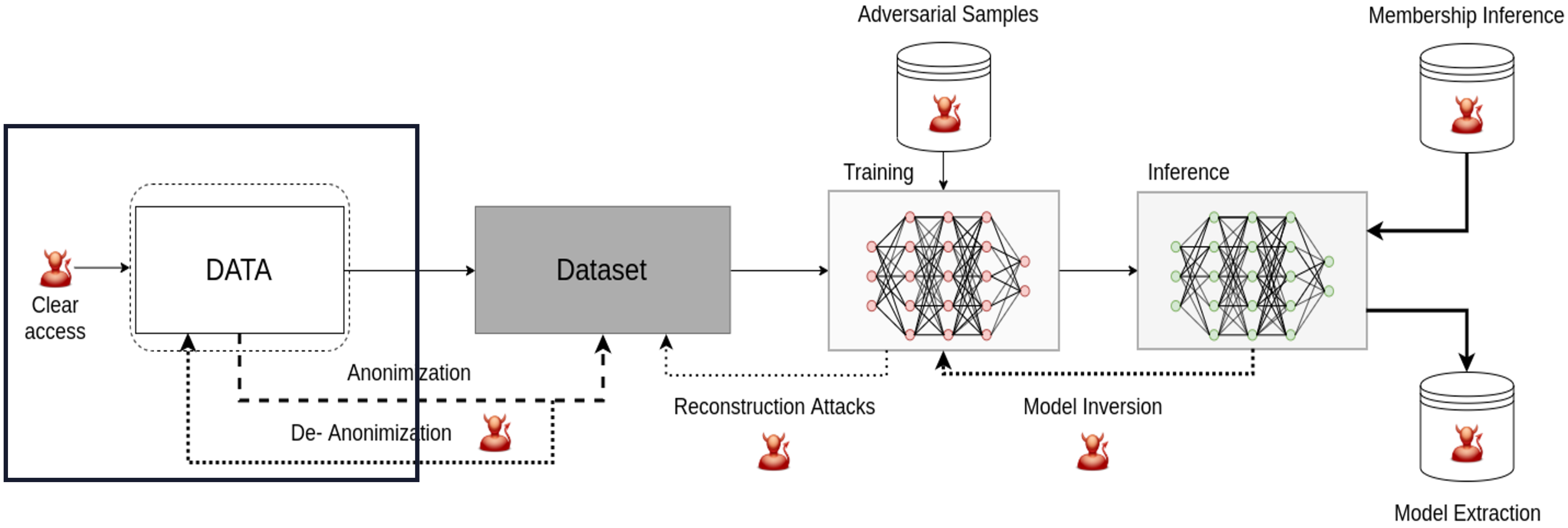

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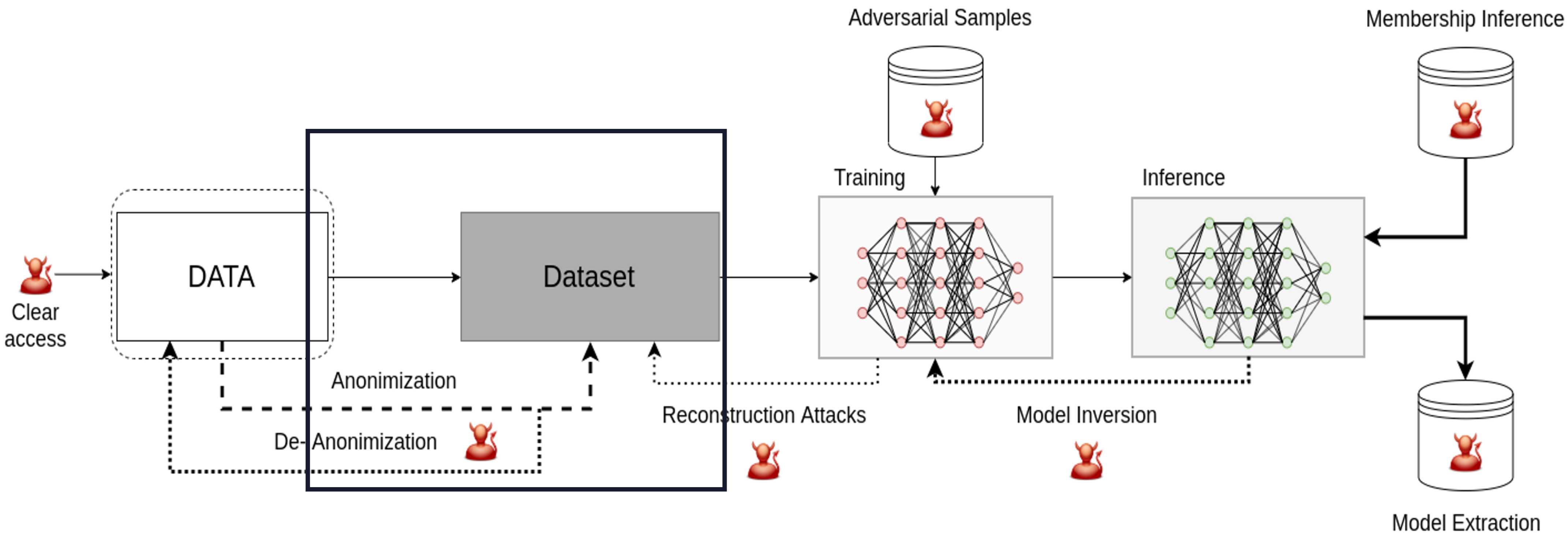

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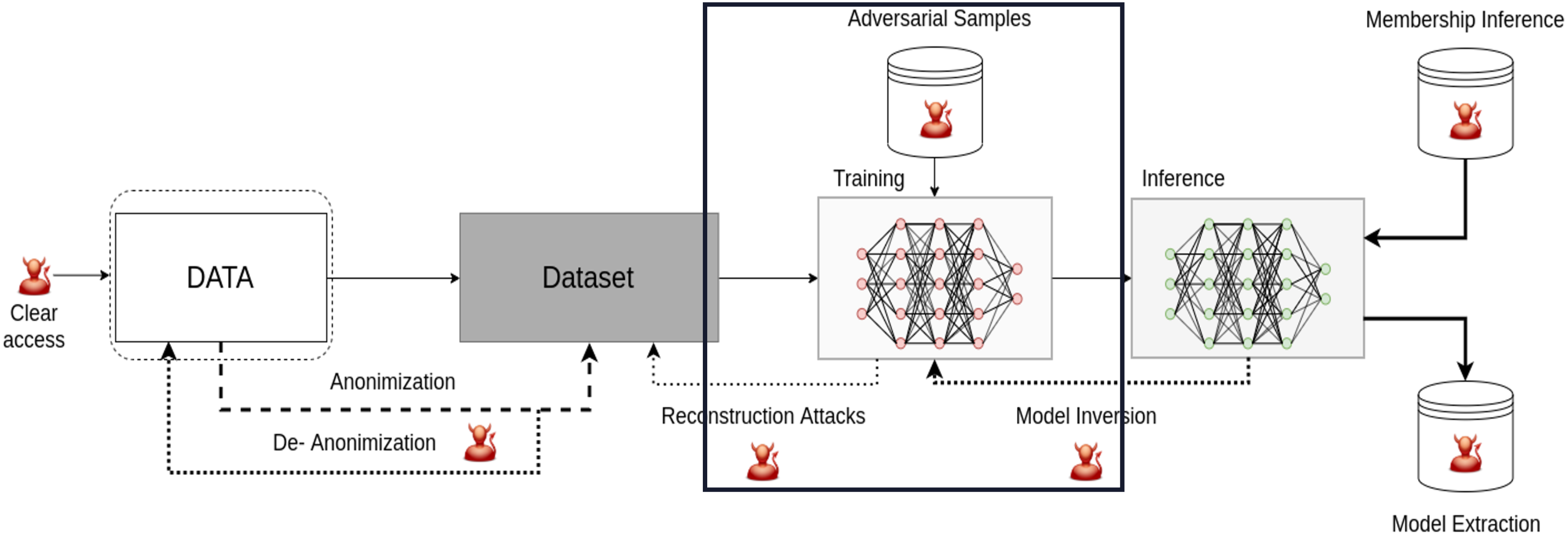

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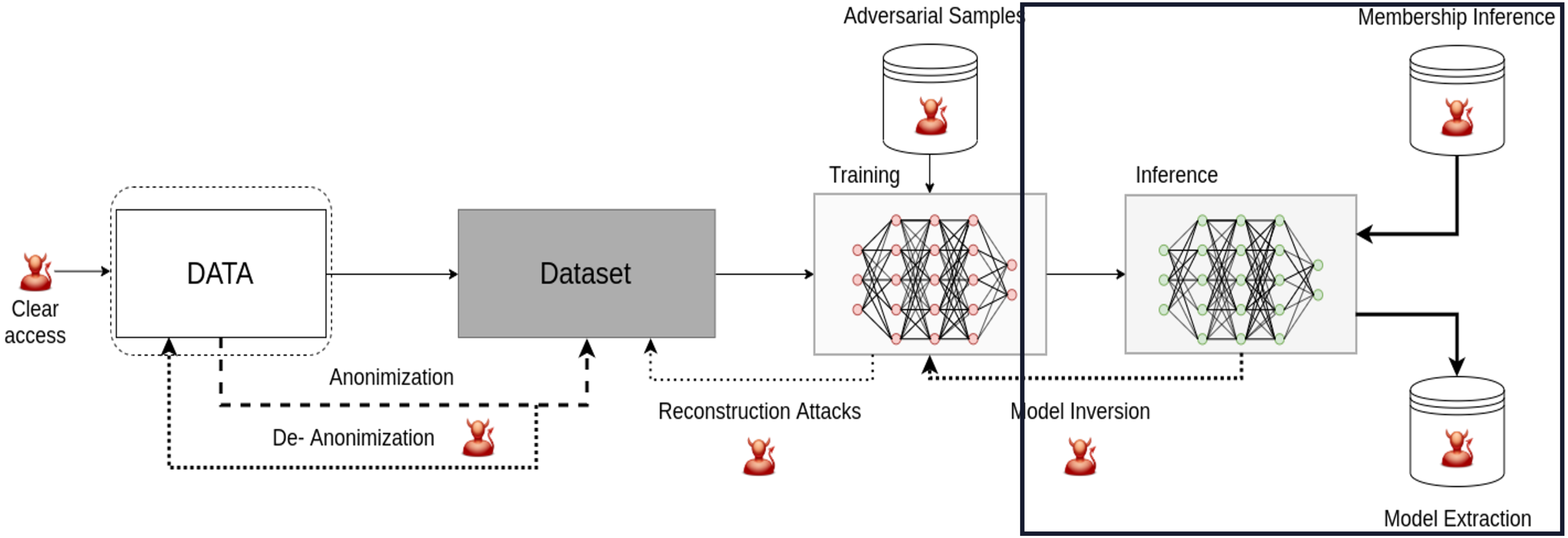
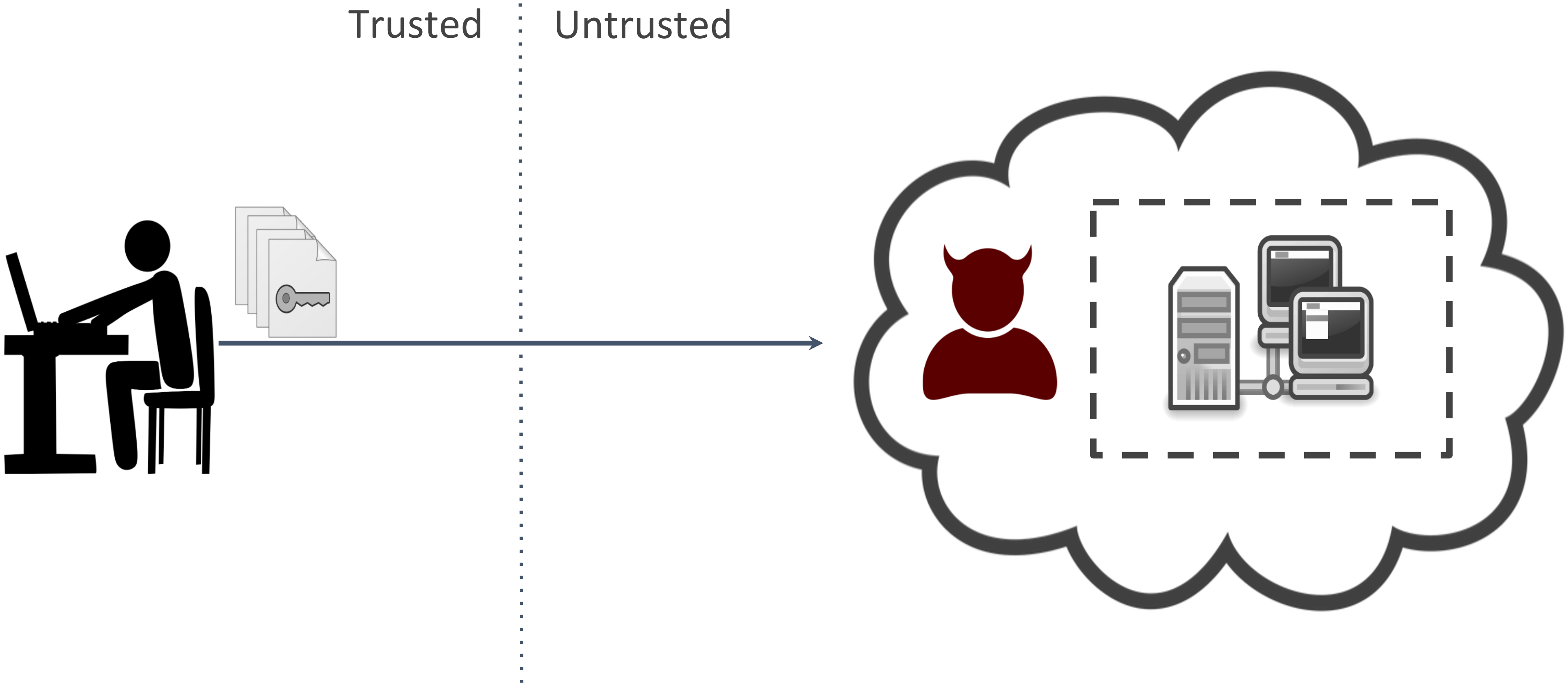


We should tackle the challenge step by step.

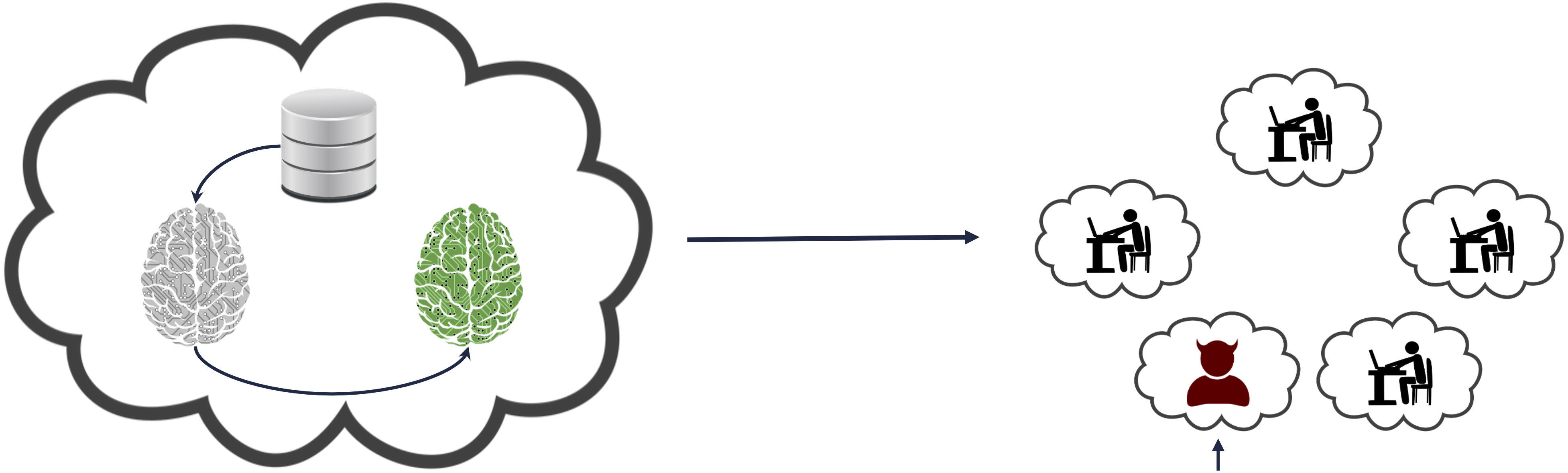
# Challenges

How can we prevent data leakage in distributed machine learning frameworks?



# Challenges

How can we guarantee that our models do not remember the training data and how can we prevent data leakage?



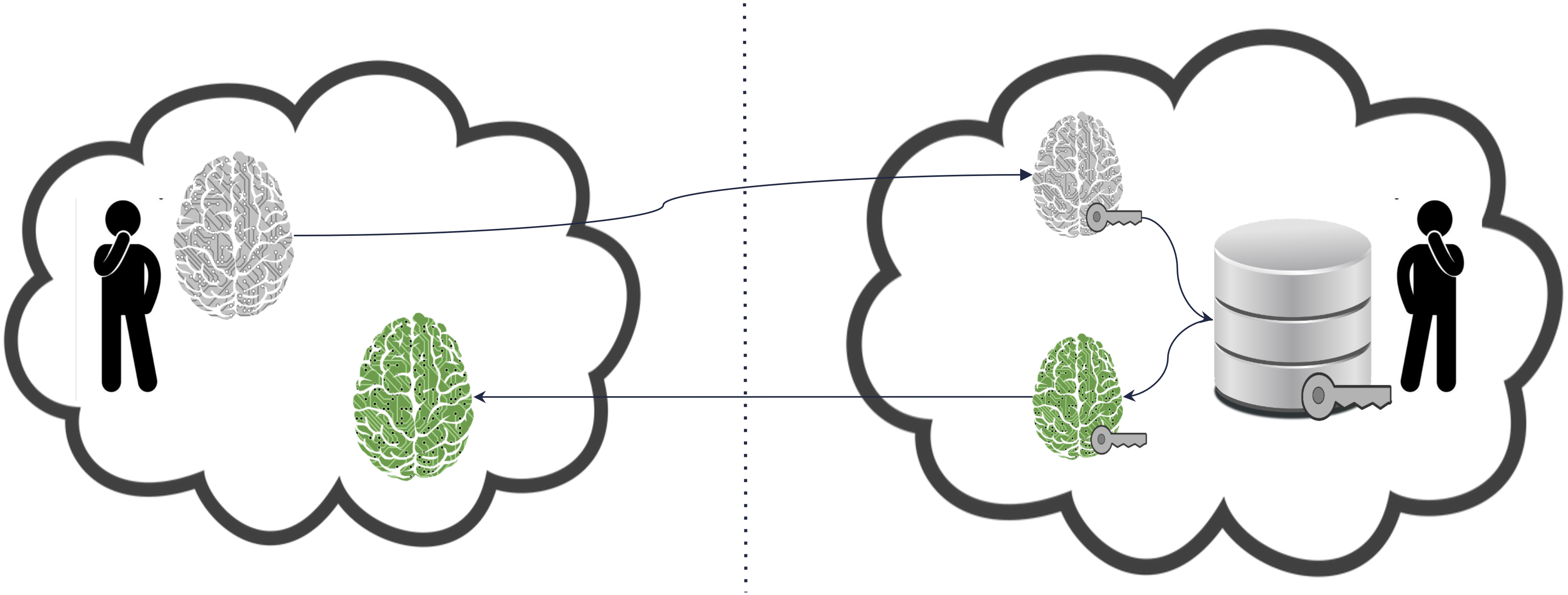
Untrained Model

Trained Model

- Membership Attacks
- Reconstruction Attacks
- Model Inversion
- Model Extraction

# Challenges

How can we protect the intellectual property of our models?



Untrained Model

Trained Model

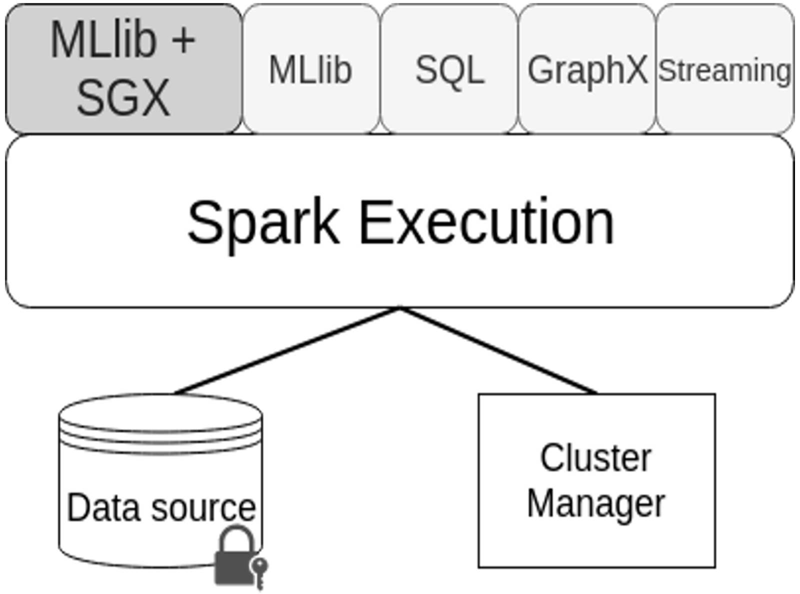
# The solution?

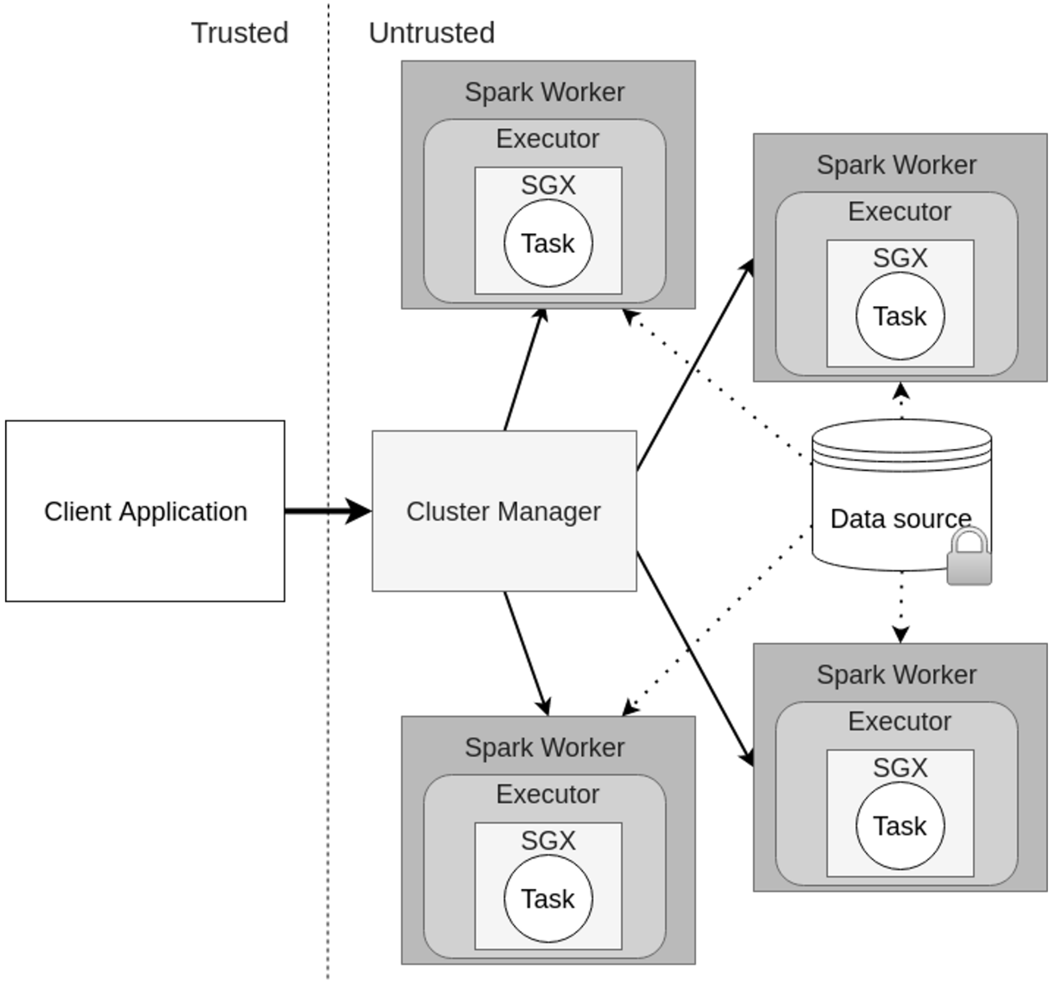
# SecureMLlib

- By relying on Apache Spark, we offer:
  - Scalability;
  - High-Availability;
  - Different APIs for different purposes.

# SecureMLlib

- Data encryption with different cryptographic primitives;
- Modification of MLlib algorithms to compute inside Intel's SGX.





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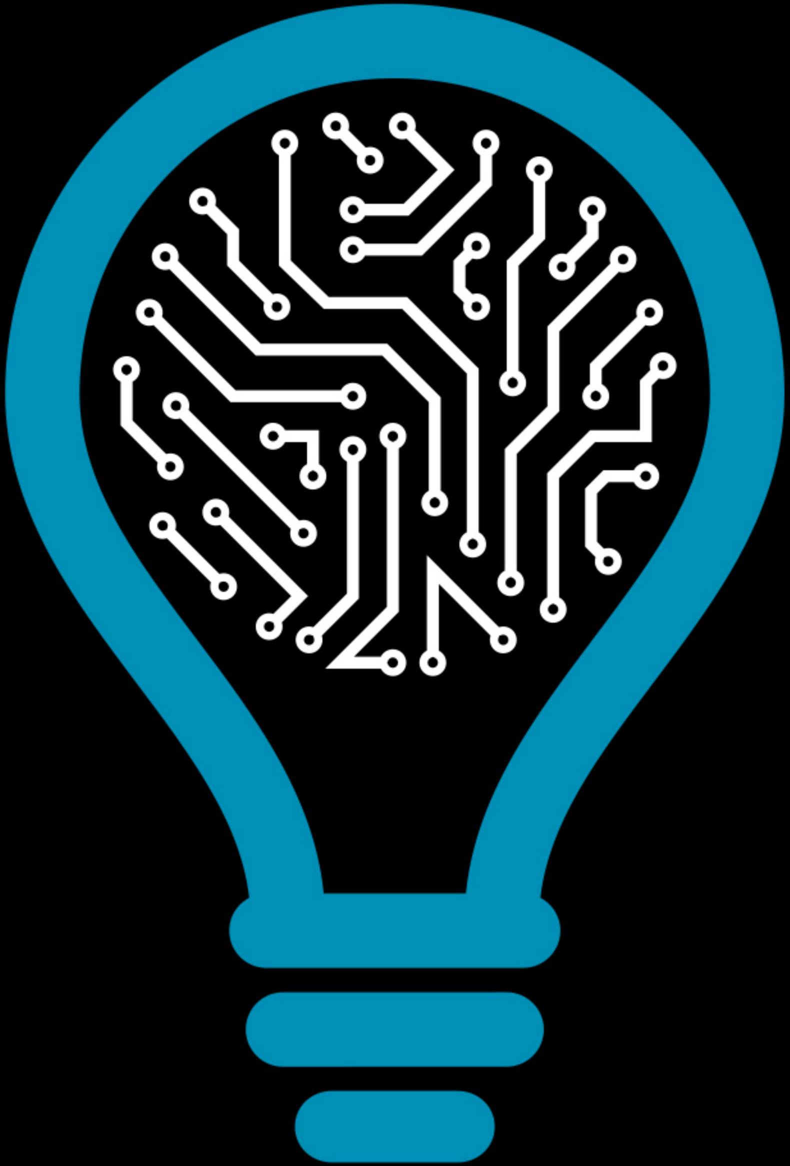

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