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<https://deepforge.org>

### PROJECT GOALS

Provide **Software as a Service** platform for applying deep learning within diverse scientific domains that integrates with existing cyberinfrastructure with emphasis on:

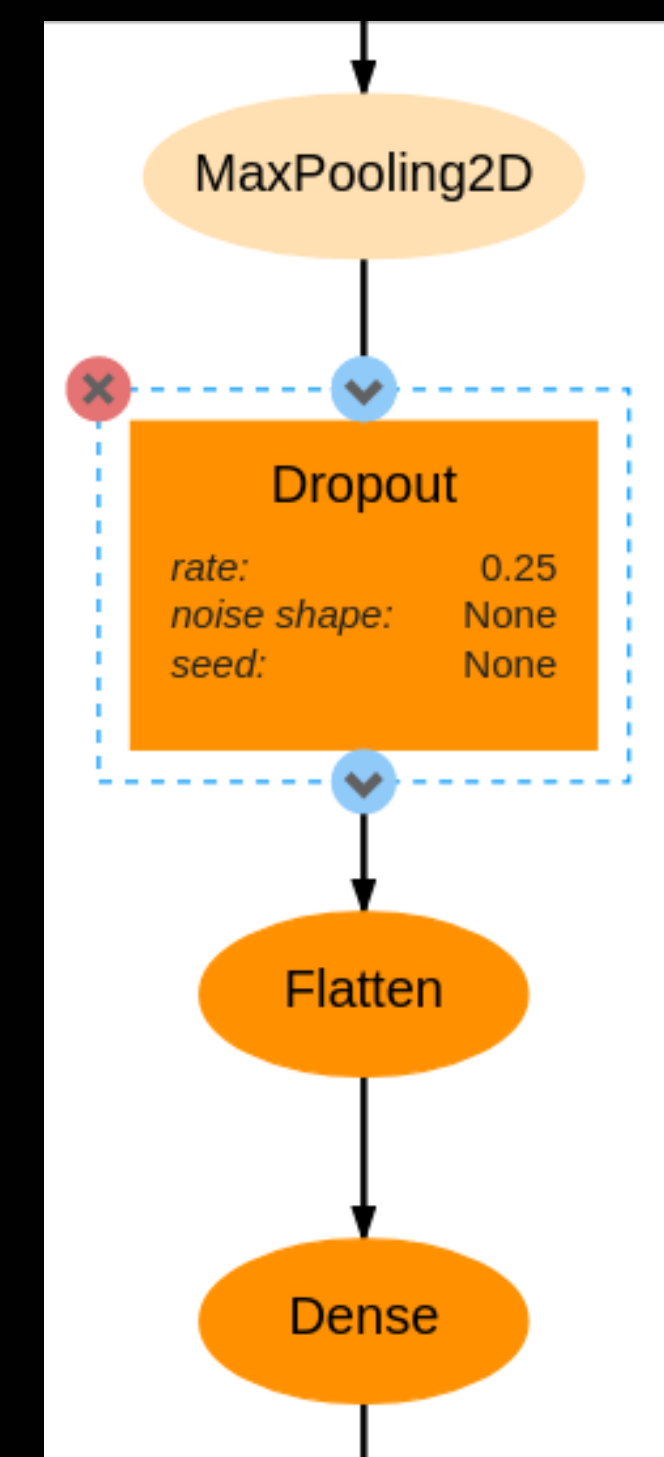
- **Simplicity**, web-based, visual editing, libraries
- **Collaboration**, real-time, versioning
- **Reproducibility**, data provenance

### BACKGROUND

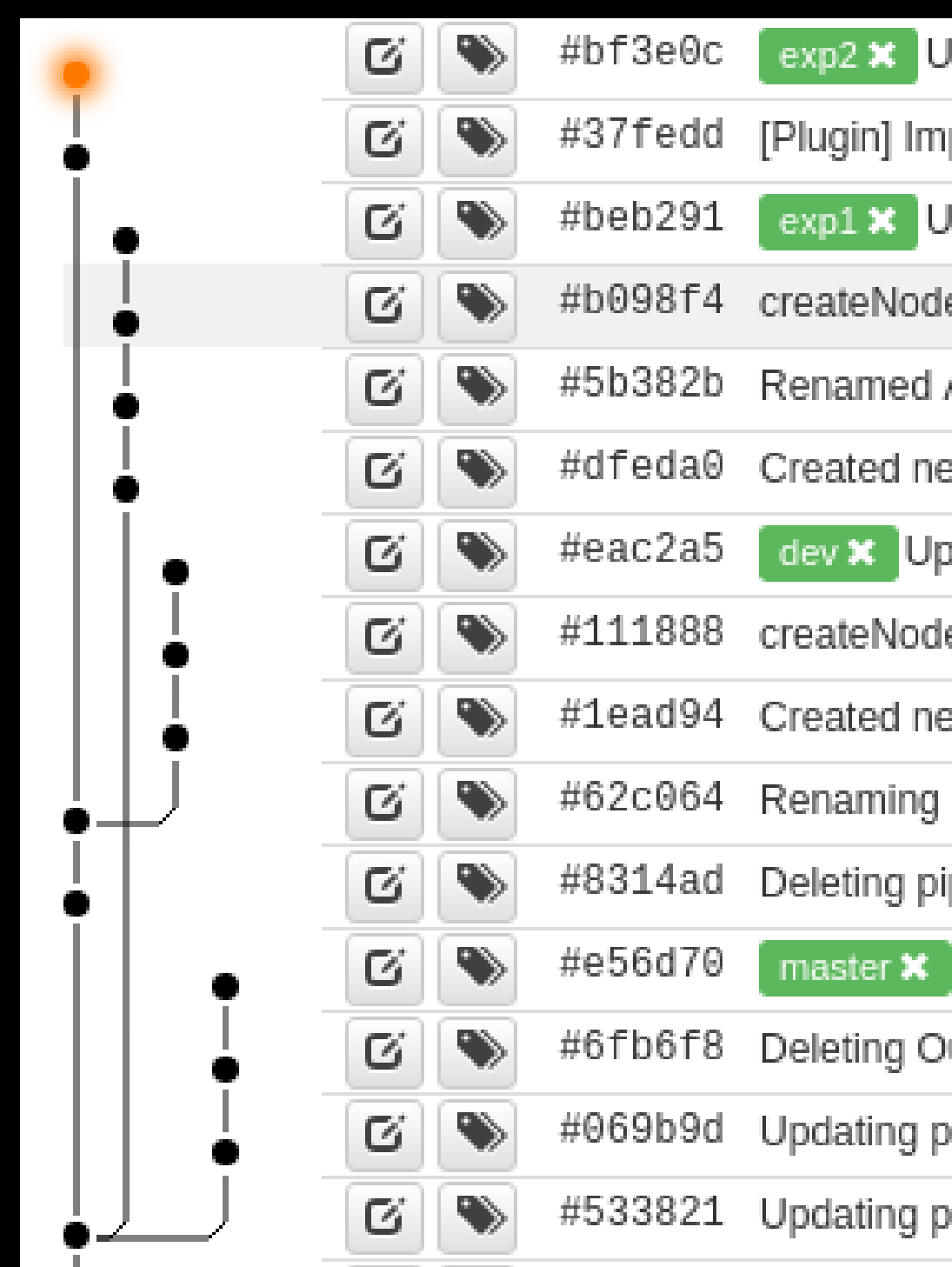
**TensorFlow** – open source machine learning framework

**Model-Integrated Computing** – domain specific languages

**WebGME** – online collaborative modeling tool



Editing a neural network architecture using the visual editor



Integrated version control makes any historical state reproducible and facilitates collaboration

### CORE CONCEPTS

**Operation** - an atomic function, accepts inputs and produces outputs

- Accepts named inputs and produces named outputs
- *Attributes* are operation parameters set at design time
- *References* are pointers to another artifact in the DSM

**Job** - A running **Operation**

Contains information about the execution of an operation

Includes metadata such as plots and images

**Pipeline** - Directed Acyclic Graph (DAG) of **Operations**

Represent a machine learning experiment

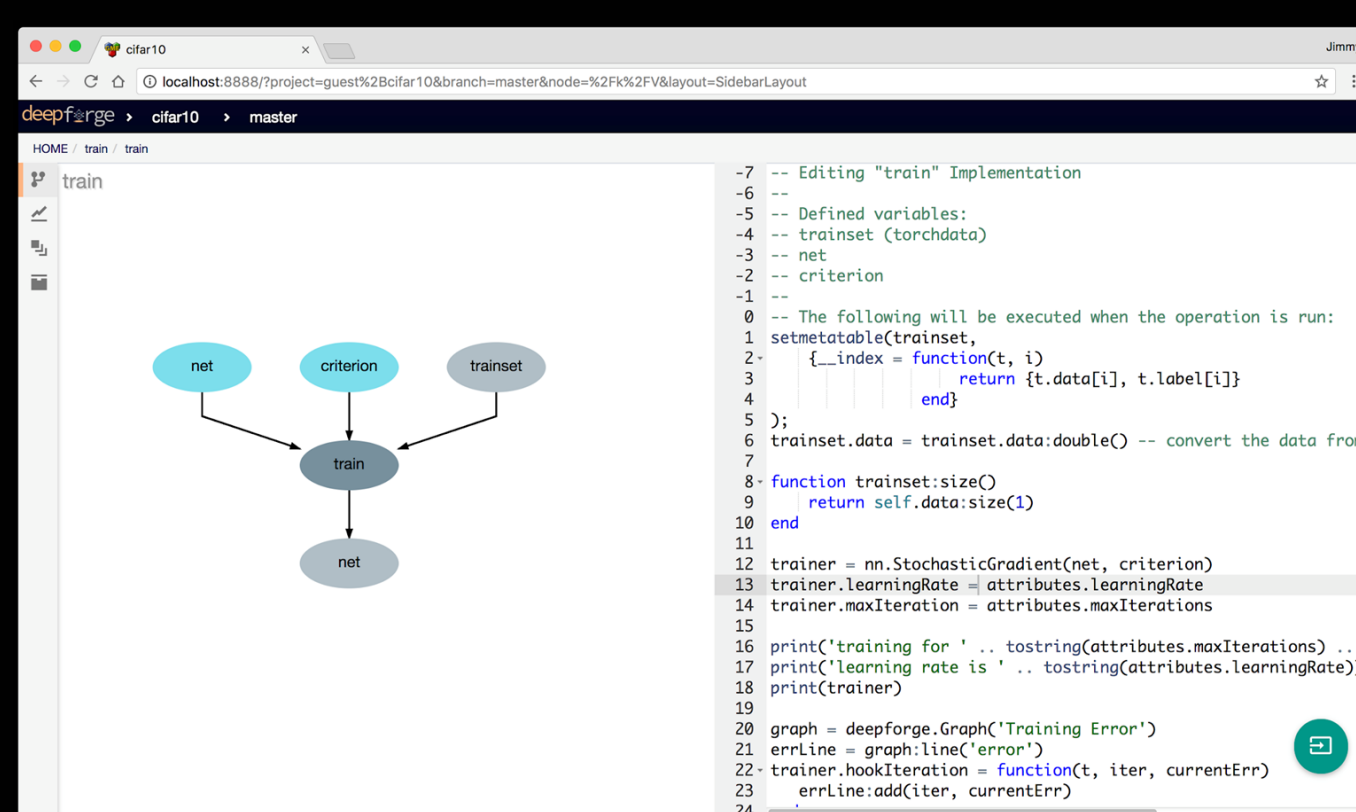
May include “Input” and “Output” operations

**Execution** - A running **Pipeline**

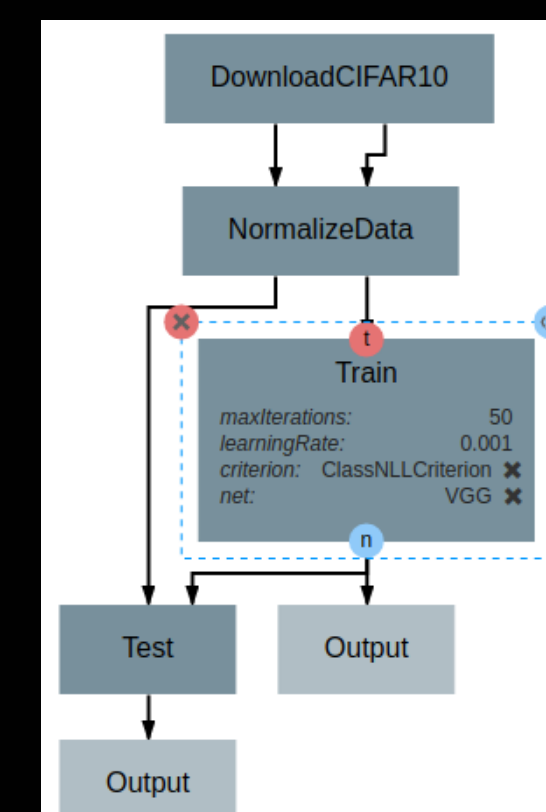
Created when running a pipeline

Maps every operation in the origin pipeline to a job

Additional concepts provided for working with neural networks: **Architectures and Layers**

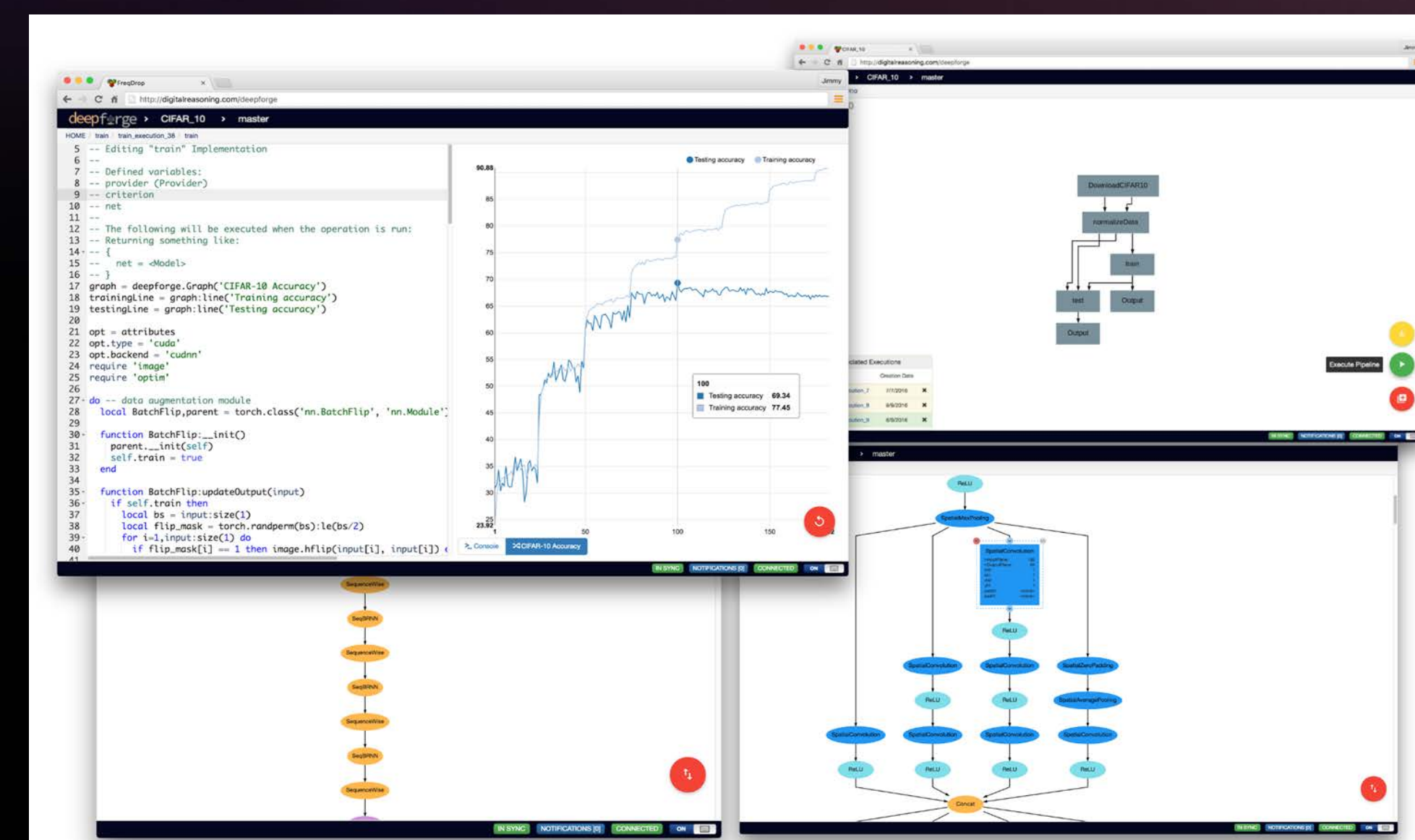


Editing a training operation with *net* and *criterion* references and a data input, *trainset*



Editing a training and testing pipeline on CIFAR 10.

### ONGOING RESEARCH



Improved neural network architecture support

- Sequence-to-sequence prediction
- Auxiliary classifier generative adversarial networks
- Bidirectional recurrent neural networks

Architecture analysis and feedback

- Error detection
- Dimensionality information

Extensible computational resource integration

- Extending the existing architecture to support modular computational resource integration

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