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Recitation 0 - Datasets

Introduction to Deep Learning- 11-485/685/785

Mugur Preda, Mengchun Zhang, Bhiksha Raj

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Why do we need Datasets and Dataloaders ?

- **Modularization**

  Dataset abstracts **what the data is** and how to access a single sample.

  DataLoader abstracts **how to iterate** over data efficiently. ***How*** the data is fed into the model (batching, shuffling, etc).

- **Efficiency**

  Load data **lazily per batch**, not all at once.

  Enable **multi-process loading** via num_workers.

- **Training Support**

  Handles **batching**, **shuffling**, and **epoch iteration**.

  Essential for **mini-batch gradient descent**.

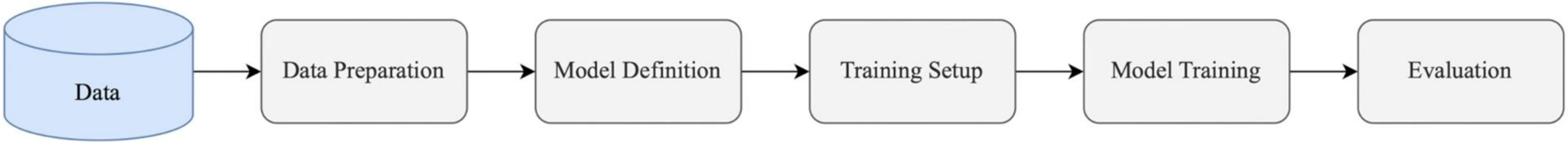
- **Customization**

  Integrates **transformations and preprocessing** (e.g., normalization, augmentation).

  Supports custom datasets (images, text, EEG, etc).

Why do we need Datasets and Dataloaders ?

- DL Training Pipeline



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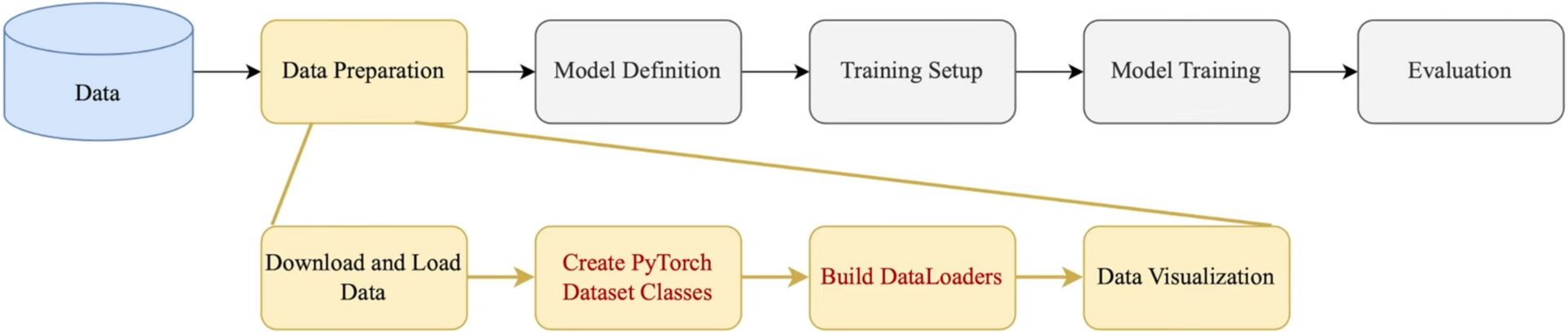

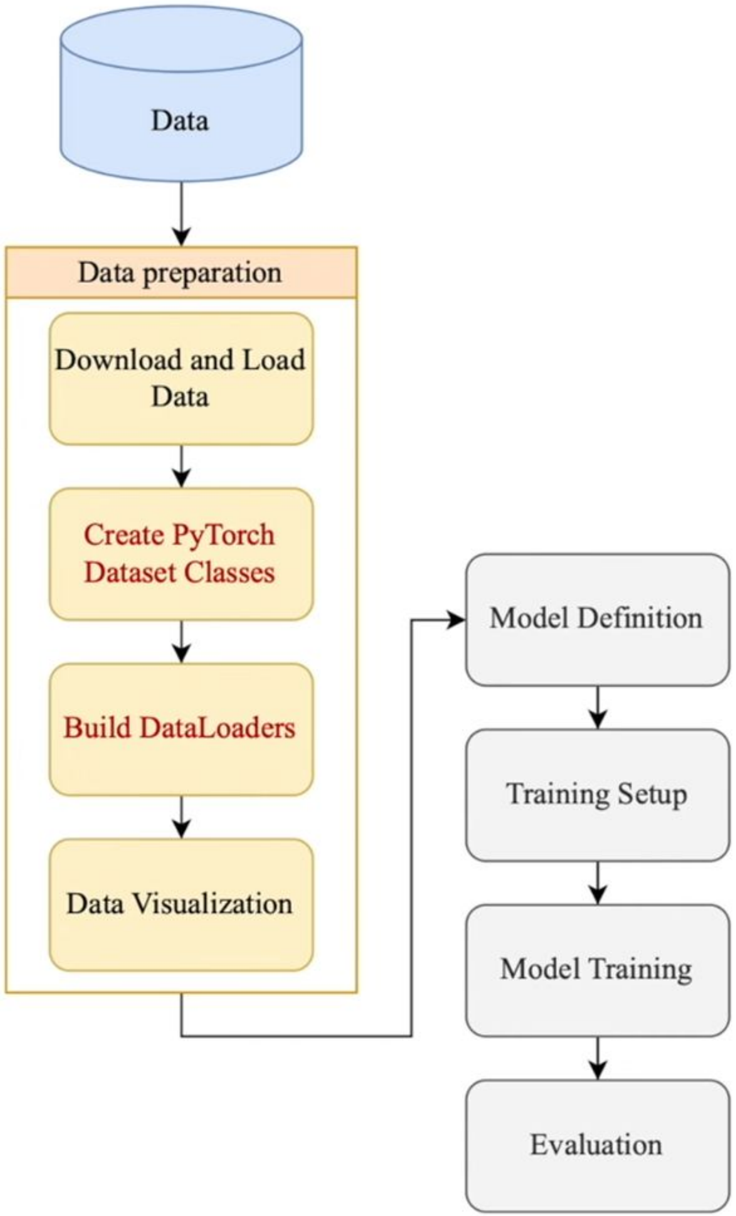

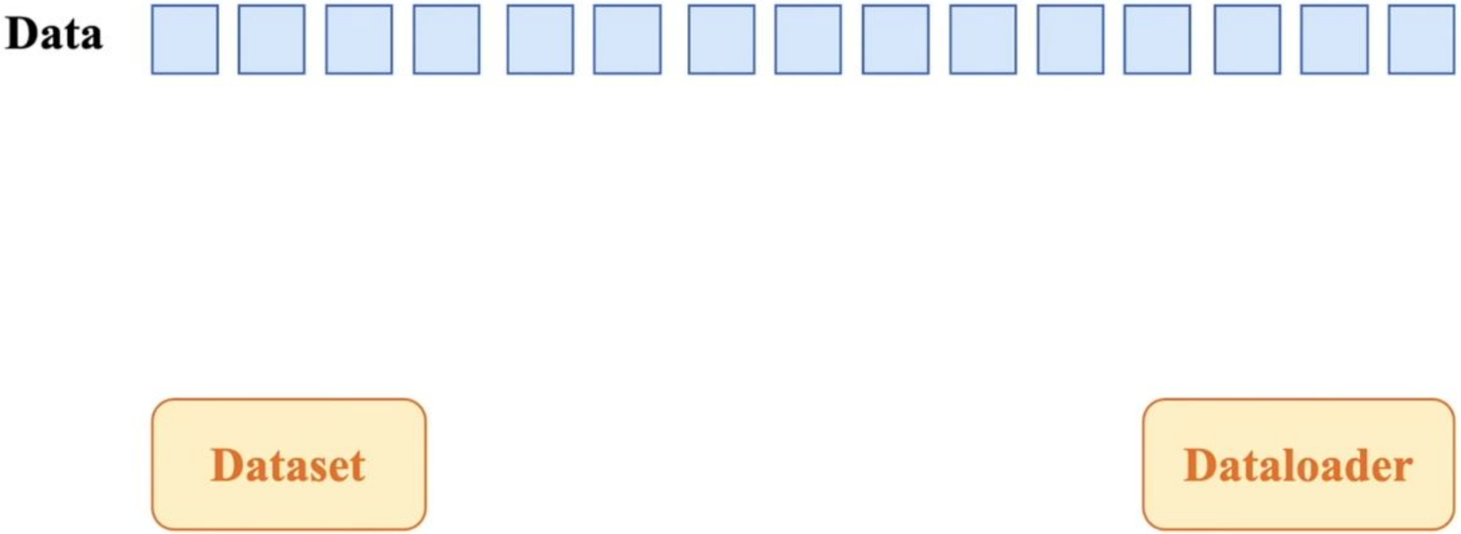

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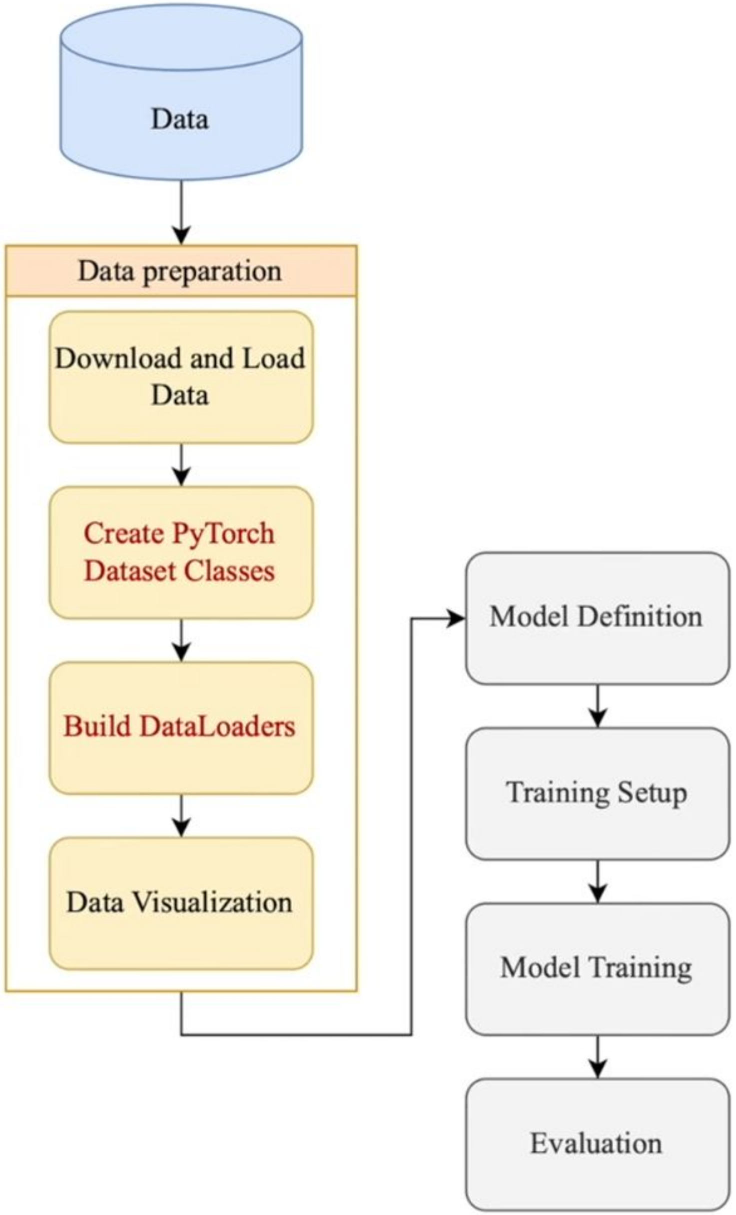


Data

Data preparation

Download and Load Data

Create PyTorch Dataset Classes

Build DataLoaders

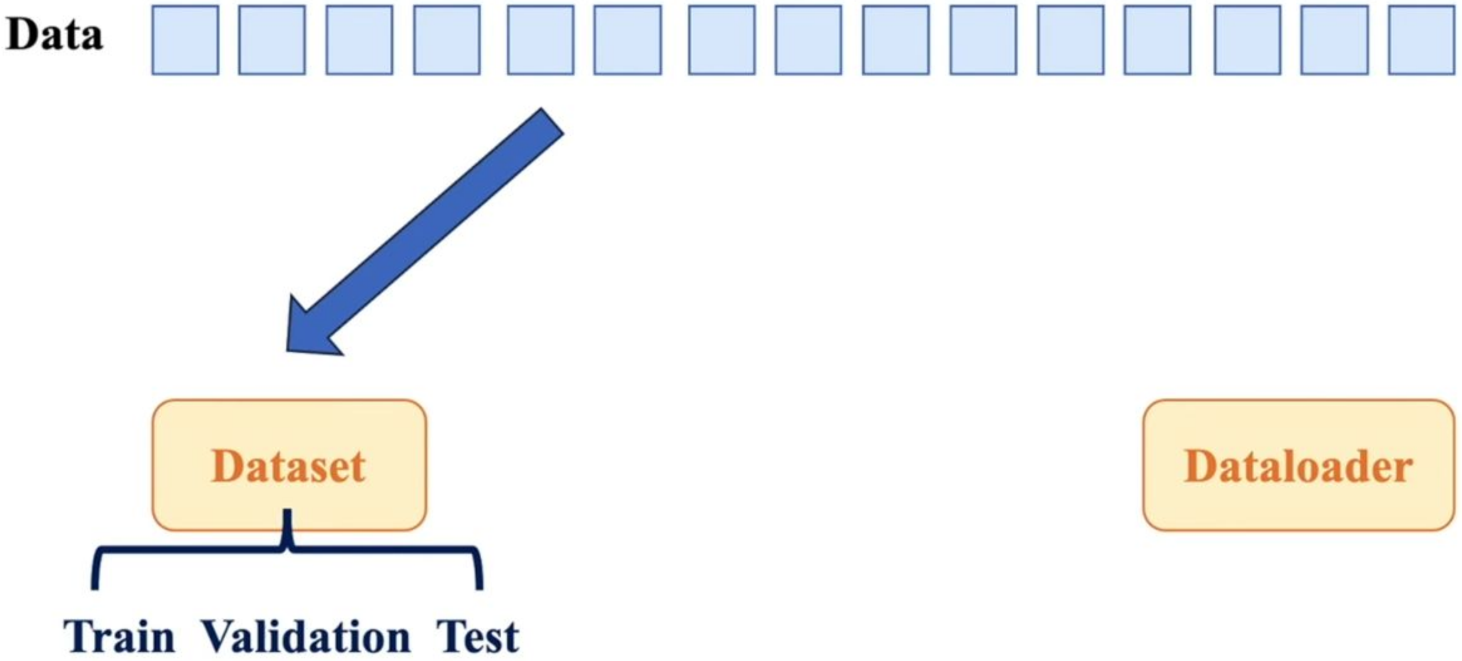
Data Visualization

Model Definition

Training Setup

Model Training

Evaluation



Data

Dataset

Train Validation Test

Dataloader

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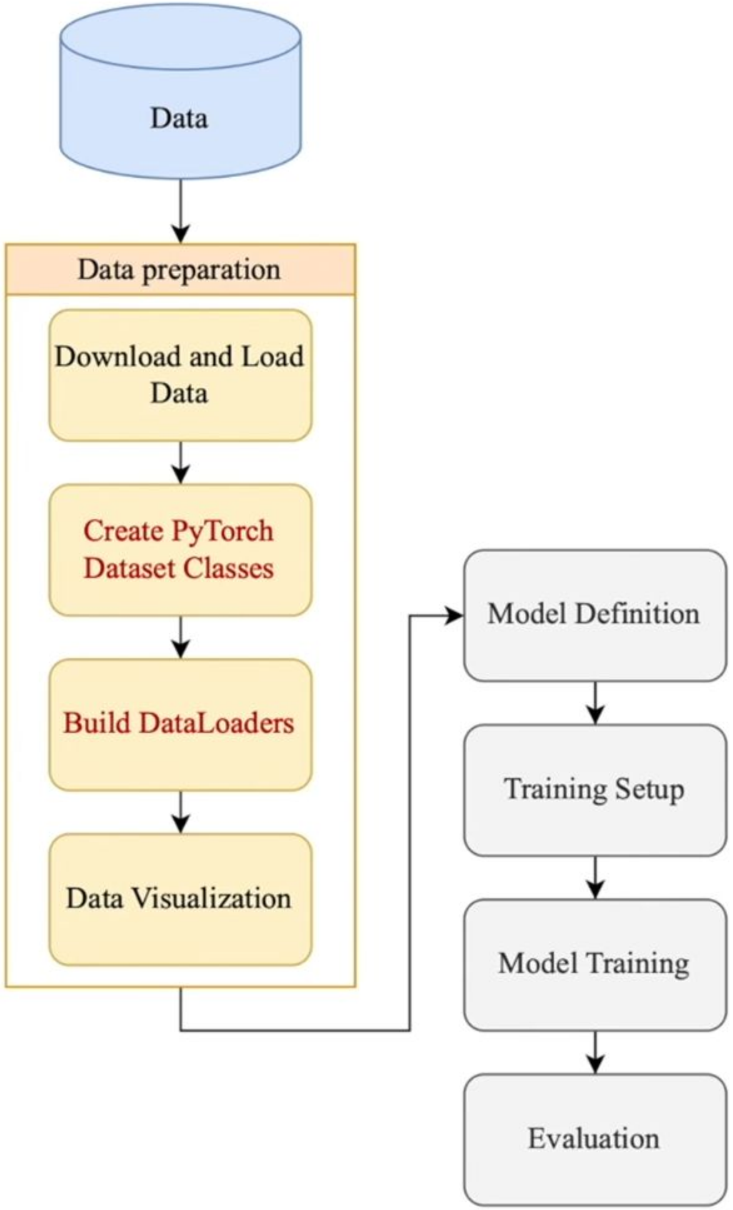

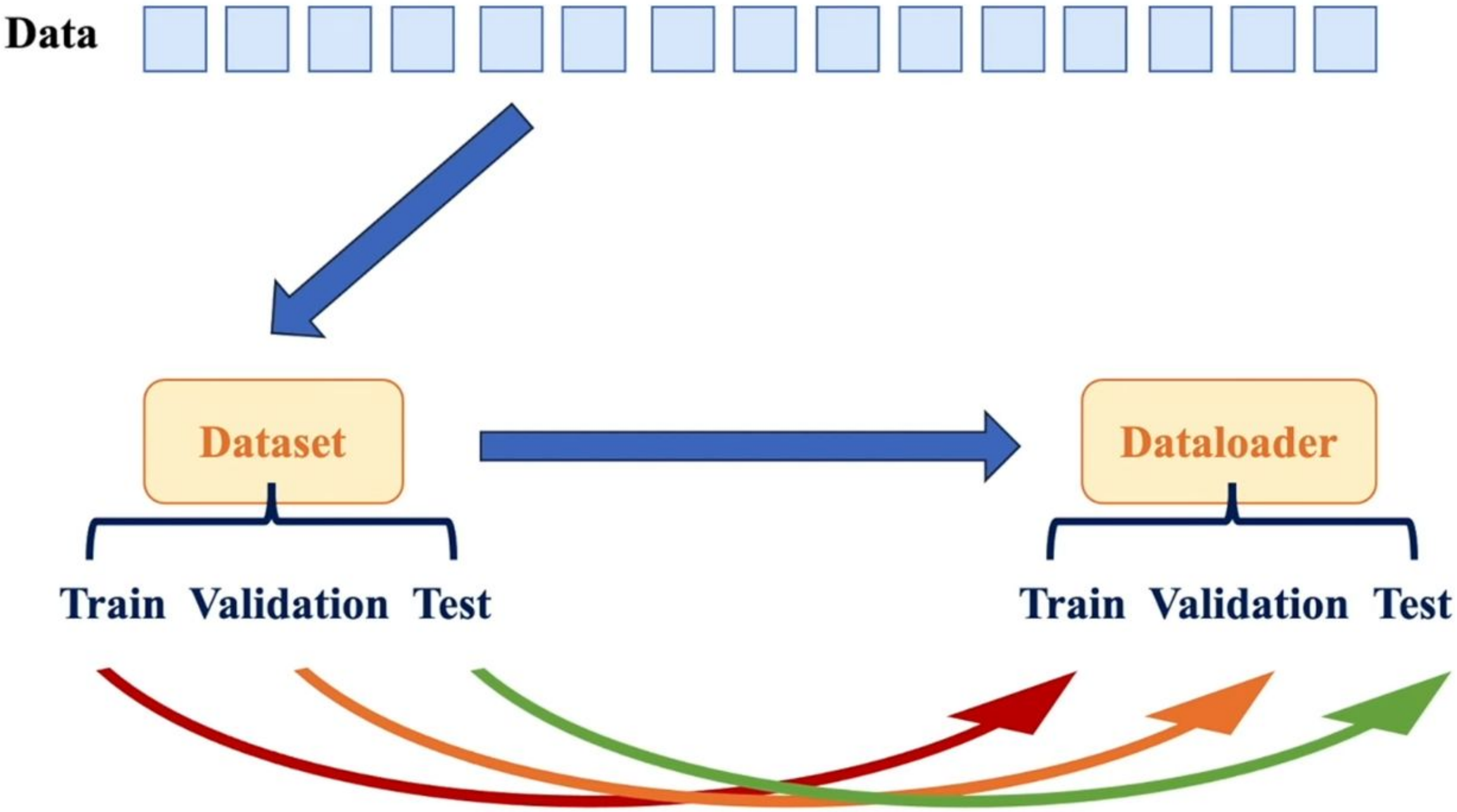

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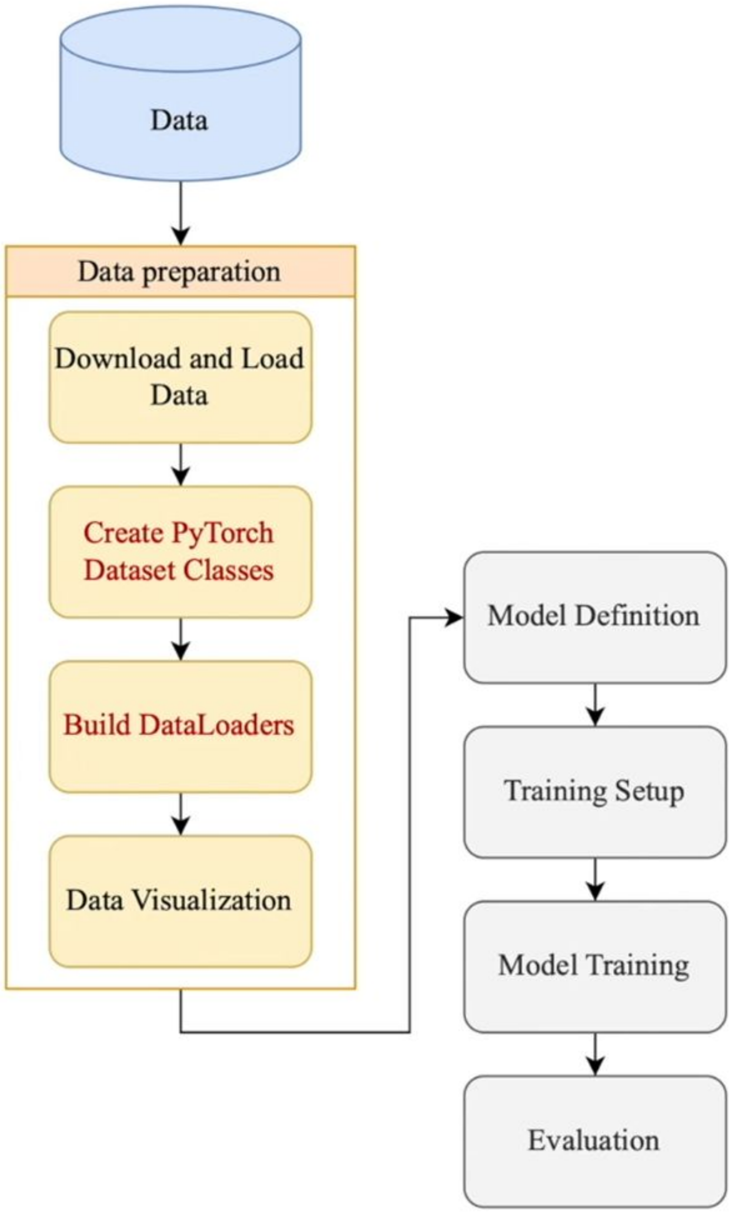

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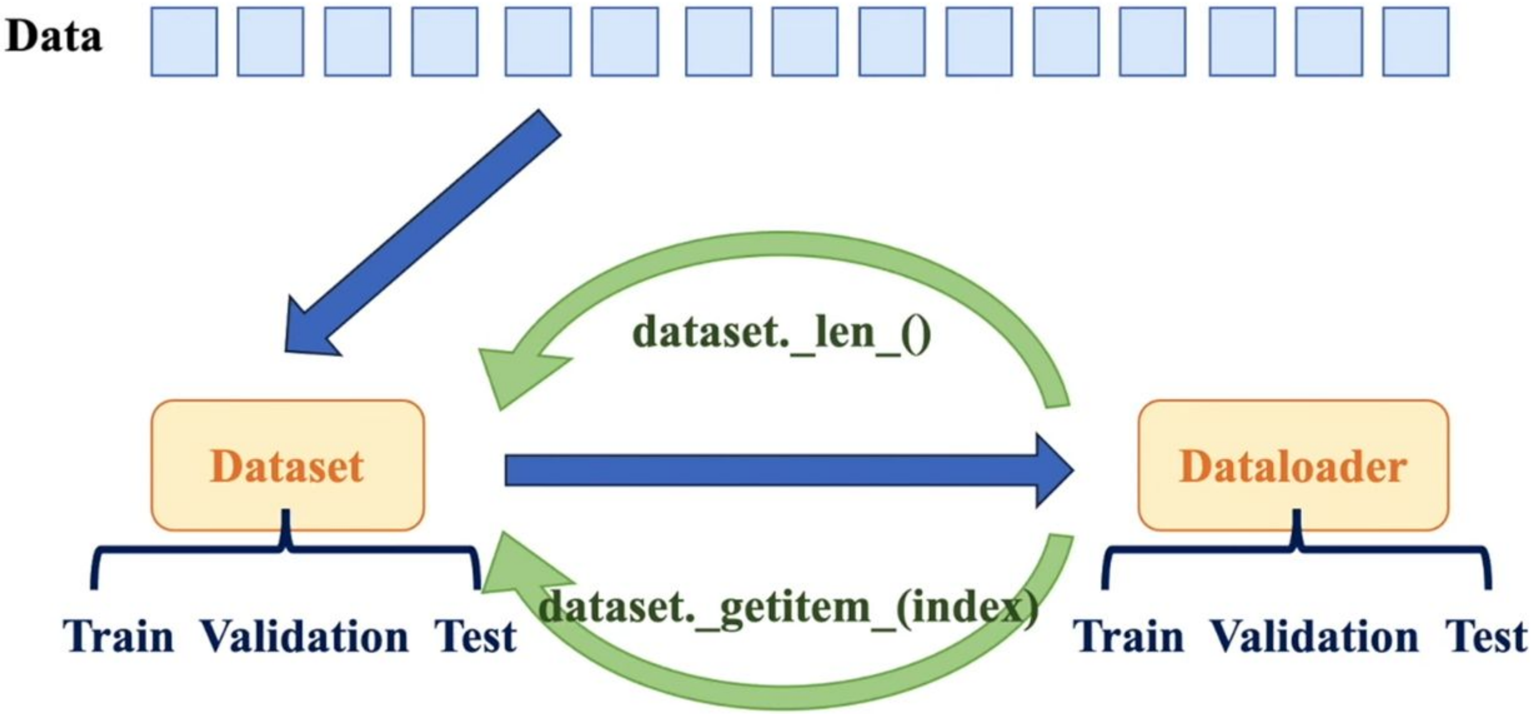

Data

dataset._len_()

Dataset

Dataloader

dataset._getitem_(index)

Train Validation Test

Train Validation Test

Access to the data itself

How to load the data (batching, shuffling, multiprocessing, etc)

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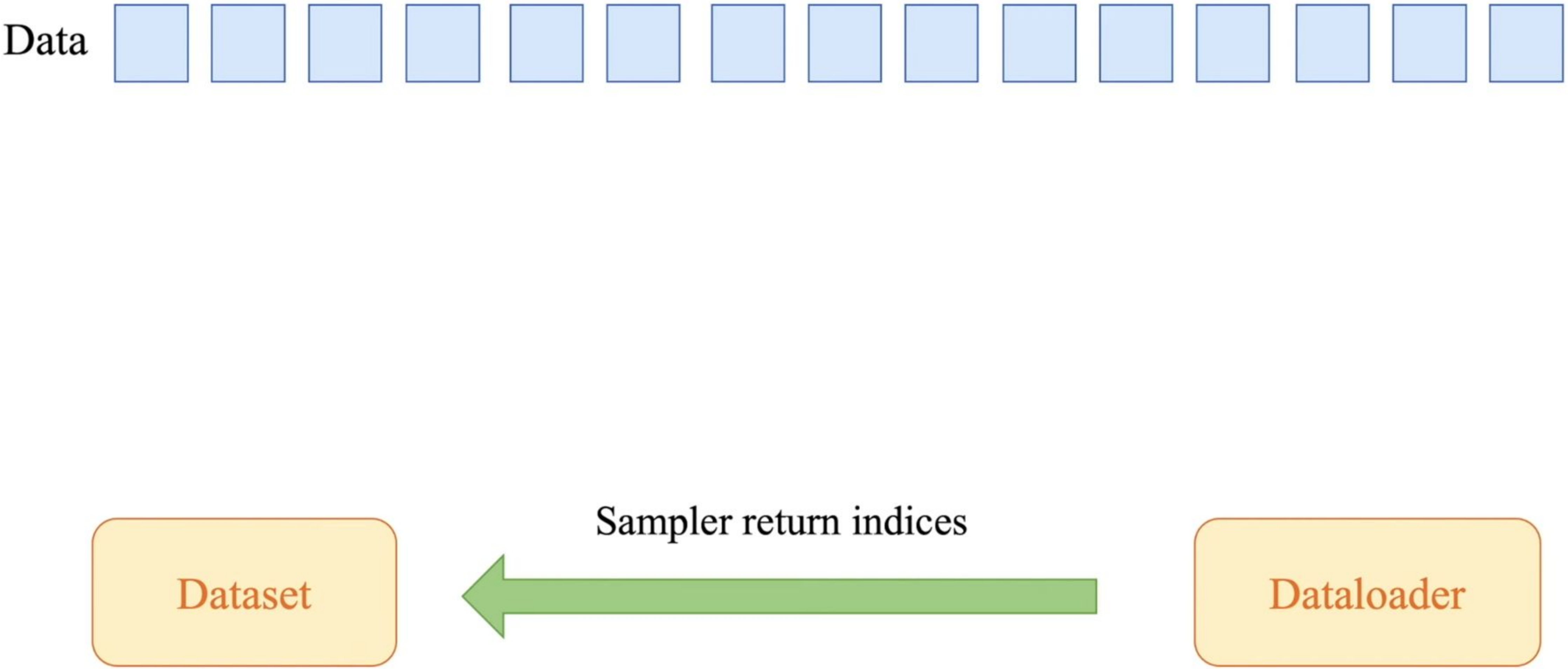

Data

Sampler return indices

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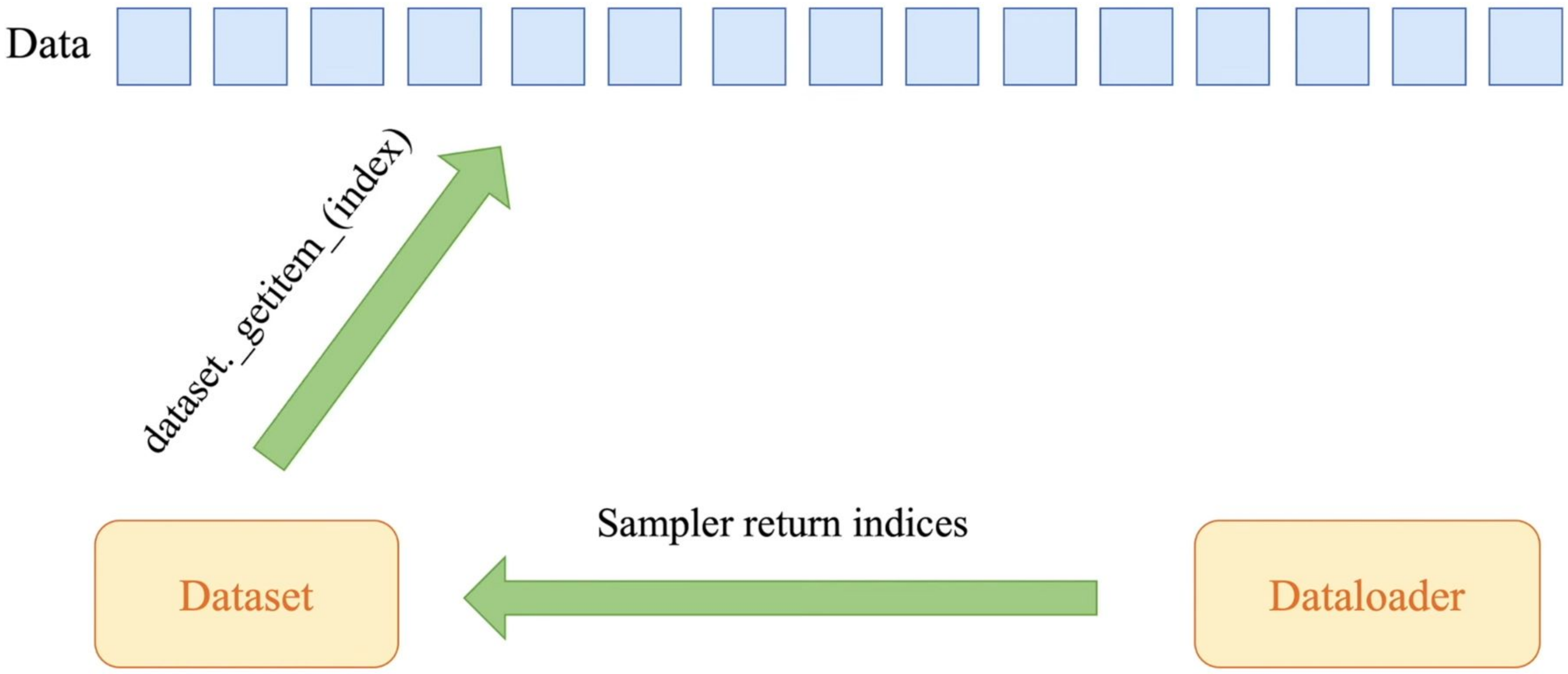

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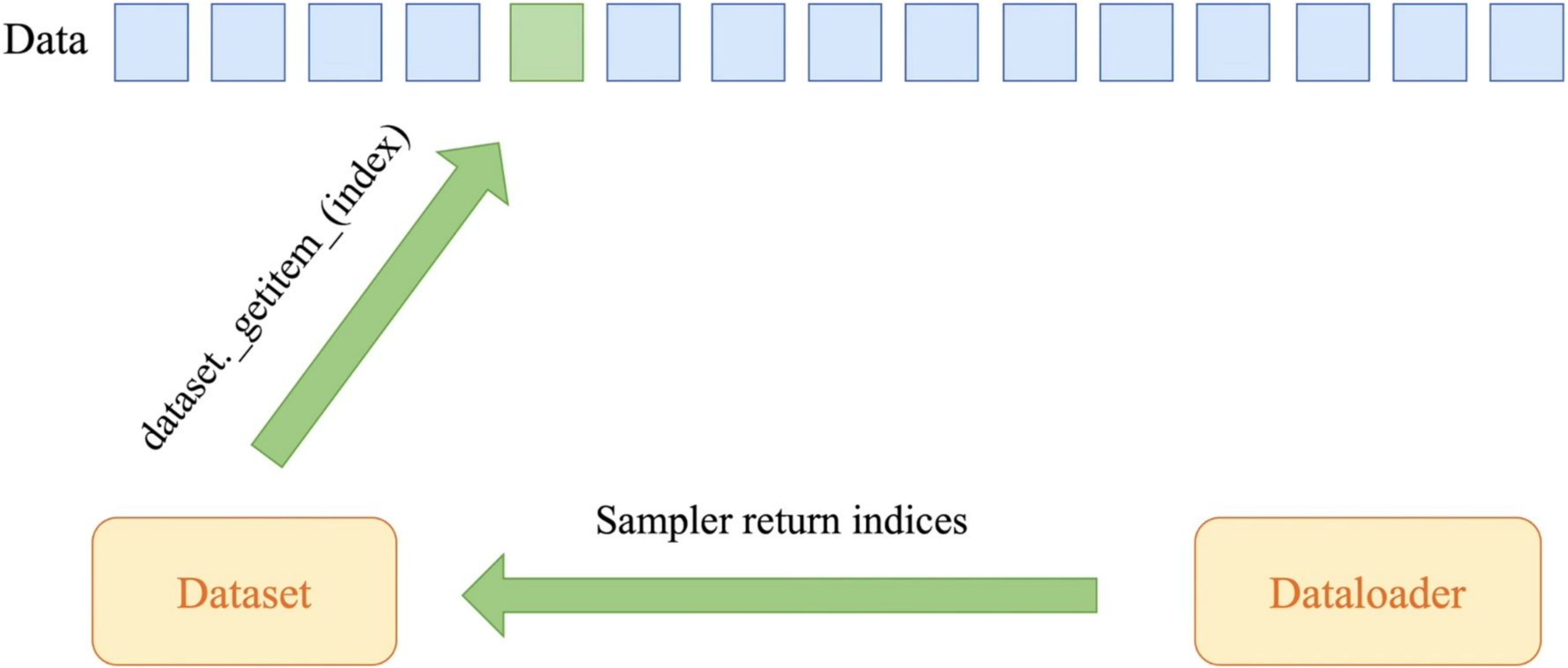

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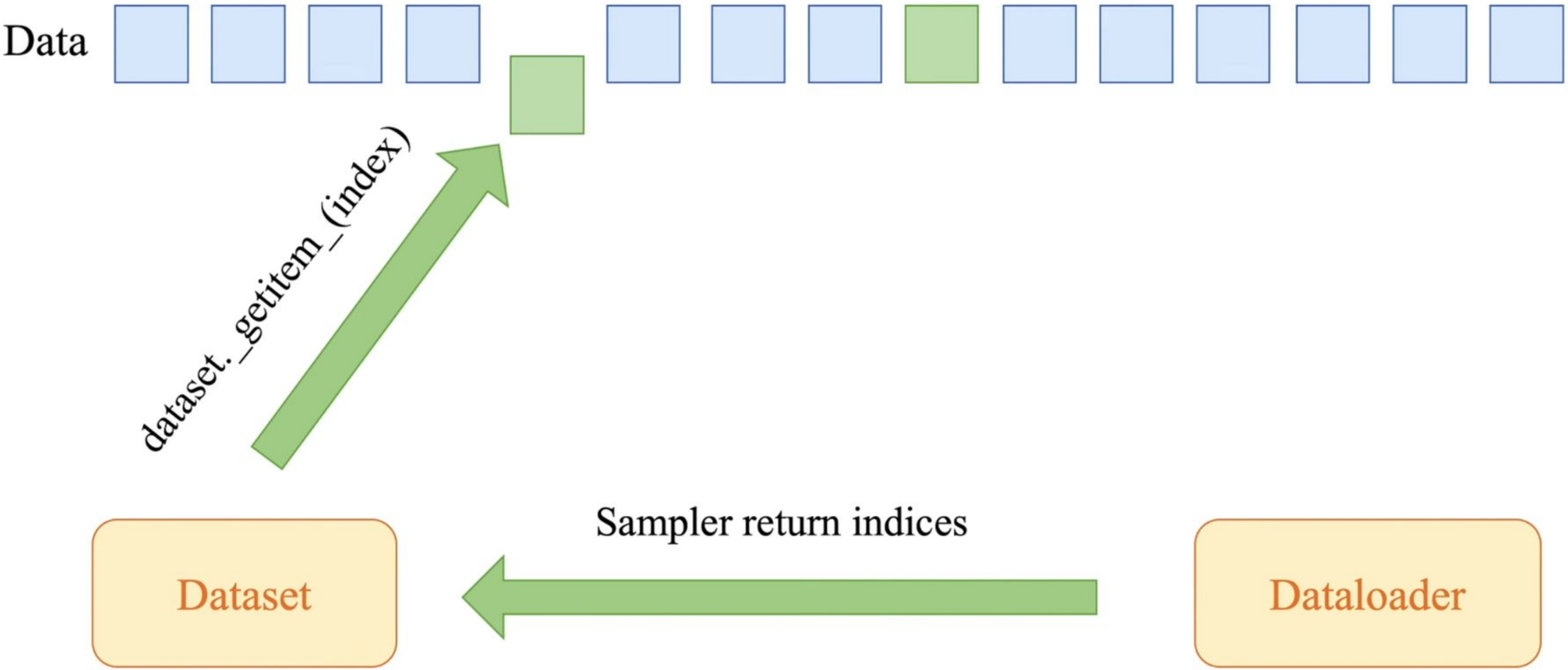

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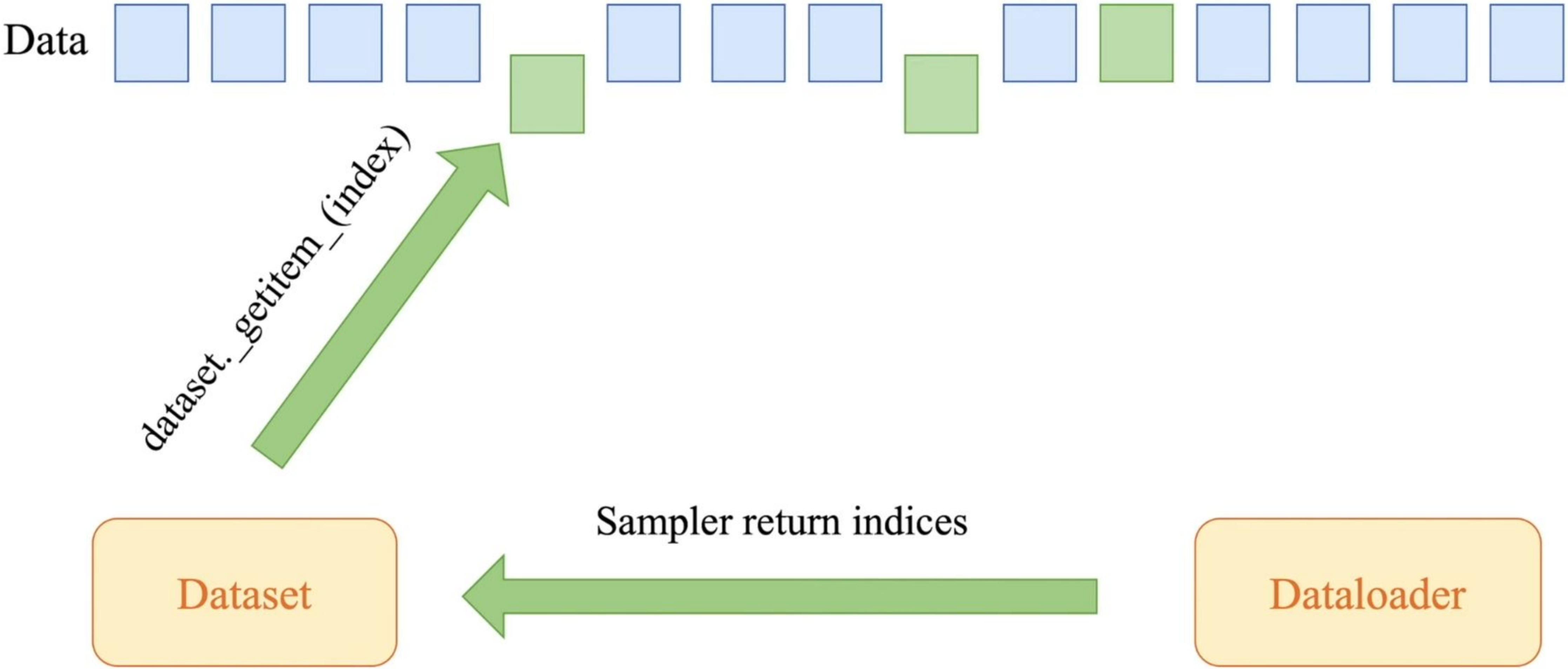

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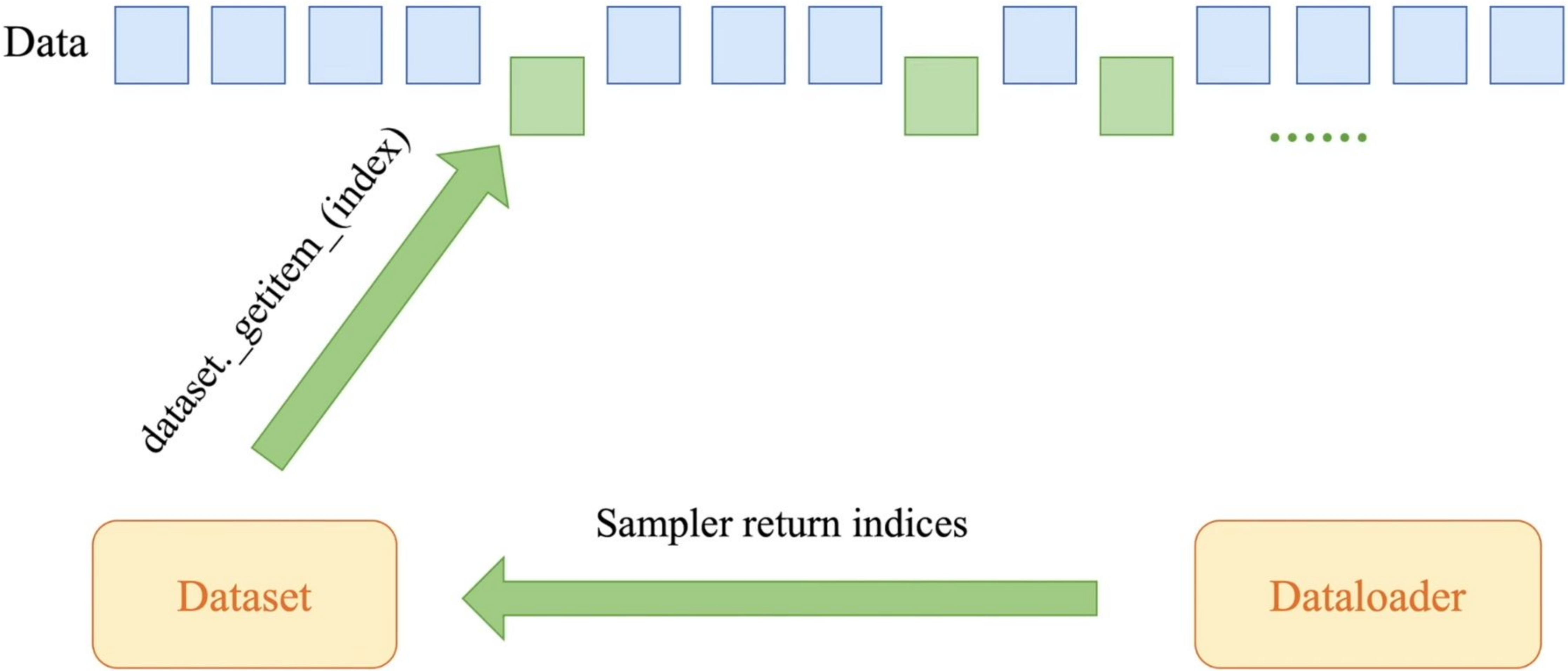

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Sampler return indices

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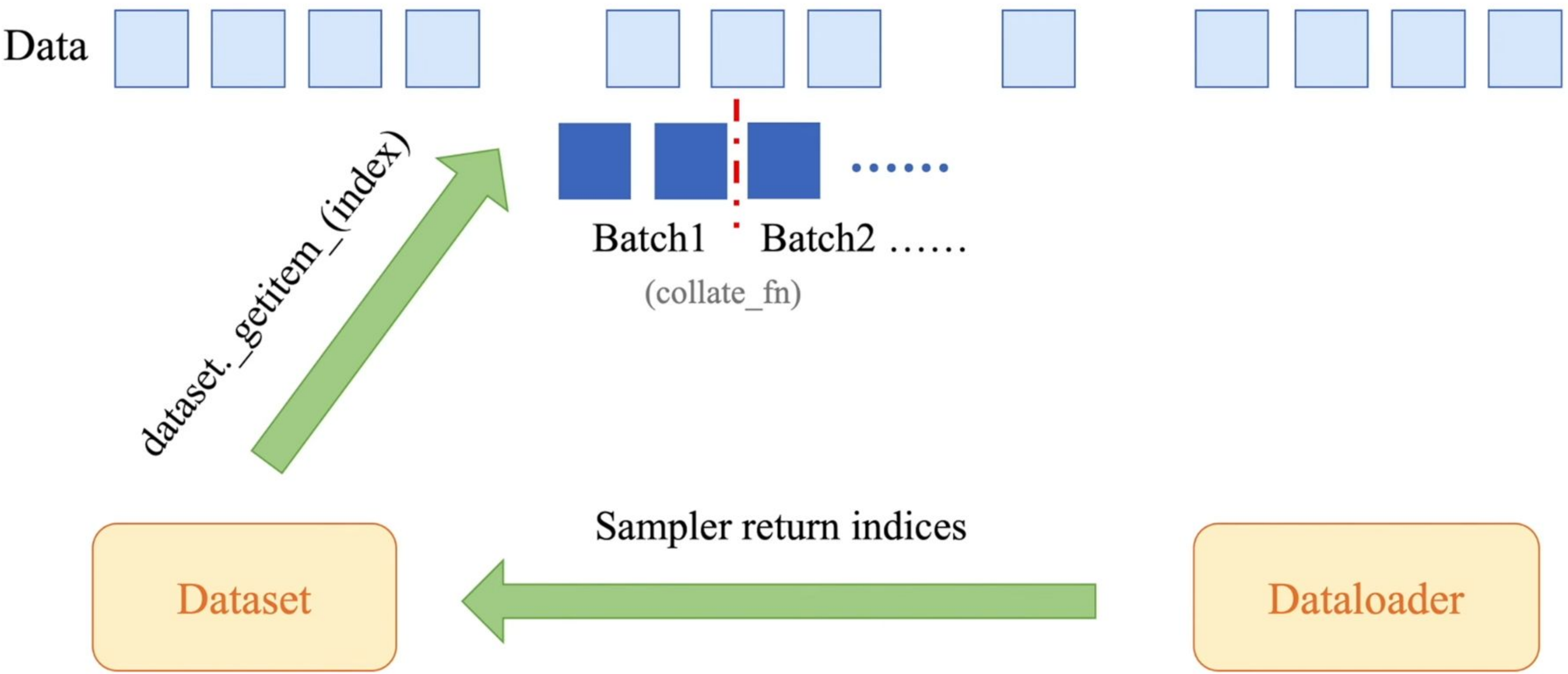

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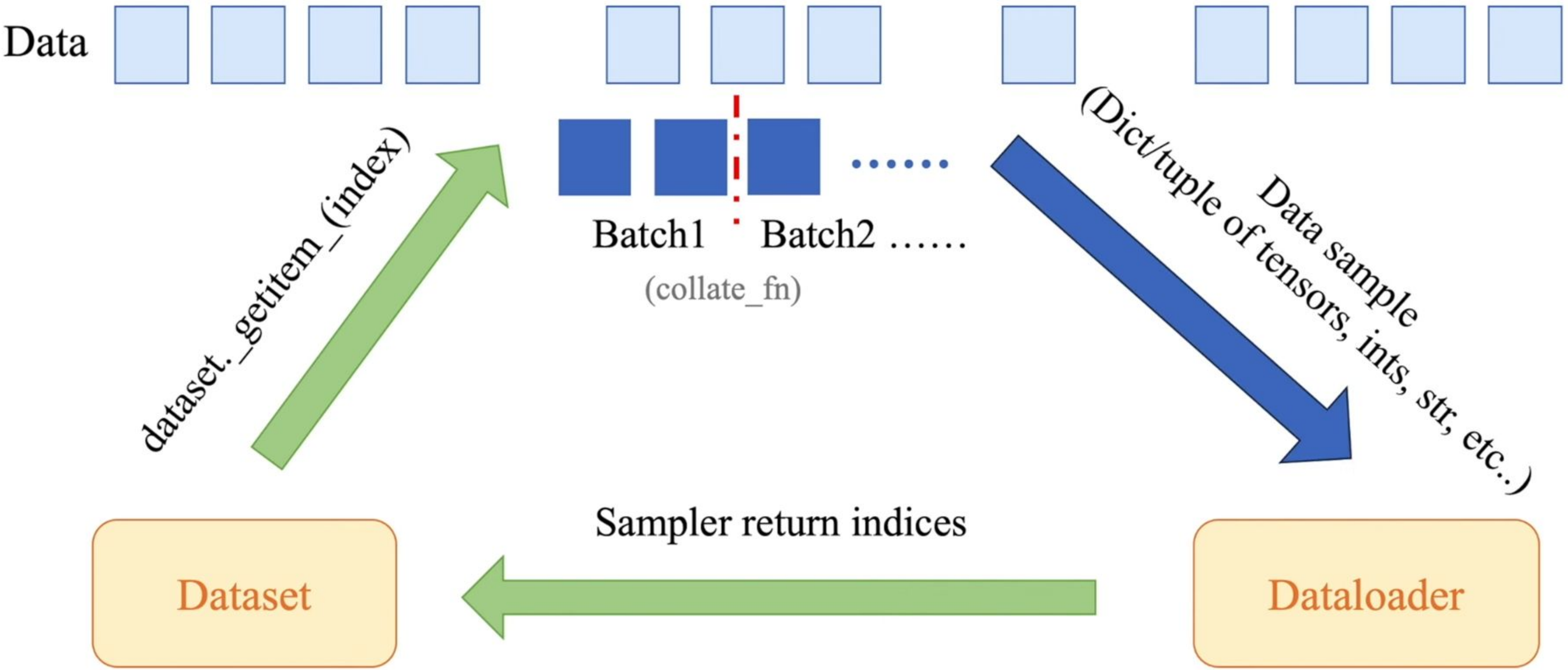

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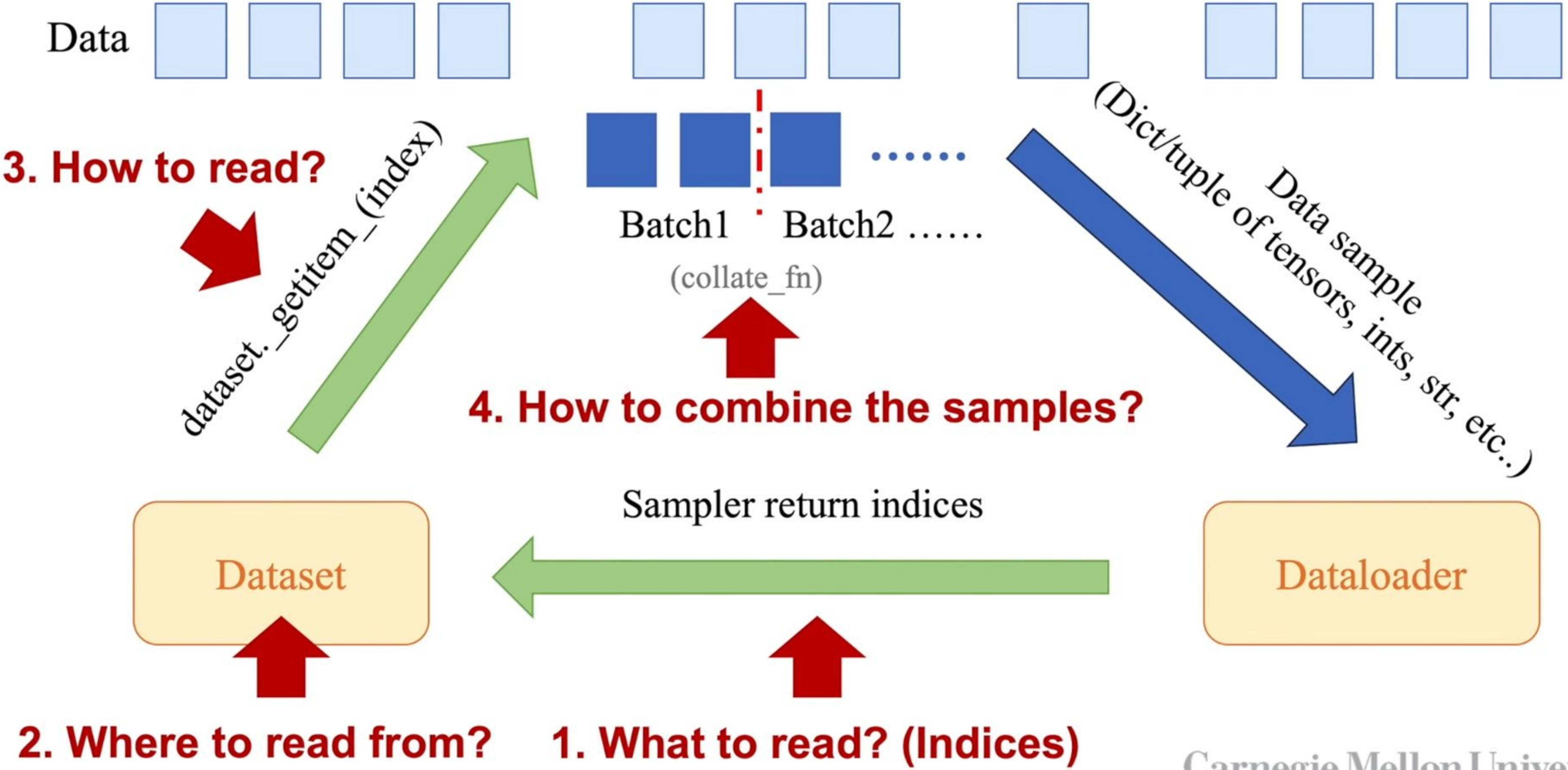

Data

3. How to read?

dataset._getitem_(index)

Batch1

Batch2 ……

……

(collate_fn)

4. How to combine the samples?

Data sample

(Dict/tuple of tensors, ints, str, etc..)

Sampler return indices

Dataset

Dataloader

2. Where to read from?

1. What to read? (Indices)

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Thank you!

Mugur Preda - mpreda