Introduction to Deep Learning

Course Instructor: Dr. M. Umair
Topic: Datasets for Deep Learning Models

Agenda

1. Introduction
2. Dataset Development Recommendations

Introduction

Introduction

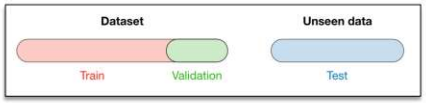
What is a Dataset

- Dataset is a *collection* of *single* or *various types of data* stored in a *digital* form.
- Datasets primarily consist of *images*, *text*, *audio*, *videos*, and *numerical data points*, etc.
- Finding a *quality dataset* is a fundamental requirement to build a real-world AI application.

Introduction

Importance of a Datasets

- Carefully *curated* and *annotated datasets* are the foundation of machine learning.
- Deep learning requires *large-scale datasets* to reach the desired *accuracy* and *generalization* performance.
- Once the model has been chosen, it is *trained* on the *entire dataset* and *tested* on the *unseen test set*.



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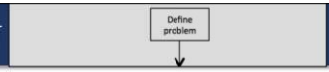

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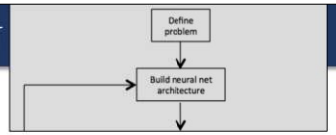

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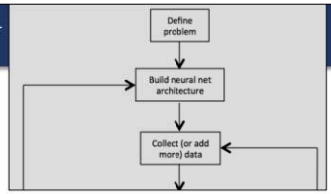

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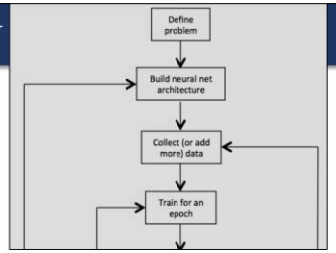

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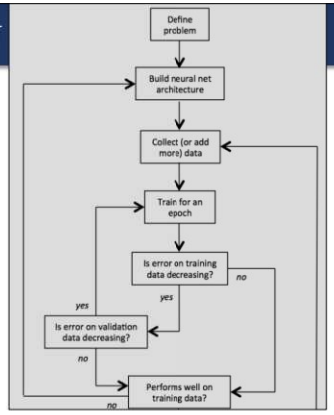

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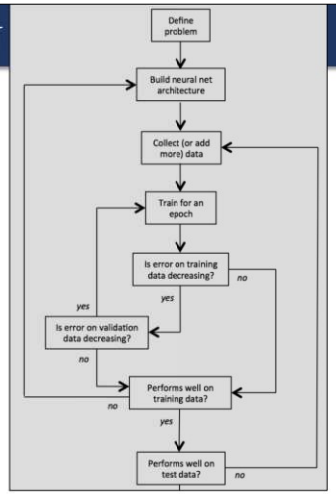
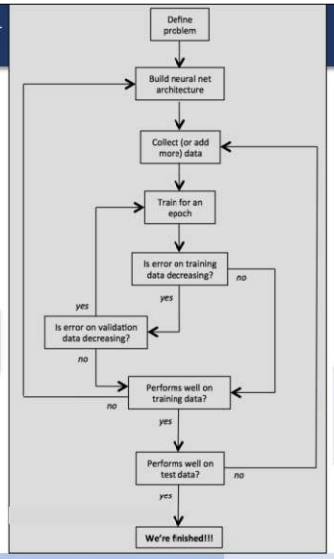


Introduction

Hyperparameters tuning (learning rate, dropout rate)

The *validation* set will tell us how the model does on data it has yet to see.



Adjust internal parameters, for example weights and bias

If the *accuracy* on the *training set* continues to *increase* while the accuracy on the validation set stays the *same (or decreases)*, it's a good sign that it's time to stop training because we're *over-fitting*.

Introduction

Should I Develop a Dataset?

- For a *highly specific problem* statement, you have to *create a dataset* for a domain, *clean* it, *visualize* it, and understand the *relevance* to get the result.
- However, if the *problem* statement is *common*, one can use a few *dataset search engines*.

Introduction

Dataset Search Engines

- UC Irvine Machine Learning Repository
- Hugging Face
- Dataset Search – Google
- Kaggle

Dataset Development Recommendations

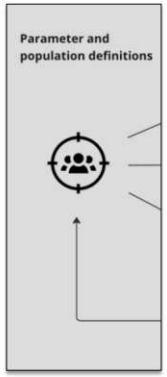
Dataset Development Recommendations

Introduction

- The *creation of datasets* is a *crucial* aspect of machine learning research.
- **FACT:** No dataset is a neutral, complete, or apolitical representation.
- Practitioners must make a *series of decisions* throughout the dataset *creation process*.

Dataset Development Recommendations

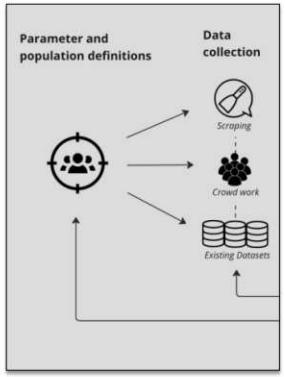
Dataset Creation Process



- This phase involves *identifying* the *specific variables of interest* within the broader group from which data will be collected.
- This phase is *crucial* for *defining the phenomena the dataset intends to capture*, what is within *scope*, and what might be considered *inappropriate*, *invalid*, or *irrelevant* data.

Dataset Development Recommendations

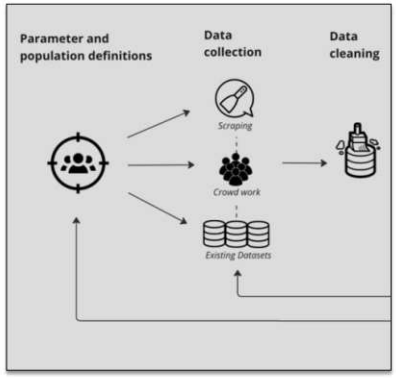
Dataset Creation Process



- *Data* is gathered from *various sources* according to the defined parameters and population.
- This can involve *different methodologies* such as *scraping* content from the web, employing various types of *sensors*, or utilizing and repurposing *existing datasets*.
- *Methods* used are often *shaped* by the *intended objectives* of the dataset, as well as *operational constraints*, such as institutional *requirements* or resource *limitations*.

Dataset Development Recommendations

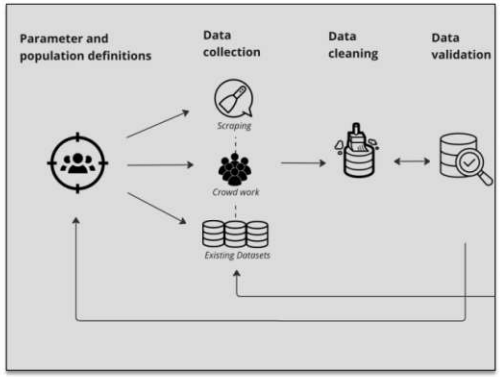
Dataset Creation Process



- Once data is collected, it often contains *errors*, *duplicates*, or *missing values* that need to be addressed.
- Data cleaning involves processing the data to correct inaccuracies, remove irrelevant information, and handle missing data.

Dataset Development Recommendations

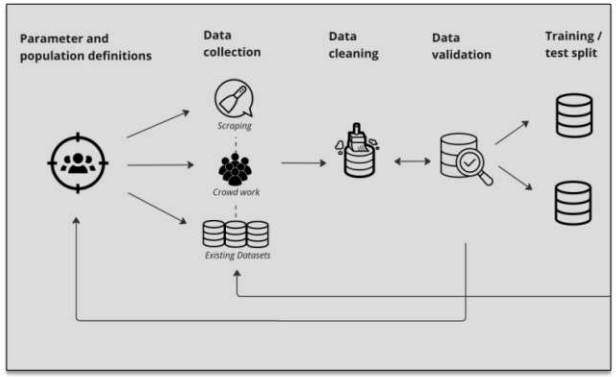
Dataset Creation Process



- This phase *checks* the dataset for *accuracy* and *consistency* with real-world phenomena.
- Data validation ensures that the dataset *meets the necessary standards and assumptions* for its intended use.

Dataset Development Recommendations

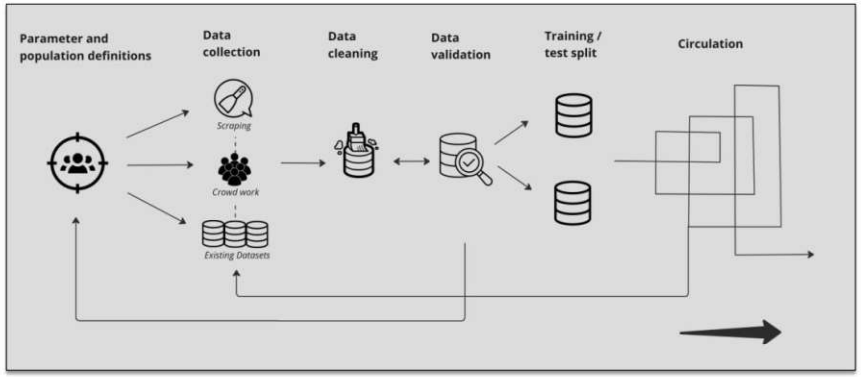
Dataset Creation Process



- The dataset is divided into *training* and *test* sets.
- The *training set* is used to build and *train the model*, while the *test set* is used to *evaluate* its performance and generalizability to unseen data.

Dataset Development Recommendations

Dataset Creation Process



References

References

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