
Weights & Biases

DISP group meeting 2023/12/05

謝昌諭

Outline

- What is Weights & Biases (wandb)?
- How to use it?
- Demo
- Reference

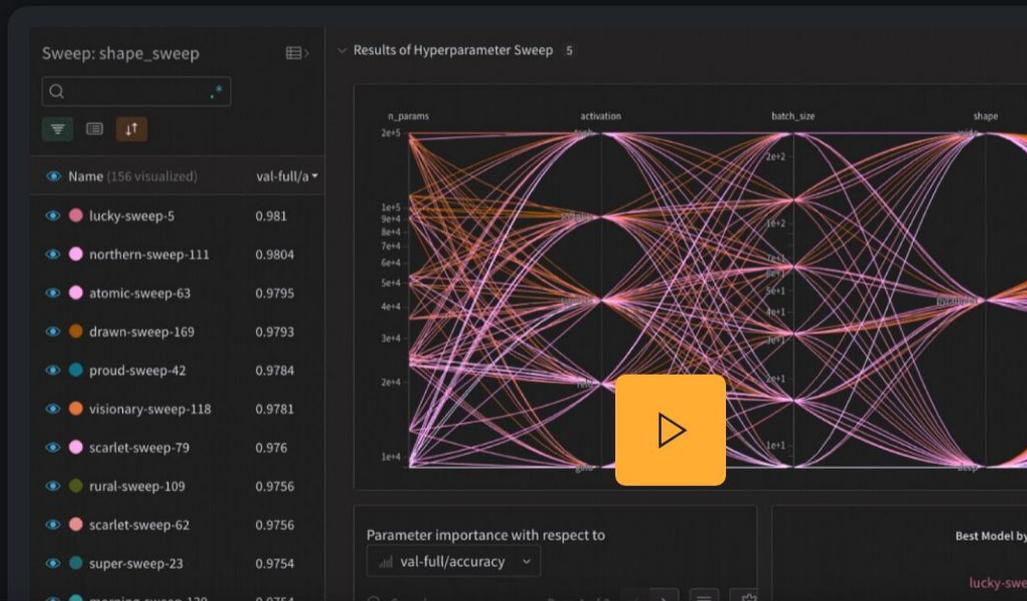
Outline

- What is Weights & Biases (wandb)?
 - Introduction
 - Basic functions
 - Advantage
- How to use it?
- Demo
- Reference

Wandb - Introduction

The AI Developer Platform

Weights & Biases helps AI developers build better models faster. Quickly track experiments, version and iterate on datasets, evaluate model performance, reproduce models, and manage your ML workflows end-to-end.



Wandb - Basic functions

- Automatic record and save
 - Loss, metrics value
 - Intermediate generated medias (images, audio, etc.)
 - System info (CPU, GPU, memory usage etc.)
 - Environment info (ubuntu, python, library version)
 - Logs
 - Gradients, parameters of each layers
 - Others
- Present (Visualize) above info on limited accessible platform.
- Provide cross-runs comparison.

Wandb - Advantage

- Easy to plug → I used less than 10 mins to convert a normal logging code to wandb logging version.
- Significantly increase productivity
 - Debugging is easier.
 - Monitoring training everywhere and everytime.

Outline

- What is Weights & Biases (wandb)?
- How to use it?
 - Preparation
 - Python Library
 - Dashboard
- Demo
- Reference

Preparation

Follow below steps to complete installation of wandb client

- Sign up a W&B account on [here](#).
- Download client library on your machine
 - `$ pip install wandb`
- Check if you install library correctly.
 - `$ wandb`
- Connect your machine with your account
 - `$ wandb login`
- Input personal **API keys** from User Settings page

Python Library - Functions

- **wandb.init():**
Initializing a new run
- **wandb.watch():**
Monitoring torch model
- **wandb.log():**
Pushing data to server
- **wandb.finish():**
Close current run

```
import wandb

run = wandb.init(
    project=PROJECT_NAME,
    config=vars(ARGVARS_OBJECT),
    name=RUN_NAME,
    save_code=True,
)

run.watch(TORCH_MODEL)
for epoch in range(EPOCH_NUM):
    TORCH_MODEL.train()
    for BS in DATALOADER:
        # training
        # computing loss function
        # back propagation
        pass
    wandb.log({
        'loss': LOSS,
        # Other ...s
    })

wandb.finish()
```

wandb.init()

- **Parameters**

- **project** — {string} Project that this run belong to. Project will be initialized if got a new project name.
- **config** — {dict} Training config.
- **name** — {string} Name of run. I prefer use combination of short config and date as run name. (Ex: GPT AdamW 1e-4 re 2023-11-27-01-15)
- **save_code** — {bool} Push code of run or not?
- **notes** — Some description of run.
- Others (See [here](#) for more details)

- **Return**

- run object (not very important during implementation).

wandb.watch()

- **Parameters**

- **models** — {torch.nn.module, tuple} The model to hook.
- **log** — {string} "gradients", "parameters" or "all".
- **log_freq** — {int} log info every N batches
- **criterion** — {torch.nn.functional} Optional loss value being optimized
- **idx** — {int} indexing models watched
- **log_graph** — {bool} log graph topology
- See more details on [here](#)

wandb.log()

- **Parameters**

- **data** — {dict} Dictionary of pushed data
- **commit** — {bool} Append (true) or overwrite (false)
- **step** — {int} The global step in processing.
- See more details on [here](#).

wandb.log() - image data

- Use wandb.Image() to pack either ndarray or pil image.
- wandb.Image() - Parameters
 - **data_or_path** — {ndarray/pil} Image data
 - **mode** — {string} What PIL mode was used (Like [here](#))
 - **classes** — {dict}
 - **boxes** — {dict}
 - **masks** — {dict}
 - See more details on [here](#).

wandb.log() - video data

- Use wandb.Video() to pack.
- wandb.Video() - Parameters
 - **data_or_path** — {ndarray, string, io} Video data
 - **fps**— {int} Frames per second
 - See more details on [here](#).
- My comment
 - Presentation on website is not very fluent.
 - Can be used for checking not demo.

wandb.log() - audio data

- Use wandb.Audio() to pack.
- wandb.Audio() - Parameters
 - **data_or_path** — {ndarray, string} Audio data
 - **sample_rate** — {int} Sample rate
 - See more details on [here](#).
- My comment
 - Presentation can be used for demo directly.

wandb.log() - table

- Use wandb.Table() to pack.
- wandb.Table() - Parameters
 - **columns** — {List} Columns name list
 - **data** — {List(List)} Data list
 - **dataframe** — {pandas.DataFrame}
 - See more details on [here](#).
- New column/data can be appended by "add_data", "add_column", etc.

Dashboard - structure

- Wandb's dashboard structure follow the order of "Home", "user", "project", "run".
- Each layer may have more than one sub layer. (For example, I have six projects with each of them having multiple trials)
- Runs under same project share common workspace, where results from all trials (containing chart, table, media, system info, etc.) were presented.

Dashboard - Home

Create Team



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Home

My projects Projects you have

Search

- elucidat.../wandb_tutorial
- elucidat.../DLMAG_hw3
- elucid.../MaskShadowGAN_r...
- elucidat.../DLMAG_hw2
- elucidat.../DLMAG_hw1_app1
- elucidat.../cifar_repro
- + Create new project

Applications

- Model registry
- Launch

Profile

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Home

Current runs info

Search

1-10 of 50

Name	Project	State	Created
wandb_sample_2023-12-04-00-40	wandb_tutorial	Finished	13 hours ago
wandb_sample_2023-12-04-00-26	wandb_tutorial	Finished	13 hours ago
GPT_AdamW_1e-4_re_2023-11-27-01-15	DLMAG_hw3	Finished	1 week ago
GPT_AdamW_1e-4_chord_2023-11-25-10-10	DLMAG_hw3	Finished	1 week ago
OPT_AdamW_1e-4_chord_2023-11-24-00-47	DLMAG_hw3	Finished	2 weeks ago
BERT_AdamW_1e-4_2023-11-22-22-38	DLMAG_hw3	Finished	2 weeks ago
GPT_AdamW_1e-4_2023-11-19-12-51	DLMAG_hw3	Finished	2 weeks ago
OPT_pre_AdamW_1e-4_2023-11-17-02-05	DLMAG_hw3	Finished	2 weeks ago
OPT_pre_AdamW_1e-4_2023-11-17-00-32	DLMAG_hw3	Killed	3 weeks ago

Dashboard - User



elucidator_ray

Create Team



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Chang-Yu
Hsieh

elucidator_ray

Edit profile

National Taiwan Univ...

Applications

Launch →

Overview Reports **Projects** Stars

Project List

Projects

Create new project

Q Search

1-6 of 6

Name	Last Run	Runs	Entity	
wandb_tutorial	13 hours ago	2	elucidator_ray	...
DLMAG_hw3	2023-11-28	21	elucidator_ray	...
MaskShadowGAN_repro	2023-11-07	2	elucidator_ray	...
DLMAG_hw2	2023-11-01	5	elucidator_ray	...
DLMAG_hw1_app1	2023-10-10	18	elucidator_ray	...
cifar_repro	2023-07-31	2	elucidator_ray	...

Dashboard - Project

elucidator_ray > Projects > wandb_tutorial Create Team Search Notifications Help 昌諭

Overview Search panels with regex Create report

Search runs .*

Run List

- Name (2 visualized)
- wandb_sample_2023-12...
- wandb_sample_2023-12...

1-2 of 2 < >

Result block

- Tables 1
- Media 3
- Charts 2
- System 23
- Hidden Panels 4

Add section

My Workspace

Updated 2 minutes ago



Demo

Reference

- [Weight & Biases Docs](#)
- 知乎
 - [WanDB: 全网终极入门指南](#)
 - [Wandb: 模型训练最强辅助](#)
- Medium
 - [Weights & Biases — ML 實驗數據追蹤](#)
 - [wandb: Weights & Biases 超越TensorBoard的深度學習訓練Log紀載工具](#)

Thanks