Weights & Biases (W&B) Setup Guide

Quick Setup for the Lab Session

What is Weights & Biases?

Weights & Biases (W&B) is a free tool for tracking machine learning experiments. It helps you:

- 📊 **Track metrics** (loss, accuracy) automatically
- 📈 **Visualize** training curves in real-time
- 🔍 **Compare** different experiments
- 💾 **Save** hyperparameters and model configurations
- 👥 **Share** results with your team

Think of it as: A lab notebook for your ML experiments!

Step 1: Create a Free Account

1. Go to: **https://wandb.ai/site**
2. Click **"Sign Up"** (top right)
3. Choose: **Sign up with GitHub** (recommended) or Email
4. Verify your email if needed
5. **Done!** You have a free account

Free tier includes:

- Unlimited experiments
- 100GB storage
- All features we need for this lab

Step 2: Install W&B

Open your terminal or Jupyter notebook and run:

```
pip install wandb
```

Or in a notebook cell:

```
!pip install wandb
```

Step 3: Login to W&B

Option A: In Terminal

```
wandb login
```

This will:

1. Open a browser window
2. Show you an API key
3. Paste the key in the terminal

Option B: In Jupyter Notebook

```
import wandb

wandb.login()
```

A link will appear - click it, copy the API key, paste it back.

Option C: Using API Key Directly

1. Go to: https://wandb.ai/authorize
2. Copy your API key
3. In Python:

```
import wandb

wandb.login(key="YOUR_API_KEY_HERE")
```

Step 4: Test Your Setup

Run this code to verify everything works:

```python
import wandb
# Initialize a test run
wandb.init(project="test-project", name="test-run")
# Log something
wandb.log({"test_metric": 42})
# Finish
wandb.finish()

print("Success! W&B is working.")
```

Then check https://wandb.ai - you should see “test-project” in your dashboard!

How W&B Works in Our Lab

1. Initialize a Run

```python
import wandb

# Start tracking

wandb.init(

project="week9-lab", # Project name (shared by team)

name="experiment-lr-0.01", # This run's name

config={ # Hyperparameters to track

"learning_rate": 0.01,

"batch_size": 64,

"epochs": 10,

"model": "CNN"

}

)
```

2. Log Metrics During Training

```python
for epoch in range(num_epochs):

# ... training code ...
```

```
# Log metrics
wandb.log({
"train_loss": train_loss,
"train_accuracy": train_acc,
"val_loss": val_loss,
"val_accuracy": val_acc,
"epoch": epoch
})
```

3. Finish the Run

```
wandb.finish()
```

Lab Session: What You'll Do

1. **Create your W&B account** (if not done)
2. **Login** in the lab notebook
3. **Run experiments** with different settings:

- Different learning rates
- Different batch sizes
- With/without BatchNorm
- With/without Dropout

4. **Compare results** in the W&B dashboard
5. **Analyze** which settings work best

Quick Reference: W&B Commands

Task | Code |

|——|——|

Install | `pip install wandb` |

Login | `wandb.login()` |

Start run | `wandb.init(project="name")` |

Log metrics | `wandb.log({"loss": 0.5})` |

Log config | `wandb.config.lr = 0.01` |

End run | `wandb.finish()` |

Troubleshooting

"wandb: command not found"

→ Reinstall: `pip install wandb --upgrade`

"Login failed"

→ Try: `wandb login --relogin`

"Network error"

→ Check internet connection, try again

"Permission denied"

→ Make sure you're logged in: `wandb.login()`

Notebook shows old runs

→ Run `wandb.finish()` before starting new experiments

Tips for the Lab

1. **Use descriptive names** for runs:
- ✅ `cnn-lr0.001-batch64`
- ❌ `run1`

2. **Log everything important:**
- Learning rate, batch size, model type
- Train loss, val loss, accuracy

3. **Compare runs** in the W&B dashboard:
- Select multiple runs
- Look at charts side-by-side
4. **Take notes** in the W&B interface:
- Add tags to runs
- Write observations

Useful Links

- **W&B Dashboard:** https://wandb.ai/home
- **Documentation:** https://docs.wandb.ai/
- **Quickstart:** https://docs.wandb.ai/quickstart
