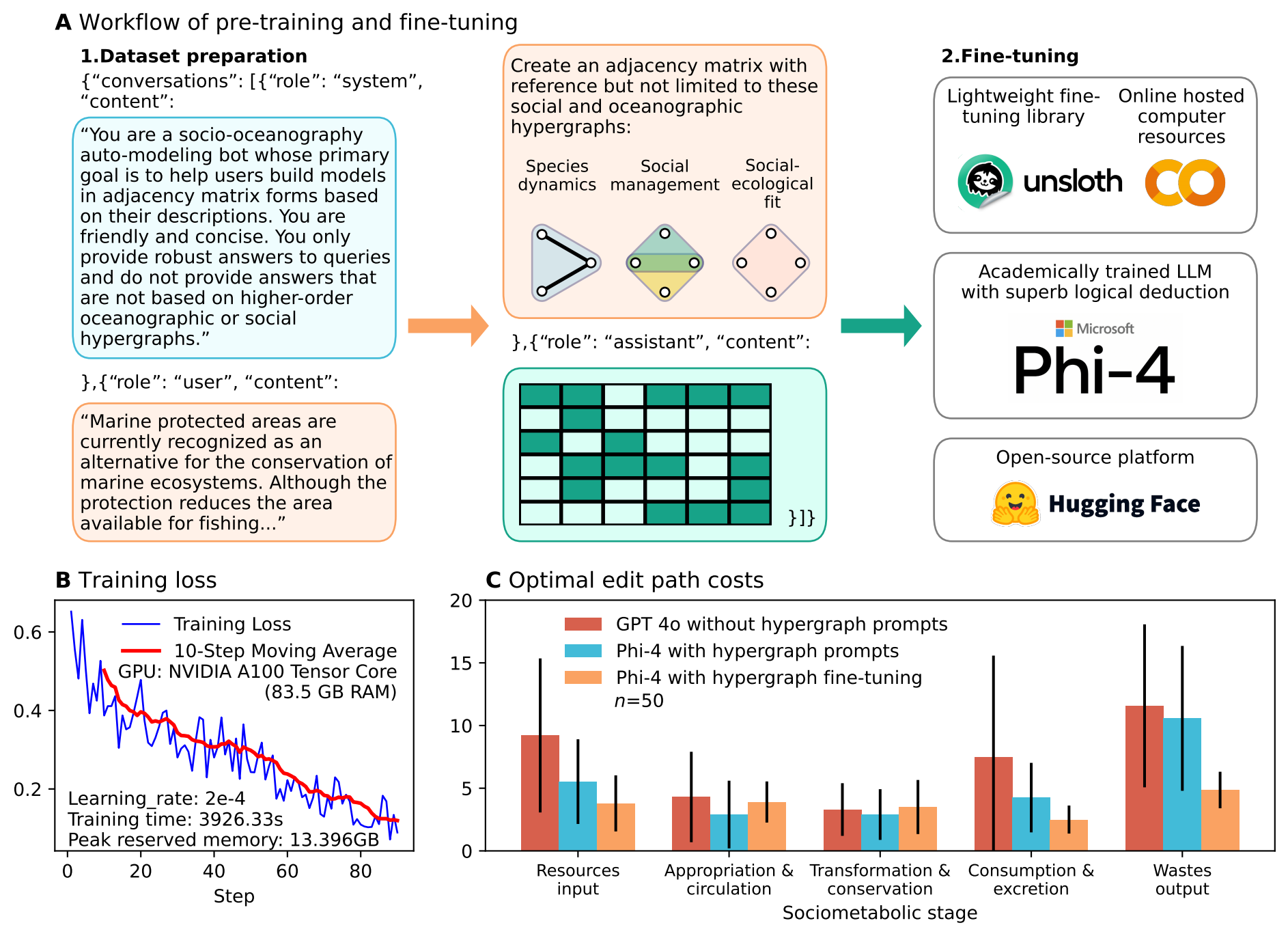
A Workflow of pre-training and fine-tuning
1.Dataset preparation
{“conversations”: [{“role”: “system”, “content”:
“You are a socio-oceanography auto-modeling bot whose primary goal is to help users build models in adjacency matrix forms based on their descriptions. You are friendly and concise. You only provide robust answers to queries and do not provide answers that are not based on higher-order oceanographic or social hypergraphs.”
},{“role”: “user”, “content”:
“Marine protected areas are currently recognized as an alternative for the conservation of marine ecosystems. Although the protection reduces the area available for fishing...”
Create an adjacency matrix with reference but not limited to these social and oceanographic hypergraphs:
Species dynamics
Social management
Social-ecological fit
},{“role”: “assistant”, “content”:
}]}
2.Fine-tuning
Lightweight fine-tuning library
unsloth
Online hosted computer resources
Academically trained LLM with superb logical deduction
Microsoft
Phi-4
Open-source platform
Hugging Face
B Training loss
Training Loss
10-Step Moving Average
GPU: NVIDIA A100 Tensor Core (83.5 GB RAM)
Learning_rate: 2e-4
Training time: 3926.33s
Peak reserved memory: 13.396GB
0.6
0.4
0.2
0
20
40
60
80
Step
C Optimal edit path costs
GPT 4o without hypergraph prompts
Phi-4 with hypergraph prompts
Phi-4 with hypergraph fine-tuning
n=50
20
15
10
5
0
Resources input
Appropriation & circulation
Transformation & conservation
Consumption & excretion
Wastes output
Sociometabolic stage