



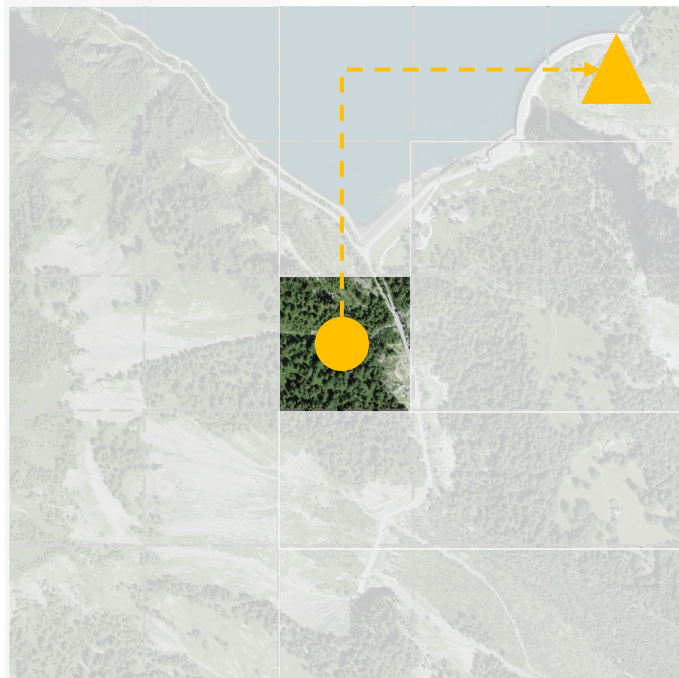
GeoExplorer: Active Geo-localization with Curiosity-Driven Exploration

Li Mi, Manon Béchaz, Zeming Chen, Antoine Bosselut, Devis Tuia

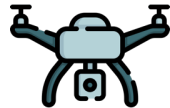
ICCV 2025

1. Introduction


Active Geo-localization



goal



start

I 



G 



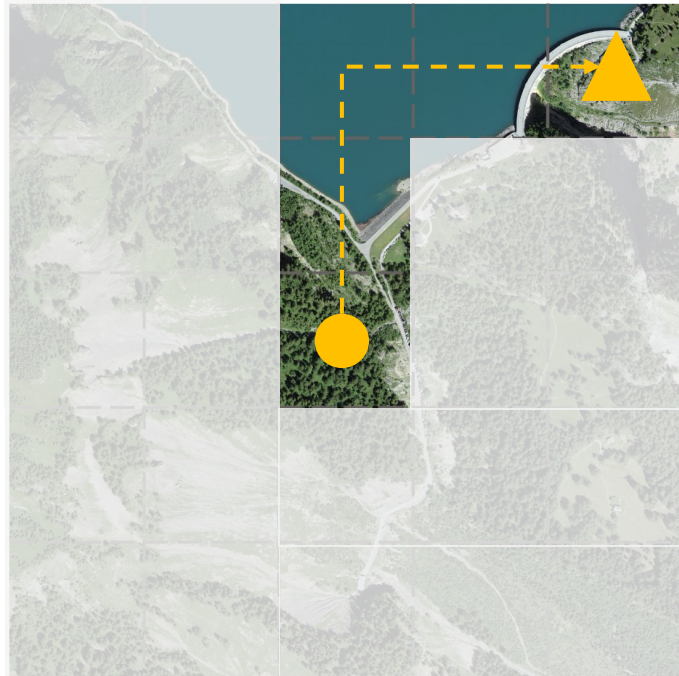
T 

I walk along the curved path beside the calm, blue water of a dam. Tall mountains stand in front of me.

[UP, DOWN, LEFT, RIGHT]

1. Introduction

Active Geo-localization



Goal-reaching reinforcement learning

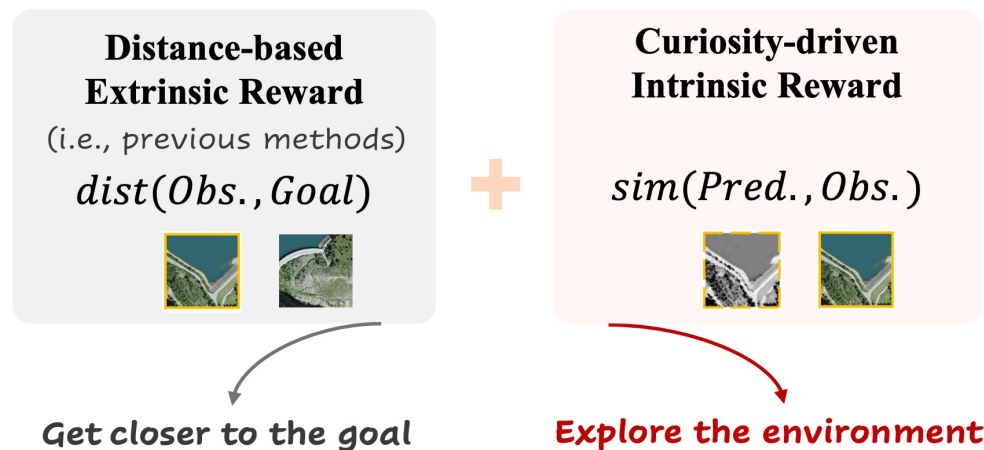
- Environment
- Agent
- Actions

1. Introduction

GeoExplorer

Improve the **representation generalizability** by:

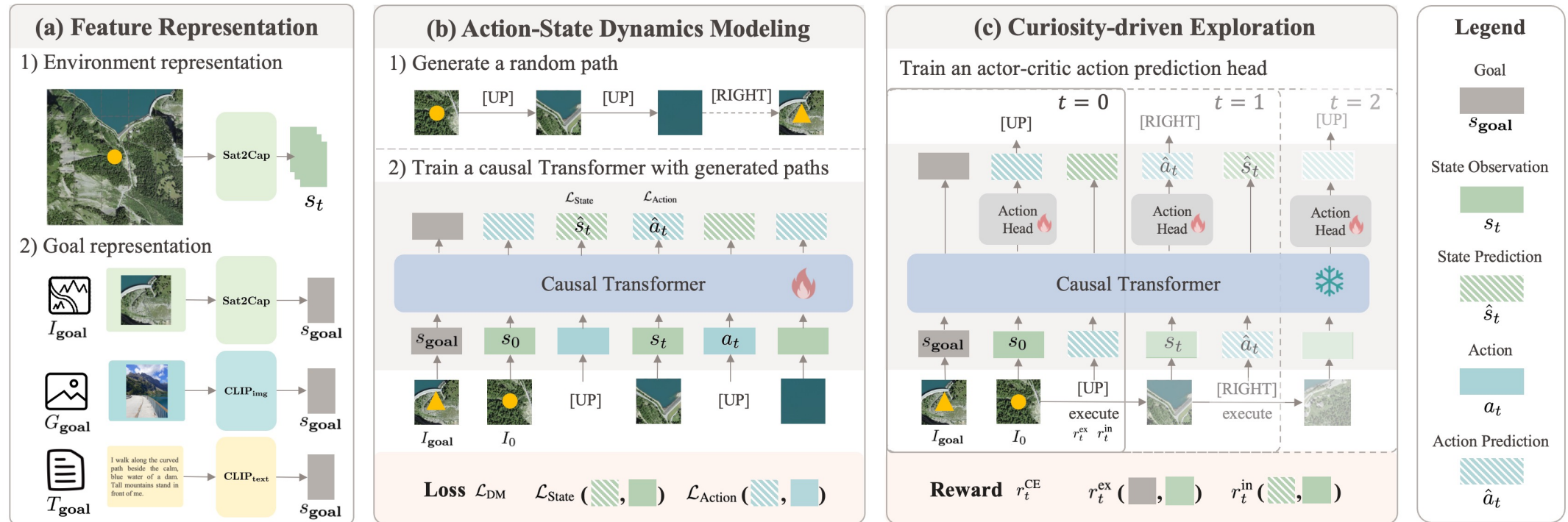
- Environment modeling
- Environment exploration



GeoExplorer combines **goal-oriented reward** and **curiosity-driven reward**

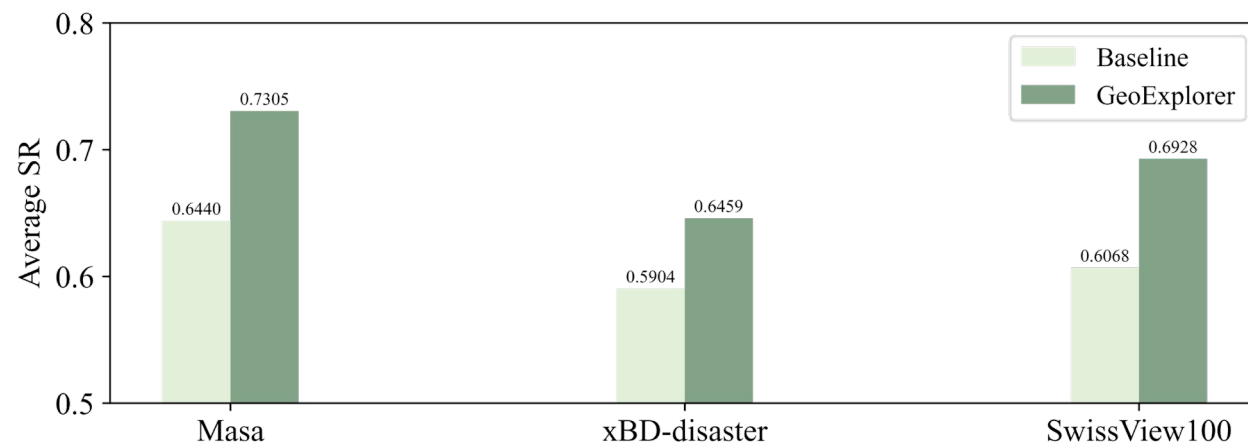
2. Method Pipeline

- Feature representation
- Model** the environment
- Explore** the environment

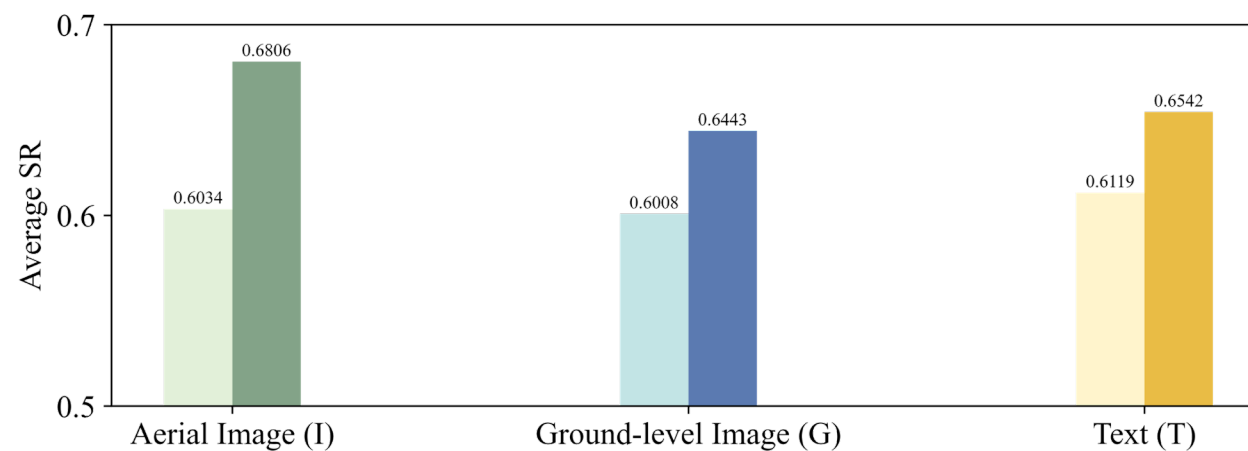


3. Results

■ Validation and Cross-domain Generalization



■ Multimodal Generalization

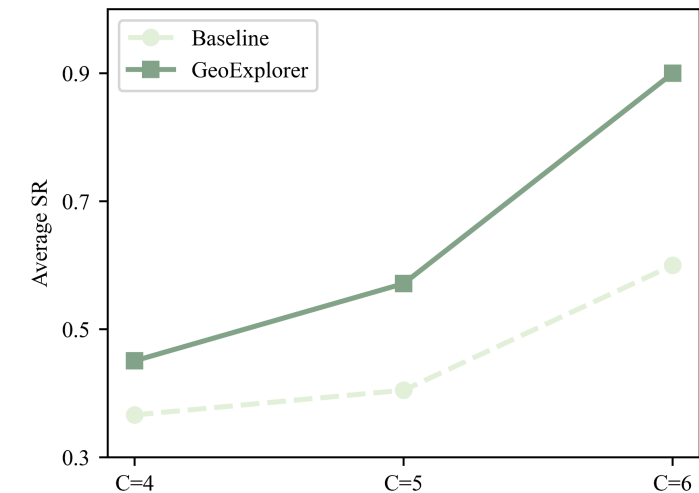
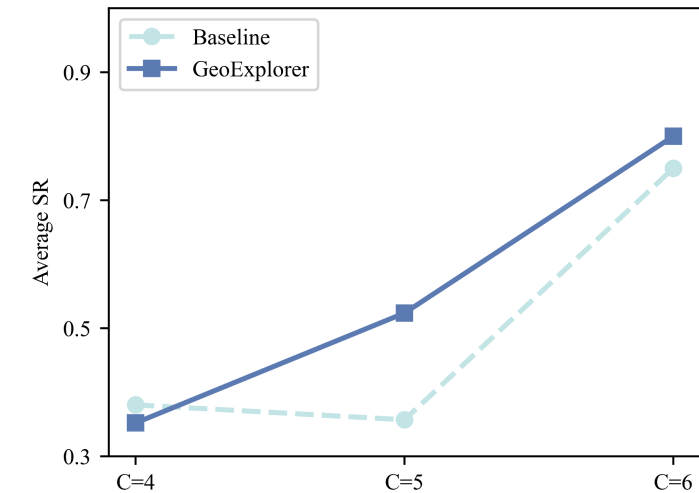
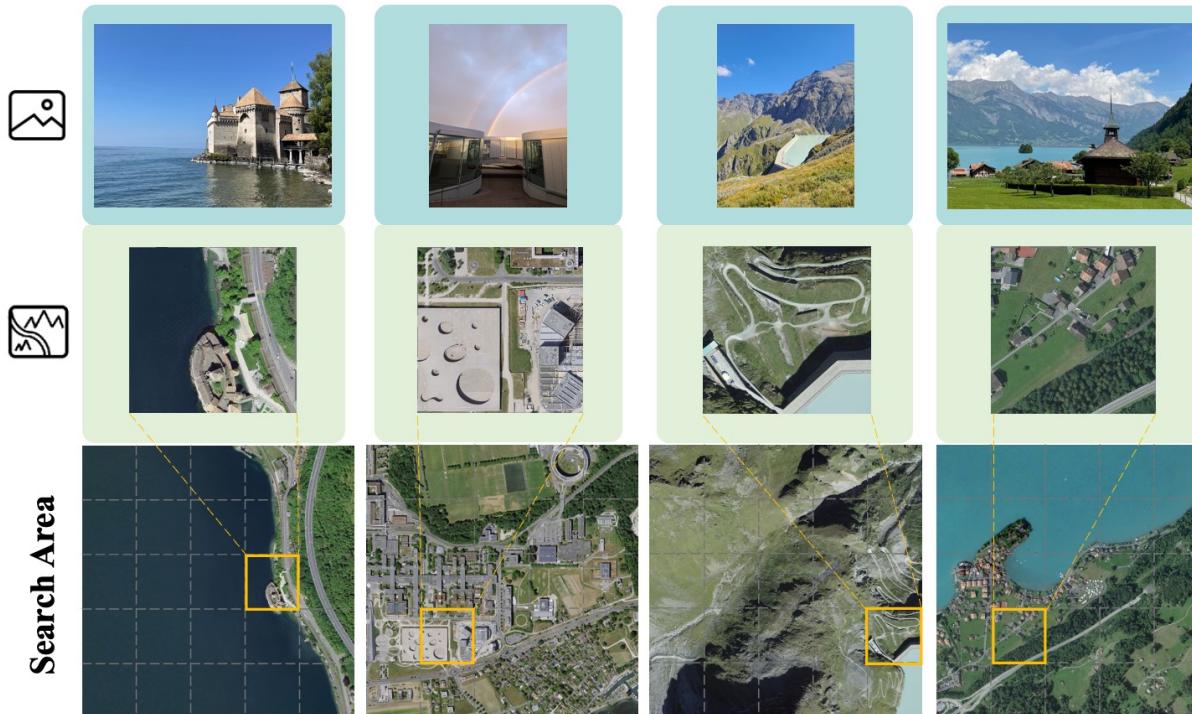


GeoExplorer shows improved **cross-domain** and **cross-modal generalization ability** over the baseline model with extrinsic reward only.

3. Results

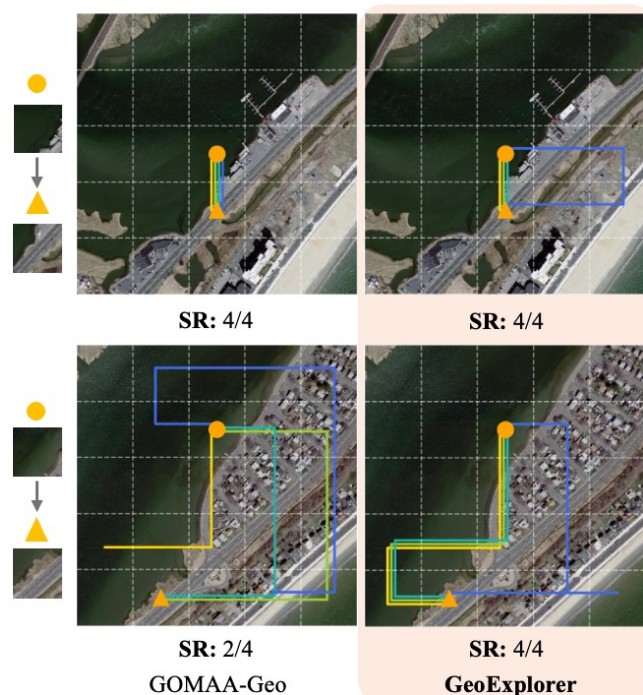
■ Unseen Target Generalization

GeoExplorer exhibits an impressive generalization ability in localizing unseen targets, especially when the path is long.

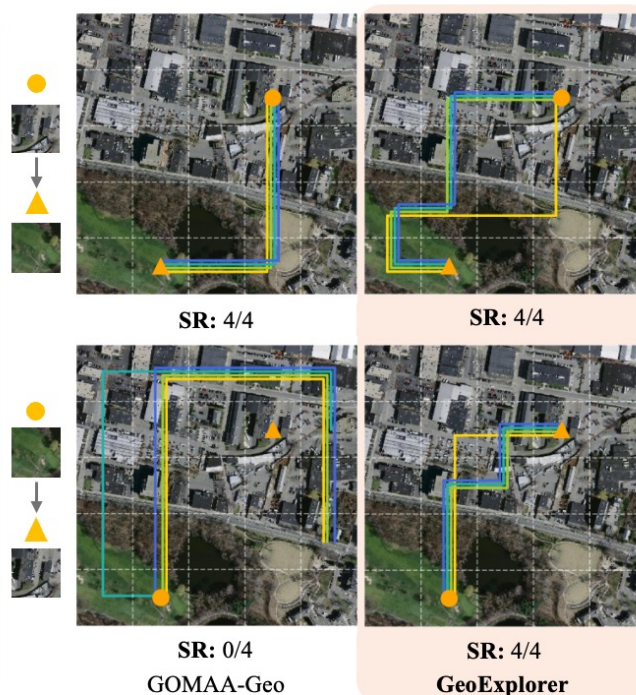


4. Does Intrinsic Reward Improve Exploration?

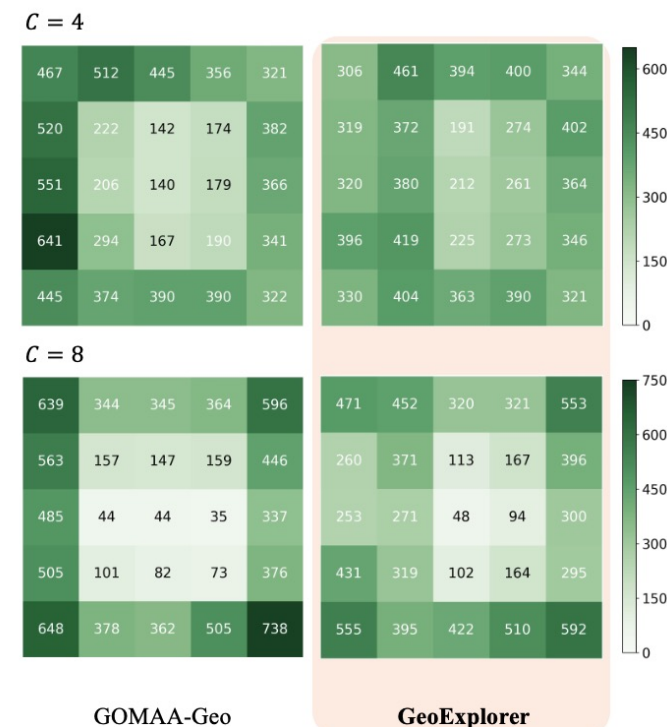
■ Visualization of Exploration Ability



(a)



(b)

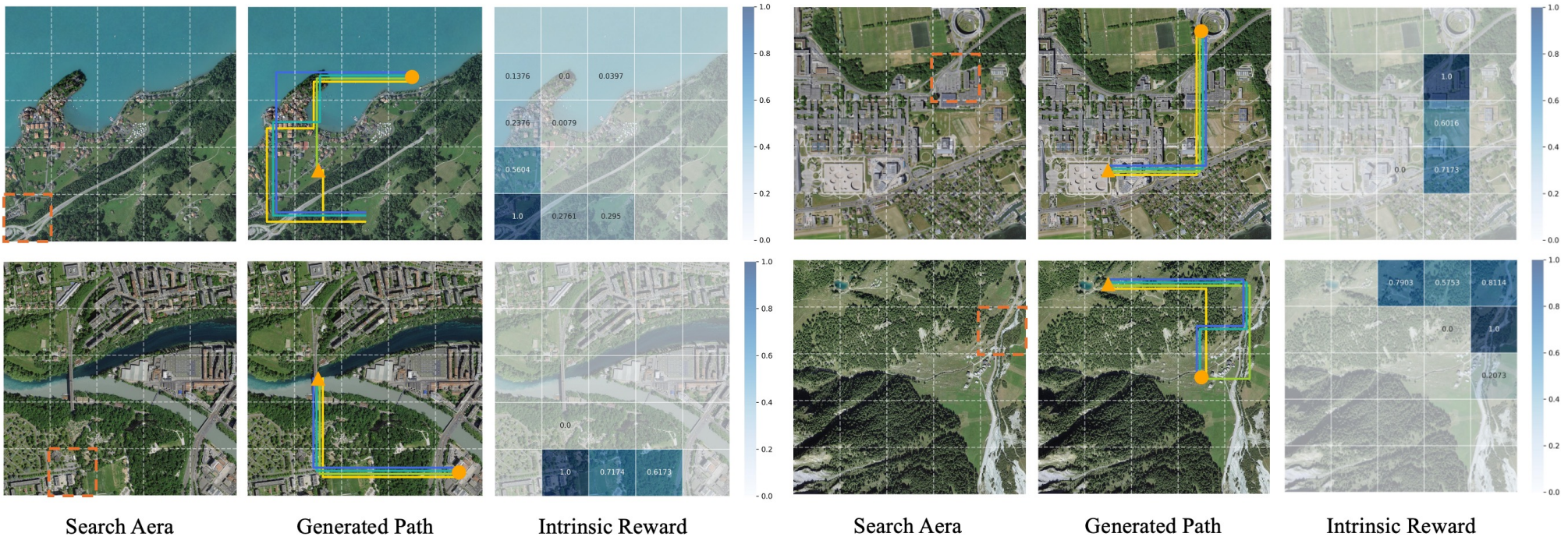


(c)

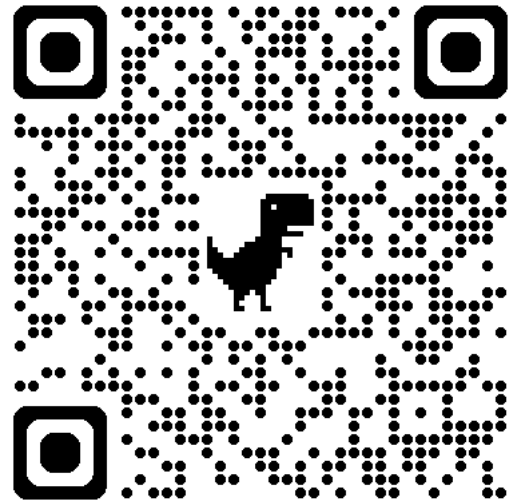
GeoExplorer shows **robust, diverse, and content-related** exploration ability.

4. Does Intrinsic Reward Improve Exploration?

■ Analysis of Intrinsic Reward



Curiosity-driven intrinsic rewards provide **dense**, **goal-agnostic**, and **content-related** guidance to enhance the exploration ability of GeoExplorer.



A trade-off between following the direct, goal-oriented guidance and **engaging in exploratory behavior**.

