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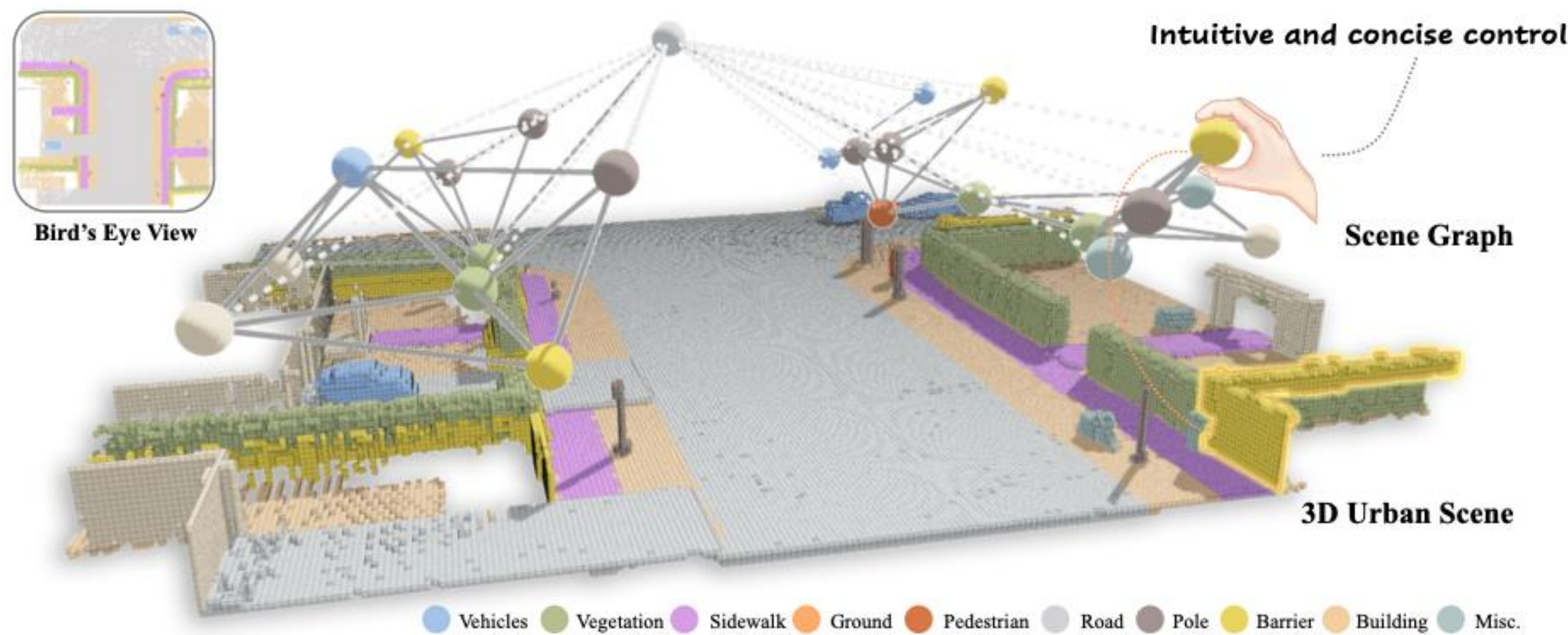
6 NVIDIA

Controllable 3D Outdoor Scene Generation via Scene Graphs

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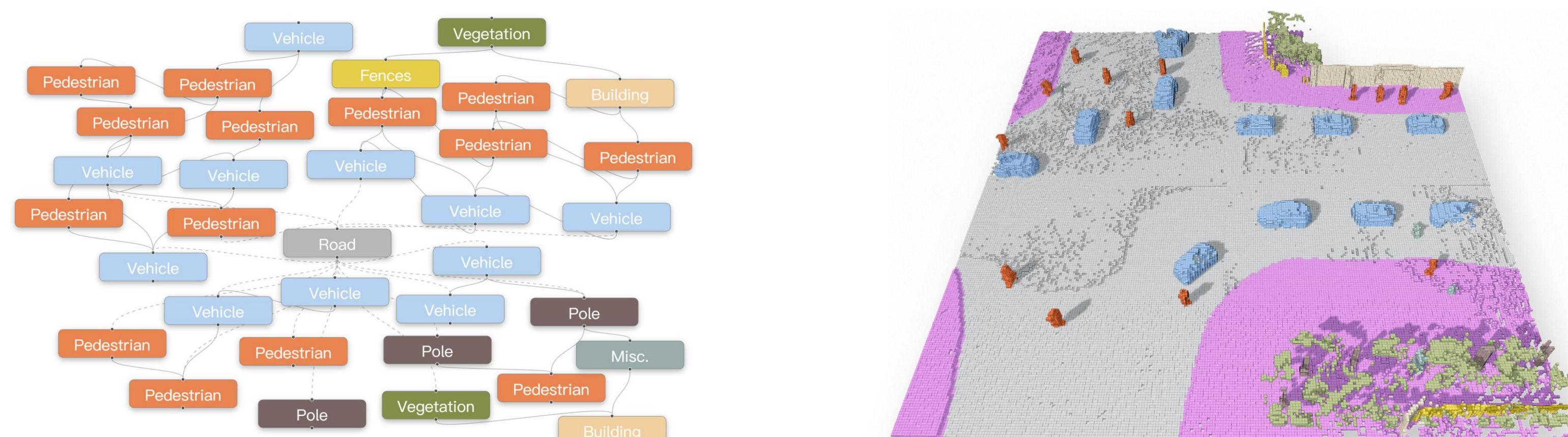
Project Page

Introduction



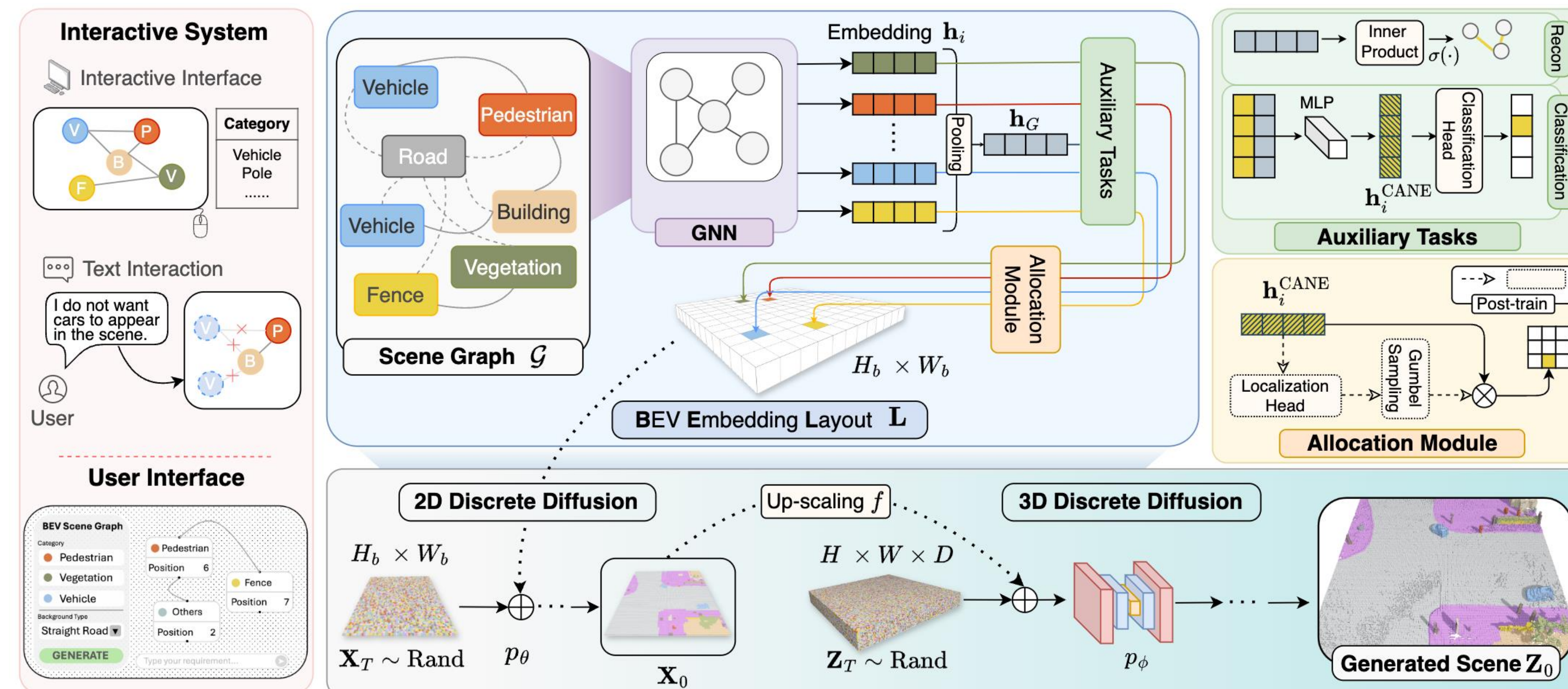
- **Motivation:** 3D scene generation is vital for autonomous driving, gaming, and virtual worlds, but current methods lack controllability.
- **Contribution:** This is the first scene-graph based framework for controllable outdoor 3D scene generation, featuring a GNN-allocation module, and an interactive system for intuitive user control.

Abnormal Case



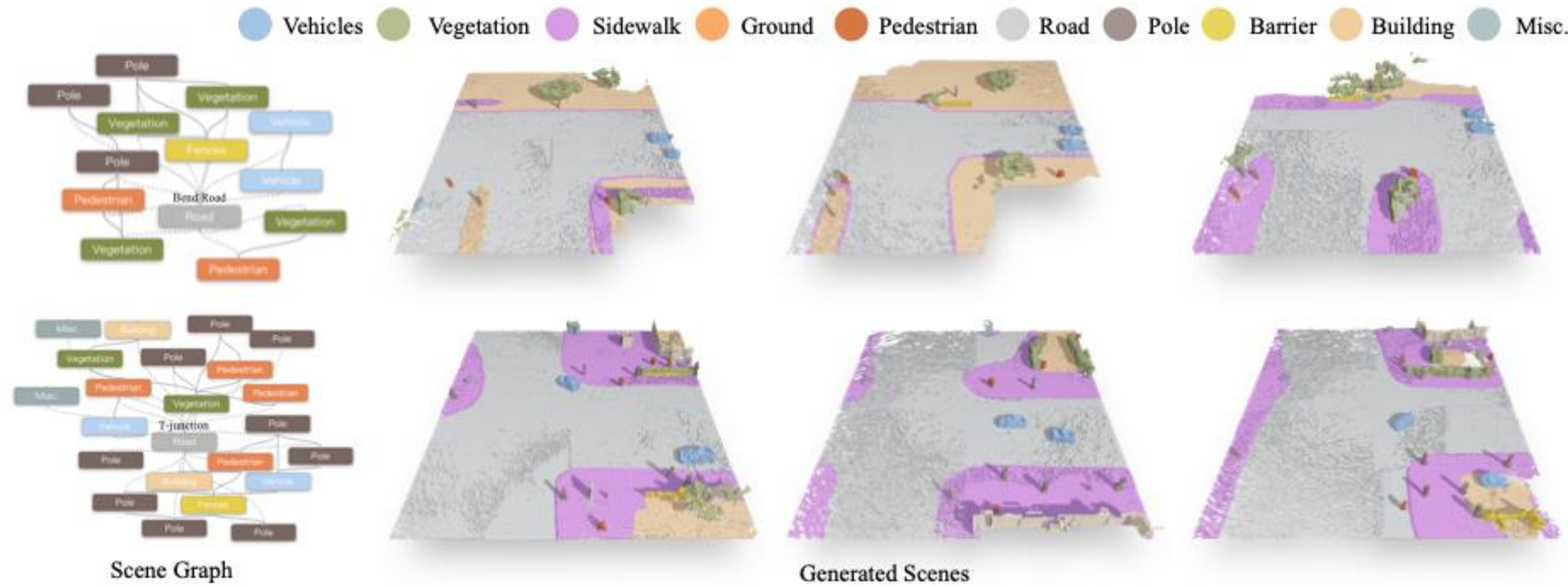
- Abnormal case with rich nodes. Pedestrians are placed crossing the road via position control.

Method

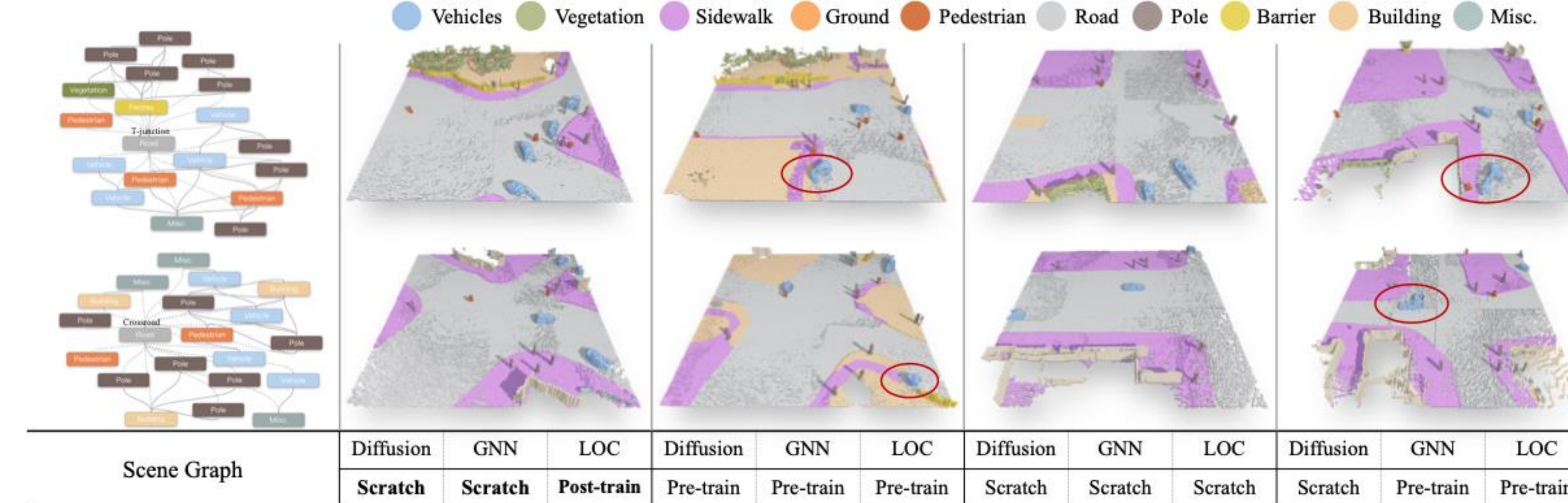


- Users build scene graphs via an interactive system, which are encoded by a GNN and refined with auxiliary tasks to capture structure and semantics.
- The allocation module converts graphs into BEV embeddings, which condition a 3D diffusion model to generate realistic outdoor scenes.

Generation Diversity



Training Strategies



Quantitative & Qualitative Results

Table: Comparison of Different Conditioning Methods

Method	Condition	Scene Quality			Control Capacity				
		mIoU	MA	F3D (↓)	MAE (↓)	Jaccard	M-Pole (↓)	M-Pede (↓)	M-Vech (↓)
Uncon-Gen [34]	-	68.21	85.69	0.338	2.07	0.68	4.78	4.71	3.59
SG2Im [18]	Scene Graph	65.43	81.72	0.486	0.97	0.81	2.25	2.79	2.64
LLM [59, 65]	Text-Embedding	68.19	85.62	0.386	1.44	0.70	3.41	3.57	3.51
Ours	Scene Graph	68.69	85.01	0.393	0.63	0.93	1.39	1.81	1.35

