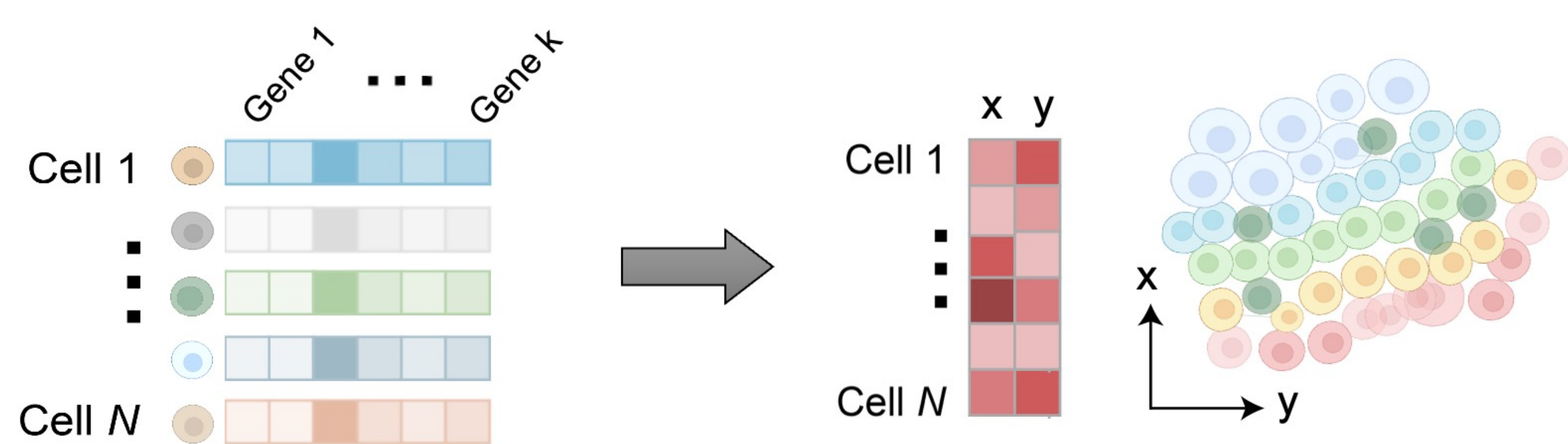


Generating complex tissue structures from gene expressions with LUNA

Tingyang Yu, Chanakya Ekbote, Jiashuo Fan, Stéphane d'Ascoli, Pascal Frossard, and Maria Brbić[†]

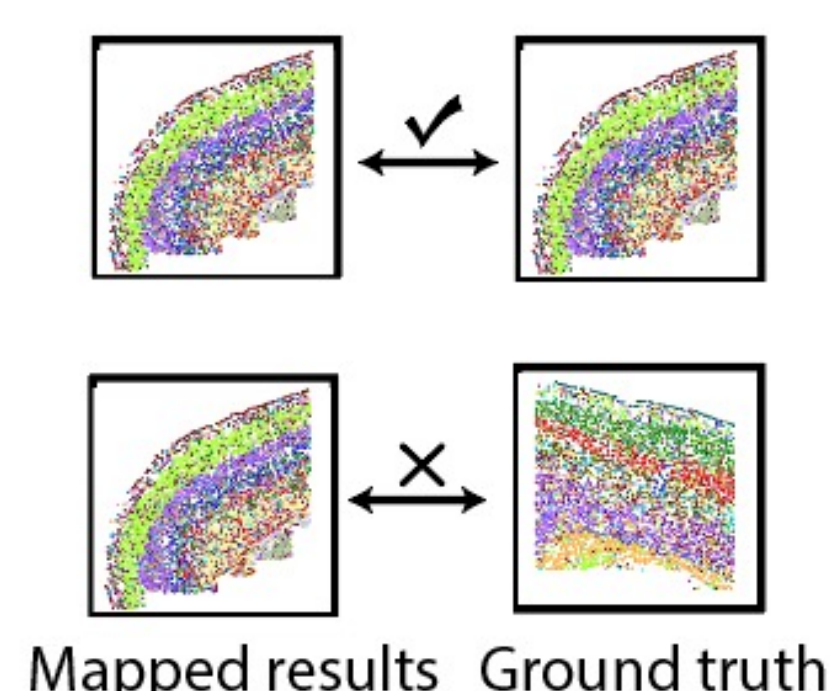
INTRODUCTION

Our Goal: Inferring **cell locations** from gene expression profiles for **complex tissues, i.e., mammalian brain**



Existing methods:

- Cannot handle **complex tissue *de novo***
- Cannot leverage information from **large-scale spatial transcriptomics datasets**.
- Performance is **sensitive** to the **selected reference slices**.

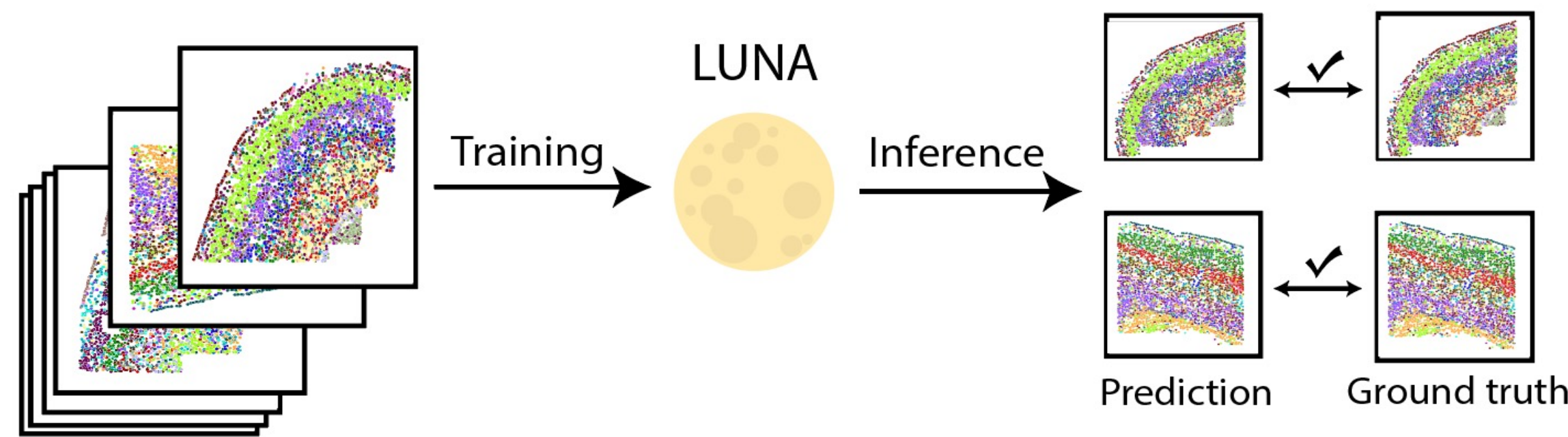


METHOD: LUNA

(Location reconstruction using generative Ai)

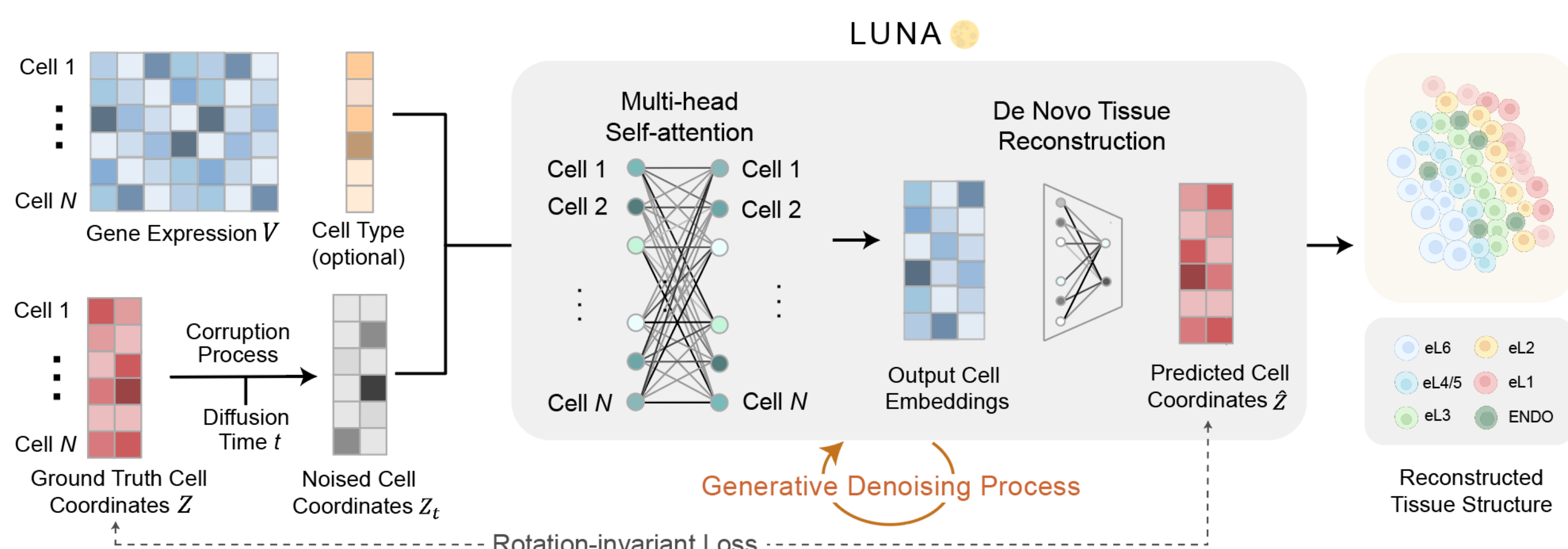
LUNA learns spatial priors across multiple slices

Generate locations conditioned on the input gene expression

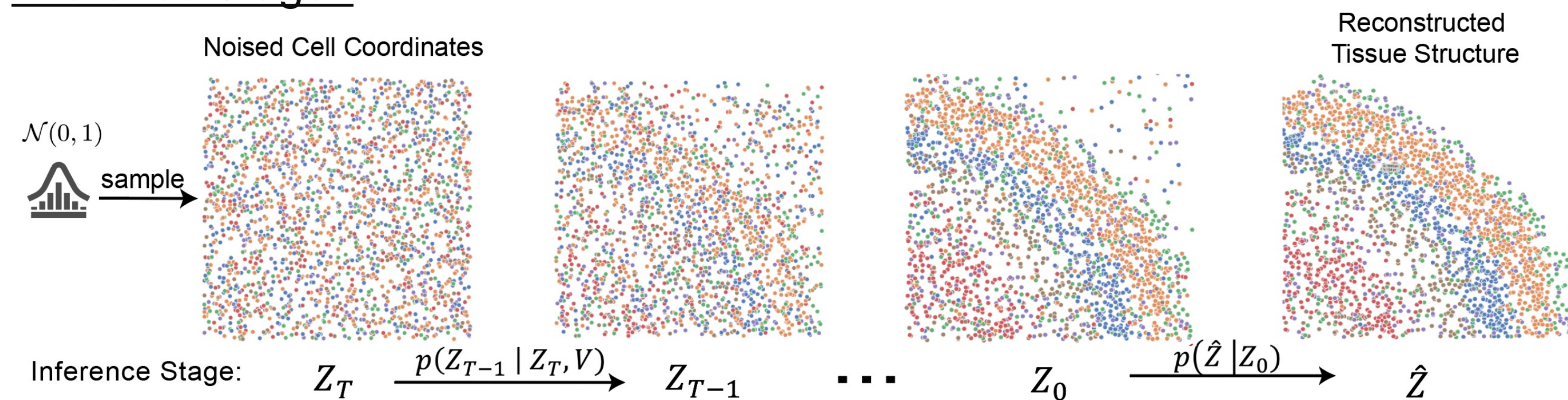


LUNA is a **generative diffusion model** that **enables each cell to "communicate"** with all other cells guided by the learned **attention scores**.

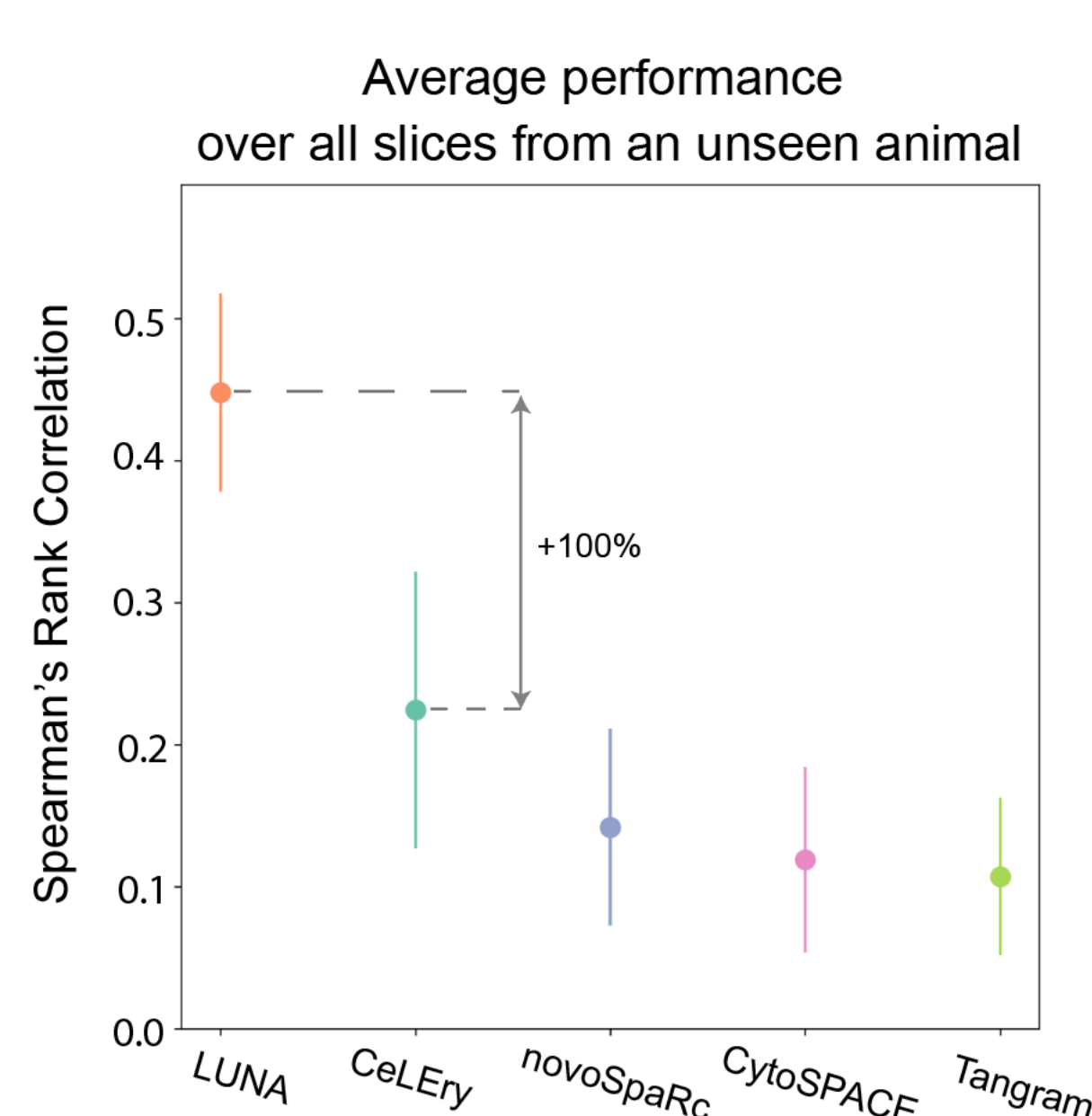
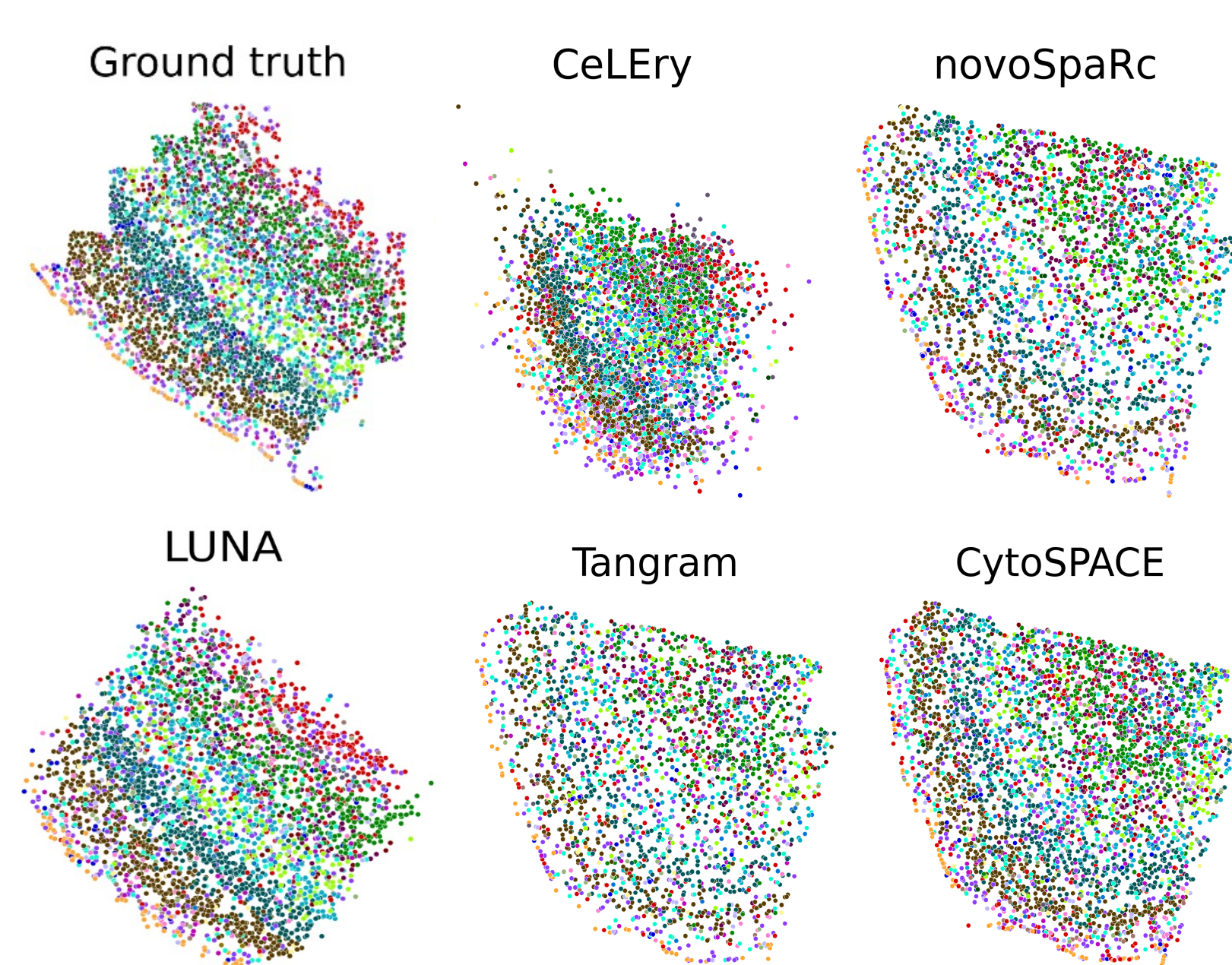
Training Stage:



Inference Stage:

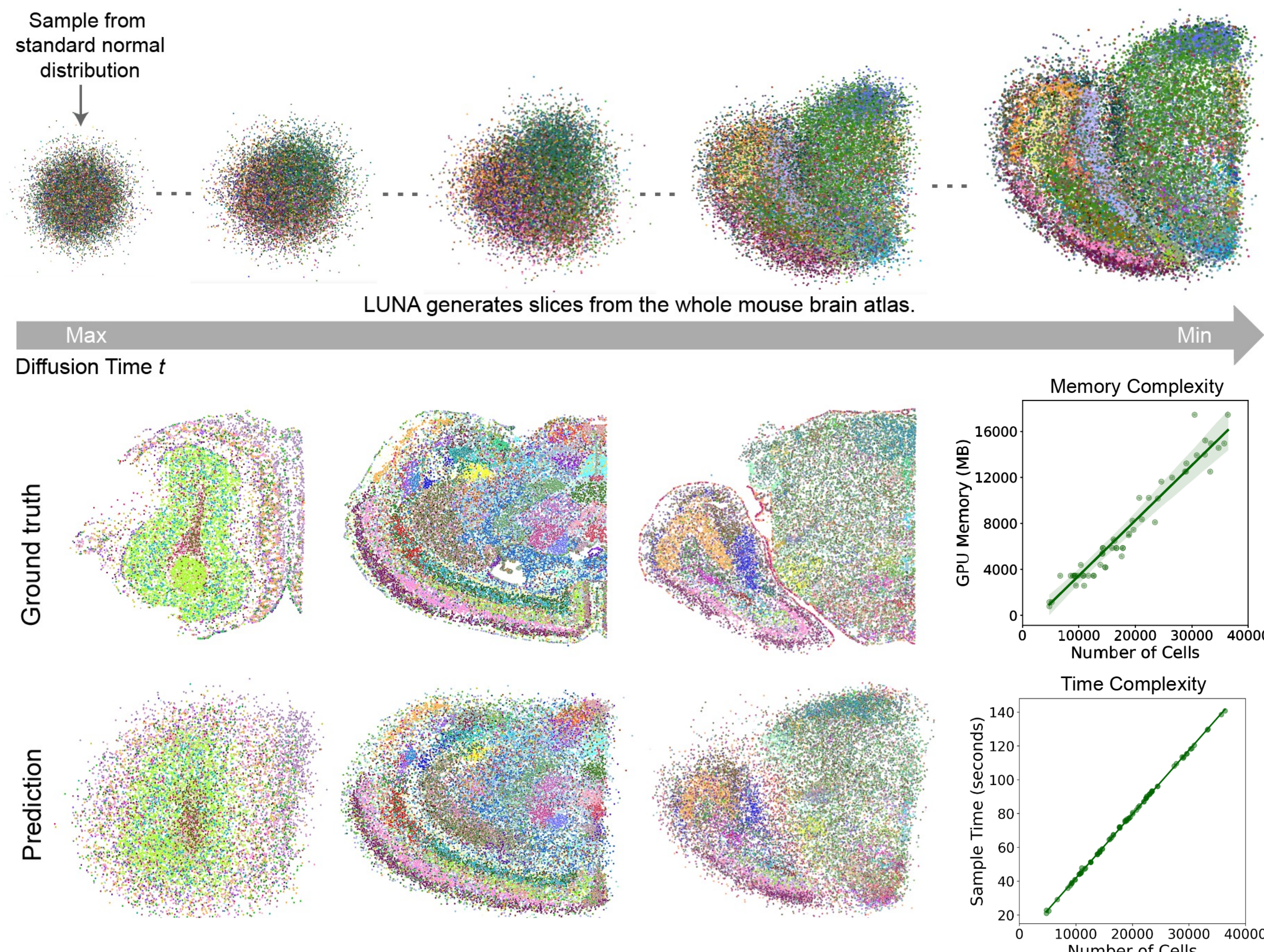


LUNA **outperforms** other methods by a large margin.

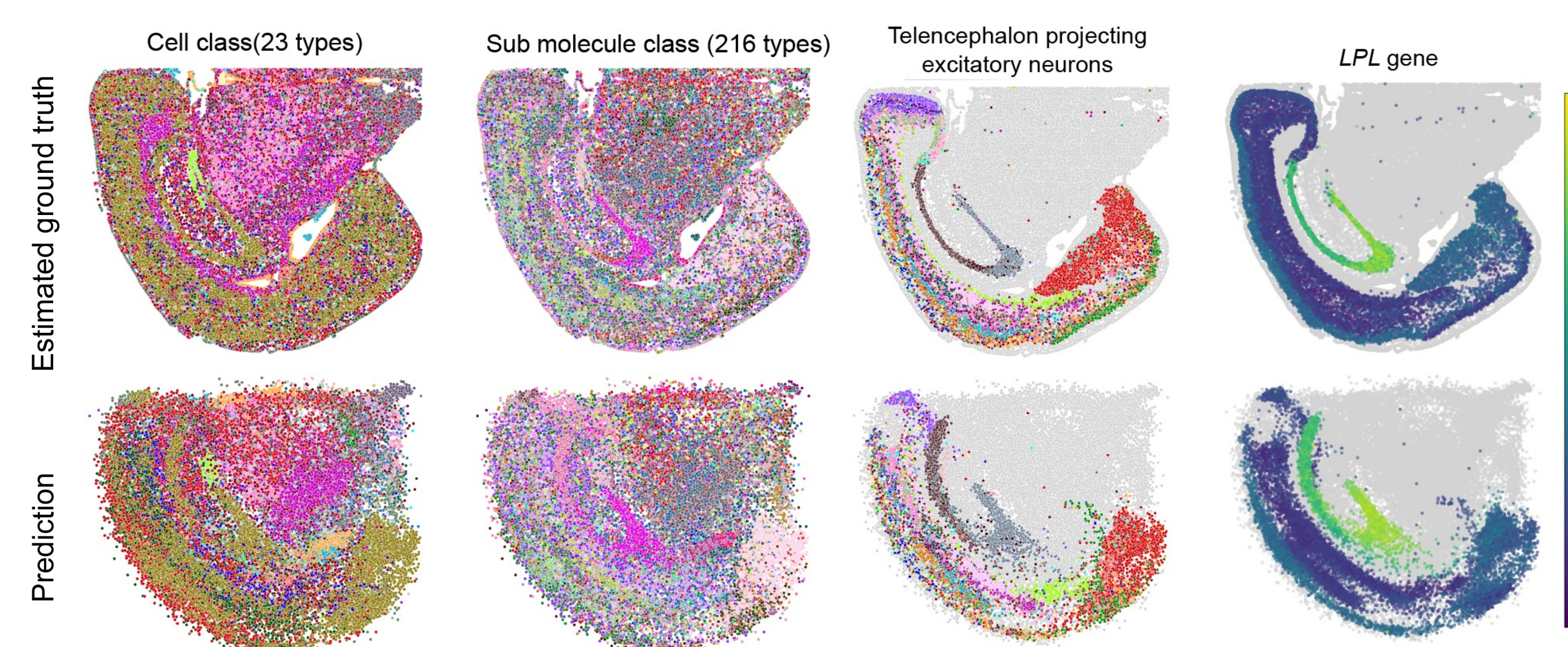


RESULTS

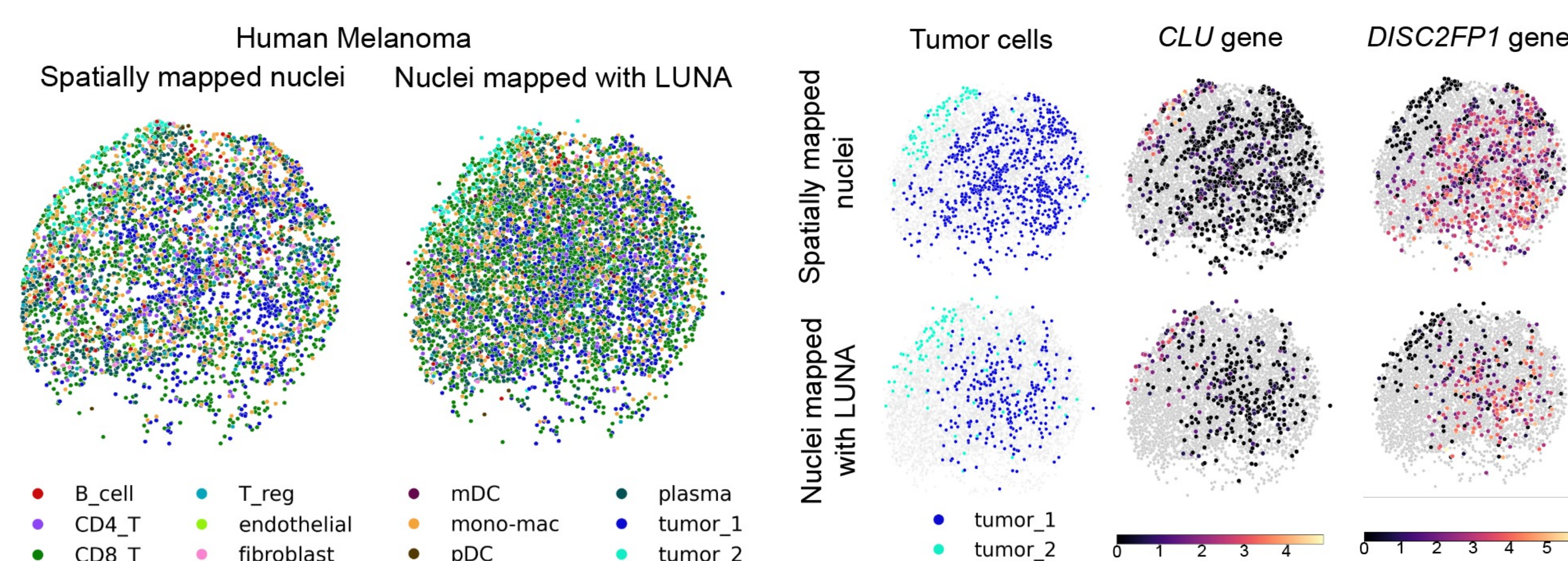
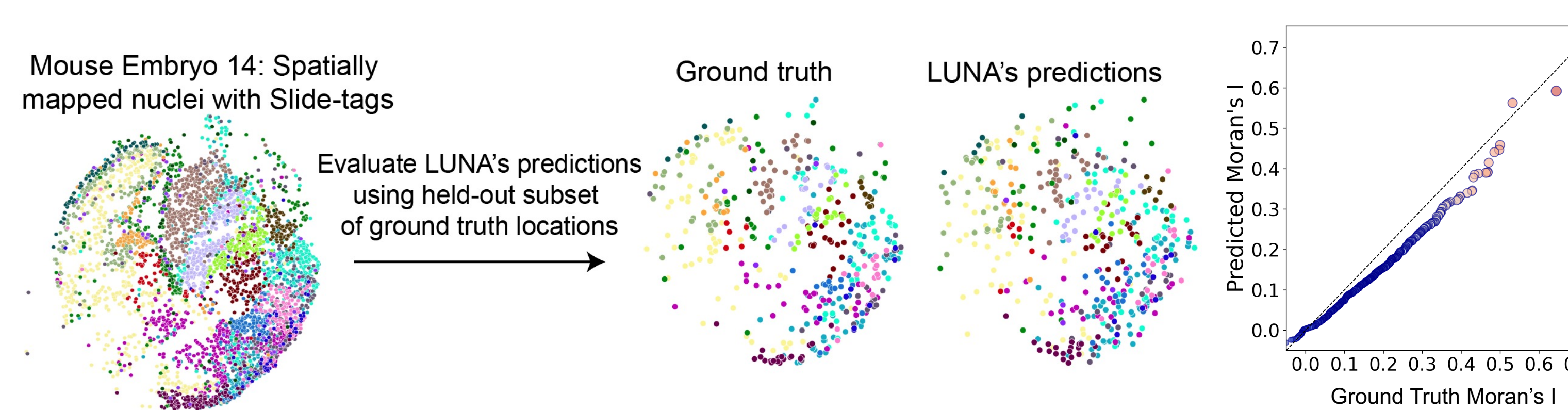
LUNA accurately reconstructs the whole mouse brain atlas with over 1.4 million cells.



De novo reconstruction of scRNA-seq data on the mouse central nervous system atlas.



LUNA infers locations of **spatially unmapped nuclei** in the **Slide-tags** data.



CONTACT

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