



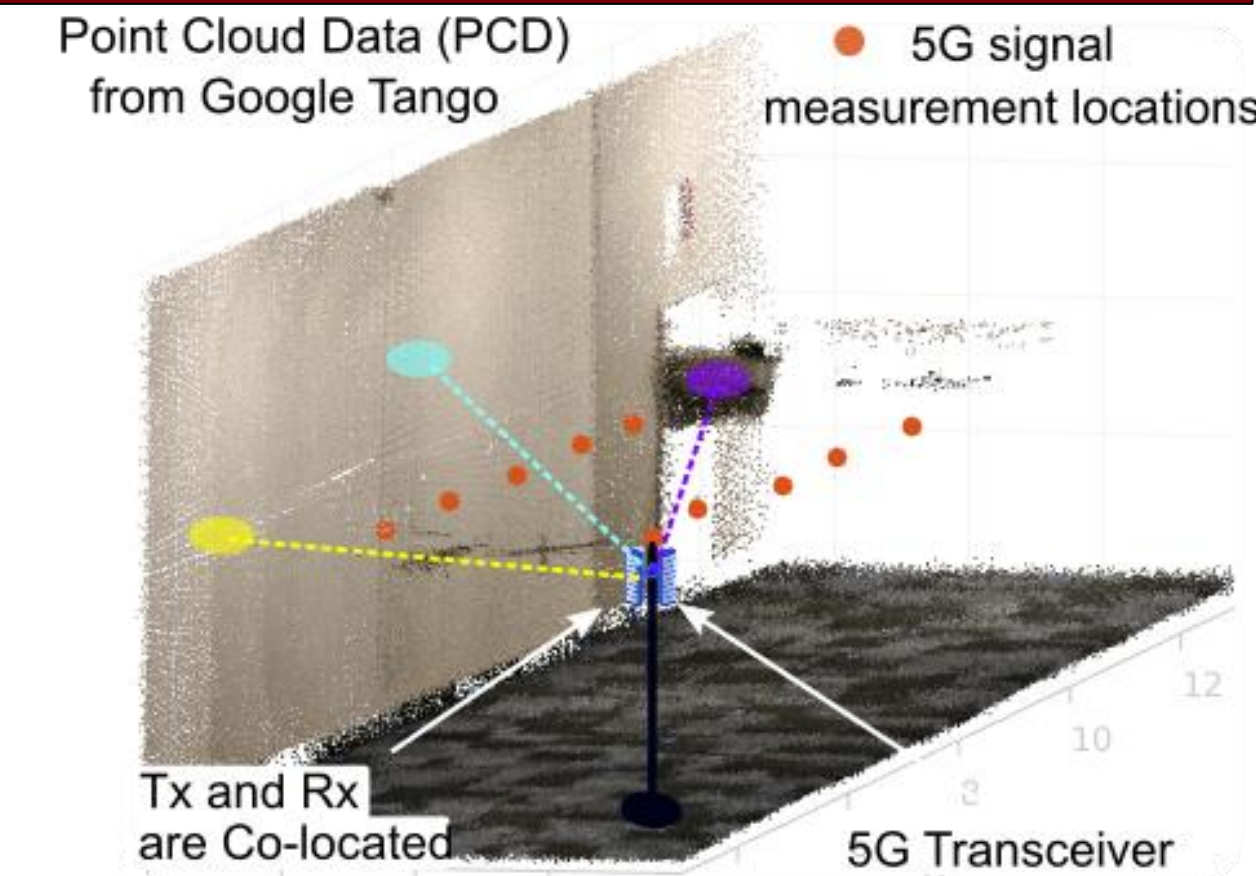
## Picocell Network Challenges

- **Picocell network topologies are difficult to design.**
  - Picocells are the backbone of 5G millimeter-wave networks.
  - Optimal deployment configurations are often unintuitive and difficult to deduce.
  - Sufficiently thorough site surveys can be prohibitively time consuming and costly.
  - Small environmental changes can affect network performance and even necessitate redeployment.



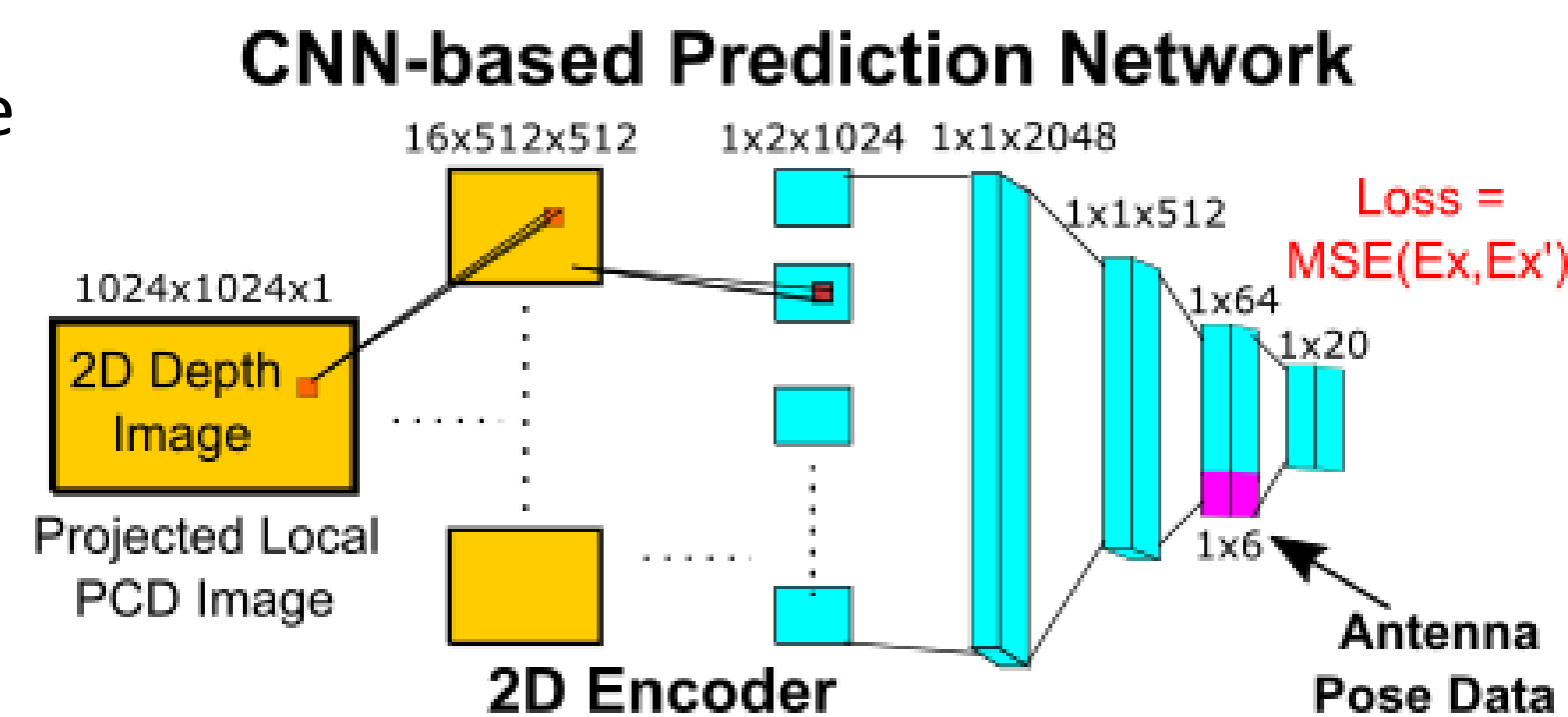
## Facilitating Optimal Deployments

- **How can this process be improved?**
  - Picocells signals can be either **line-of-sight (LOS)** or **non-line-of-sight (NLOS)**.
  - We can maximize network reliability by maximizing NLOS alternatives.
  - Using **visual data** and **millimeter-wave reflection data** from the site, we can create a 5G reflection model.
  - The resulting model could be comprehensively tested **quickly** and at **low cost**, instead of an extended physical site survey.



## VisualMM Design

- **VisualMM efficiently builds 5G reflection model.**
  - A visual model of the area is created using an AR device while reflection data is being collected by a co-located transceiver.
  - We would then use a **convolutional neural network (CNN)**, to create a mapping between objects in the area and their reflection characteristics.
  - This mapping could then be used to analyze potential network configurations.
  - **Speed, cost, and ease of use** are the major driving factors.



## Key Points and Goals

- **VisualMM is an ML-based approach to optimize 5G network deployments.**
  - VisualMM constructs a **5G reflection model** for a potential location, using sparse visual and millimeter-wave data.
  - It can perform **automated site analysis** instead of a physical site survey.
  - **Ongoing works:** Evaluate deployment effectiveness, effect of lighting conditions
  - **Future Goal:** Can a model from one area provide insight into another?

