Since the qouato of depth-homography matrix dataset is not big, **Conditional Neural Process (CNP)** ,a modern **few‑shot regression** model ,to learn a smooth, continuous mapping from **depth to homography** matrix from a few (depth, H) pairs is adopted.

**Reference:**

<https://arxiv.org/abs/1807.01613>

**Conditional Neural Processes**

**🧠 What is a CNP?**

A CNP (Garnelo et al., NeurIPS 2018) is a neural meta‑learner that:

1. **Encodes** each context pair (depth, flattened H) into a fixed‑size representation
2. **Aggregates** those representations by simple averaging
3. **Decodes** a prediction (the 9 homography entries) for any new depth

Because it learns a **distribution over functions** rather than just fitting parameters, it excels at interpolation from extremely small datasets.

**📈 Why CNP (instead of SIREN, GP, or plain regression)?**

| **Criterion** | **Plain Poly Fit** | **Gaussian Process** | **SIREN/MLP** | **CNP** |
| --- | --- | --- | --- | --- |
| Data needed | ≥3 (exact for 5 pts) | ≥3 (exact) | ≫5 | ≈5 |
| Over‑fit risk | None (exact) | Low | Very high | Low |
| Continuous smoothness | ✔ | ✔ | Depends | ✔ |
| Uncertainty estimate | ✘ | ✔ | ✘ | ✘ (but ANP would) |
| Novelty (paper‑worthy) | Low | Medium | Low | High |

**📚 Academic pedigree**

* **Conditional Neural Processes** (Garnelo et al., NeurIPS ’18)
* **Attentive Neural Processes** (Kim et al., ICML ’19) — adds self‑attention for richer context aggregation

Your script implements the **simpler CNP** (no attention) because:

* It’s **easiest to code from scratch**
* It reliably interpolates with just five points
* It demonstrates the core NP idea (few‑shot continuous mapping) in under 200 lines

Yes you used a Conditional Neural Process exactly as the paper describes, albeit in its simplest deterministic form.

Formulations:

A screenshot of a computer program

AI-generated content may be incorrect.

A screenshot of a black screen

AI-generated content may be incorrect.

A black background with white text

AI-generated content may be incorrect.

A screenshot of a computer

AI-generated content may be incorrect.