



Reconstructing Vehicles from a Single Image

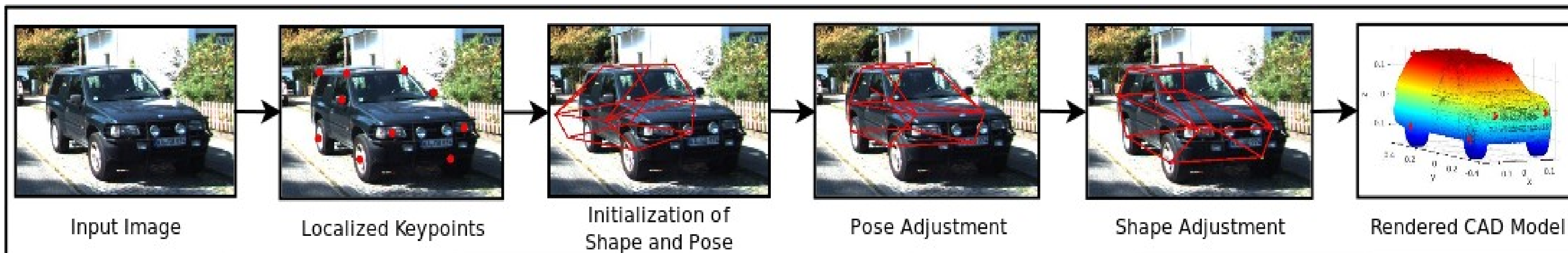
Objective (Ill posed!)



Input : RGB image of a car

Output: 3D Pose and Shape

Proposed Pipeline

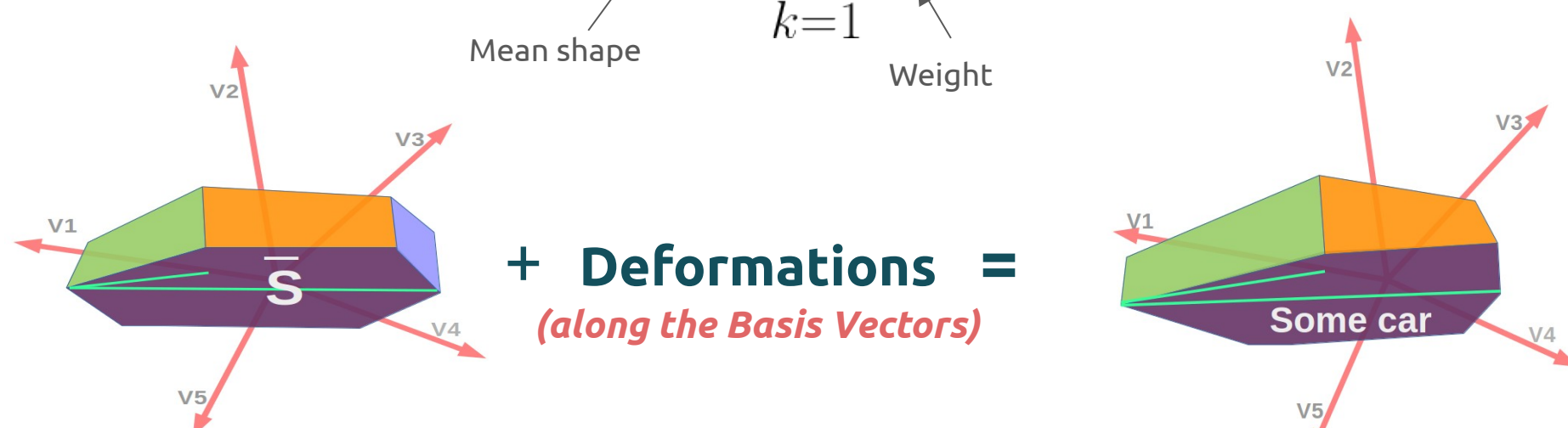


Shape Priors

A **mean shape** and a set of **deformation basis vectors** constitute the learnt shape prior.

$$\text{Object shape} \rightarrow S = \bar{S} + \sum_{k=1}^K \lambda_k V_k$$

Mean shape Number of basis shapes Basis shape Weight



Shape-Aware Adjustment:

We use several constraints and define a nonlinear least squares problem that recovers shape (lambdas).

Constraints that we use

Keypoint reprojection error

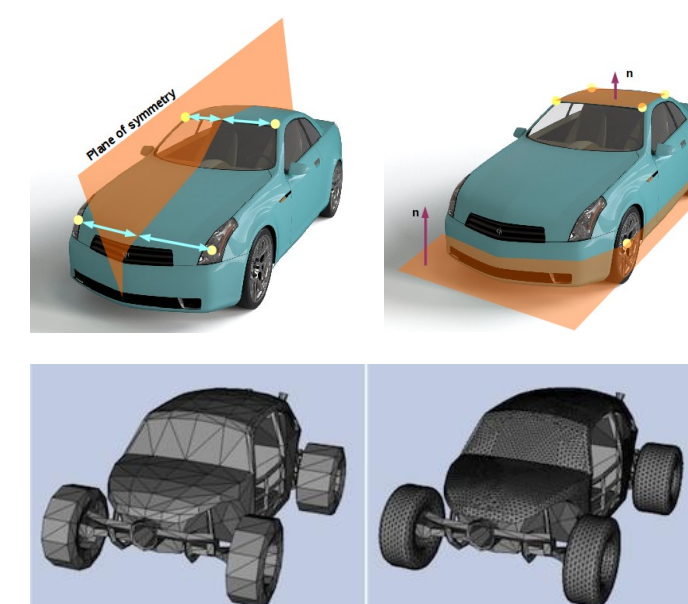
Planarity

Symmetry

Regularizers

Dimension Priors

Laplacian Mesh Smoothing



Deep learning helps

- We train a deep, fully convolutional regressor to predict a set of discriminative **keypoints**, given an image.

