Taskonomy

Concept

- Relationships between different computer vision tasks.
- Currently tasks are being siloed, they are tackled separately.
- Tasks live in a space of tasks from which we can ‘sample’.
- What are the relationships between the tasks?

Taskonomy: Computes an affinity matrix of whether one task has the statistics required to complete another task.

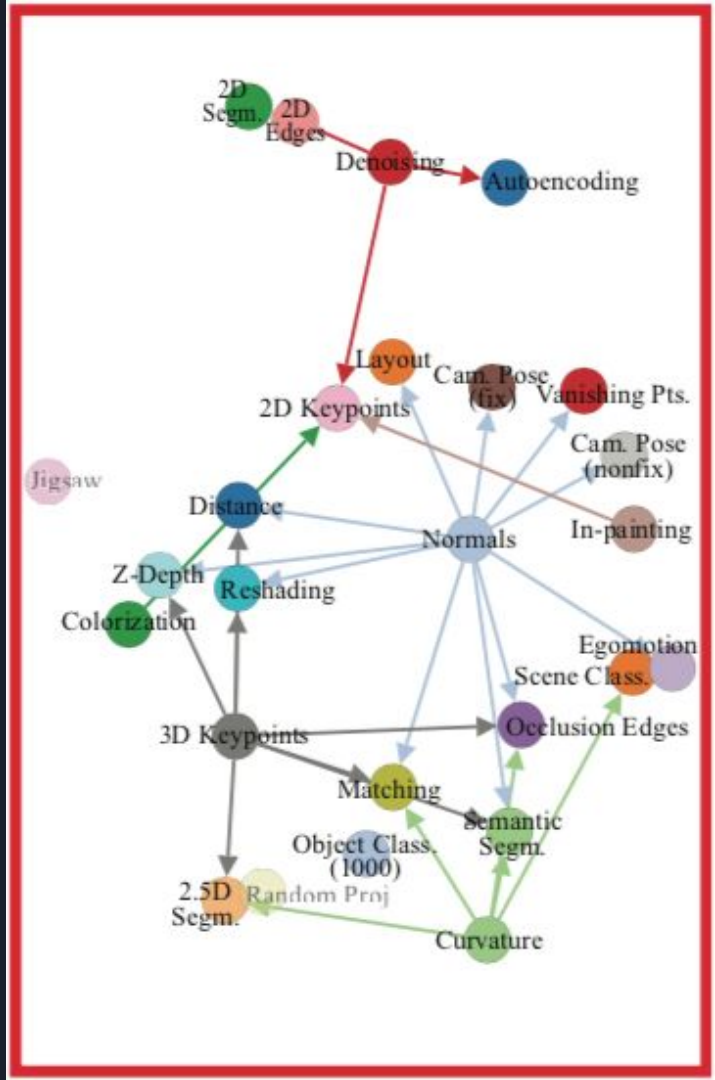
Why is this useful?

- Reduction of data requirements by approximately ⅔
- A model aware of the relationships between tasks demands less supervision/computation and behaves more predictably.
- Unofficially, performs on par or close to state of the art task specific models.

Taskonomy

By Zamir et al. (2018)

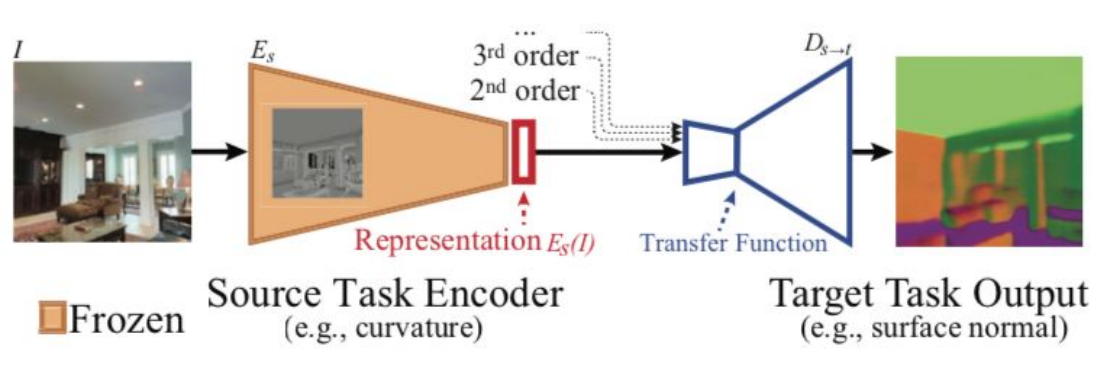
Taskonomy is a computationally found directed hypergraph that captures the notion of transferability over any given task dictionary.



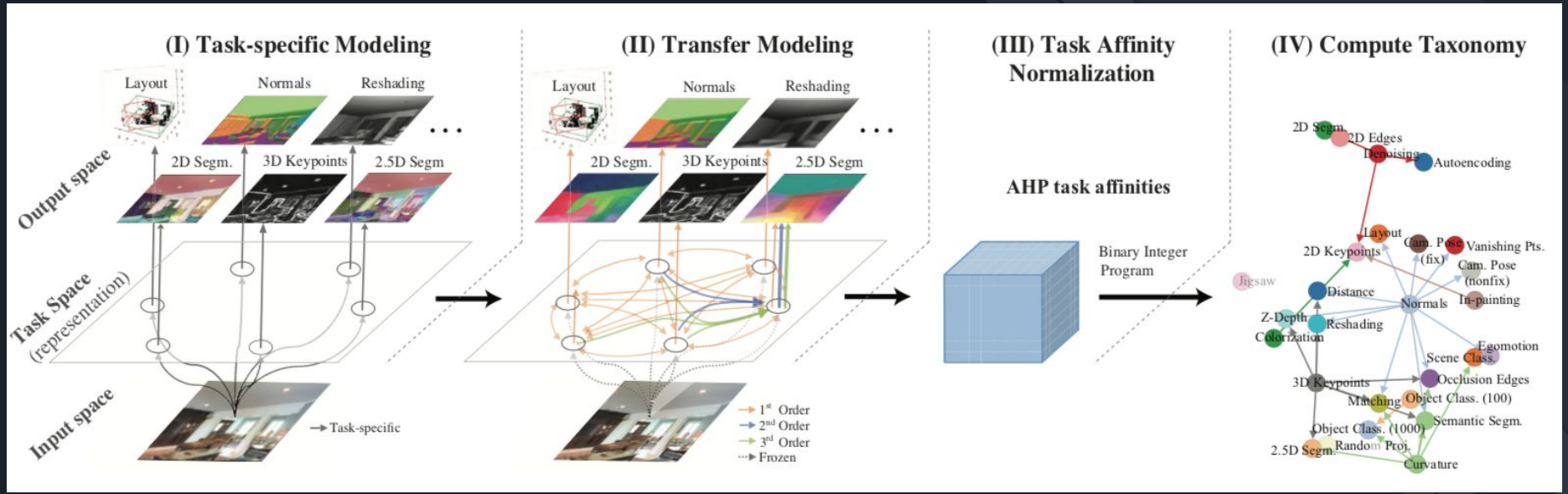
More formally.

Maximize the collective performance on a set of tasks T s.t. computational budget γ.

The number of tasks that can be trained (**source tasks**) is defined as **S.**



Taskonomy Steps



Training Task specific models

- Define a dictionary of tasks
- Use the same encoder-decoder architecture for all tasks
- Train

Transfer Modelling

- Learn a readout function for target tasks.

$$D_{s \to t} := \arg\min_{\theta} \mathbb{E}_{I \in \mathcal{D}} \left[L_t \left(D_\theta \left(E_s(I) \right), f_t(I) \right) \right]$$

- A successful transfer has all of the statistics necessary for the target task

Normalization

- Different loss functions for each task.
- Loss functions live in different spaces. How to normalize this?
- Paper uses Analytic Hierarchy Process