Constraint based learning

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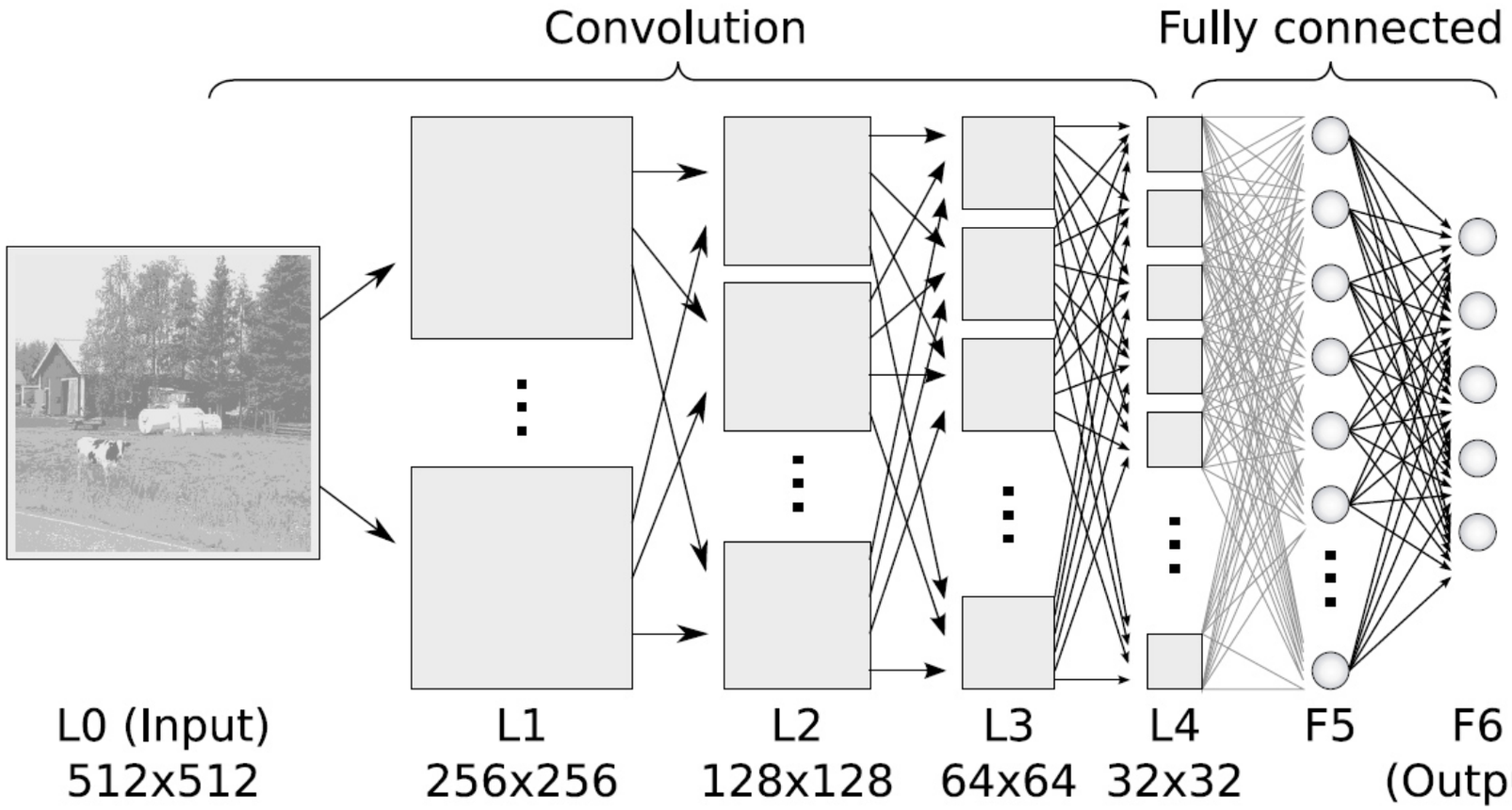
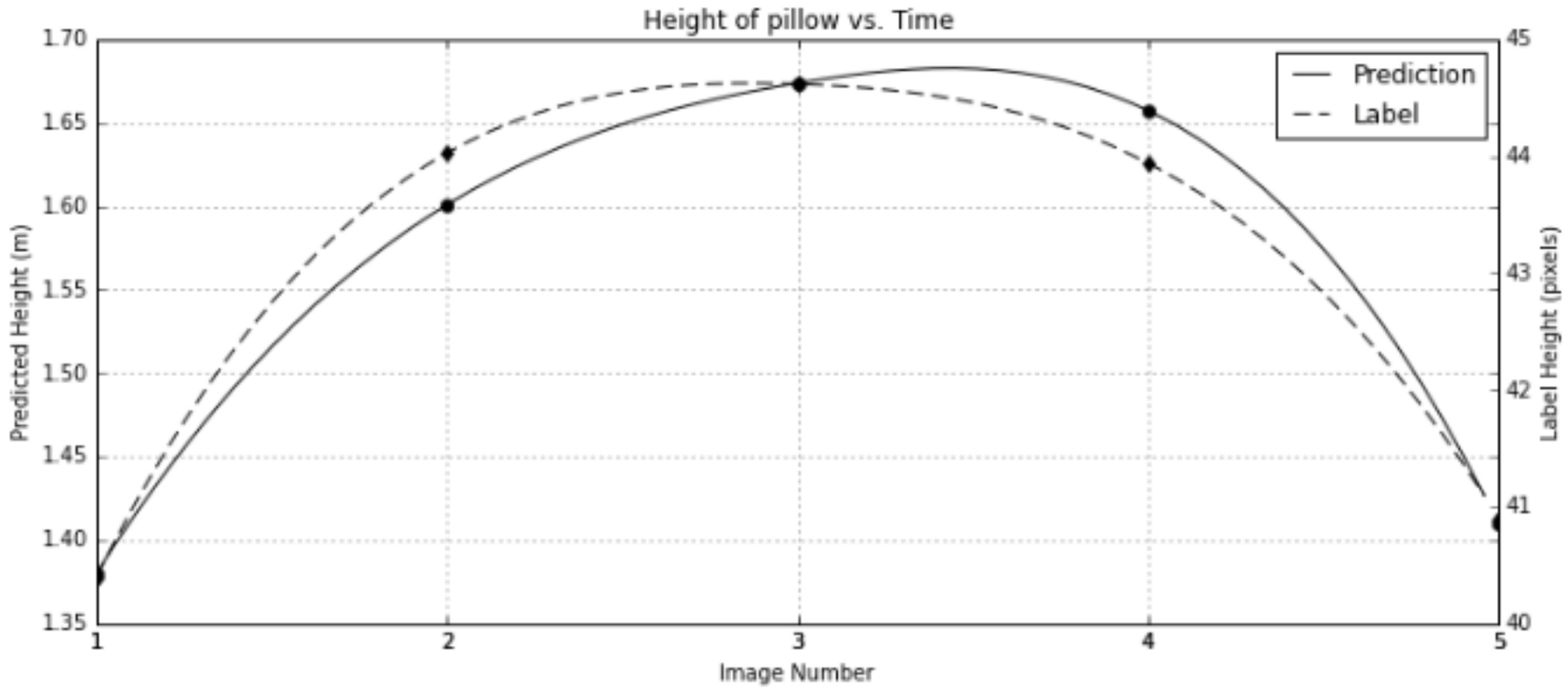
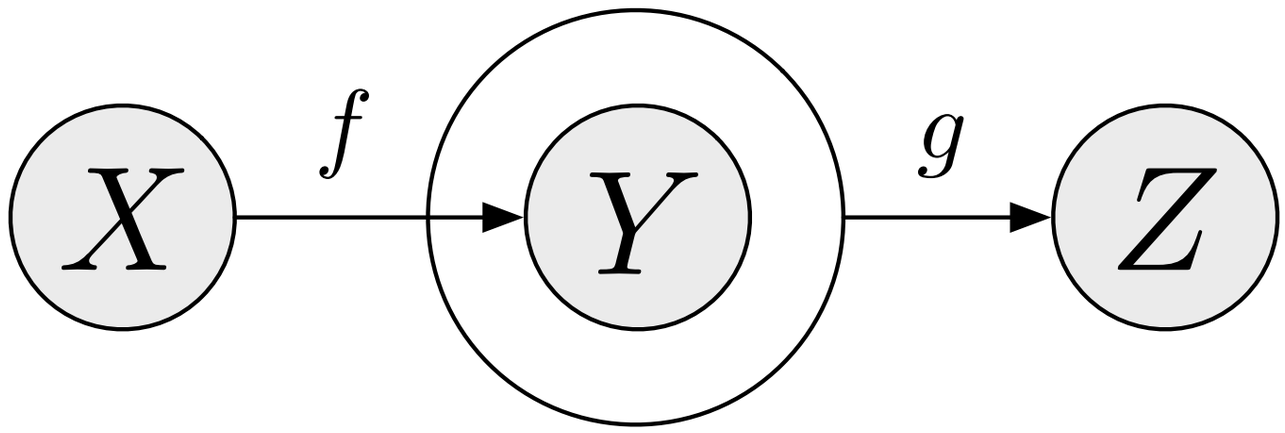


- f : Image -> Real number(s)
- Parameters are optimized over
- Features are optimized over
- Collect many, many label pairs $(x_i, y_i) \rightarrow f(x_i) = y_i$



- Train neural net to predict pillow height in each image
- $y = y_o + v_o * t + 9.8t^2$
- no labels required

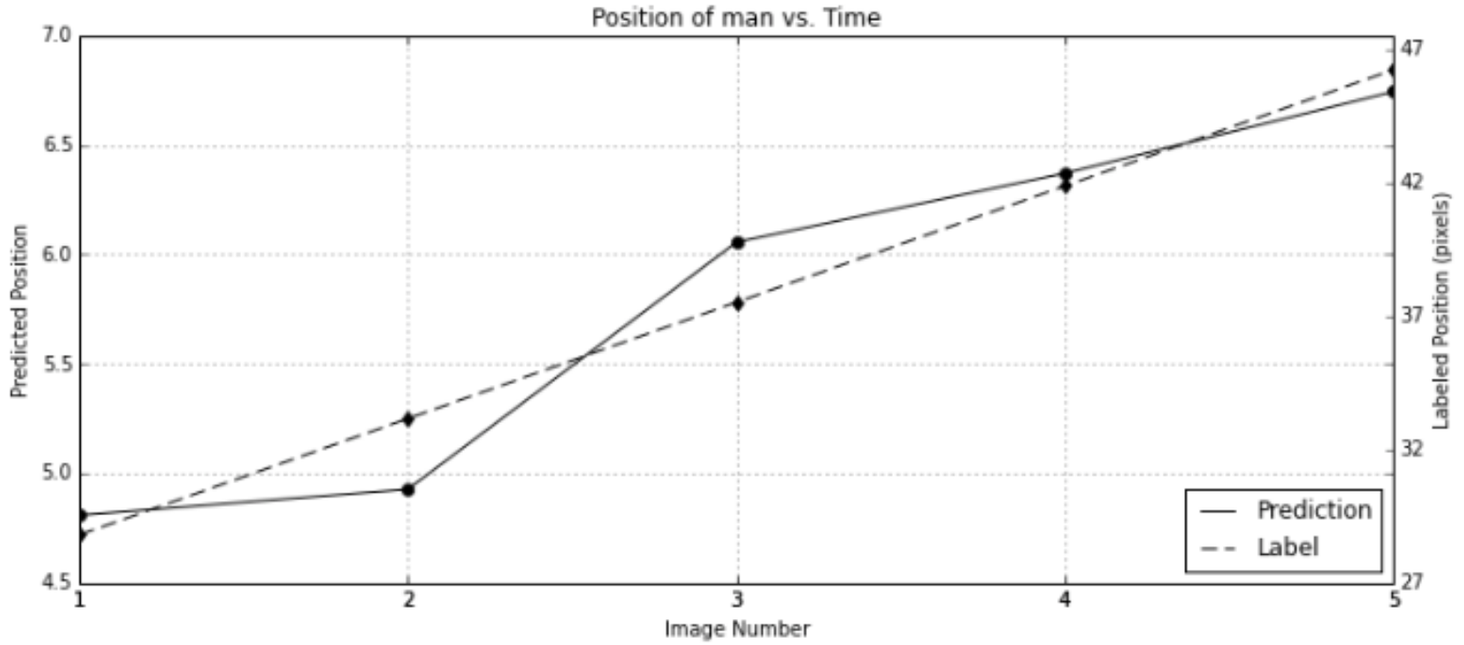
Constraint based Learning



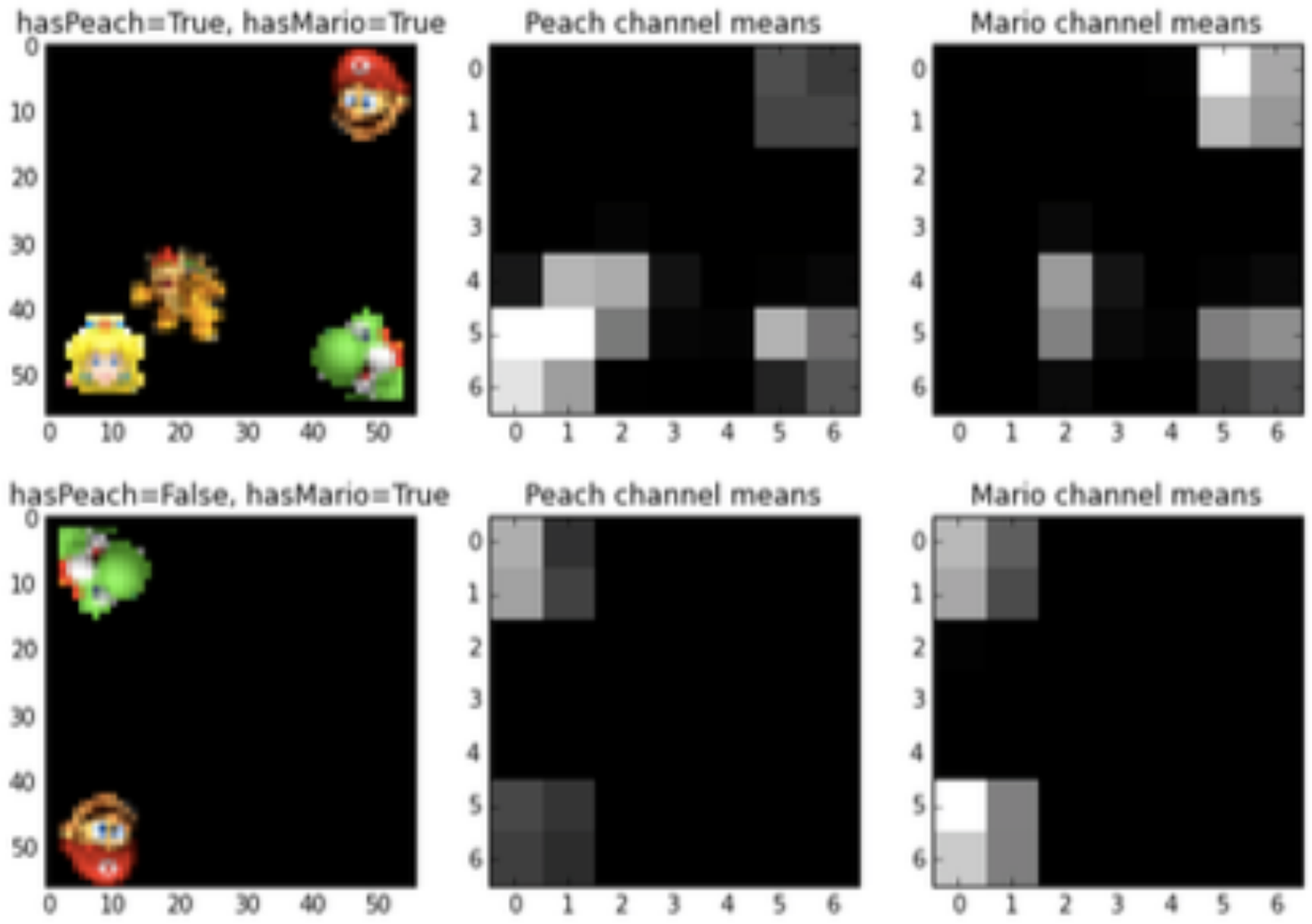
Goal is to recover the transformation, f, without providing labels, y. Instead, use prior knowledge to describe the structure, z, of the outputs, and require

$$f(x) \in g^{-1}(z)$$

We explore cases where g is necessary, but not sufficient.



- Train neural net to predict horizontal position in each image
- $h = h_o + v_o * t$
- Unfortunately, this is solved trivially by $f(x) = c$
- We boost variance and limit range



- Train neural net to find two objects, y_1, y_2, such that $y_1 \Rightarrow y_2$
- Add sufficiency constraints, including rotational invariance, high entropy

Future Ideas

- Constraints based on PDEs (temperature equation, wave equation)
- Constraints based on gravitational laws in space
- Have system guess physics and then test for convergence