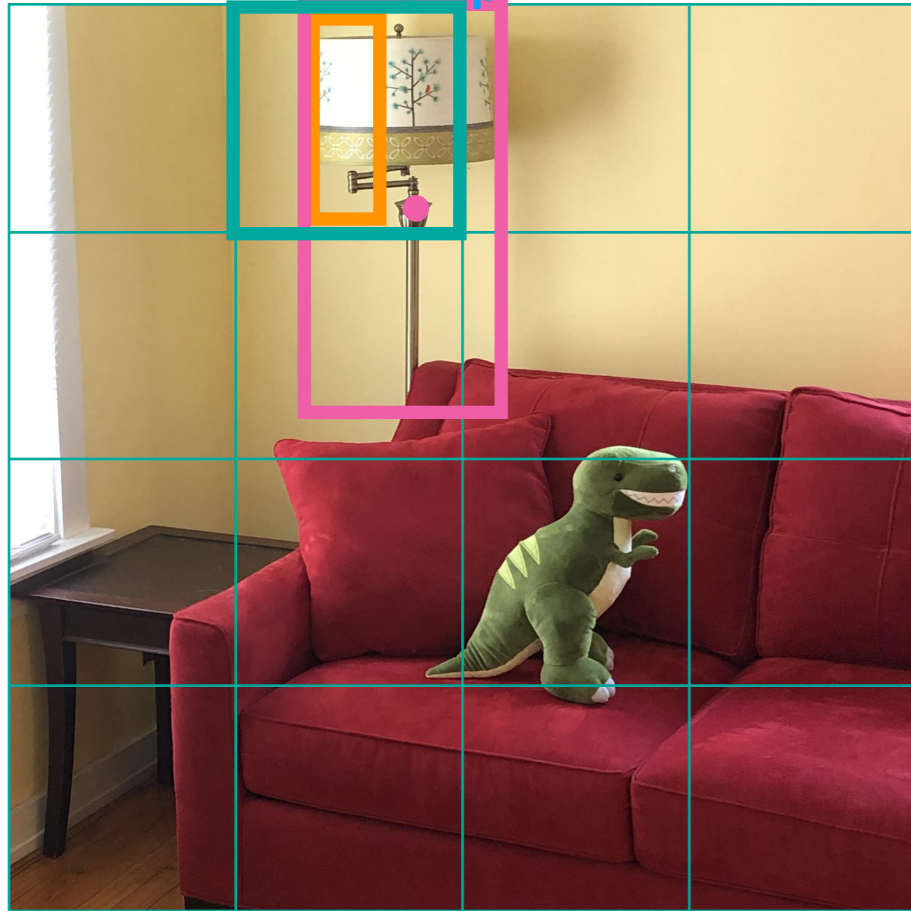


Parameterization of Location

Lamp



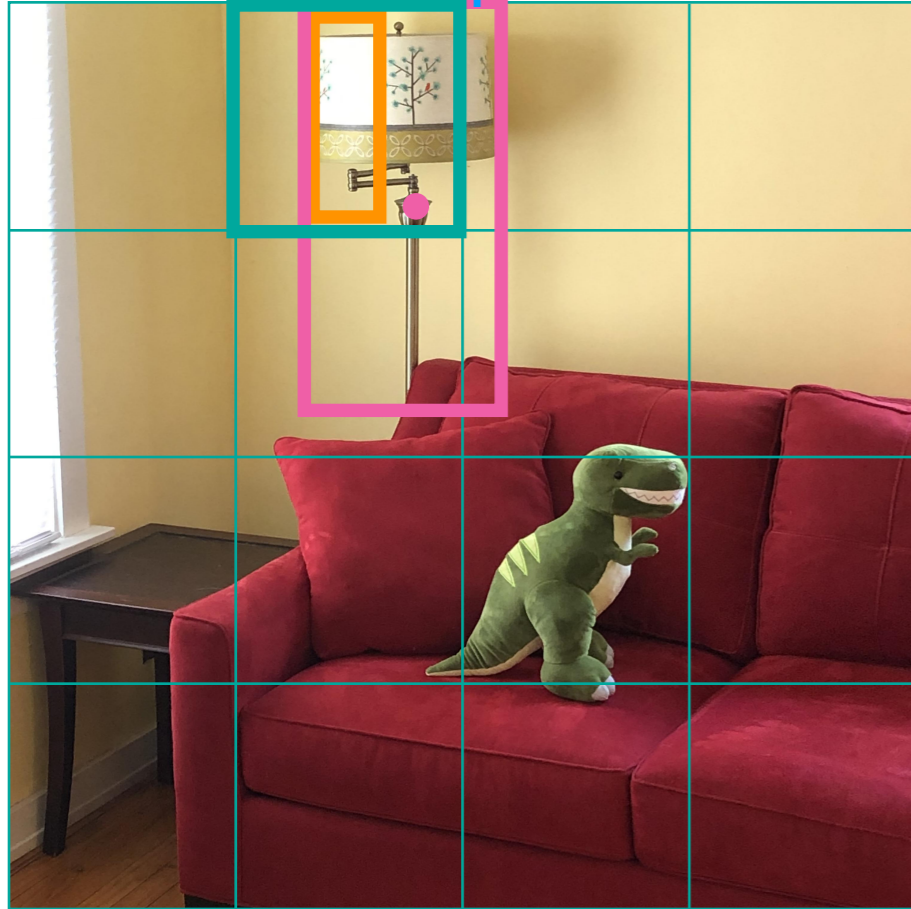
Location Specification:

If there is an object, what is the object's **location**?

- $y = (b_x, b_y, b_w, b_h) = (0.8, 0.9, 3.0, 1.8)$
- Center coordinates are specified in coordinates relative to this **cell**
 - Top left corner of cell is (0, 0), lower right corner of **cell** is (1, 1)
 - Maybe center (pink point) is at $(0.8, 0.9)$ relative to **cell**
- Box width and height are multiples of **anchor box** width and height
 - Maybe width and height are $(3.0, 1.8)$ times that of the **anchor box**

Parameterization of Location

Lamp



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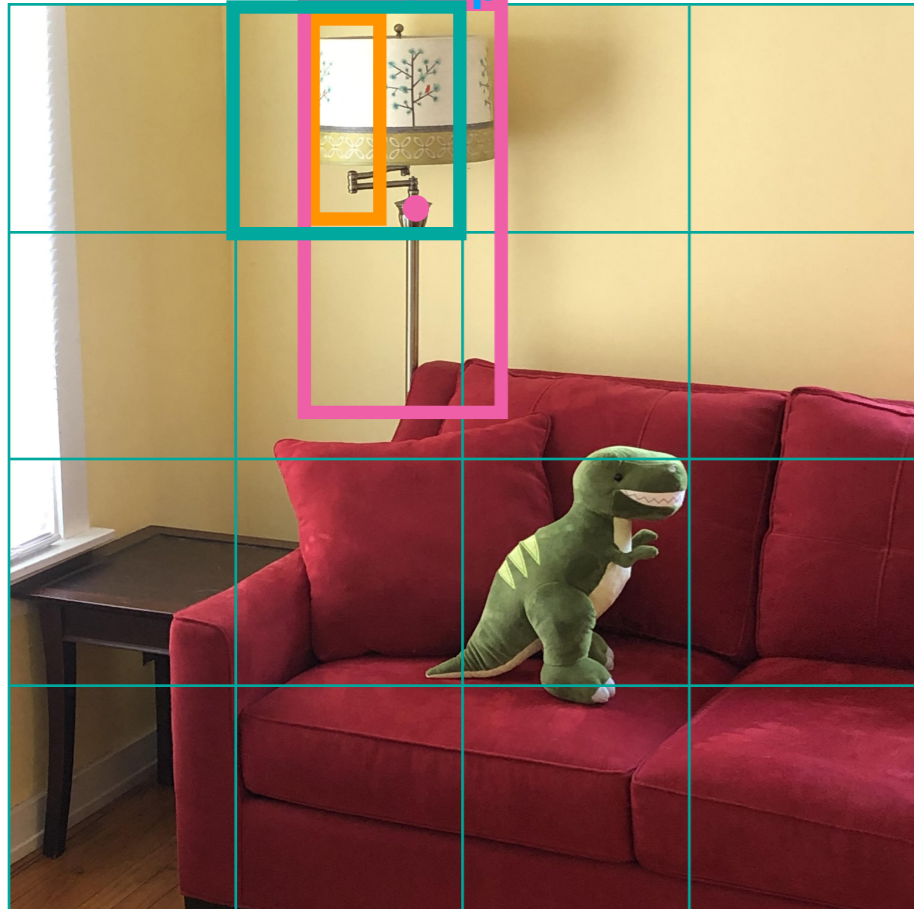
Parameter Constraints:

The parameters (b_x, b_y, b_w, b_h) must satisfy the following constraints:

- Center point must fall within cell
 - $0 < b_x < 1$ $0 < b_y < 1$
- Width and height must be positive
 - $0 < b_w$ $0 < b_h$

Parameterization of Location

Lamp



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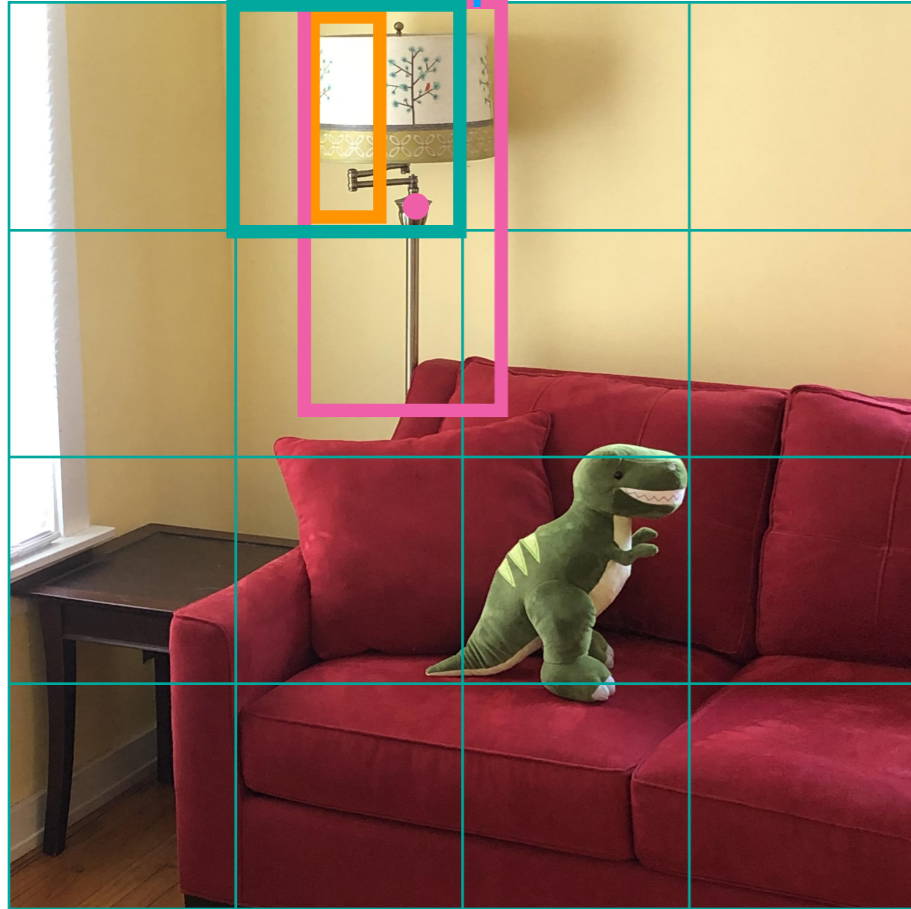
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Enforce Constraints with Transformations:

- Neural network outputs (a_x, a_y, a_w, a_h)
- Set $b_x = \text{sigmoid}(a_x)$ $b_y = \text{sigmoid}(a_y)$
- Set $b_w = \text{exp}(a_w)$ $b_h = \text{exp}(a_h)$

Parameterization of Location

Lamp



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Loss Function Doesn't Change:

- Still use mean squared error loss based on (b_x, b_y, b_w, b_h)