Bootstrapping Top-down Information for Self-modulating Slot Attention

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POSTECH

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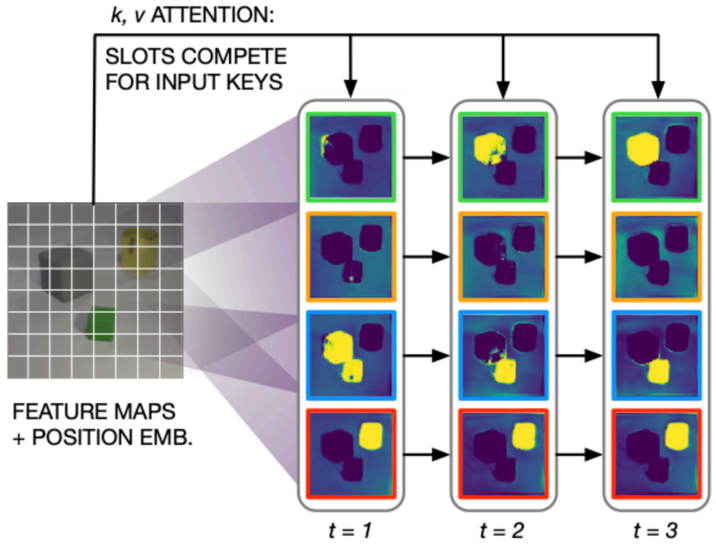
Task: Object-centric learning

What is object-centric learning?

- Task of learning representations of individual objects from visual scenes without manual labels
- Slot-attention: compute per-object representations (slot) through clustering-like attention

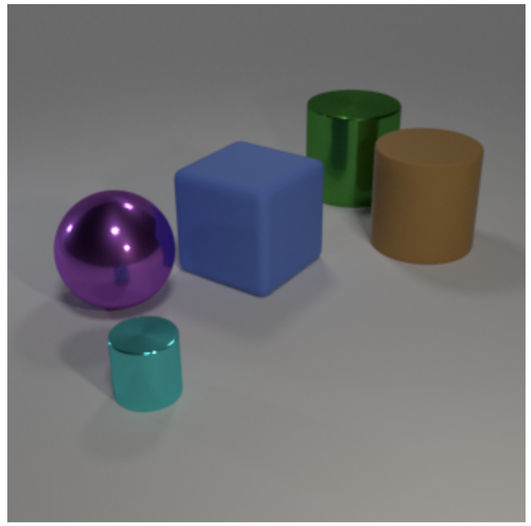


Object-Centric Learning with Slot Attention, NeurIPS 2020

Motivation: Incorporating top-down approaches

Conventional OCLs are bottom-up methods

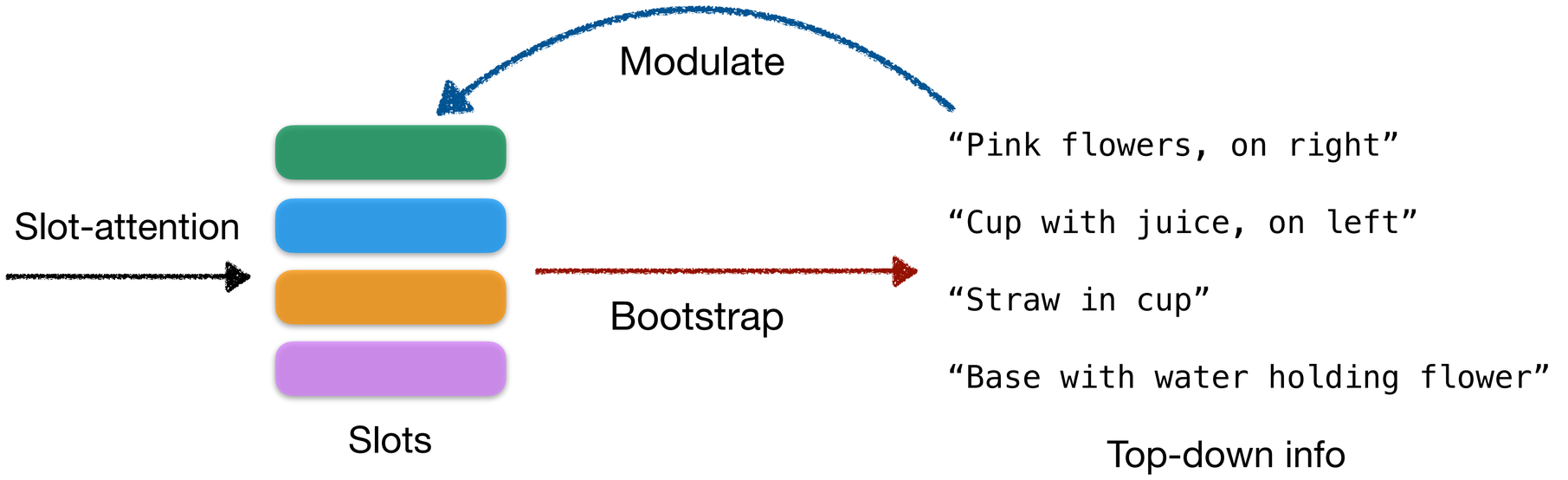
- Slot attention can be considered as a ***bottom-up*** method; it relies on aggregating features without high-level semantic information.
- It assumes that features within an object are homogeneous & can be clustered.
  - But this does not always hold for the real-world images



Motivation: Incorporating top-down approaches

Can we bootstrap top-down info, and then use it to modulate model?

- Incorporating top-down information can fix the issue
  - Problem will be much easier if we can provide model about the semantic information or rough location of each object



Bootstrapping top-down information

- During training, the codebook of slots is learned together using vector quantization.
  - Codebook learns to store distinct semantic patterns, where each code can act as automatically discovered top-down semantic information.

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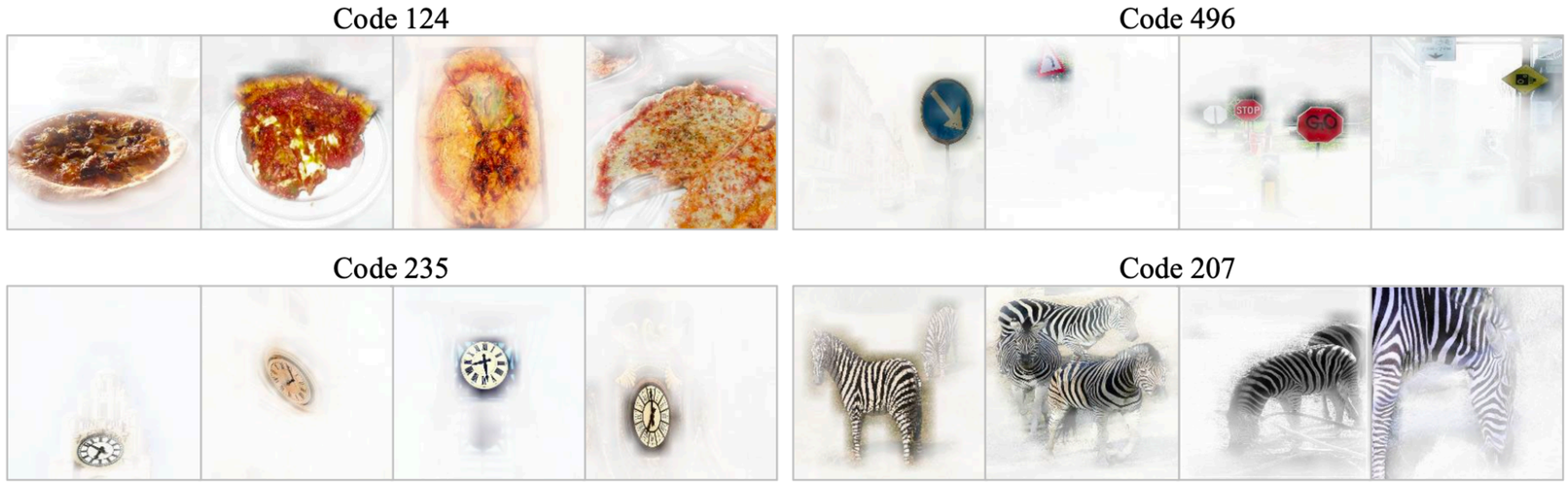
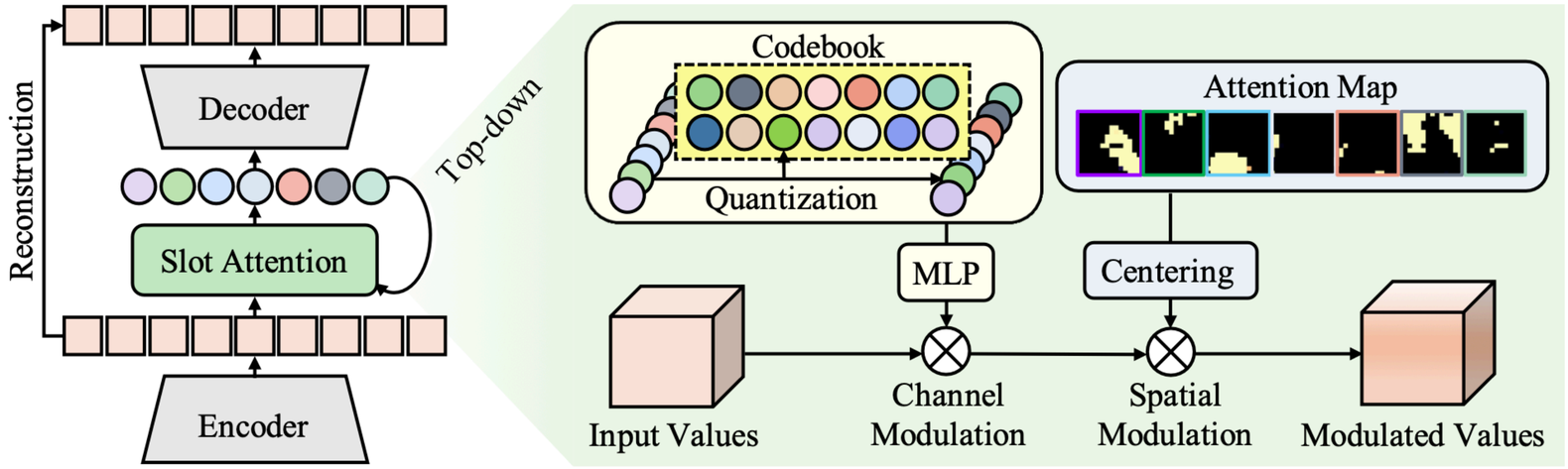


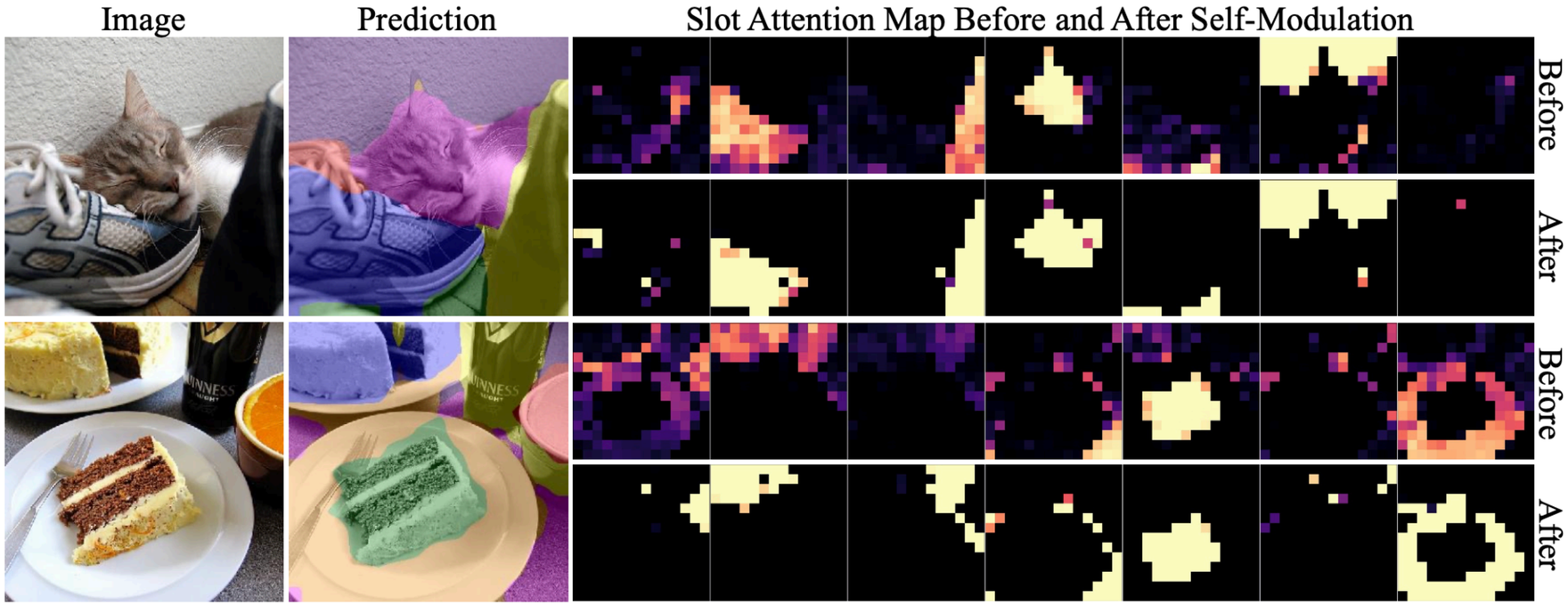
Self-modulating slot attention

- Using bootstrapped top-down information, input value of the slot attention is modulated.
  - The modulation guides the update of the slots, by prioritizing visual features relevant to top-down information



Results

- Our proposed top-down pathway largely improved the quality of object-centric representation in the real-world images.



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