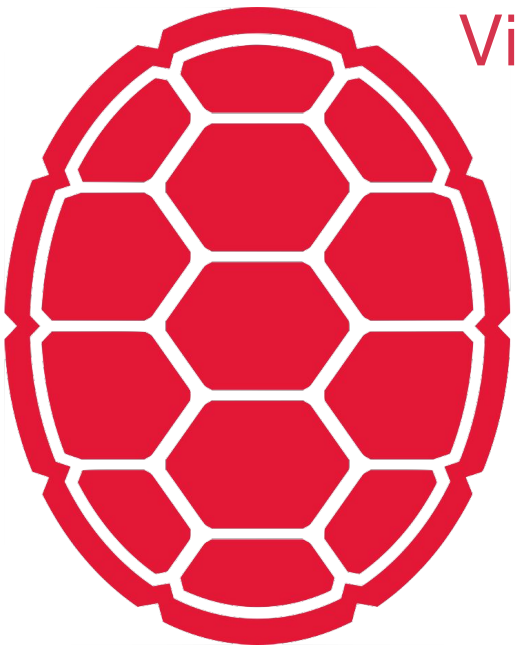

Vision–Language Models

Jordan Boyd-Graber

University of Maryland

Introduction / Foundations

Slides from Mohit Iyyer, Vicente Ordonez, Fei-Fei Li, Justin Johnson, and Jacob Andreas

Using Patches for Transformers

AN IMAGE IS WORTH 16X16 WORDS: TRANSFORMERS FOR IMAGE RECOGNITION AT SCALE

Alexey Dosovitskiy[*,†], **Lucas Beyer**[*], **Alexander Kolesnikov**[*], **Dirk Weissenborn**[*], **Xiaohua Zhai**[*], **Thomas Unterthiner, Mostafa Dehghani, Matthias Minderer, Georg Heigold, Sylvain Gelly, Jakob Uszkoreit, Neil Houlsby**[*,†]

[*]equal technical contribution, [†]equal advising

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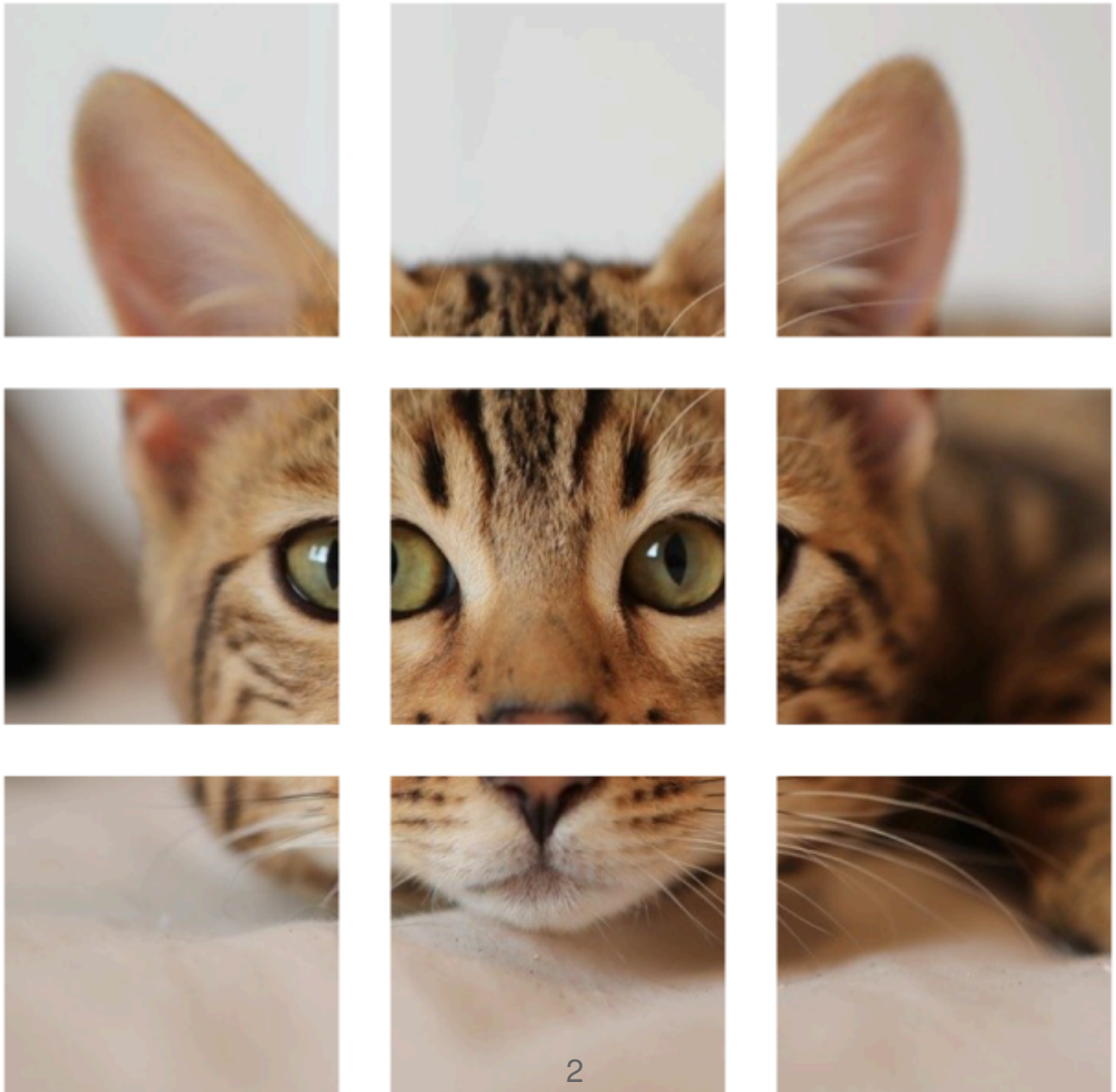
Using Patches for Transformers

Using Patches for Transformers



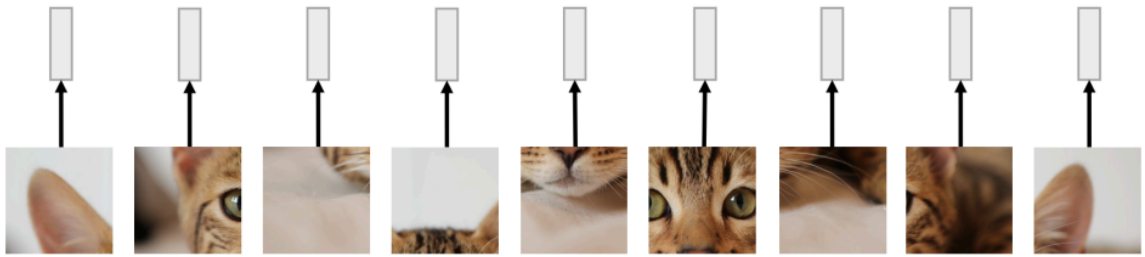
Using Patches for Transformers

N input patches, each of shape 3x16x16

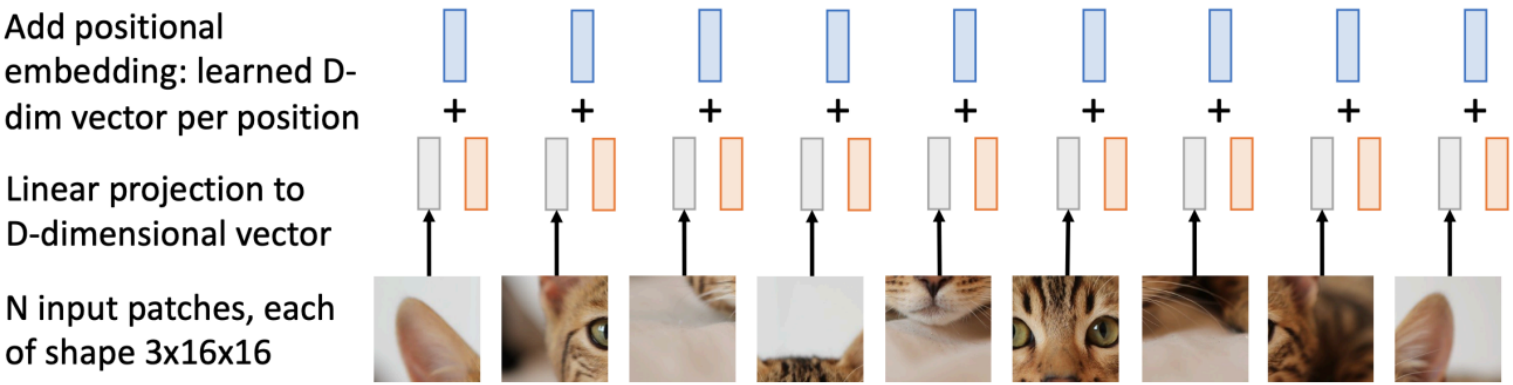
Using Patches for Transformers

Linear projection to D-dimensional vector

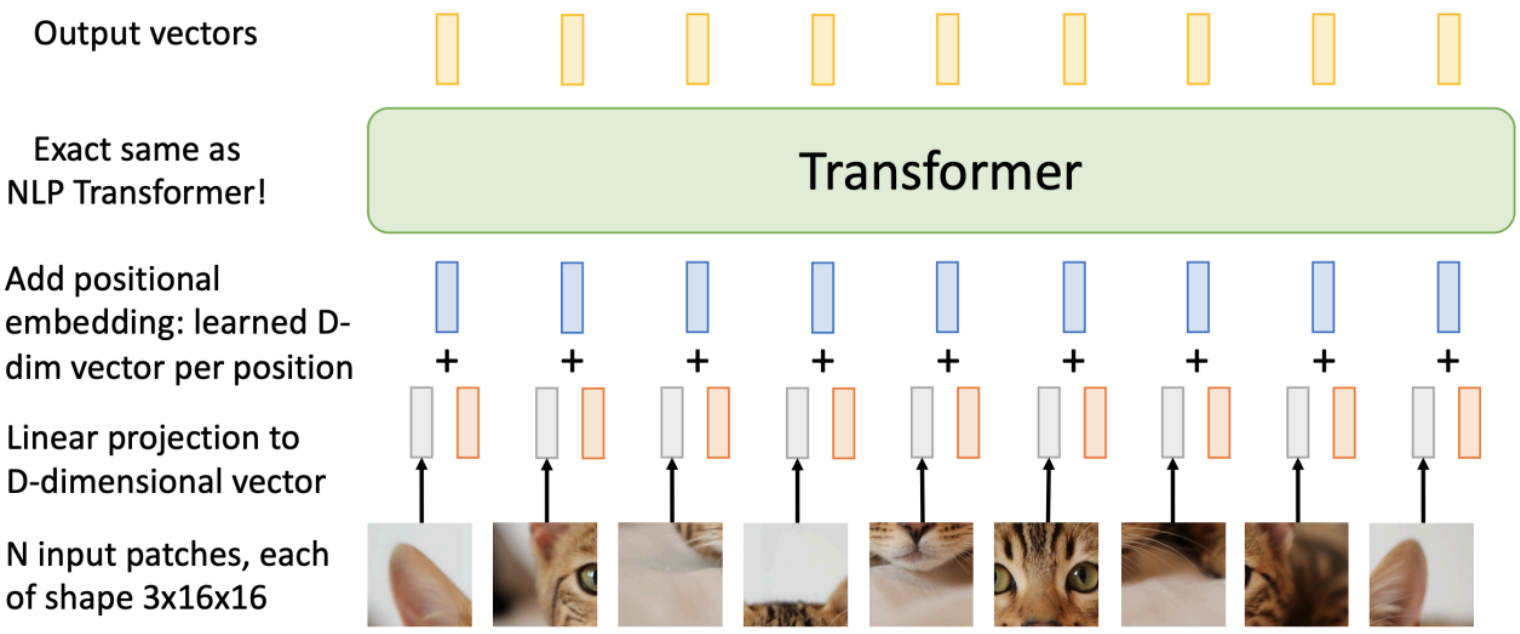
N input patches, each of shape 3x16x16



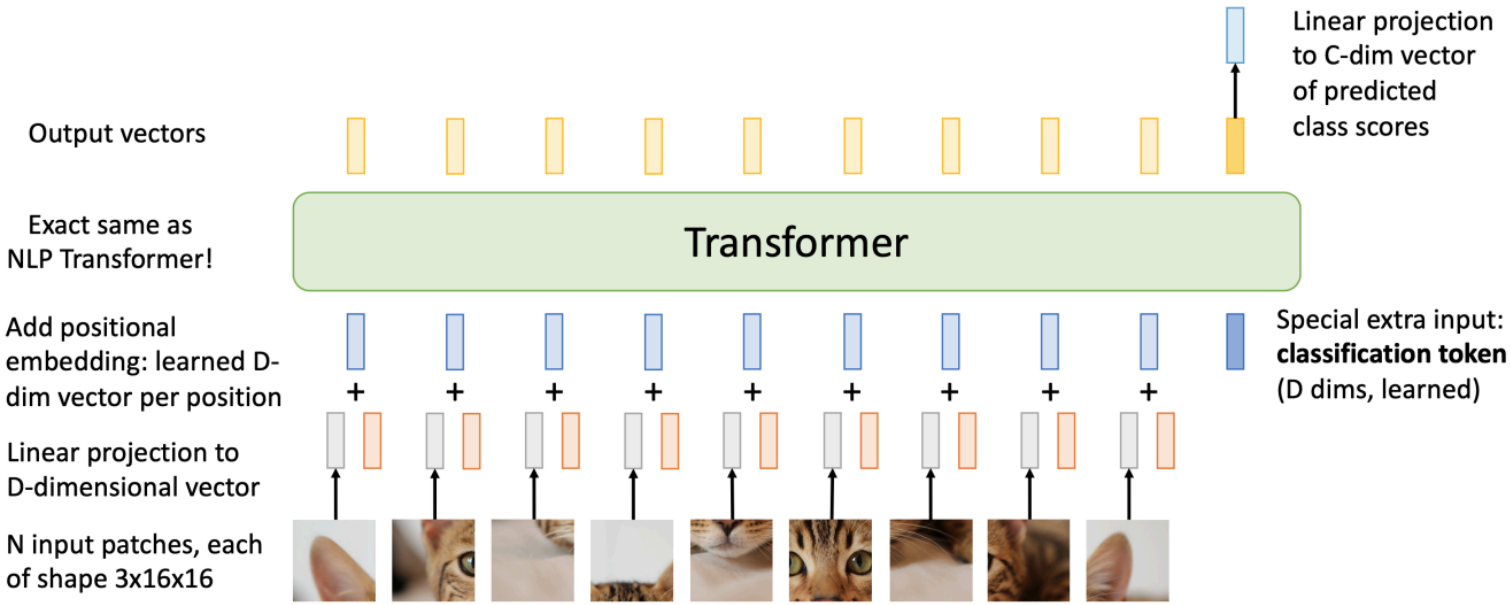
Using Patches for Transformers



Using Patches for Transformers



Using Patches for Transformers



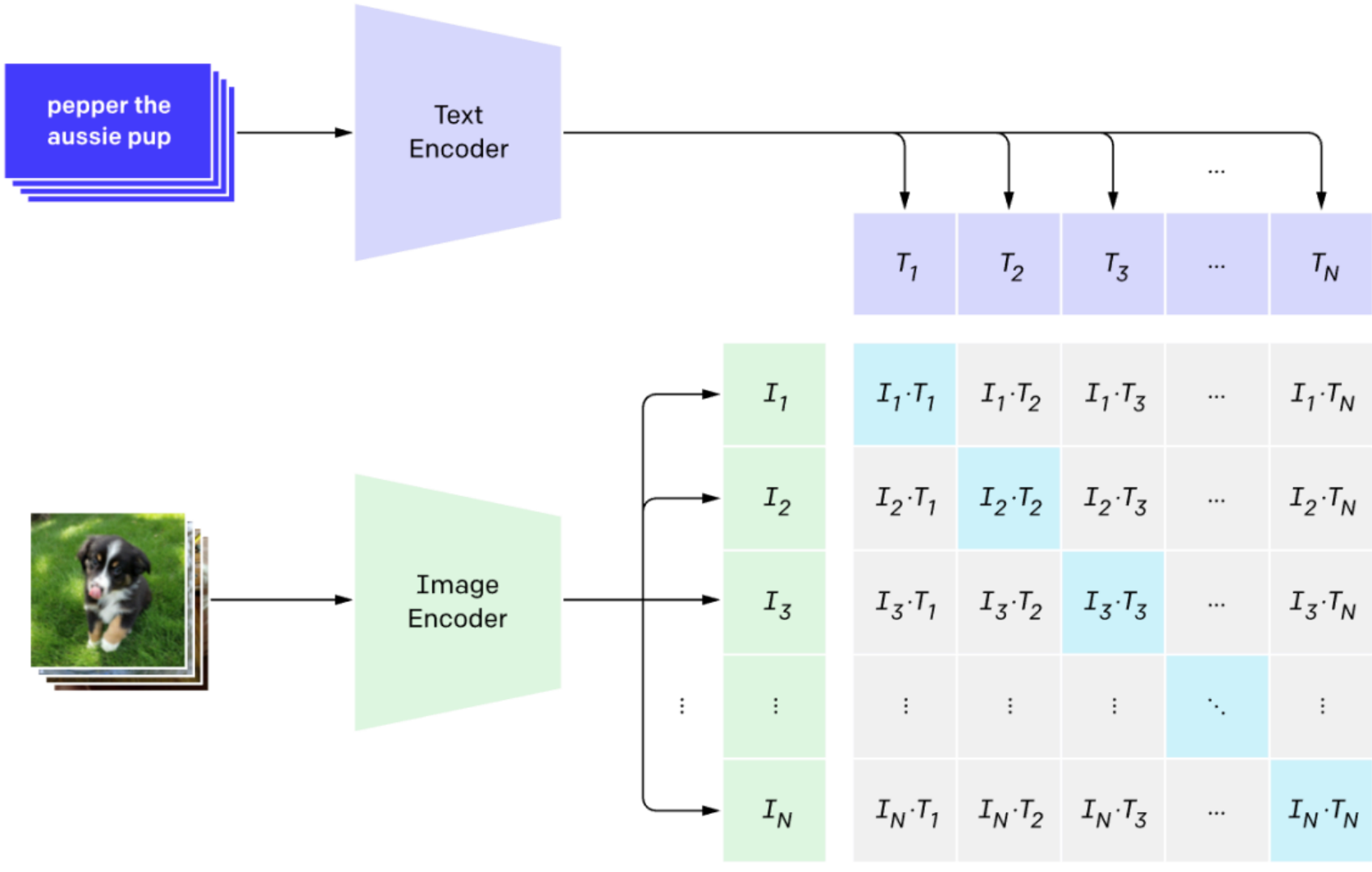
CLIP

Learning Transferable Visual Models From Natural Language Supervision

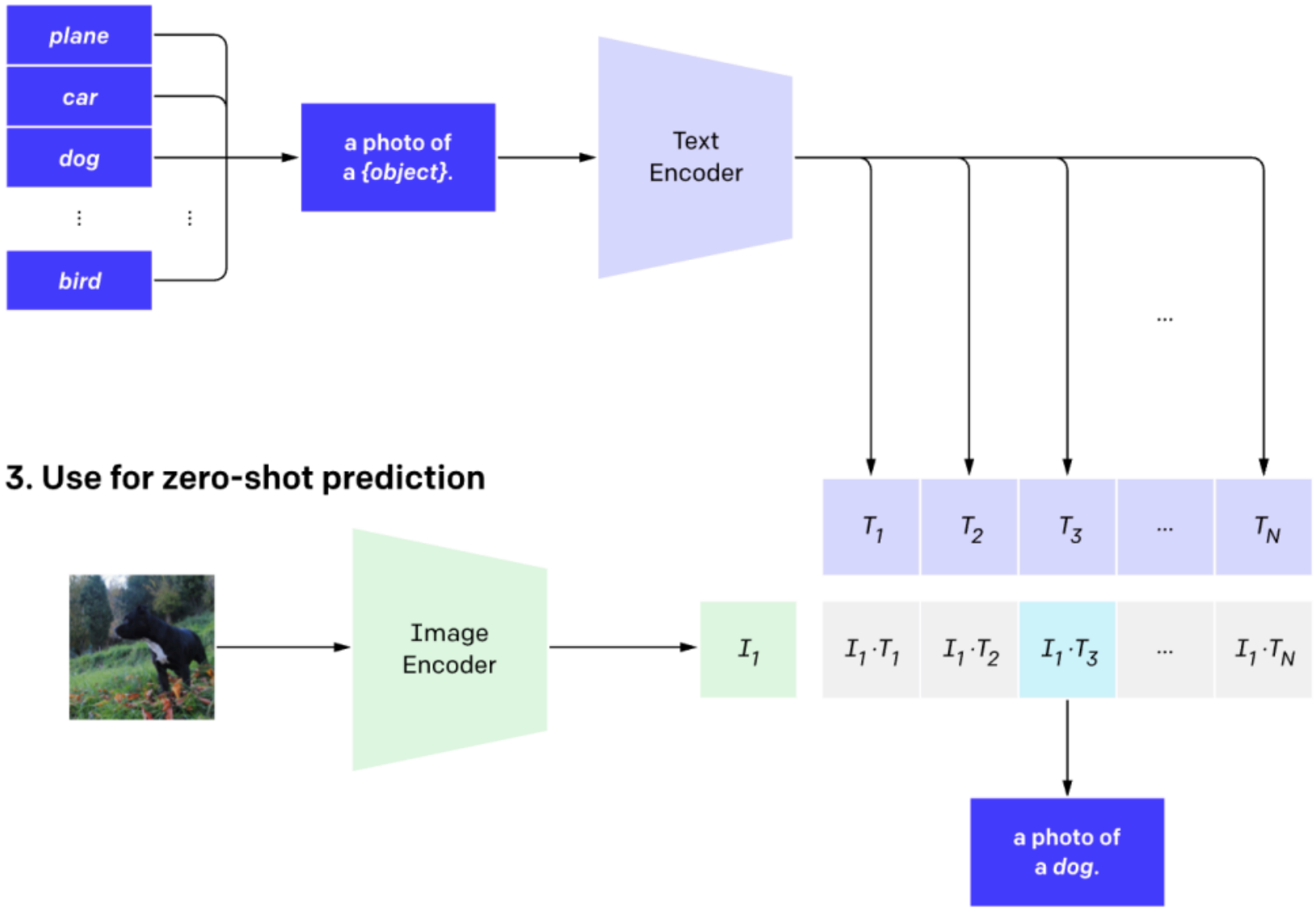
Alec Radford [*1] **Jong Wook Kim** [*1] **Chris Hallacy** [1] **Aditya Ramesh** [1] **Gabriel Goh** [1] **Sandhini Agarwal** [1]
Girish Sastry [1] **Amanda Askell** [1] **Pamela Mishkin** [1] **Jack Clark** [1] **Gretchen Krueger** [1] **Ilya Sutskever** [1]

- OpenAI collect 400 million (image, text) pairs from the web
- Then, they train an image encoder and a text encoder with a simple contrastive loss: given a collection of images and text, predict which (image, text) pairs actually occurred in the dataset

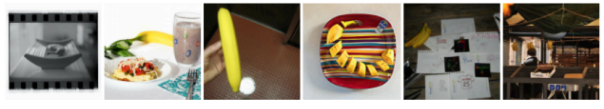
Joint Training



Joint Training



Joint Training

DATASET	IMAGENET RESNET101	CLIP VIT-L
 ImageNet	76.2%	76.2%
 ImageNet V2	64.3%	70.1%
 ImageNet Rendition	37.7%	88.9%
 ObjectNet	32.6%	72.3%
 ImageNet Sketch	25.2%	60.2%
 ImageNet Adversarial	2.7%	77.1%

Generating text is one thing, but what about image generation?

- Could do autoregressive model pixel by pixel (people have tried)
- But better to learn higher-order structure