

Yapay GörSEL Zekaya Doğru

Aykut Erdem



HACETTEPE
UNIVERSITY
COMPUTER
VISION LAB

5 Ekim 2018 – DeepCon'18



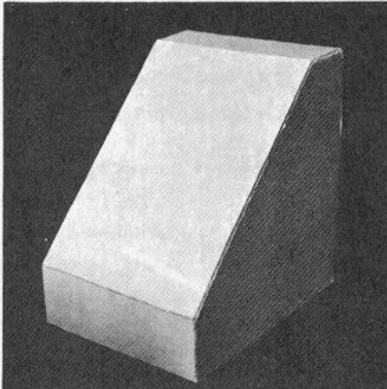
Görme

"Görmek ne anlama geliyor? Düz adamın cevabı (ve Aristo'nun da), baktığımızda neyin nerede olduğunu bilmek. Başka bir deyişle, görme, dünyada mevcut olan şeylerin ve bunların konumlarının görüntülerden keşfedilme sürecidir."

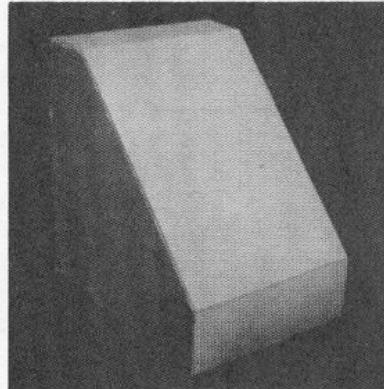
[Marr, 1982]

Görsel: The Sense of Sight (Annie Louisa Swynnerton, 1895) 2

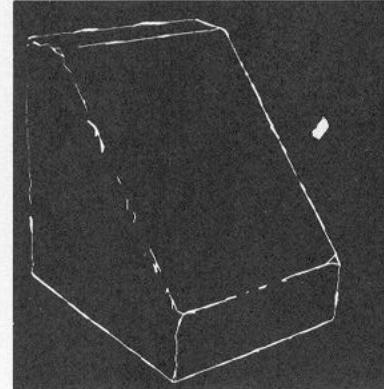
Bilgisayarla Görme Konusunda Yapılan İlk Doktora Tezi (1963)



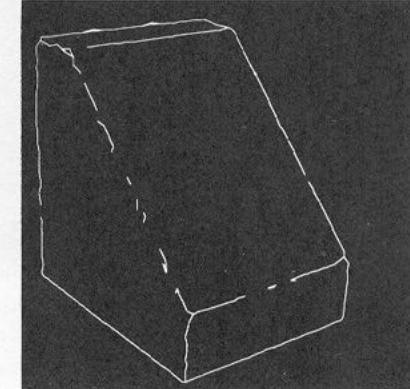
(a) Original picture.



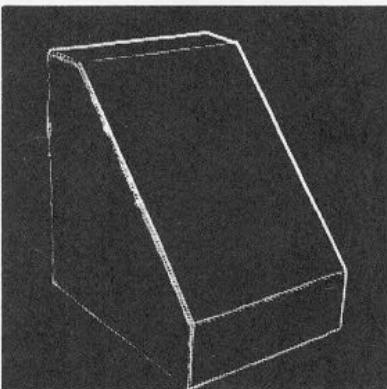
(b) Computer display of picture
(reflected by mistake).



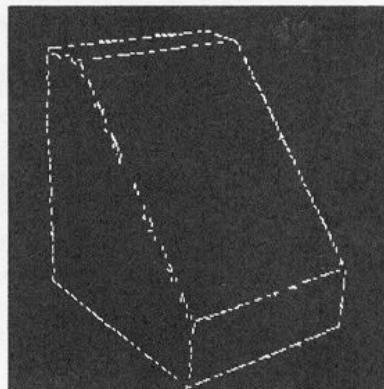
(e) Connected feature points.



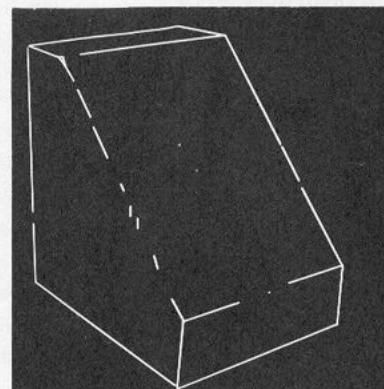
(f) After complexity reduction.



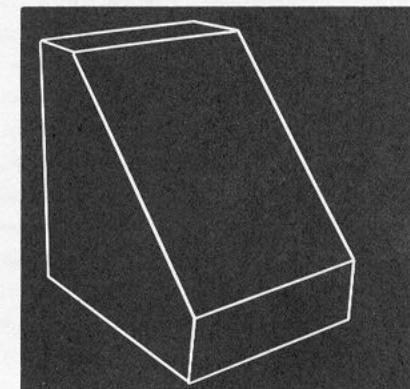
(c) Differentiated picture.



(d) Feature points selected.



(g) After initial line fitting.



(h) Final line drawing.

- Machine perception of three-dimensional solids [Roberts, 1963]

Görme Yaz Projesi (1966)

Genel Hedefler:

ŞEKİL-ZEMİN ANALİZİ.

Verilen bir resmi,
muhtemel nesneler, arka
plan alanları ve
gürültü gibi bölgelere
ayırmak.

BÖLGE TANIMLAMA.

Şekil ve yüzey
Özelliklerinin analizi.

NESNE TANIMA.

Nesneleri, bilinen
nesneler kümesiyle
eşleştirip
isimlendirme.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
PROJECT MAC

Artificial Intelligence Group
Vision Memo. No. 100.

July 7, 1966

THE SUMMER VISION PROJECT

Seymour Papert

The summer vision project is an attempt to use our summer workers effectively in the construction of a significant part of a visual system. The particular task was chosen partly because it can be segmented into sub-problems which will allow individuals to work independently and yet participate in the construction of a system complex enough to be a real landmark in the development of "pattern recognition".

[Papert 1966]

Görme, insanlara neden kolay görünür?

- Beynimiz görme için uzmanlaşmıştır.
- Bir insan beynindeki korteksin ~%50'si görsel bilginin işlenmesi için ayrılmıştır.
(bkz. motor kontrol: ~%20-30,
dil: ~%10-20%)

Görsel Algı*:

540,000,000 yıllık veri

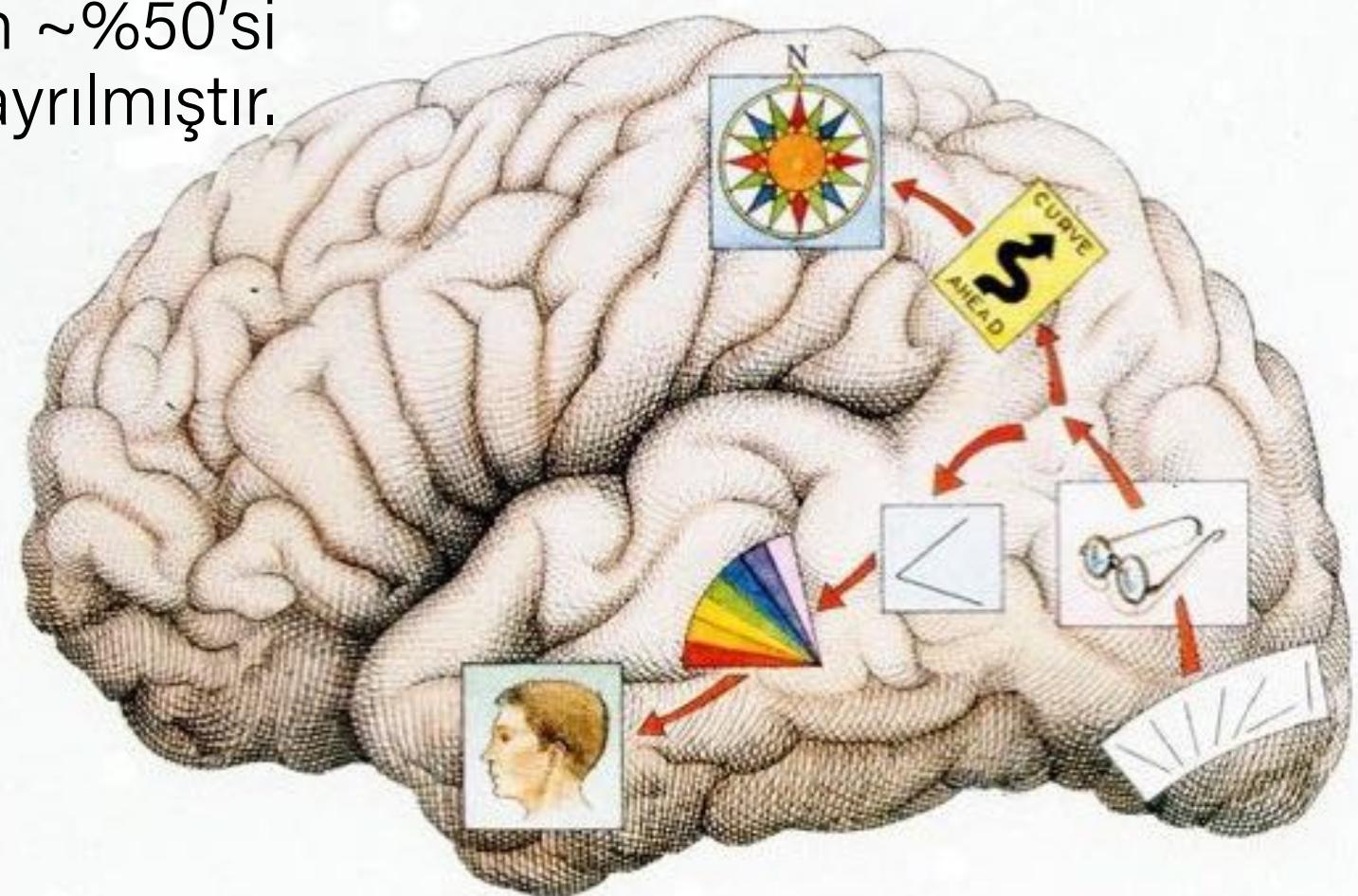
Bipedal Yürüme:

230,000,000 yıllık veri

Soyut Düşünce:

100,000 yıllık veri

*Renkli görme



Görme Neden Zor Bir Problem?

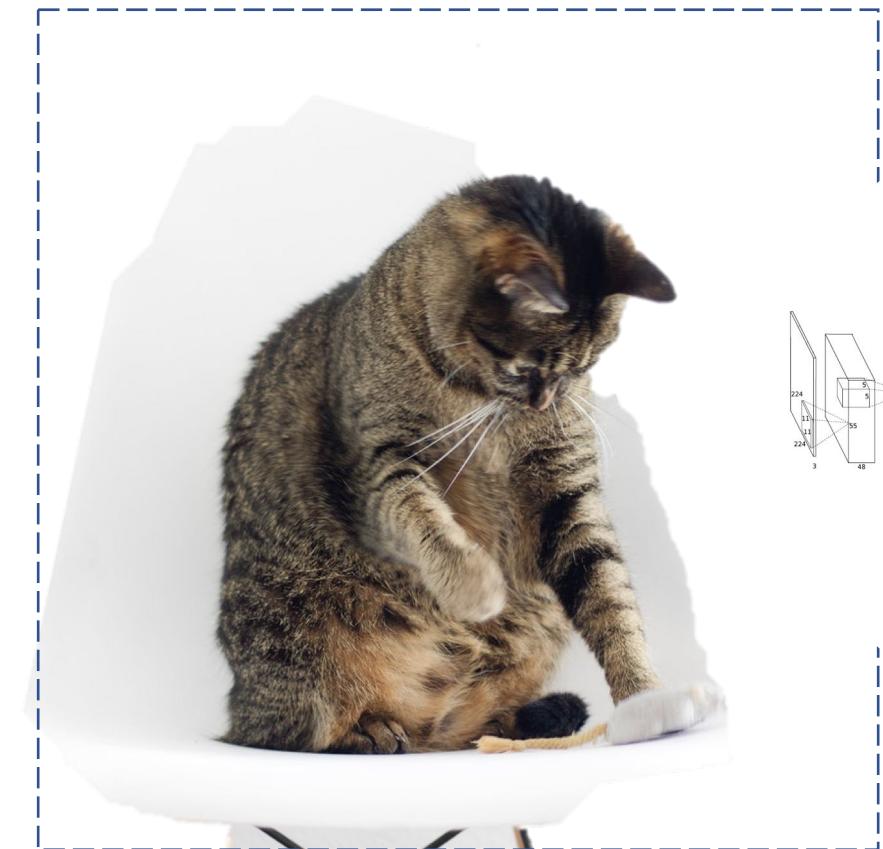


[132,
204,
158]

2012'de Ne Yaşandı?

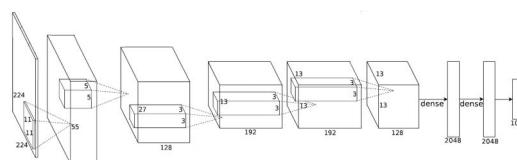
IMAGENET Large Scale Visual Recognition Challenge (ILSVRC)

- **1.2M** eğitim görüntüsü, **1K** farklı sınıf
- top-5 sınıflandırma hatası



Bir derin evrişimsel ağ (CNN) olan AlexNet'in başarısı

- 7 gizli katman (toparlama (pooling) katmanları hariç)
- 60M parametre



AlexNet

Kedi



- Y. LeCun, L. Bottou, Y. Bengio, and P. Haffner. Gradient-based learning applied to document recognition. Proceedings of the IEEE. 86 (11): 2278–2324, 1998.
- A. Krizhevsky, I. Sutskever, G.E. Hinton. ImageNet Classification with Deep Convolutional Neural Networks. NIPS 2012

2012'deki Takımlar	%Hata
Supervision (Toronto)	15.3
ISI (Tokyo)	26.1
VGG (Oxford)	26.9
XRCE/INRIA	27.0
UvA (Amsterdam)	29.6
INRIA/LEAR	33.4

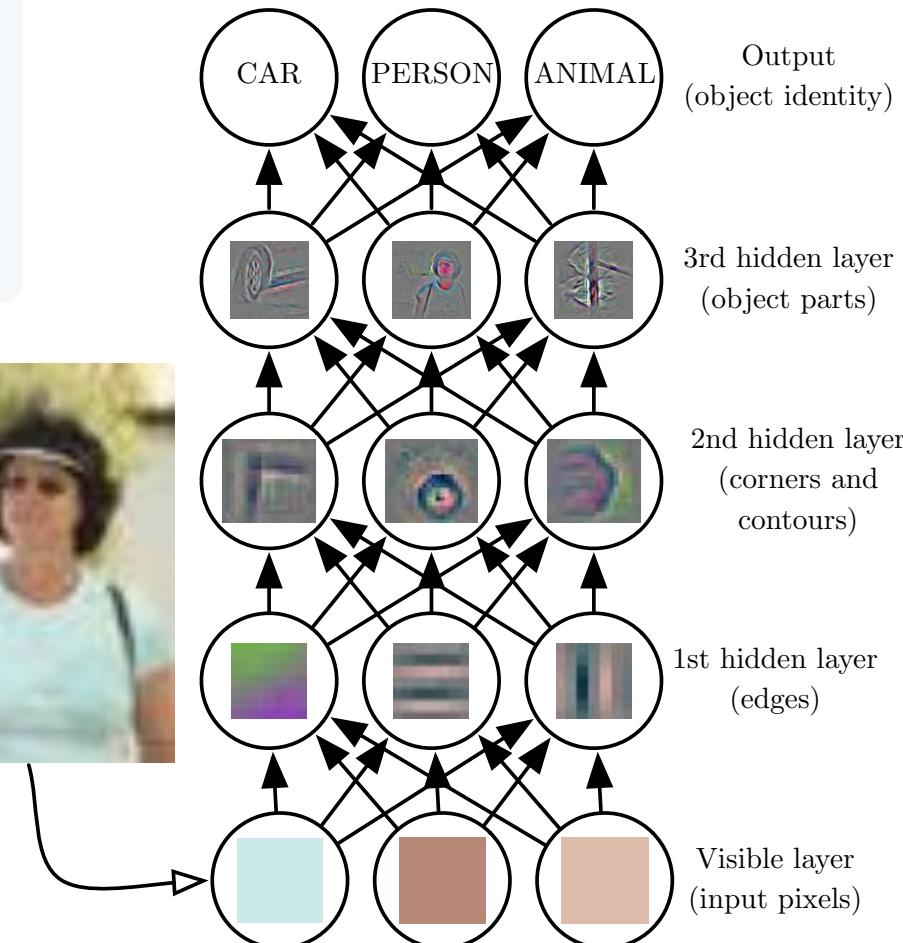
CNN tabanlı model, sig modeller

CNN'ler görsel kortekste bulunan yönlü hücrelerden ilhamla geliştirilmiştir.

Derin Öğrenme

“Derin öğrenme, verilerin farklı soyutlama düzeylerindeki temsillerini öğrenmek için çoklu işlem katmanlarından oluşan hesaplamalı modeller geliştirilmesini olanaklı kılar.”

— Yann LeCun, Yoshua Bengio and Geoff Hinton



Nesne Tespit ve Bölümleme

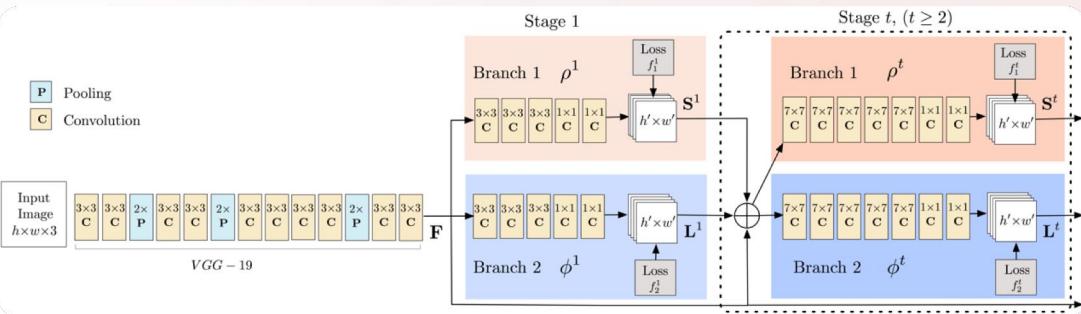


3B Nokta Bulutlarında Nesne Tespiti



11.4 fps

Poz Tahmini



Görüntü Stil Transferi



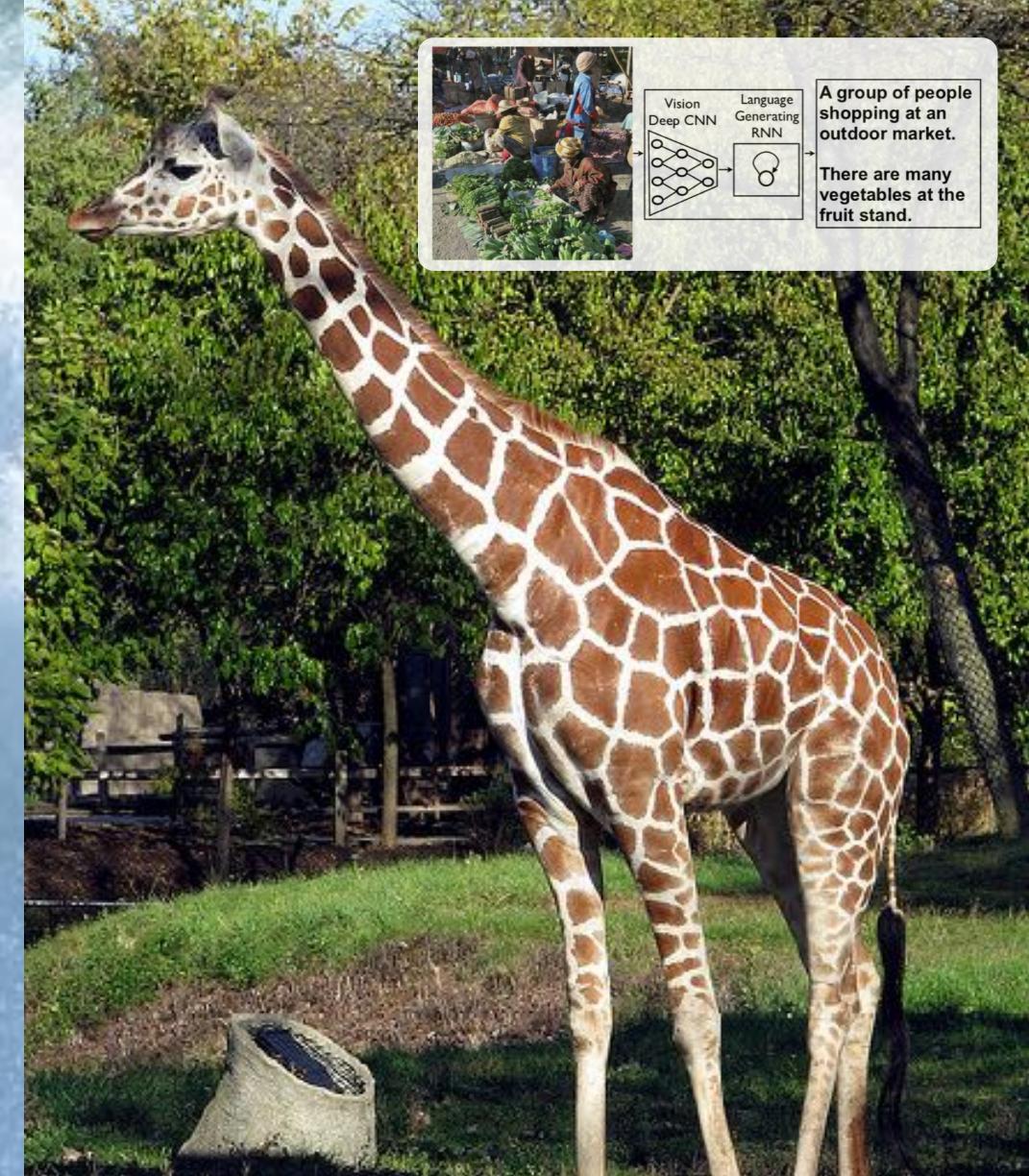
Görüntü Stil Transferi



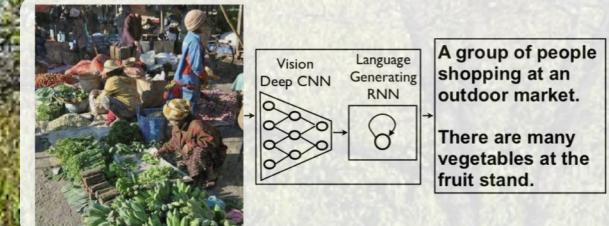
Görüntü Altyazılıma



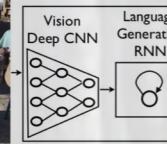
A man riding a wave on a surfboard in the water.



A giraffe standing in the grass next to a tree.



Görüntü Altyazılıma

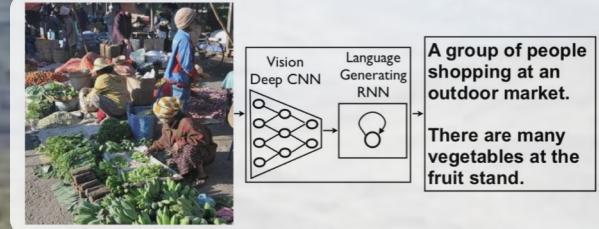


A group of people shopping at an outdoor market.
There are many vegetables at the fruit stand.



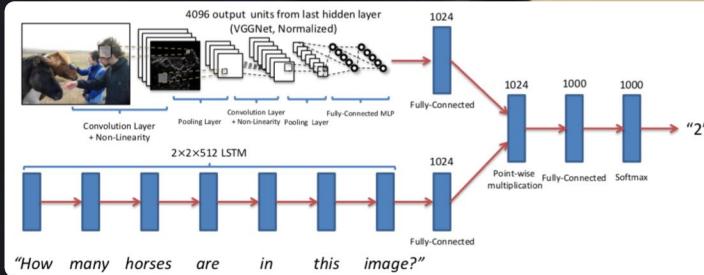
Yarış pistinde virajı almakta olan bir yarış arabası

Görüntü Altyazılıma



Günbatımında bir dağa tırmanmakta olan bir adam

Görsel Soru Yanıtlama



Question: What is the girl reaching into?

Answer: apples

Derin Modeller Akıl Yürütebiliyor mu?

- **Akıl Yürütme:** "Yeni bir soruyu yanıtlamak için önceden edinilmiş bilgiyi cebirsel olarak işlemek."
- Çok geniş bir tanım



Derin Modeller Akıl Yürütebiliyor mu?

- **Akıl Yürütme:** "Yeni bir soruyu yanıtlamak için önceden edinilmiş bilgiyi cebirsel olarak işlemek."
- **Çok geniş bir tanım**
 - mantıksal akıl yürütme
 - olasılıksal çıkarım
 - **Eğitilebilir modüller üzerinde çalışan bileşim (composition) kuralları**



Derin Modeller Akıl Yürütebiliyor mu?

- Derin öğrenme modelleri büyük korelasyon makineleridir.
- Eğitim verisinden birşeyler öğrenirken tümevarımsal yargılar (*inductive bias*) kullanırlar. Bu durum hem faydalı hem de zararlıdır:
 - Hedef ve eğitim dağılımları benzer olduğunda iyi genellemeler yapabilirler.
 - Doğrudan ilişkiyi (*correlation*) nedensellik (*causality*) ile karıştırabilirler.



Görüntü Altyazılıma

The screenshot shows a TechCrunch article titled "Microsoft demos next-generation image-captioning Captionbot". The article is by Haje Jan Kamps and published on March 30, 2016. It features three small images at the top: a baseball player, a skateboarder, and a sandwich. Below the images is a call-to-action button labeled "Use this photo". The main text discusses Microsoft's Cognitive Services and their API tools.

Microsoft demos next-generation image-captioning Captionbot

Haje Jan Kamps
@Haje / Mar 30, 2016

The power of the cloud is a bit fuzzy to most of us, but Microsoft wants to improve that by giving developers a series of API tools. The suite, dubbed Cognitive Services, empowers developers to make their software far smarter, including tools for trainable speech-to-text processing and a quality of object recognition verging on *actual magic*.



picdescbot @picdescbot · Feb 19

a herd of sheep grazing on a lush green field



6



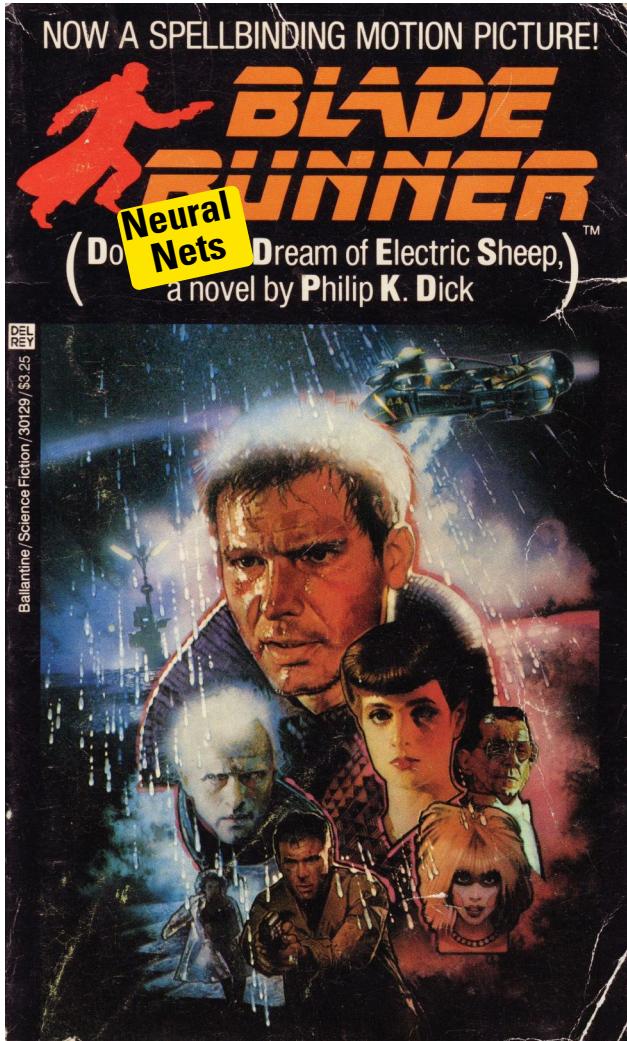
3



18



Görüntü Altyazılıma



picdescbot @picdescbot · Feb 19

a herd of sheep grazing on a lush green field



[picdescbot](#) @picdescbot · Mar 8
a yellow and orange flowers in a field



8

41

103

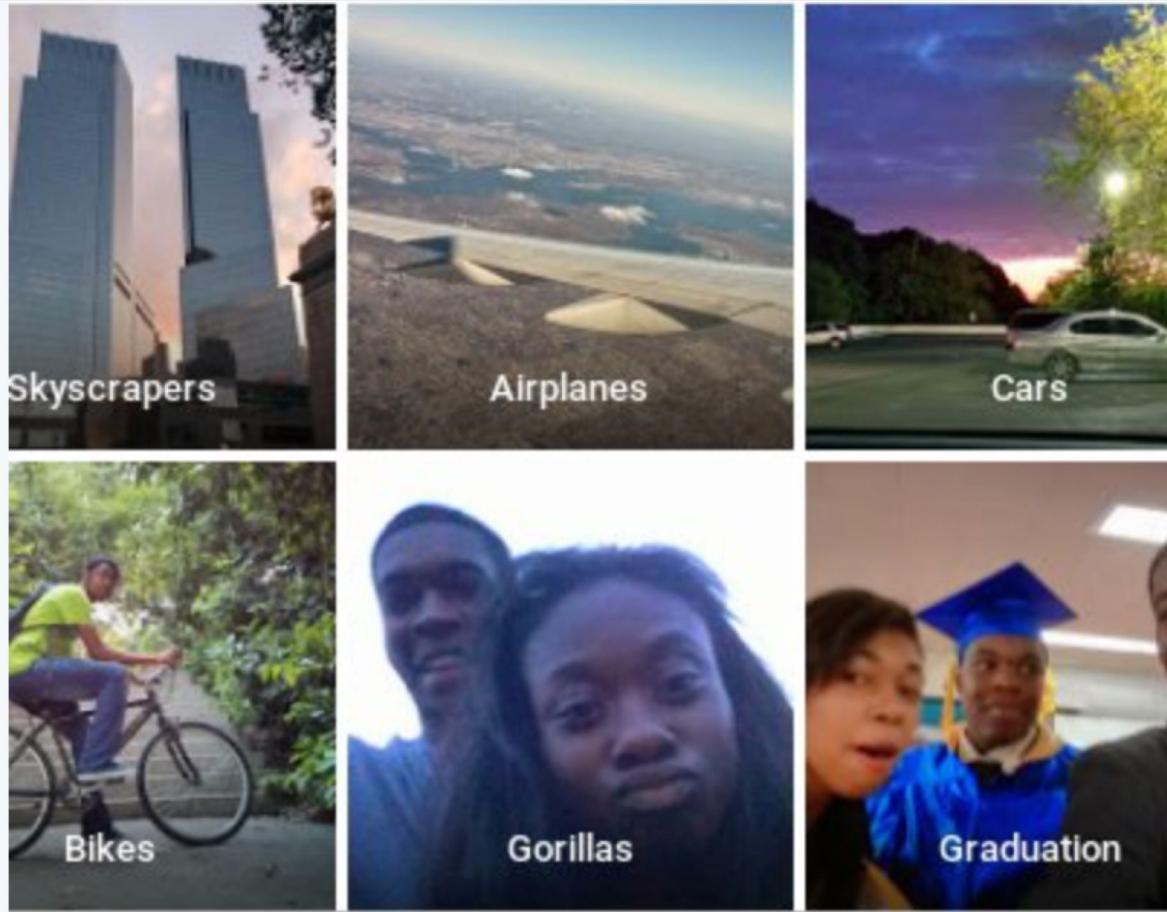
✉



▼

Suda yüzmekte olan bir köpek.





jackyalciné is about 40% into the IndieWeb.

@jackyalcine



Google Photos, y'all fucked up. My friend's not a gorilla.

4:22 AM - Jun 29, 2015

Heart 2,280 Comment 3,592 people are talking about this

Support The Guardian

The Guardian

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World | UK | Science | Cities | Global development

i

Google says sorry for racist auto-tag in photo app

- Google Photos labelled a picture of two black people as 'gorillas'
- Google Maps and Flickr have also suffered from race-related problems

Jana Kasperkevic in New York

Twitter @kasperka Email
Wed 1 Jul 2015 18.52 BST

Soru Yanıtlama

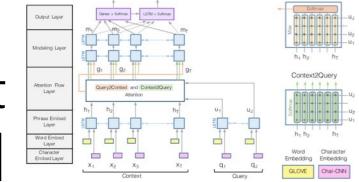
Stanford Question Answering Dataset
(SQuAD) [Rajpurkar et al., 2016]

Individual Huguenots settled at the Cape of Good Hope from as early as 1671 with the arrival of François Villion (Viljoen). The first Huguenot to arrive at the Cape of Good Hope was however Maria de la Queillerie, wife of commander Jan van Riebeeck (and daughter of a Walloon church minister), who arrived on 6 April 1652 to establish a settlement at what is today Cape Town. The couple left for the Far East ten years later. On 31 December 1687 the first organised group of Huguenots set sail from the Netherlands to the Dutch East India Company post at the Cape of Good Hope. The largest portion of the Huguenots to settle in the Cape arrived between 1688 and 1689 in seven ships as part of the organised migration, but quite a few arrived as late as 1700; thereafter, the numbers declined and only small groups arrived at a time.

The number of new Huguenot colonists declined after what year?

Soru Yanıtlama

Stanford Question Answering Dataset
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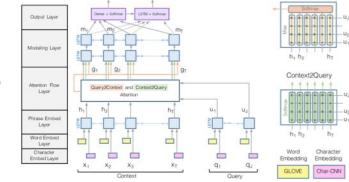
The number of new Huguenot colonists declined after what year?

Doğru Yanıt: "1700"

BiDAF-E [Seo et al., 2016]	80.0
İnsan başarısı	91.2

Soru Yanıtlama

Stanford Question Answering Dataset
(SQuAD) [Rajpurkar et al., 2016]



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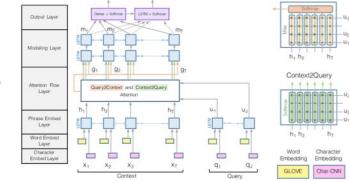
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The number of new Huguenot colonists declined after what year?

Doğru Yanıt: "1700"

Tahmin: "1961"

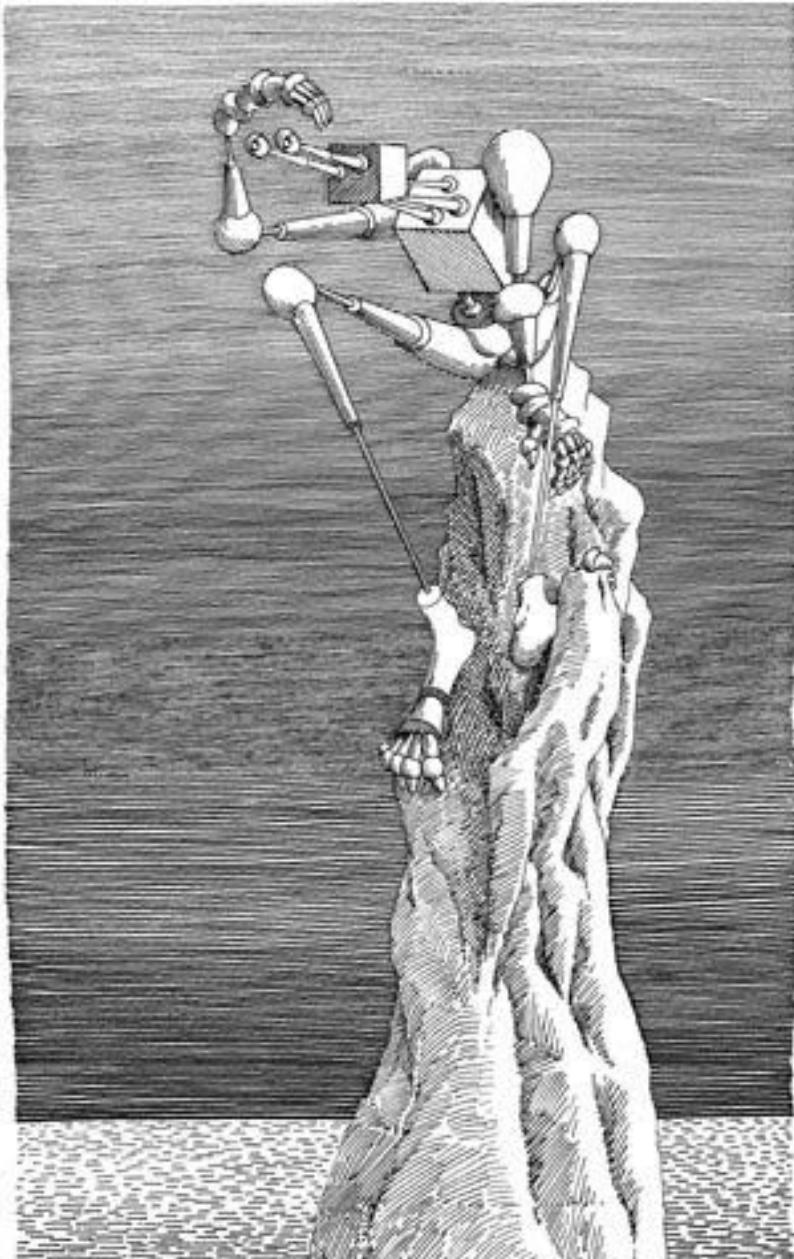
46.9

BiDAF-E [Seo et al., 2016] 80.0

İnsan başarısı 91.2

ileriye bakmak...

- Zeka sadece **Örütü Tanıma** demek değildir.
- **Öğrenme, dünyayı modelleme** sürecidir...
 - gördüklerimizi açıklamak ve anlamak
 - olası ama görmediğimiz şeyleri hayal etmek
 - bazı şeyleri gerçekleştirmek için **problem çözme ve planlama**
 - dünya hakkında daha fazla şey öğrenirken **yeni modeller kurmak**
 - **modellerimizi paylaşmak**, başkaları ile iletişim kurmak, onların modellerini anlamak ve onlardan ve onlar ile öğrenmek



Gördüklerimizi Açıklamak ve Anlamak



Q: What fruit is showing in this picture?



A: Bananas

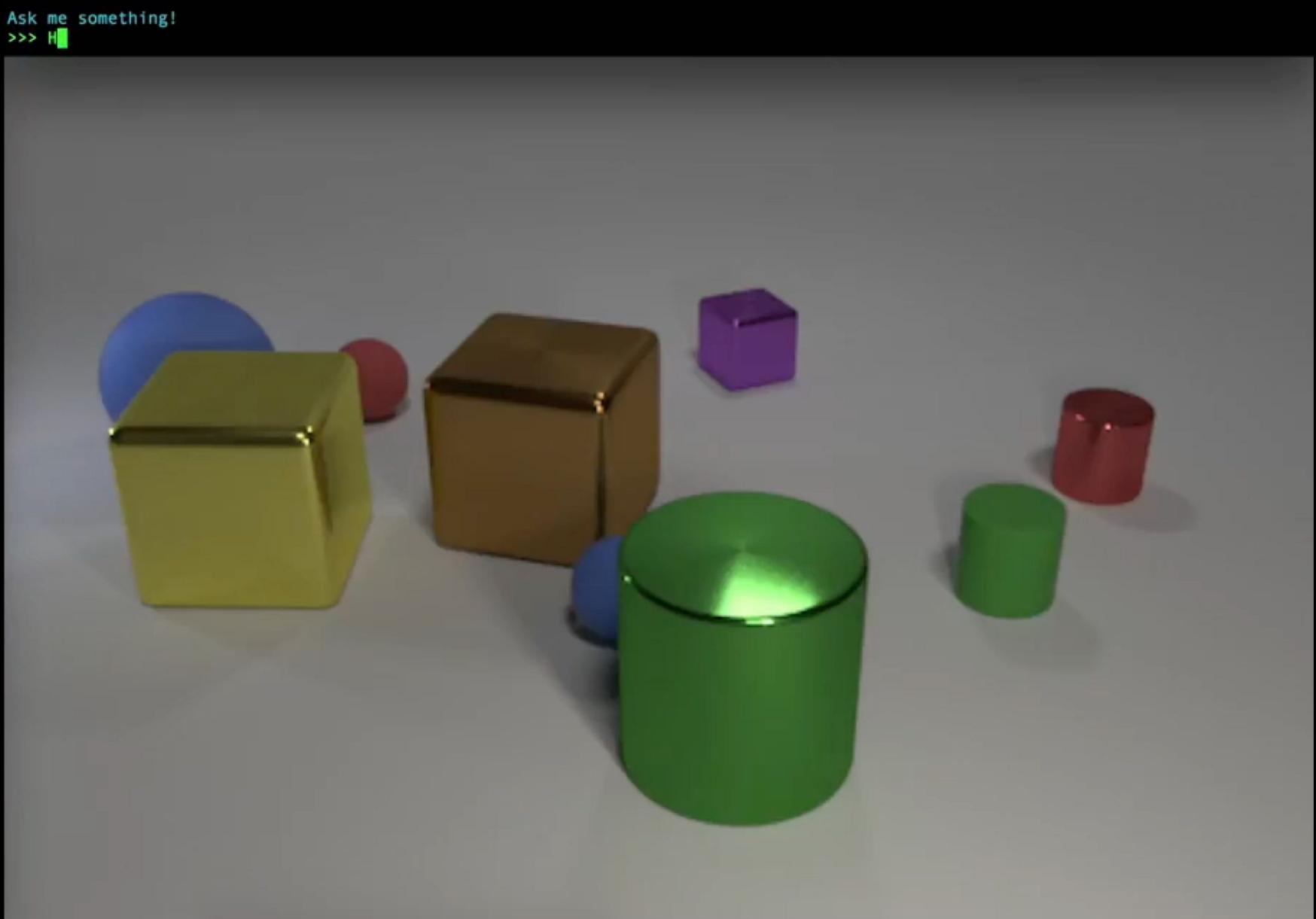
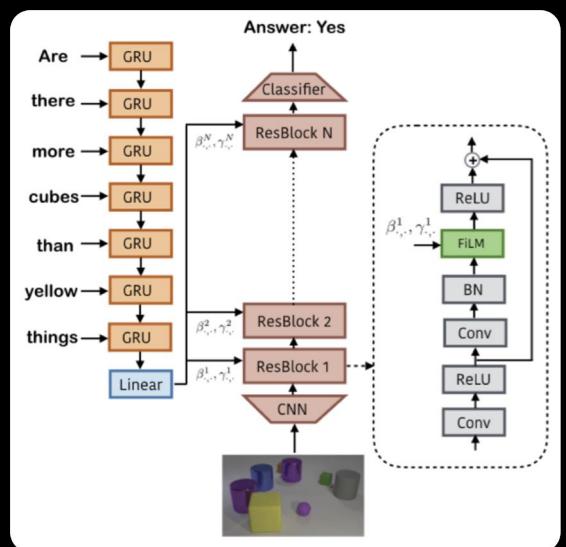
Görsel Akıl Yürütmeye



How many objects are
either small cylinders
or red things?

Answer: 5

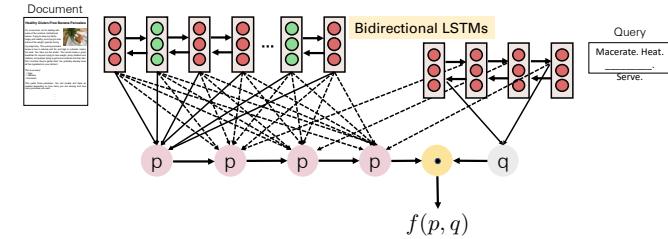
Görsel Akıl Yürütmeye



Çok Kipli Soru Yanıtlama

Recipe: Bacon Sushi

- Step 1: What You'll Need** This recipe makes enough bacon sushi to feed 2 - 4 people. 2 x 500g(1 lb.) packages of bacon (I chose an applewood smoked bacon, but any type would work). 3 tbsp. oil. 1 medium onion, finely diced. 1 1...
- Step 2: Cooking the Bacon** The bacon "nori" will have to be partially cooked before it can be rolled with the risotto filling. Preheat the oven to 350 degrees F. Lay half a package of bacon on the rack of the roasting pan, then bak...
- Step 3: Making the Risotto Filling** I once made risotto with sushi rice, since I had no Arborio rice on hand, and I decided that the starchiness was similar in the two. My experiment was a success, and the resulting dish was just as deli...
- Step 4: Jazzing Up the Risotto** Risotto is a wonderfully customizable dish, and a quick search on the internet will result in a multitude of variations. Here are two of my favorites: Asian mushroom risotto. 1 tbsp. oil. 1 package...
- Step 5: Rolling the Sushi** Cover the sushi rolling mat with a large piece of aluminum foil as protection from the risotto and bacon grease. (You don't want your next sushi dinner tasting like bacon. Or maybe you do...) Lay the stri...
- Step 6: Baking and Slicing** Preheat the oven to 350 degrees F. Place the aluminum foil-covered sushi rolls in the oven and bake for 20 minutes. This will warm all the ingredients and crisp the bacon a little more. It will also melt a...
- Step 7: And You're Done!** Serve the sushi with a light crispy vegetable side dish, such as refreshing cucumber sticks, or a green salad. White wine makes an excellent compliment to the meal, especially if it is the same wine used in ...



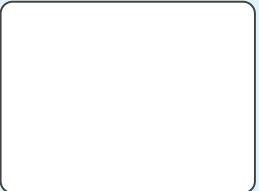
C

Reci

Visual Cloze Style Question

Question

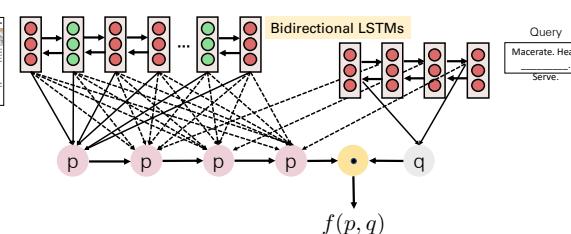
Choose the best image for the missing blank to correctly complete the recipe



Answer



le. 2 x 500g(1 lb.) packages of bacon
1 medium onion, finely diced. 1 1...
re it can be rolled with the risotto
e rack of the roasting pan, then bak...
o Arborio rice on hand, and I decided
and the resulting dish was just as deli...



Query

Macerate. Heat.

Serve.

Visual Coherence Style Question

Question

Select the incoherent image in the following sequence of images



Answer

A.

B.

C.

D.

quick search on the internet will result
risotto. 1 tbsp. oil. 1 package...

in foil as protection from the risotto
Or maybe you do...) Lay the stri...

foil-covered sushi rolls in the oven
on a little more. It will also melt a...

Visual Ordering Style Question

Question

Choose the correct order of the images to make a complete recipe



(i)

(ii)

(iii)

(iv)

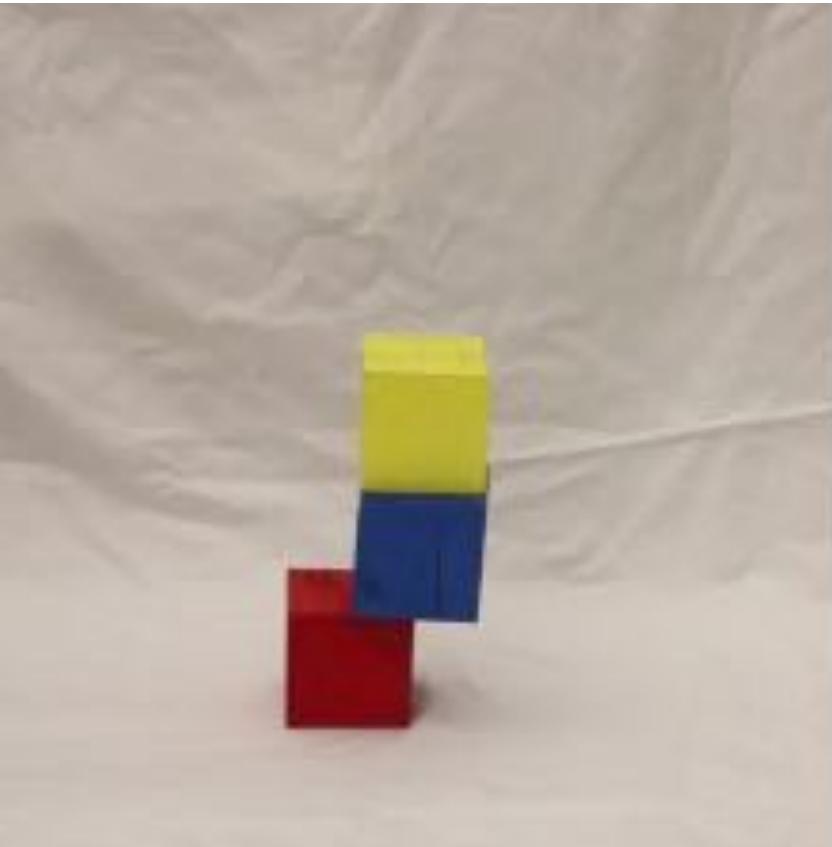
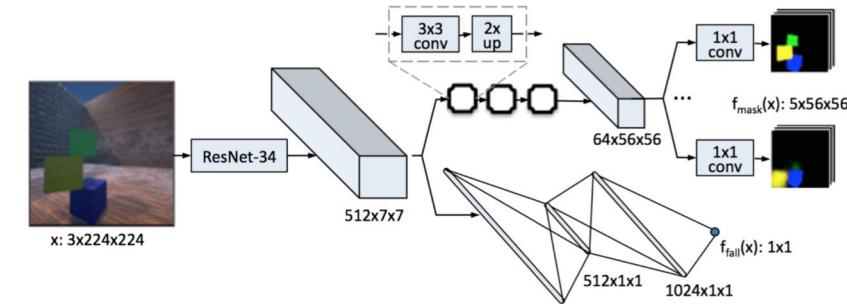
uch as refreshing cucumber sticks, or
ially if it is the same wine used in ...

Sezgisel Fizik

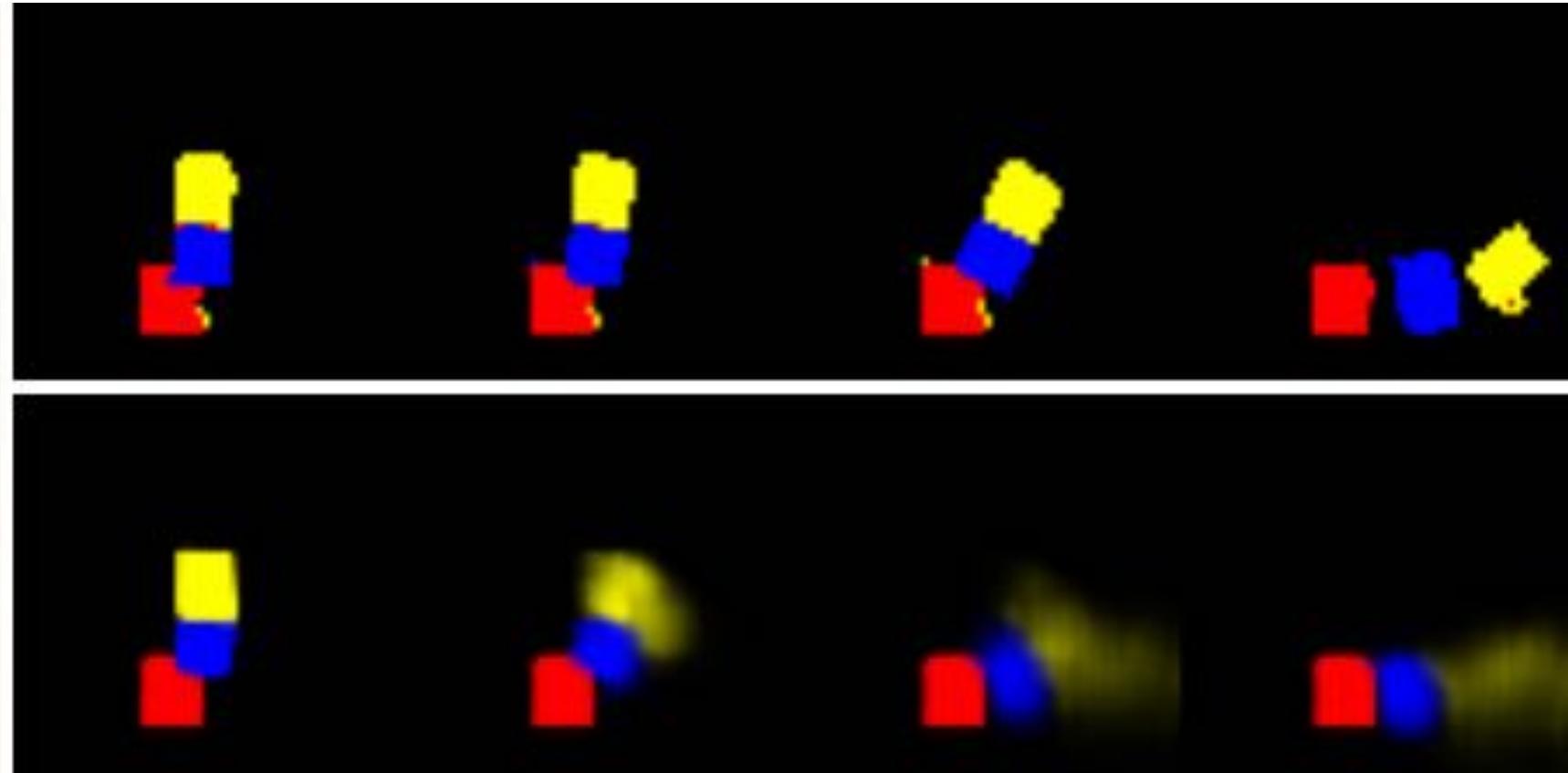
- Dünyanın fiziksel düzeyde nasıl işlediğini sağduyuya dayalı anlama
- Çevremizi algılamaya, anlamaya ve eyleme geçmemize yardımcı olmaktadır.



Sezgisel Fizik



ilk video karesi

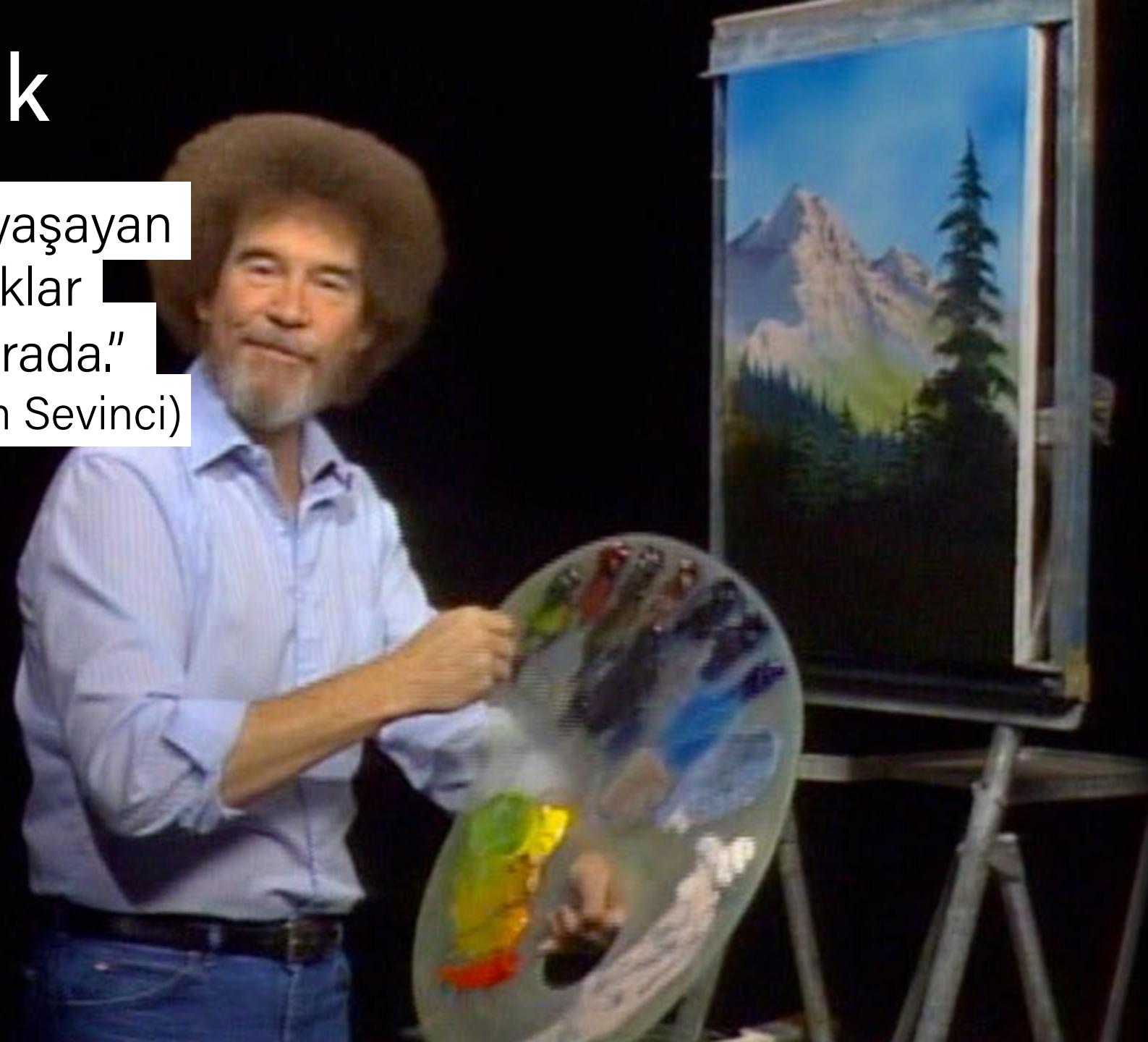


PhysNet'in gelecek tahmini

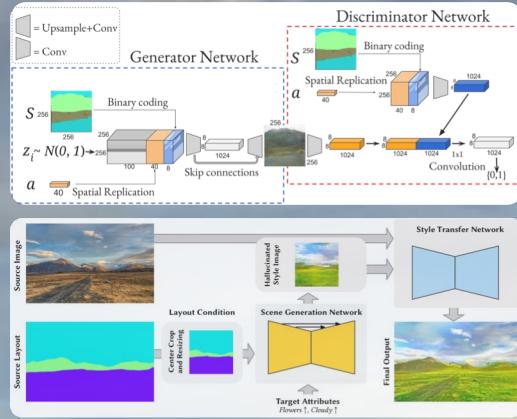
Düşlemek

“Belki de şurada yaşayan
mutlu küçük çalılıklar
vardır. İşte tam şurada.”

— Bob Ross (Resim Sevinci)



Sahne Nitelikleri ile Oynaması



gökyüzü

dağ

çalışlık arazi

Sahnenin anlamsal
düzeni



Gece
görünümü



Tahmin



Günbatımında
görünüm



Tahmin



Bir kış günü
görünüm



Tahmin



Bulutlu bir bahar
gününde görünüm



Tahmin





Nemli, yağmurlu
ve sisli bir günde
görünüm



Tahmin

Metin Tabanlı Elbise Değiştirme



Long sleeve down-filled quilted silk-blend twill coat in black. Tonal detachable fox fur trim at hood and front. Hook-eye closure at front. Concealed drawstring and welt pockets at waist. Concealed drawstring at hem. Raglan sleeves. Tonal silk lining. Gunmetal-tone hardware. Tonal stitching.



Long sleeve 'fully fashioned French terry' knit cashmere pullover in light grey. Rib knit crewneck collar, cuffs, and hem. Raglan sleeves. Rib knit panel at armscyes and side-seams. Signature 'four bar' striping knit in white at upper sleeve. Signature tricolor grosgrain pull-tab at back yoke. Tonal stitching.



Long sleeve semi-sheer cotton shirt featuring check pattern in black and white. Raw edge at spread collar. Button closure at front. Patch pocket at chest. Tonal stitching.



girdi
görüntüsü



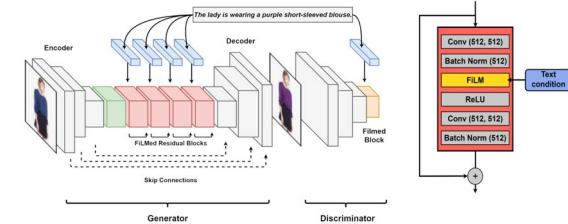
renksel
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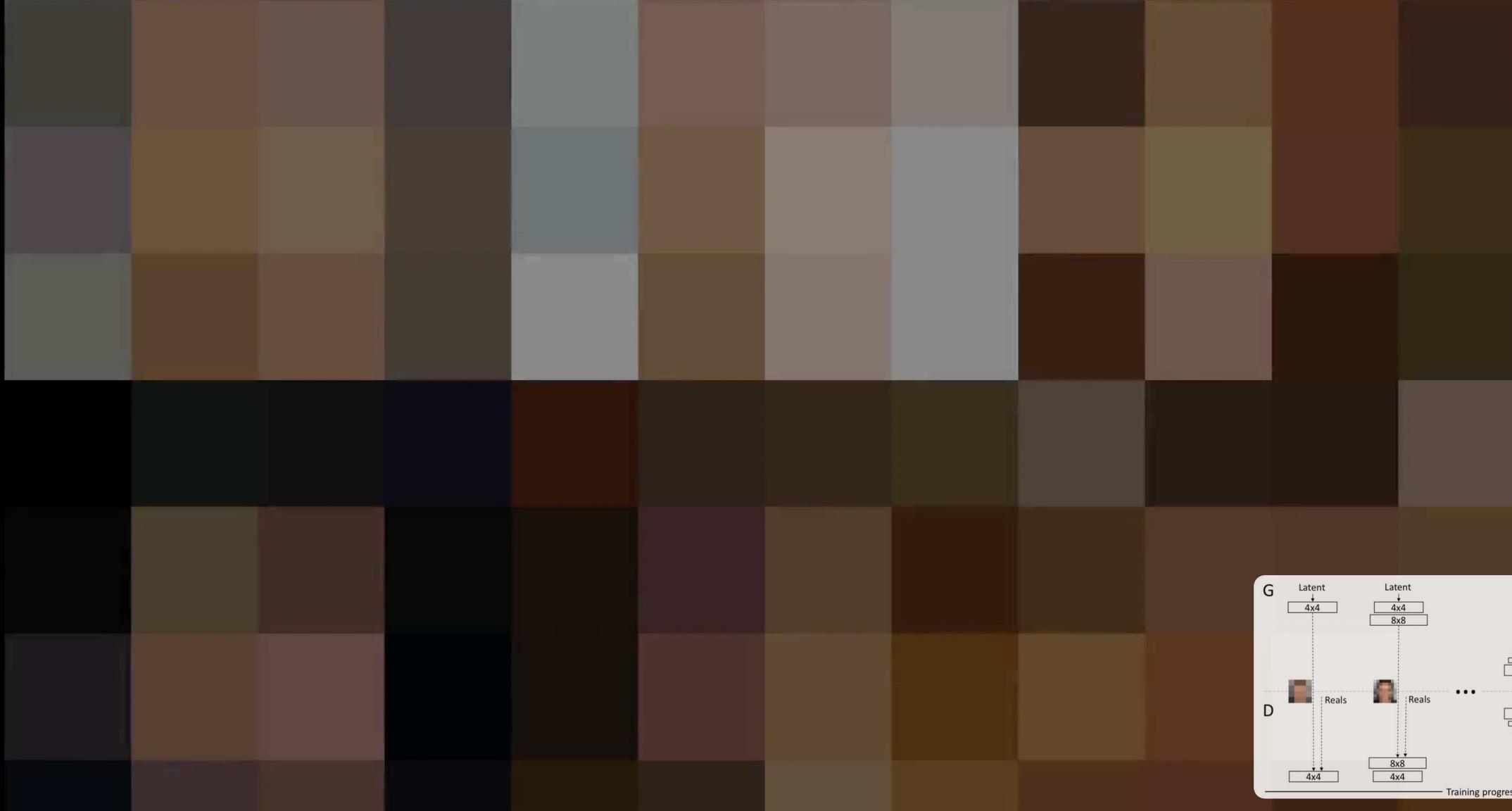
yapsal
dönüştürüler



karışık
dönüştürüler



Yüksek Kalitede Görüntü Sentezi

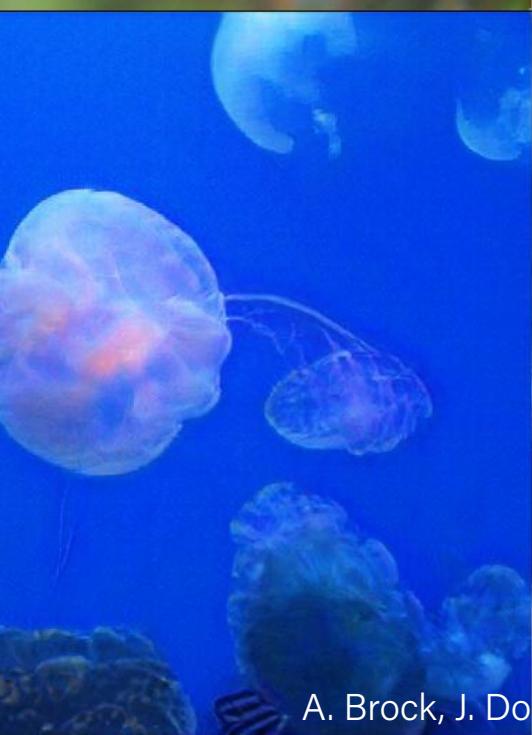


4x4

T.Karras, T.Aila, S.Laine and J. Lehtinen. Progressive Growing of GANs for Improved Quality, Stability, and Variation. ICLR 2018

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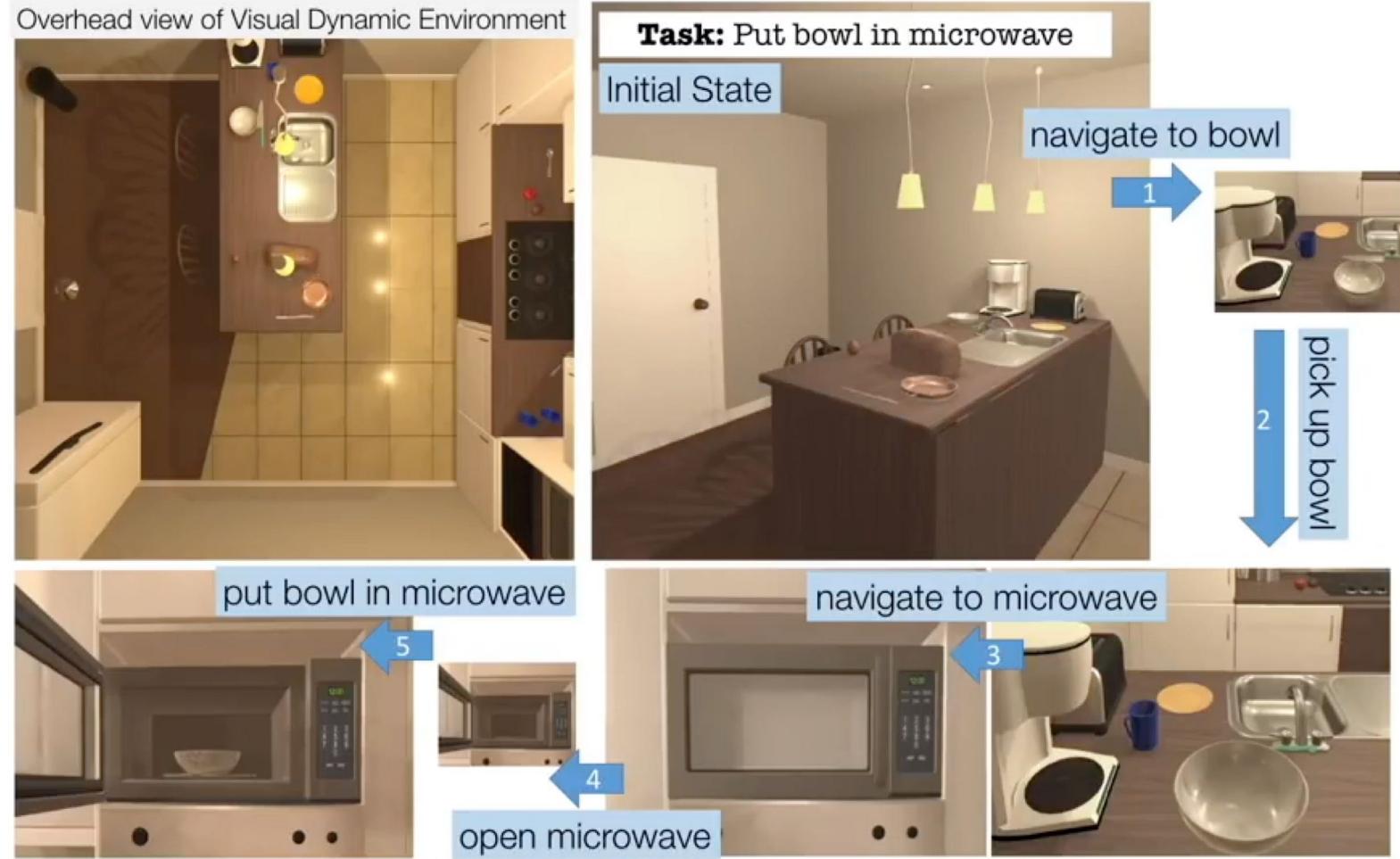
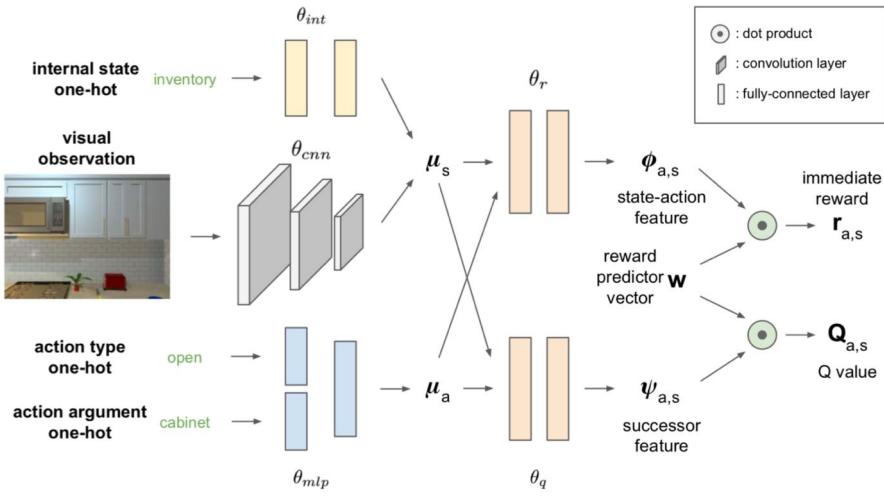
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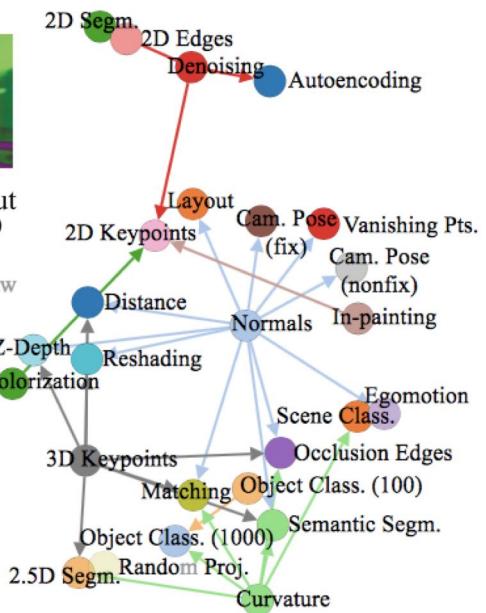
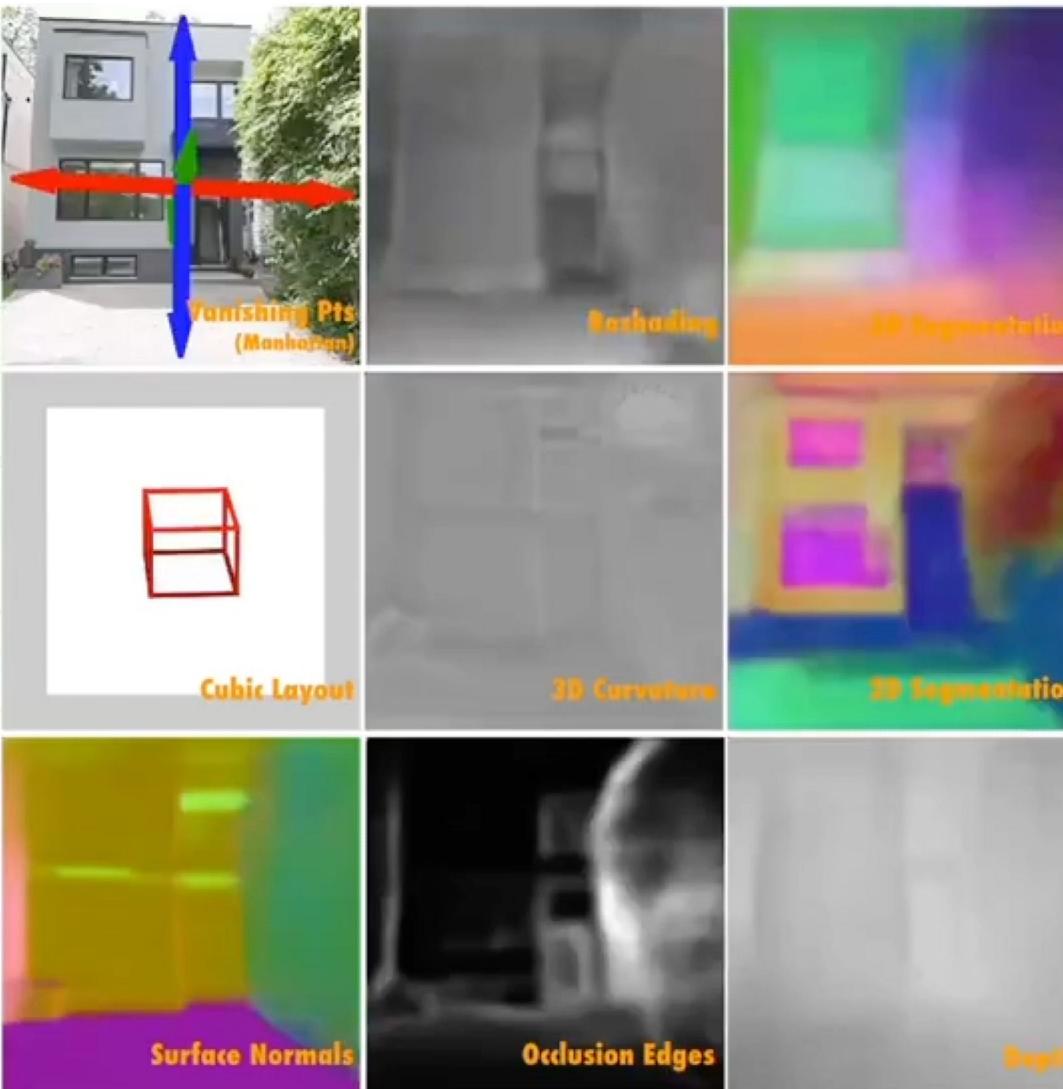
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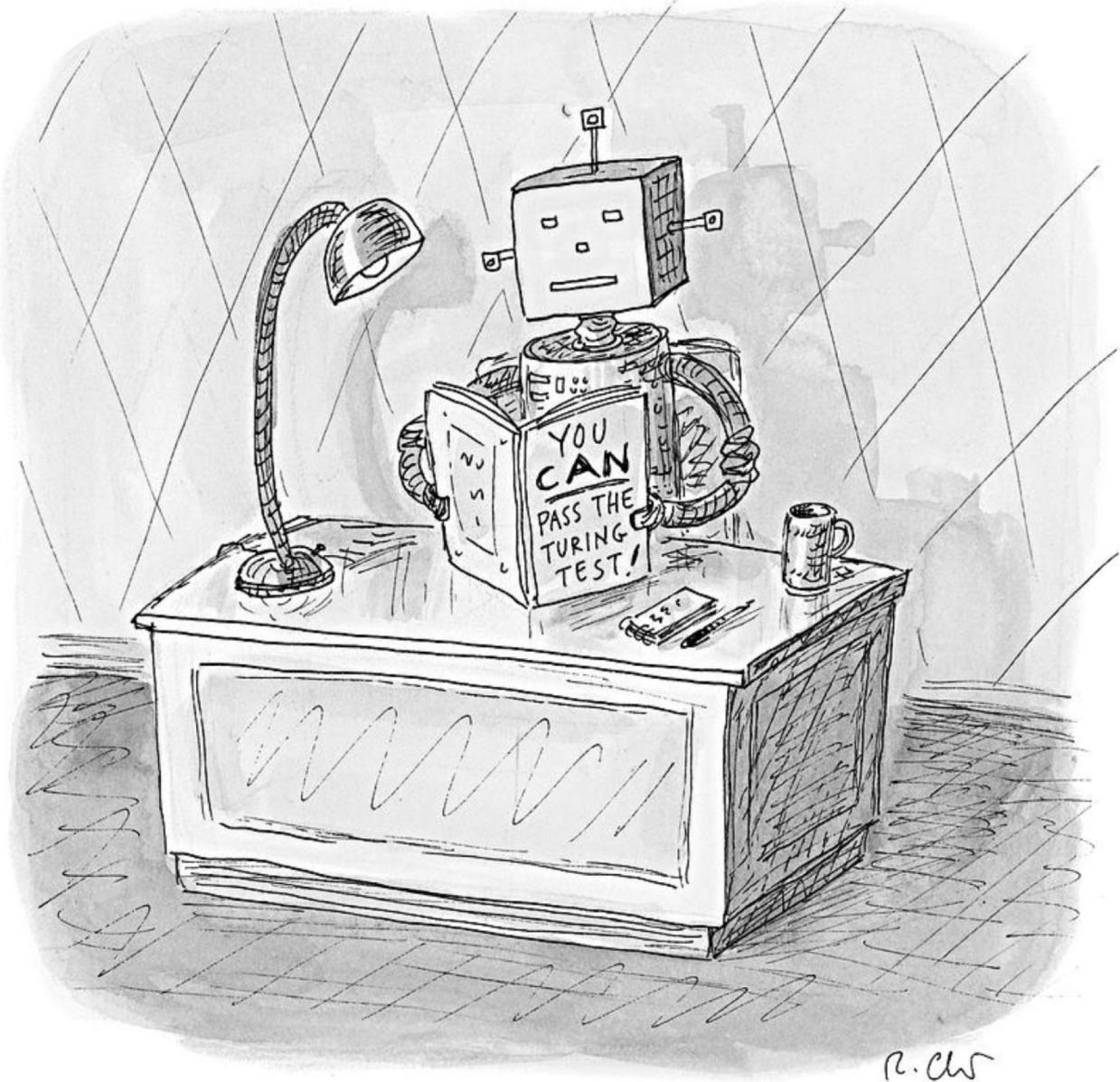


Planlama



Öğrenme Aktarma





ilginiz için
teşekkürler...