



Deep Learning

Bardia Nikbakhsh

MohammadHossein Asgariyan

▶ دیپ لرنینگ چیست

▶ چرا این روزها دیپ لرنینگ همه گیر شده

▪ توسعه الگوریتم

▪ افزایش داده

▪ افزایش قدرت پردازشی

▪ بهتر شدن ابزارها

▶ کاربردهای دیپ لرنینگ در زندگی روزمره

▪ پزشکی

▪ دستیاران مجازی

▪ پردازش زبان های طبیعی

▪ کامپیوتر ویژن

▪ سیستم توصیه گر

▪ تشخیص الکترومیوگرافی

▪ بازشناسی خودکار گفتار

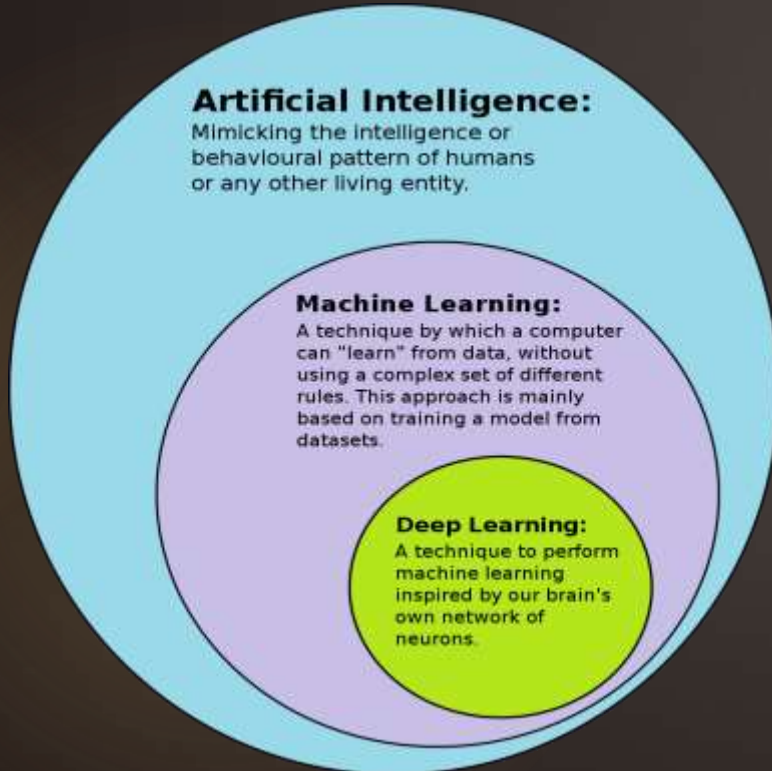
▪ سرمایه گذاری

▶ خلاصه

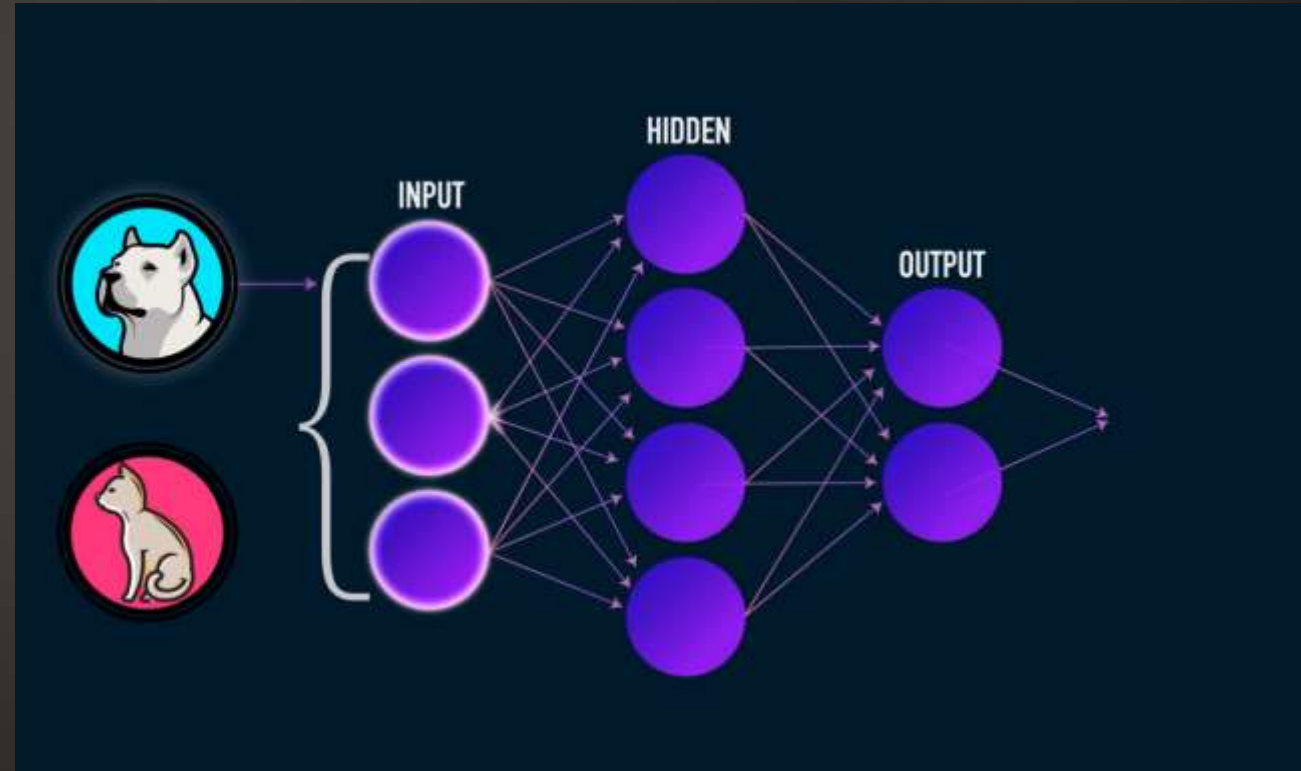
▶ منابع

یادگیری عمیق

یادگیری عمیق شاخه‌ای از یادگیری ماشین است هدف آن طراحی سیستمی است که قابلیت یادگیری داشته باشد. و به وسیله شبکه‌های عصبی عمیق پیاده سازی میشود.



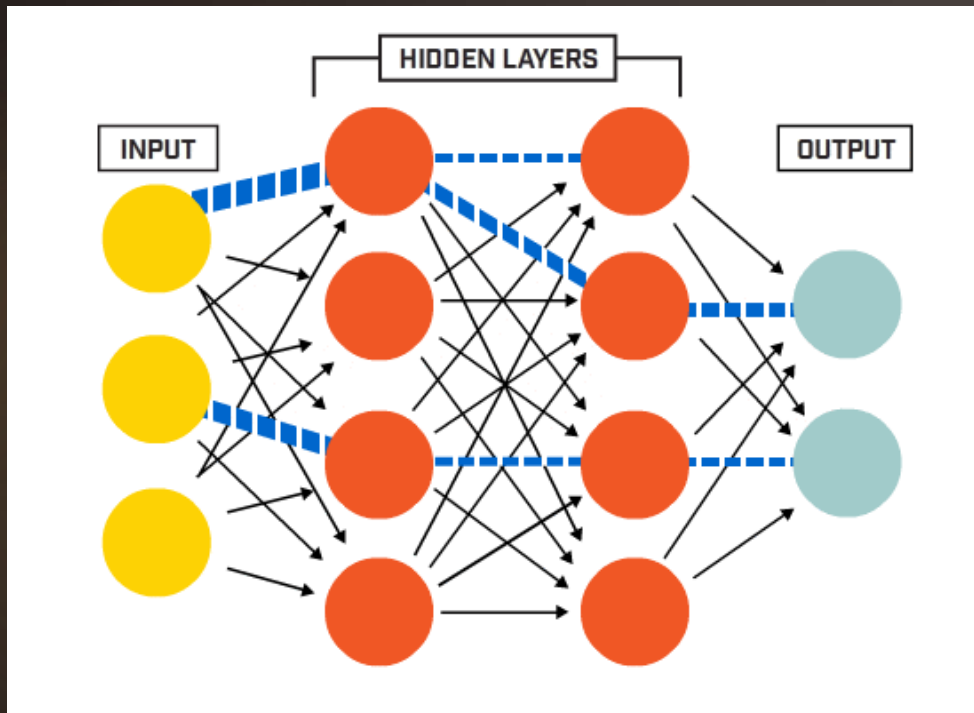
ارتباط ماشین لرنینگ و دیپ لرنینگ



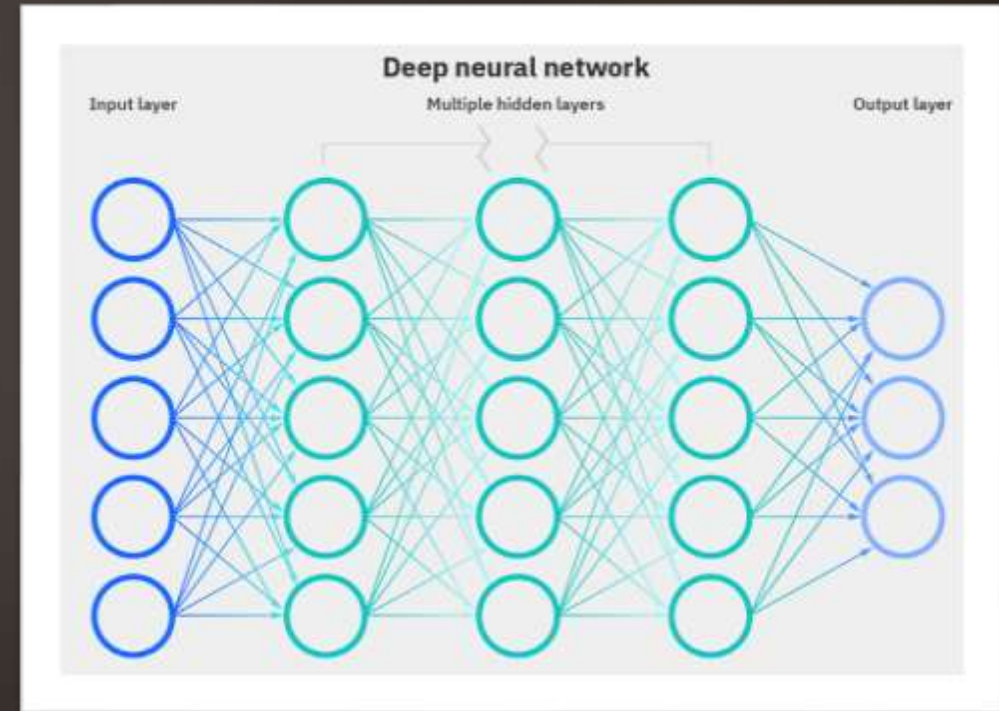
شبکه عصبی یا Neural Network

یادگیری عمیق

یادگیری عمیق به استخراج الگوهایی از **اطلاعات ورودی**، از طریق الگوریتم‌های ماشین لرنینگ می‌باشد. ۸۰ درصد اطلاعات ورودی برای یادگیری و ۲۰ درصد برای تست استفاده میشود.



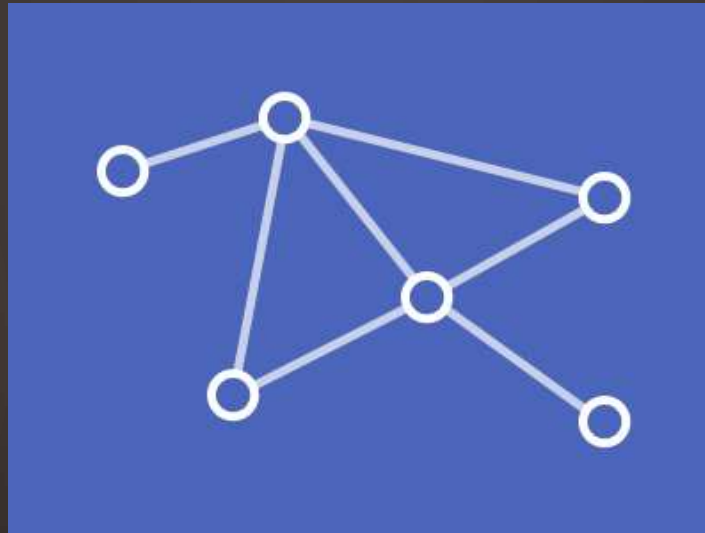
ورودی و خروجی در شبکه عصبی



شبکه عصبی پیچیده

چرا این روزها دیپ لرنینگ ترند شده؟

■ توسعه الگوریتم‌ها



چرا این روزها دیپ لرنینگ ترند شده؟

■ افزایش قدرت محاسباتی (GPUs, TPUs, ...)



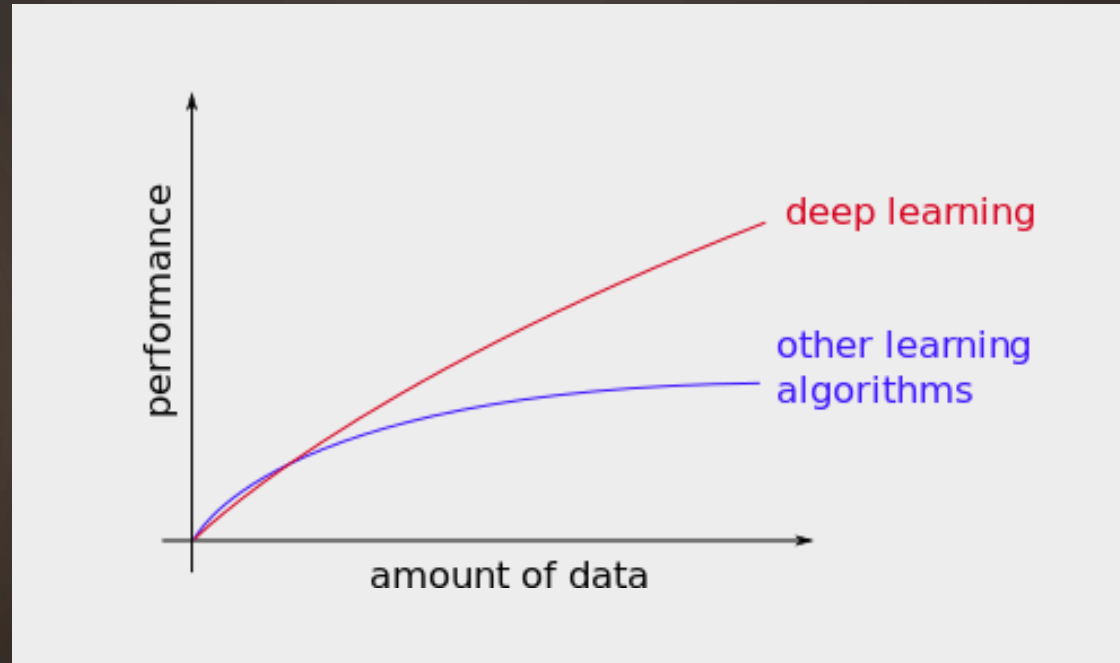
GPU



TPU

چرا این روزها دیپ لرنینگ ترند شده؟

■ افزایش اطلاعات در دسترس



چرا این روزها دیپ لرنینگ ترند شده؟

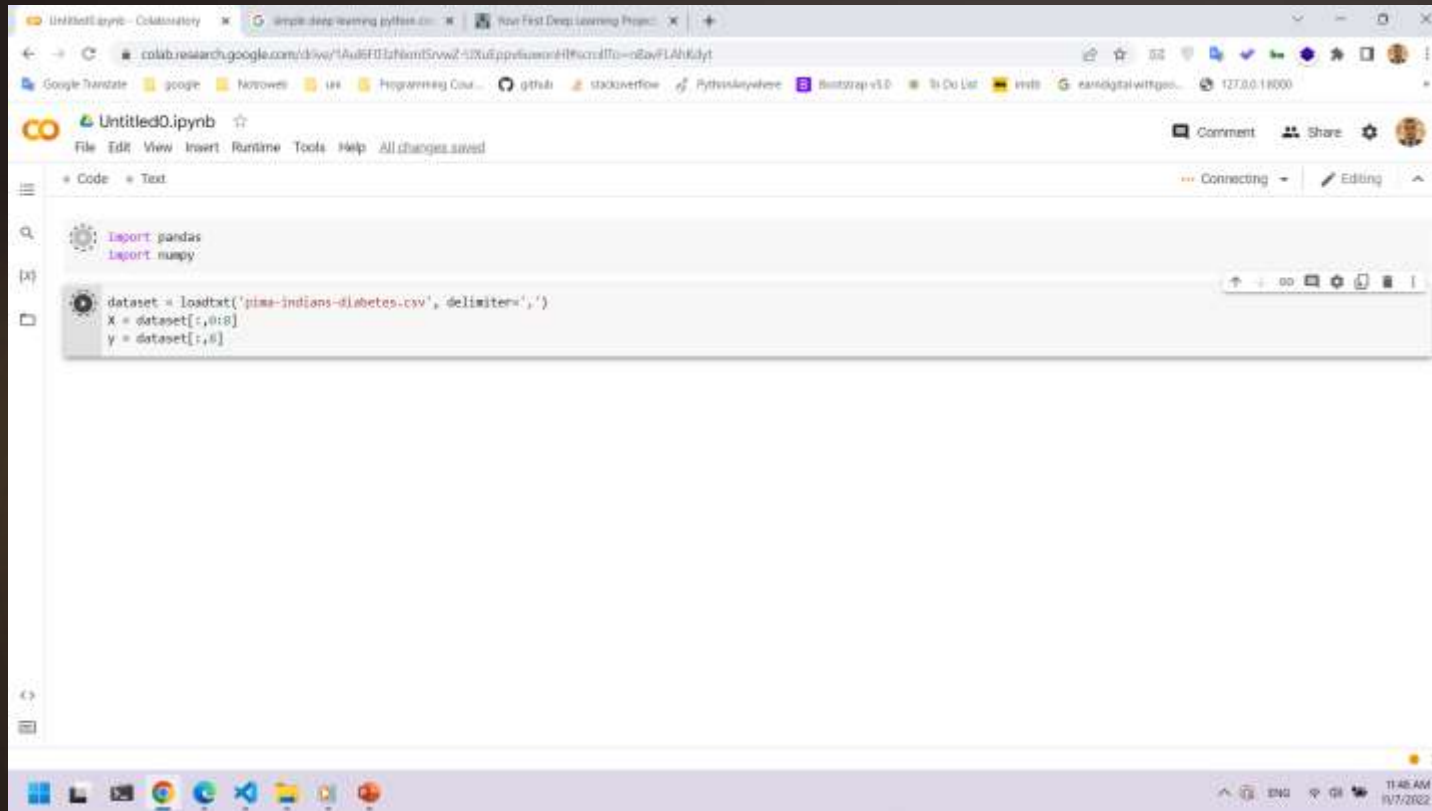
■ ابزارها و مدل های متن باز



Google Colab



9



Google Colab که کوتاه شده واژه Google Colaboratory می باشد که به معنای آزمایشگاه مشترک گوگل هست که شما می تونید به صورت آنلاین از اون استفاده کنید و در مرورگرهای خود کدهای پایتونی رو بنویسید و اجرا کنید.

کاربردهای دیپ لرنینگ

■ پزشکی

- ▶ Applications of Big Data and Deep Learning in HealthCare Industry from Disease Detection to Cost Reduction
- ▶ N.Chitgar, R.Abbasnejad, M.Ahangaran , M.Seifolahzade

1. پیش بینی عفونت های مرتبط با مراقبت های بهداشتی

2. شناسایی و توصیف بیماری از طریق عکس های اشعه X بیمار (تشخیص سرطان قفسه سینه با تحلیل عکس های رادیولوژی)

3. افزایش کیفیت عکس های رادیولوژی

Applications of Big Data and Deep Learning in HealthCare Industry from Disease Detection to Cost Reduction

M.Seifolahzade*, N.Chitgar*, R.Abbasnejad*, M.Ahangaran*

* MSc Student of Computer Engineering, Mazandaran university of science and technology, Babol, Iran.
Tel: +98-911-311-3427, E-mail: mseifolahzade@iust.ac.ir

* MSc Student of Computer Engineering, Mazandaran university of science and technology, Babol, Iran.
Tel: +98-911-788-6380, E-mail: nchitgar@iust.ac.ir

* Department of Computer Engineering, Mazandaran university of science and technology, Babol, Iran.
Tel: +98-911-111-6212, E-mail: fanaaravani@iust.ac.ir

* PhD Student of Computer Science, Iran University of Science and Technology.
Tel: +98-11-32466121, Email: ahangaran@iust.ac.ir

Abstract

Big Data Analytics and Deep Learning are two high-focus of data science. A key benefit of Deep Learning is the analysis and learning of massive amounts of unsupervised data, making it a valuable tool for Big Data Analytics where raw data is largely unlabeled and un-categorized. As the data keeps getting bigger, deep learning is coming to play a key role in providing big data predictive analytics solutions. Nowadays, many complex processes can generate big data, for example, there are a greater number of healthcare industry than ever before, collecting many terabytes of data per day. Today we use deep learning method for identifying Metastatic Breast Cancer, recurrent neural cascade model for automated image annotation or predict healthcare-associated infections. In this paper, we provide a brief overview of big data and deep learning, and some of its applications in the field of health care are mentioned.

Keywords:

Big Data, Deep Learning, HealthCare, Cost Reduction

Introduction

Deep learning and Big Data are two hottest trends in the rapidly growing digital world [1]. The goal of machine learning is to enable a system to learn from the past or present and use that knowledge to make predictions or decisions regarding unknown future events [2]. The general focus of machine learning is the representation of the input data and generalization of the learnt patterns for use on future unseen data. Deep Learning algorithms are one promising avenue of research into the automated extraction of complex data representations (features) at high levels of abstraction [4].

The meaning of the term "big data" is still the subject of

some disagreement, but it generally refers to data that is too big or too complex to process on a single machine [2]. Big Data represents the general realm of problems and techniques used for application domains that collect and maintain massive volumes of raw data for domain-specific data analysis. Modern data-intensive technologies as well as increased computational and data storage resources have contributed heavily to the development of Big Data science. Mining and extracting meaningful patterns from massive input data for decision making, prediction, and other inference is at the core of Big Data Analytics [4].

According to the latest traffic forecast report by Cisco Systems [3], half a billion mobile devices were globally sold in 2015, and the mobile data traffic grew by 74% generating 3.7 Exabyte's (1 Exabyte = 1018 bytes) of mobile data per month. Mobile big data (MBD) is a concept that describes a massive amount of mobile data which cannot be processed using a single machine. Deep learning is a solid tool in MBD analytics [3].

Technology based companies such as Google, Yahoo, Microsoft, DOD and Amazon have collected and maintained data that is measured in Exabyte proportions or larger. Moreover, social media organizations such as Facebook, YouTube, and Twitter have billions of users that constantly generate a very large quantity of data. Various organizations have invested in developing products using Big Data Analytics to addressing their monitoring, experimentation, data analysis, simulations, and other knowledge and business needs, making it a central topic in data science research [4].

For example, researchers need to use Big Data to discover new drugs. Marketers need to use social networks, mobile, geo-location, and sensor data to reach more customers. The United States National Security Agency (NSA) needs to process the Exabyte's (10¹⁸) of data collected over the internet in the Utah Data Center [5].



کاربردهای دیپ لرنینگ

■ دستیاران مجازی Virtual Assistants

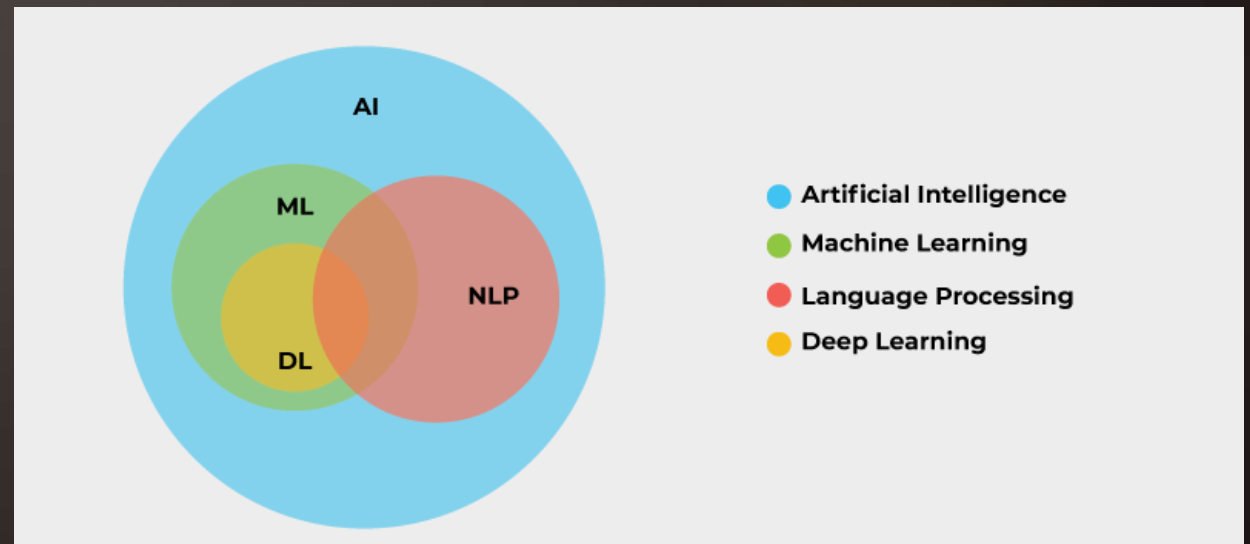
▶ دستیار مجازی هوشمند از هوش مصنوعی و یادگیری ماشین استفاده می‌کند تا کاربران سریع‌تر به درخواست‌ها یا پاسخ سوالات خود برسند. این پلتفرم‌ها از پردازش زبان طبیعی که به نام NLP نیز شناخته می‌شود، استفاده می‌کنند که به رایانه‌ها کمک می‌کند متن و کلمات گفتاری مشابه انسان را درک کنند.

▶ مثال‌های این دستیاران را در زیر مشاهده می‌کنید:

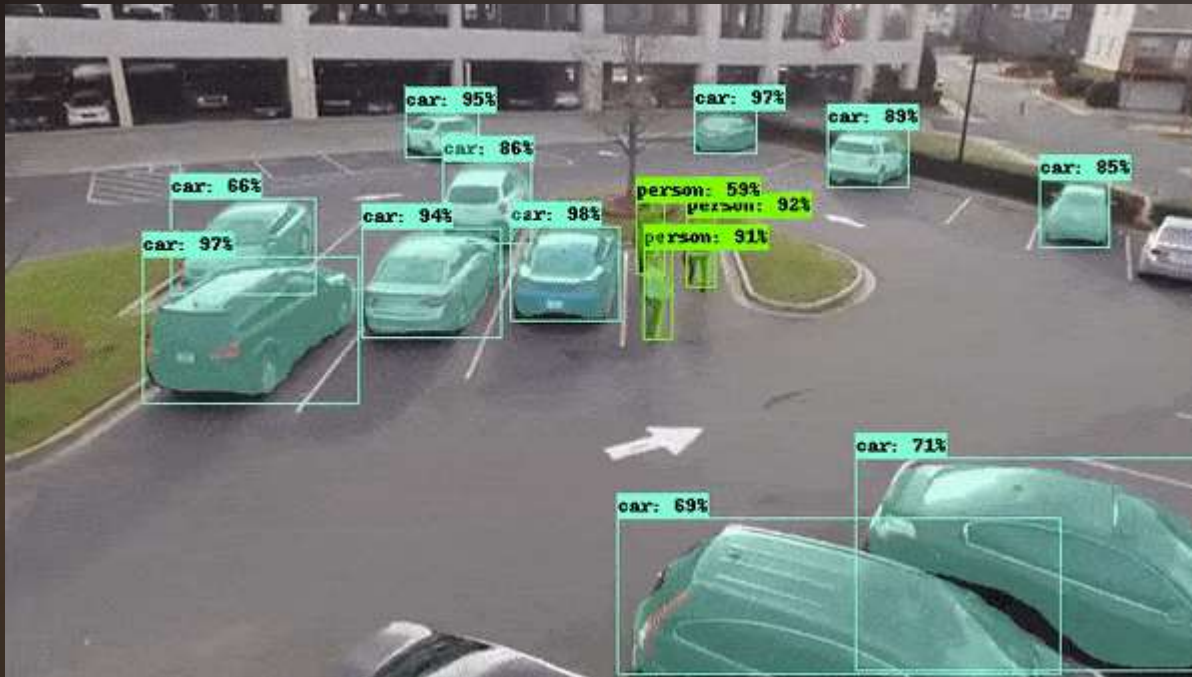


NLP

- ان ال پی یا برنامه ریزی زبانی طبیعی دانشی بسیار کاربردی است که به تعاملات بین رایانه و انسان، از طریق زبان طبیعی می پردازد. هدف غایی NLP، خواندن، رمزگشایی، فهم و درک زبان انسان با روشی ارزشمند است. بیش تر روش های پردازش زبان طبیعی برای استخراج و فهم معنای زبان انسانی، مبتنی بر تکنیک های یادگیری ماشین است.
- مخفف Natural Language Processing می باشد.



بینایی رایانه ▶



- رهگیری اجسام (خودروهای خودران)
- تشخیص چهره (فیس آیدی)
- بازشناسی تصویر
- حذف نویز
- رنگی کردن تصاویر سیاه و سفید
- ترمیم تصاویر آسیب دیده
- رده بندی تصاویر پزشکی
- ...



Deep learning for object detection and scene perception in self-driving cars: Survey, challenges, and open issues

Abhishek Gupta, Alagan Anpalagan^{*}, Ling Guan, Ahmed Shaharyar Khwaja

Ryerson University, 350 Victoria Street, Toronto, M5S2K2, Ontario, Canada

ARTICLE INFO

Keywords:
Self-driving cars
Levels of automation
Machine learning
Deep learning
Convolutional neural networks
Scene perception
Object detection
Multimodal sensor fusion
LIDAR
Computer vision
Autonomous driving initiatives

ABSTRACT

This article presents a comprehensive survey of deep learning applications for object detection and scene perception in autonomous vehicles. Unlike existing review papers, we examine the theory underlying self-driving vehicles from deep learning perspective and current implementations, followed by their critical evaluations. Deep learning is one potential solution for object detection and scene perception problems, which can enable algorithm-driven and data-driven cars. In this article, we aim to bridge the gap between deep learning and self-driving cars through a comprehensive survey. We begin with an introduction to self-driving cars, deep learning, and computer vision followed by an overview of artificial general intelligence. Then, we classify existing powerful deep learning libraries and their role and significance in the growth of deep learning. Finally, we discuss several techniques that address the image perception issues in real-time driving, and critically evaluate recent implementations and tests conducted on self-driving cars. The findings and practices at various stages are summarized to correlate prevalent and futuristic techniques, and the applicability, scalability and feasibility of deep learning to self-driving cars for achieving safe driving without human intervention. Based on the current survey, several recommendations for further research are discussed at the end of this article.

1. Introduction

With recent advances in artificial intelligence (AI), machine learning (ML) and deep learning (DL), various applications of these techniques have gained prominence and come to fore. One such application is self-driving cars, which is anticipated to have a profound and revolutionary impact on society and the way people commute [1]. Although, the acceptance and domestication of technology can face initial or prolonged reluctance, yet these cars will mark the first far reaching integration of personal robots into the human society [2]. The last decade has witnessed growing research interest in applying AI to drive cars [3]. Due to rapid advances in AI and associated technologies, cars are eventually poised to evolve into autonomous robots contrasted with human lives, and bring about a diverse socio-economic impact [4]. However, for these cars to become a functional reality, they need to be equipped with perception and cognition to tackle high-pressure real-life scenarios, arrive at suitable decisions, and take appropriate and safest action at all times [5].

Embedded in the self-driving vehicles' AI are visual recognition systems (VRS) that encompass image classification, object detection, segmentation, and localization for basic ocular performance [6]. Object detection is emerging as a subdomain of computer vision (CV) that

benefits from DL, especially convolutional neural networks (CNNs) [7]. This article discusses the self-driving cars' vision systems, role of DL to interpret complex vision, enhance perception, and actuate kinematic manoeuvres in self-driving cars [8]. This article surveys methods that tailor DL to perform object detection and scene perception in self-driving cars. In the survey, we also answer the following questions while appreciating the contribution of DL in these areas [9,10]:

1. What are the mutually reinforcing and fundamental operational requirements for fully functional self-driving cars?
2. What landmarks and developments have been achieved in self-driving cars in the last 20 years and what are some promising research directions for the next decade?
3. What is DL and how does DL create artificial perception? With the arrival of DL, is it eventually feasible to attain human level cognition and perception in self-driving cars?
4. Why is DL a promising technique for solving object detection and scene perception in self-driving cars? What are the cutting-edge DL models used for object detection and scene perception in self-driving cars?

^{*} Corresponding author.
E-mail address: alagan@sc.ryerson.ca (A. Anpalagan).

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بینایی رایانه

- Deep learning for object detection and scene perception in self-driving cars: Survey, challenges, and open issues
- Ryerson University, Toronto, Canada
- ELSEVIER

هنوز به تنهایی و بدون نیاز به انسان قادر به درک کامل محیط رانندگی نیست
 عمدتاً آزمایش های قبلی در جاده های باز و هوای خوب بوده اما آزمایشات اخیر شامل شرایط آب و هوایی مانند رانندگی در مه و برف میباشد
 امروزه با بهبود دوربین ها و استفاده از ترکیب سنسورهای چندوجهی سوالات در مورد این خودروها از شاید و اما و اگر به کی و چطور تغییر کرده اند
 میزان نفوذ این خودروها به میان جامعه بشری به توانایی آنها در رانندگی ایمن بستگی دارد که این امر نیاز حیاتی به تکنیک های قابل اعتماد تشخیص و رهگیری اجسام دارد



Deep learning for object detection and scene perception in self-driving cars: Survey, challenges, and open issues

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بینایی رایانه

1. مردم چگونه به فناوری خودروهای خودران پاسخ میدهند؟
2. با ظهور 5G پیشرفت های تکاملی را میتوان انتظار داشت؟
3. در حال حاضر درک تصویر مبتنی بر دیپ لرنینگ در چه مرحله ای نسبت به چشم انسان قرار دارد؟
4. در طی ۵ سال آینده انتظارات برای نزدیک شدن به دقت ۱۰۰٪ خودروهای خودران چگونه است؟

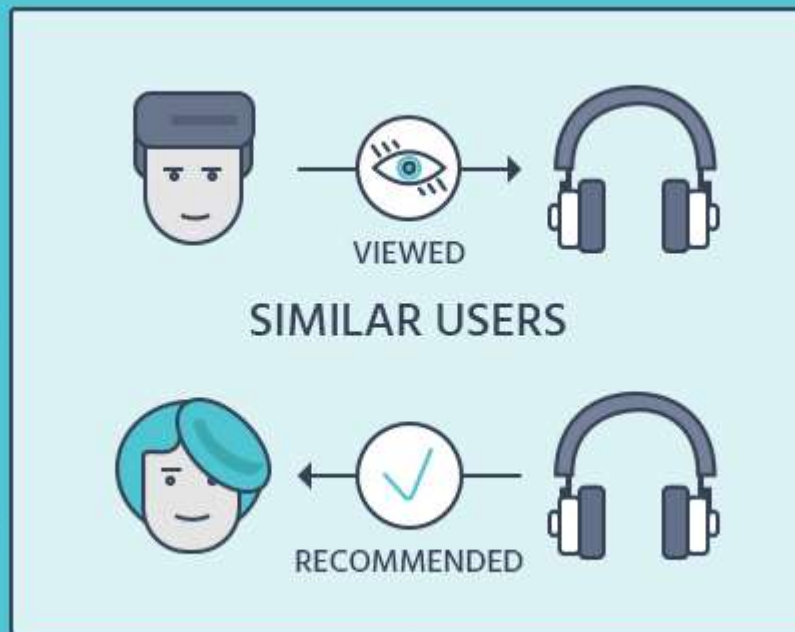
■ شروع هرچه سریع تر به جمع آوری داده ها در آب و هوای خطرناک نظیر باران، تکرک، برف، مه و...

■ سیستم های هوش مصنوعی بر اساس تابع هزینه/پاداش تصمیم گیری می کنند

کاربردهای دیپ لرنینگ

16

سیستم‌های توصیه‌گر ►



IMDb

 Spotify

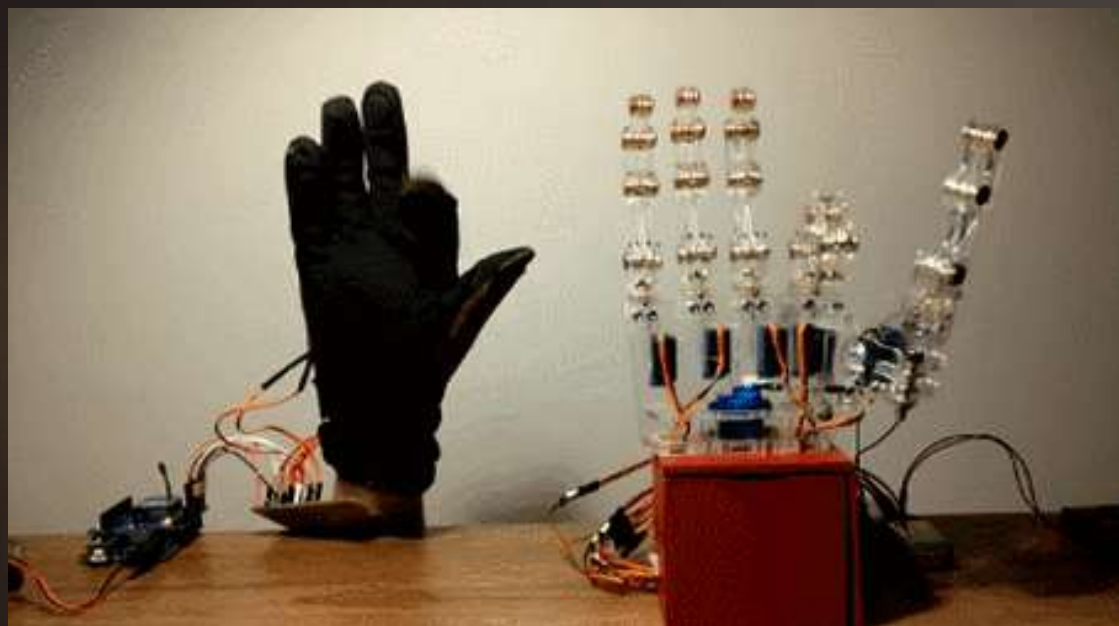
 Meta

 amazon

کاربردهای دیپ لرنینگ

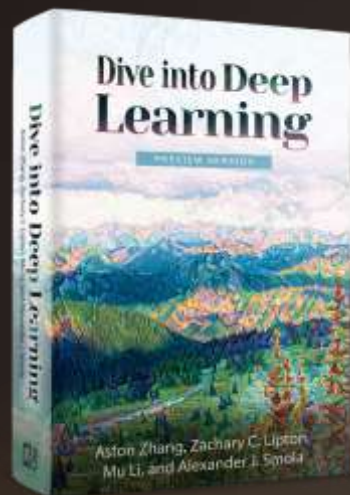
17

▶ تشخیص الکترومیوگرافی



جمع بندی نهایی

- ▶ دیپ لرنینگ یعنی : استفاده از الگوریتم های ماشین لرنینگ در شبکه های عصبی
- ▶ دیپ لرنینگ با سرعت در حال پیشرفت و فراگیر شدن میباشد
- ▶ استفاده های بسیار زیادی در پزشکی(الکترومیوگرافی) صنعت(کامپیوتر ویژن) زندگی روزمره(ریکامندر سیستم) هرچند که هیچکدام از این کاربرهائی که گفته شد محدود به یک عرصه خاص نمیشن و داخل بقیه زمینهها هم مورد استفاده قرار میگیرند.
- ▶ همچنین ما تمام تلاشمون این بود که مطالب رو به زبان ساده بیان و همراه با آشنا کردن شما با دیپ لرنینگ شمارو به اون علاقه مند هم بکنیم



▶ Dive into Deep Learning



- ▶ en.wikipedia.org/wiki/Deep_learning
- ▶ civilica.com/doc/648780/
- ▶ sciencedirect.com/science/article/pii/S2590005621000059
- ▶ www.researchgate.net
- ▶ Notroweb.ir

با تشکر فراوان