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7 Machine Learning Applications at Google

It is truly amazing that my Medium profile has been gaining significant traction thanks to a singular post, **"The 10 Algorithms Machine Learning Engineers Need to Know."** Up to this point, it has close to 500 recommends and has been featured in the LAB41 collection (findings, experimental results, and thoughts on big data challenges) that specializes in machine learning, data science, and deep learning. Because of that, I want to write more posts on this topic of machine learning and contribute knowledge to this increasingly popular technology trends.

Steven Levy's article, "How Google is Remaking Itself as a Machine-Learning-First Company", is one of the most popular piece over the summer. Essentially, it shows how Google has been obsessed with

machine learning technology since the beginning of 2016, with initiatives like open-sourced TensorFlow and the Brain Residency Program. As the most favorite place to work in the world, Google's mission is **to organize the world's information and make it universally accessible and useful**. So it comes to no surprise how much the company is investing in artificial intelligence, the future of technology. About 2 weeks ago, I had the opportunity to attend a talk at Galvanize to learn about some of the cool machine learning applications at Google. The speaker is Christine Robson, a product manager for Google's internal machine learning efforts. Here are the 7 applications and products that Christine described as the coolest use of machine learning at Google:

1—Google Translate

Google Translate is a free multilingual statistical machine translation service to translate text, speech, images, sites, or real-time video from one language into another. When Google Translate generates a translation, it looks for patterns in hundreds of millions of documents to help decide on the best translation. By detecting patterns in documents that have already been translated by human translators, Google Translate makes intelligent guesses (AI) as to what an appropriate translation should be.
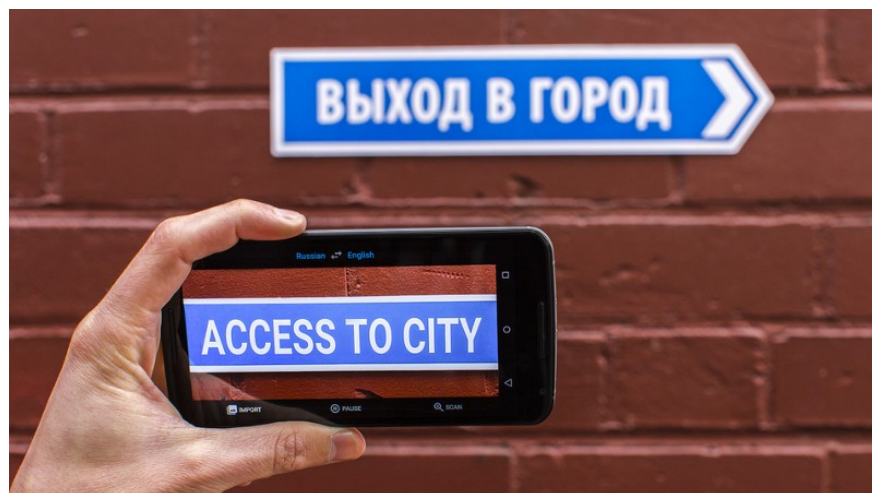

Google Translate Word Lens

Personally, I use Google Translate a whole lot when I live and travel abroad last semester. I lived in Copenhagen, where the main language is Danish, which I am not familiar with. So whenever I do grocery

shopping, I always use Google Translate to detect the products' labels and figure out what they mean in English. When I travel to other European countries, I also use Google Translate to figure out the street signs, the subway banners, and other navigation-related texts. It is really an amazing and simple piece of technology that saves me a lot of time.

2—Google Voice Search

Google Voice Search allows users to use Google Search by speaking on a mobile phone or computer, i.e. have the device search for data upon entering information on what to search into the device by speaking. It is Google's effort to compete with Apple's own Siri voice assistant, and has been said to be amazingly quick and relevant, and has more depth than Siri."
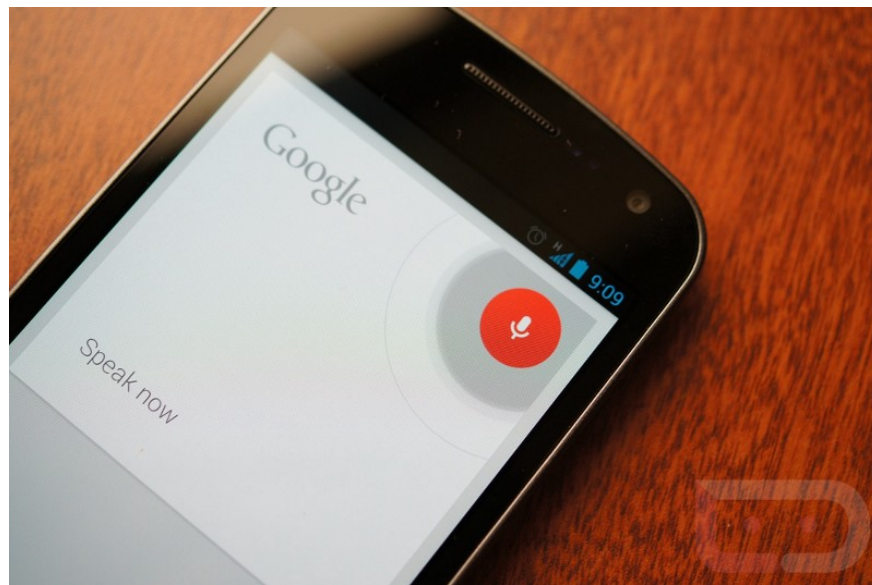

Google Voice Search

I own an Android phone, so I know this feature better than anyone else. My biggest liking of Google Voice Search is its integration with other products such as Google Maps and YouTube. When I don't feel like typing, I can say my searches and information will pop up immediately.

3—Gmail Inbox's Smart Reply

This feature is amazingly favored by busy professionals whose inboxes are flooded with emails every day and they don't have time to respond

to all. Smart Reply uses machine learning to automatically generate replies to emails, saving mobile users the hassle of tapping out answers on those tiny keyboards. According to Christine, this feature accounts for 10% of all email responses sent on mobile, quite an achieving feat.
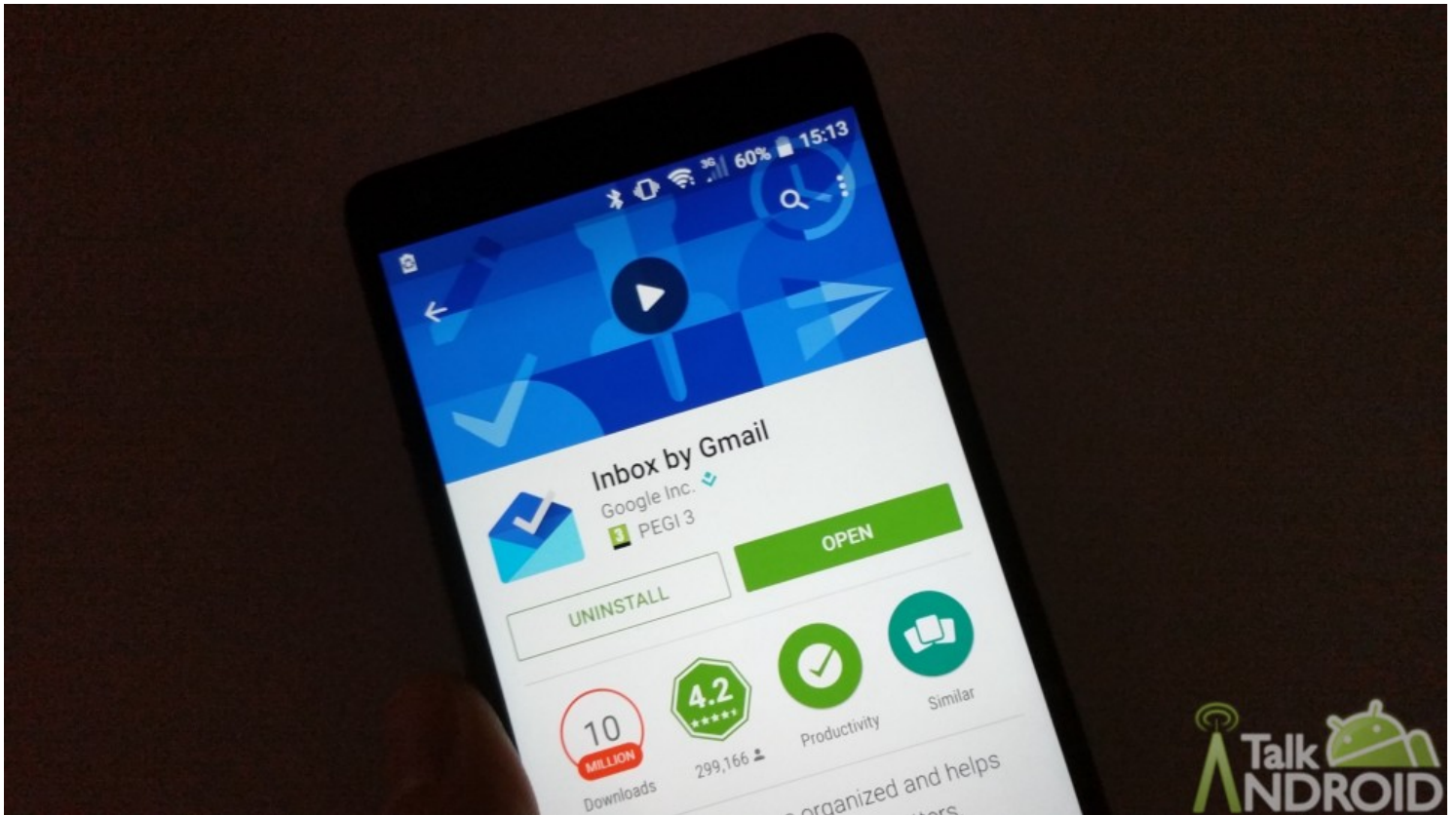
Inbox by Gmail

What made Smart Reply feasible was that success could be easily defined—plausible replies to real-life emails. Thus, the system could be trained by noting whether or not users actually clicked on the suggested replies. I haven't used Smart Reply yet (I still manually process every email that comes into my inbox), but undoubtedly when I start working, this will become a handy assistant to make my professional life less stressful.

4—RankBrain

A deep neural network for search ranking, RankBrain helps Google process search results and provide more relevant search results for users. If RankBrain sees a word or phrase it isn't familiar with, the

machine can make a guess as to what words or phrases might have a similar meaning and filter the result accordingly, making it more effective at handling never-before-seen search queries. According to Christine, RankBrain is the 3rd most important factor in the ranking algorithm along with links and content.


Google Rankbrain

Now 95% of Google's revenue come from advertisings on its search engine; so technology like RankBrain will only make the company more profitable.

5 — Google Photos

I am sure you use Google Photos a ton if you are an Android user. A photo/video sharing and storage service, Google Photos includes unlimited photo and video storage, and apps for Android, iOS, and the browser. Users back up their photos to the cloud service, which become accessible between all of their devices connected to the service. More recently, the app also automatically creates an album that collect photos taken during a specific period organized into an album of showing the "best" photos from the trip. In order to identify the "best" photos, the app uses machine learning where a computer has been trained to "learn" to recognize images.
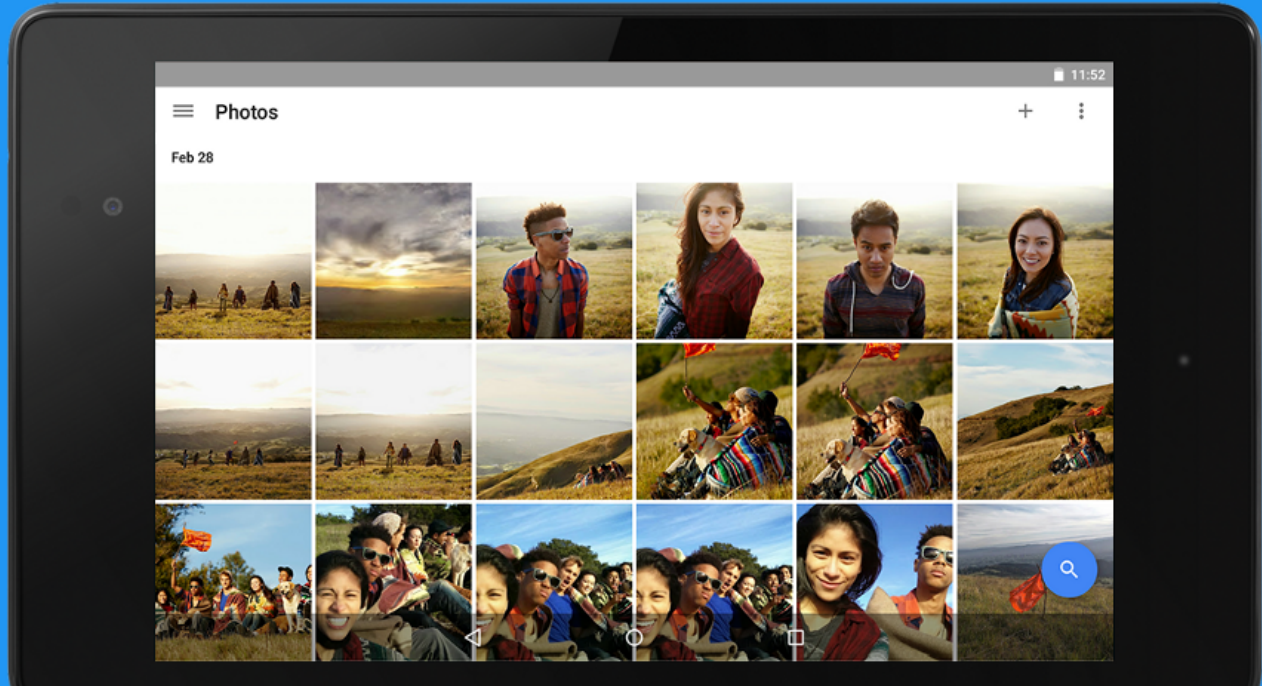
Google Photos

By experts' standards, Google Photos is the best in cloud photo storage over its competition from Amazon (Amazon Cloud Drive), Apple (iCloud), Dropbox, and Microsoft (OneDrive). I use the service a ton because of the seamless integration and synchronization, that photos can be edited in my computer and then synched to the folders in my Android phone.

6—Google Cloud Vision API

A more technical and enterprise product, Google Cloud Vision API enables developers to understand the content of an image by encapsulating powerful machine learning models in an easy to use REST API. It quickly classifies images into thousands of categories, detects individual objects and faces within images, and finds and reads printed words contained within images. As a developer, you can build metadata on your image catalog, moderate offensive content, or enable new marketing scenarios through image sentiment analysis.

Google Cloud Vision API

7—DeepDream

DeepDream is a computer vision program created by Google which uses a convolutional neural networks to find and enhance patterns in images via algorithmic pareidolia, thus creating a dreamlike hallucinogenic appearance in the deliberately over-processed images. I really can't do any justice of explaining this complicated algorithm, so I urge you to check out the Deep Dream Generator platform and explore the technology itself.

DeepDream image

If there is a single most important thing I learn from Christine's talk, it's this:

> *"The biggest problem with any machine learning model always lies in the data."*

What she means is that once you know about machine learning models, it is not too difficult to implement them, but it is really hard to own a good dataset to be trained at the first place. Thus, if you want to deepen your machine learning, I suggest you taking classes or getting familiar with statistics and linear algebra to be comfortable dealing with data.

Google has been a frontier in the development of machine learning technology by open-sourcing its tools so developers can create amazing applications themselves. Among the most popular one is **TensorFlow**, the #1 GitHub repository that does computation using data flow graphs for scalable machine learning. Other initiatives include Google's Machine Learning Ninja Rotation (for internal employees only)— which pulls talented coders from different teams to participate in a regimen that teaches them the AI techniques that will make their products smarter, and the **Brain Residency Program**—sort of like a PhD program in deep learning.

If you have an interest in machine learning in general or machine learning at Google in specific, check out the hyperlinks included in this post. I am sure you will realize how big of an impact machine learning applications are having in your day-to-day activities.