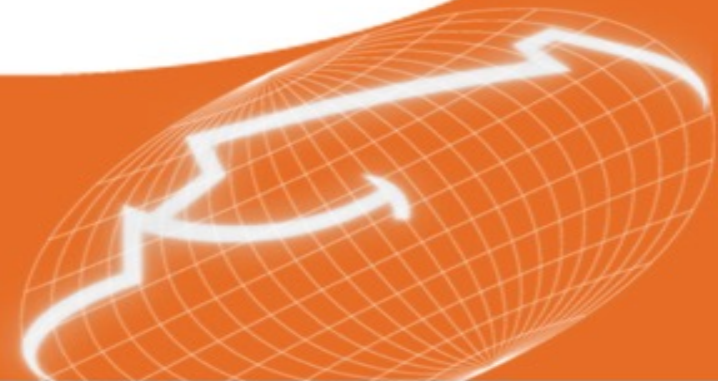


Frontier Technologies Making IP Work for Everyone



Dr. Hongxia Yang
Alibaba Group



Brief Bio



Experience:

- ✓ PhD in Stats & ML, Duke University
- ✓ AI Scientist, DAMO Academy, Alibaba Group
- ✓ Principal Data Scientist of Computational Ads, Yahoo! Inc
- ✓ Research Staff Member, IBM T.J. Watson

Awards:

- ✓ 2019 World Artificial Intelligence Conference, Super AI Leader (SAIL Award)
- ✓ 2020 National Science and Technology Progress Award (China's Highest Tech Award)
- ✓ 2021 1st prize of Science and Technology Progress of the Chinese Institute of Electronics
- ✓ Published over 80 top conference and journal papers and held close to 20 US/Chinese patents

Overview

- **Introduction to Alibaba Group and DAMO Academy**
- Pretrained Models and M6
- Topics about Frontier technology and IP
 - How can frontier technologies make IP more accessible for users of the IP system?
 - What are the hopes and expectations of innovators and creators have regarding frontier technologies and IP?
 - How can frontier technologies make IP more accessible to young inventors and creators and enable SMEs to protect their rights?

About DAMO Academy



- Committed to exploring the unknown of technology
- Based on basic science, disruptive technology and applied technology research
- Focus on "Intelligence + Computing"
- High-level talents from industry and academia



AI Intelligence

Audio

Visual

Decision Intelligence

NLP

Industrial AI



Data Computing

Chips

DB and Storage

intelligent computing

OS



Robotics

Autopilot



X

quantum computing

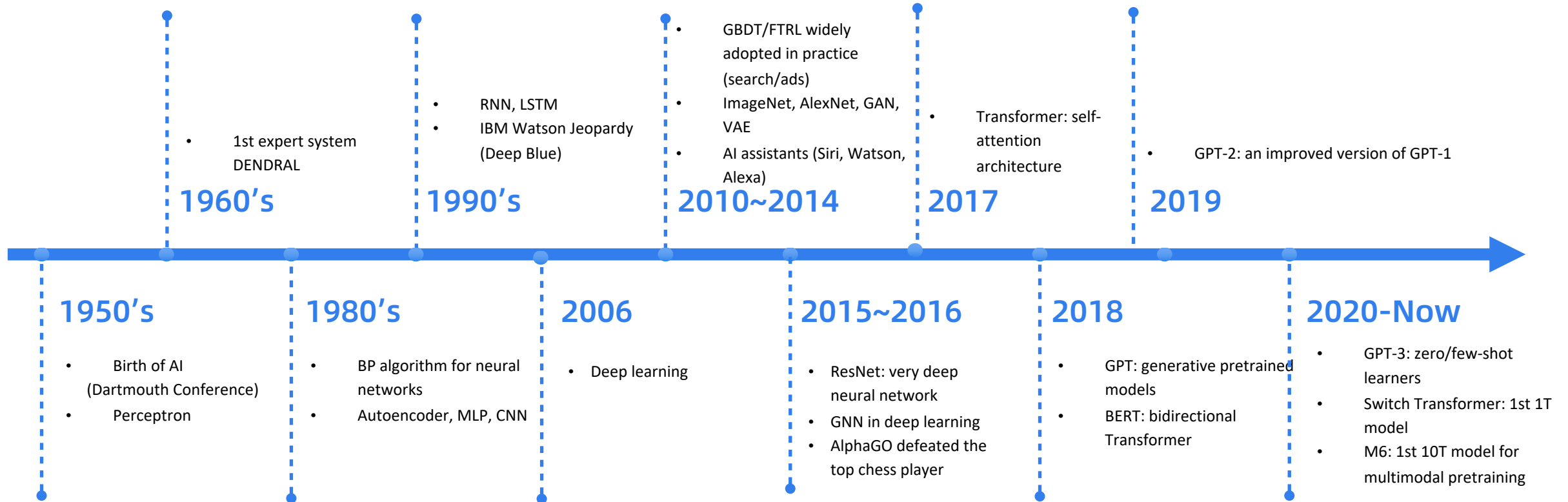
XG

XR

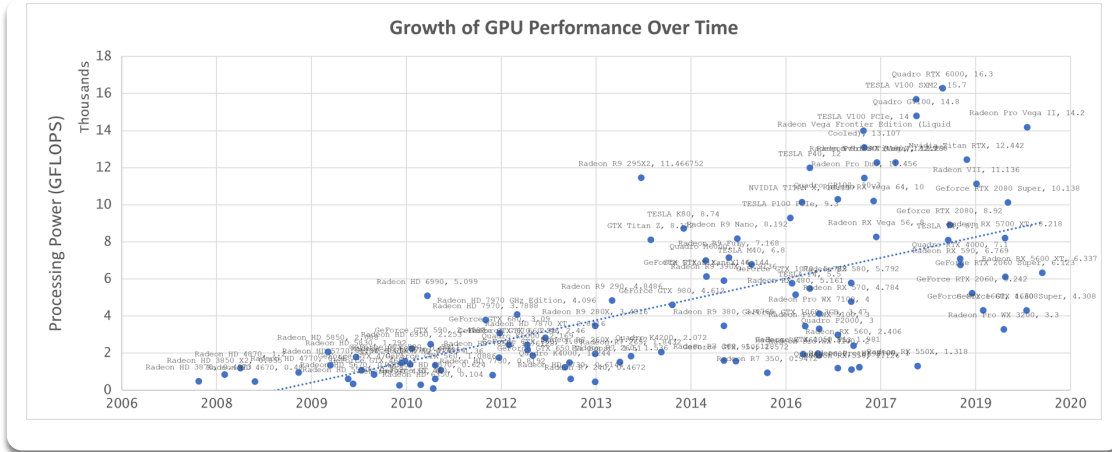
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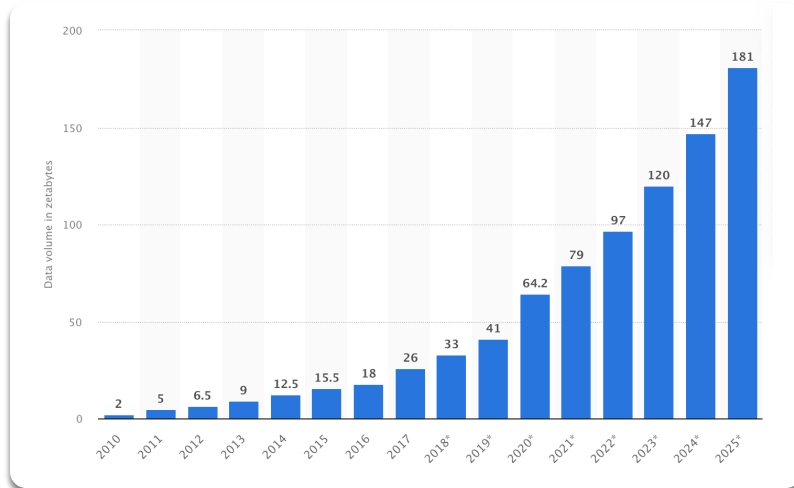
Exponential Growth in Artificial Intelligence



Three Driving Factors

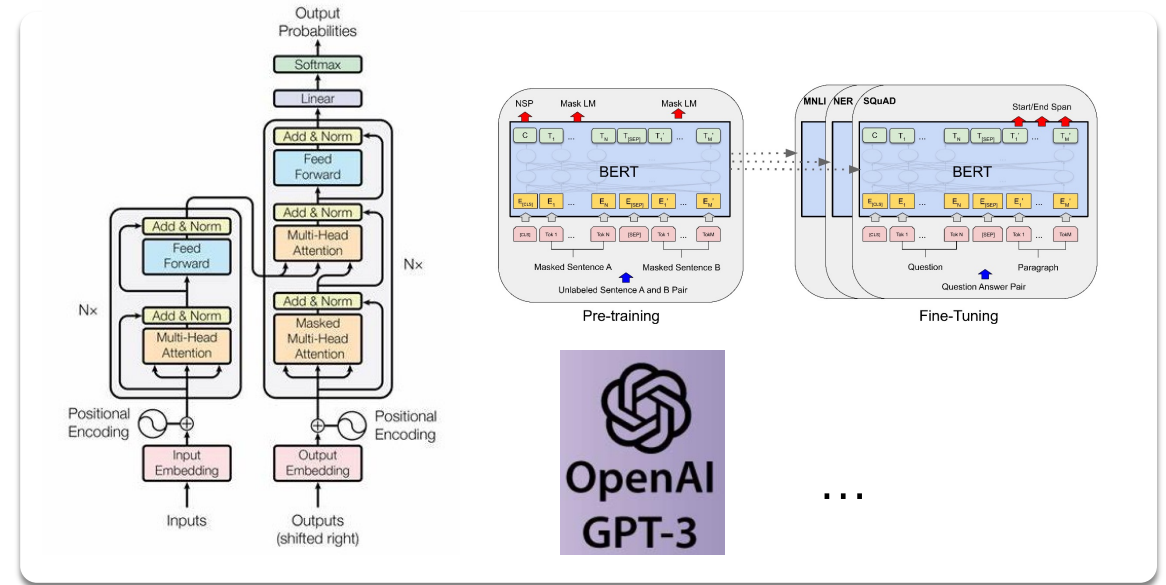


Soaring Computing Capability



Volume of data/information created, captured, copied, and consumed worldwide from 2010 to 2025(in zettabytes) *From Statista

Explosion of Training Data



Model Innovations: Transformers, Pretrained Families

SOTA of Large-scale Pretrained Models

BERT (Google)

Landmark work of pretraining

- Supports almost every English-based query on the Google search engine, increasing efficiency by 10%

Model architecture highlights

- Bidirectional Transformers, trained with Masked Language Model (MLM) and Next Sentence Prediction (NSP)

Pretraining data and model size

- BooksCorpus (800M words) and English Wikipedia (2,500M words). BERT-large contains 340M parameters

GPT (OpenAI)

GPT Series

- GPT-1, GPT-2, and GPT-3

GPT-3 with 175 billion model parameters

- Demonstrate that the super-large-scale model has the ability to perform few/zero-shot learning

Model architecture highlights

- Transformer-powered decoder blocks, zero/few-shot learners, masked self-attention

Pretraining Data and Model Size

- CommonCrawl (from 2016 to 2019) has 45TB of compressed plaintext before filtering and 570GB after filtering. GPT-2 contains 1.5 billion parameters and GPT-3 increased to 175 billion

Switch Transformer

Switch Transformer, 1.6 Trillion

- Mixture of Experts (MoE), sparsely activated, constant computational cost

Engineering practices and hardware facilities face greater challenges

- For such a large-scale model to be deployed on a cluster for training, GPUs, machinery and equipment, storage, etc. all incur new challenges

Pretraining data and model size

- 34B tokens of the C4 dataset. Switch Transformer contains 1.6T parameters.

Article Writing

2021 Beijing College Entrance Exam Essay

从下面两个题目中任选一题，按要求作答。不少于700字。将题目抄在答题卡上。

(1) 每一个人都生活在特定的时代，每个人在特定的时代中的人生道路各不相同。在同一个时代，有人感叹生不逢时，有人只愿安分随时，有人深感生逢其时、时不我待……

请以“论生逢其时”为题目，写一篇议论文。

要求：论点明确，论据充实，论证合理；语言流畅，书写清晰。

论生逢其时

每个人都生活在特定的时代，每个人都有自己的生活方式。我们不能选择我们出生的那一天，但我们可以选择与我们相伴的时代。

我们生活在这个伟大的时代里，我们的祖国母亲饱经风霜，历尽沧桑，却始终保持着清醒的头脑，没有因一时的成功而沾沾自喜，也没有因失败而垂头丧气，而是坚强地昂首阔步地走过了不平凡的历程，创造了辉煌的业绩。

这是一个多姿多彩的时代，也是一个充满机遇与挑战的时代。在这样一个百年未有的时代，在这样一个时代背景下，有人只慨叹生不逢时，碌碌无为。也有人为了自己的理想而奋斗，主动把握时机为中华民族生生不息、绵延发展贡献自己的智慧和力量，就如我们现在看到的很多电视剧里的英雄，他们都是为了国家和民族的发展而努力奋斗的。所以我们应该学习他们的优秀品质，这样才能让我们的祖国越来越强大。

我们应当记住，时代的精神永远都是昂扬向上的，我们的人生也永远都不会是一帆风顺的，但是我们要永远保持一颗对未来充满希望的心，永远拥有一份对工作满腔热忱的心，因为只有这样才会对得起自己的努力付出，对得起家人的期盼，也对得起朋友的陪伴，我们要做一个积极向上的人，不管遇到什么困难，我们都要勇敢面对，不要害怕，不要退缩，不要放弃，相信自己。

生逢其时，作为祖国未来的建设者和纳税人，我们不能忘记自己的责任，更不能放弃自己的使命。我们要热爱祖国，热爱党，热爱人民，热爱中国特色社会主义事业，以实际行动为祖国的繁荣昌盛而贡献自己的力量。我们既不走封闭僵化的老路，也不走改旗易帜的邪路，始终坚持正确的政治方向和舆论导向，在大是大非问题上立场坚定、旗帜鲜明、敢于亮剑，在错误道路上勇于担当、奋勇搏击，在歪风邪气面前坚忍不拔、斗志昂扬，在违法乱纪问题上坚决斗争，保证人民安居乐业、社会安定有序，让改革发展成果更多、更公平地惠及全体人民。

Born At the Right Time

Everyone lives in a specific era, and everyone has their own way of life. We can't choose the day we were born, but we can choose the era with us.

We are living in this great era. Our motherland has gone through hardships and vicissitudes, but has always kept a clear head. She did not feel complacent about a momentary success, nor was she downcast because of failure. Instead, she walked with her head firmly and stride forward. The extraordinary course has created brilliant achievements.

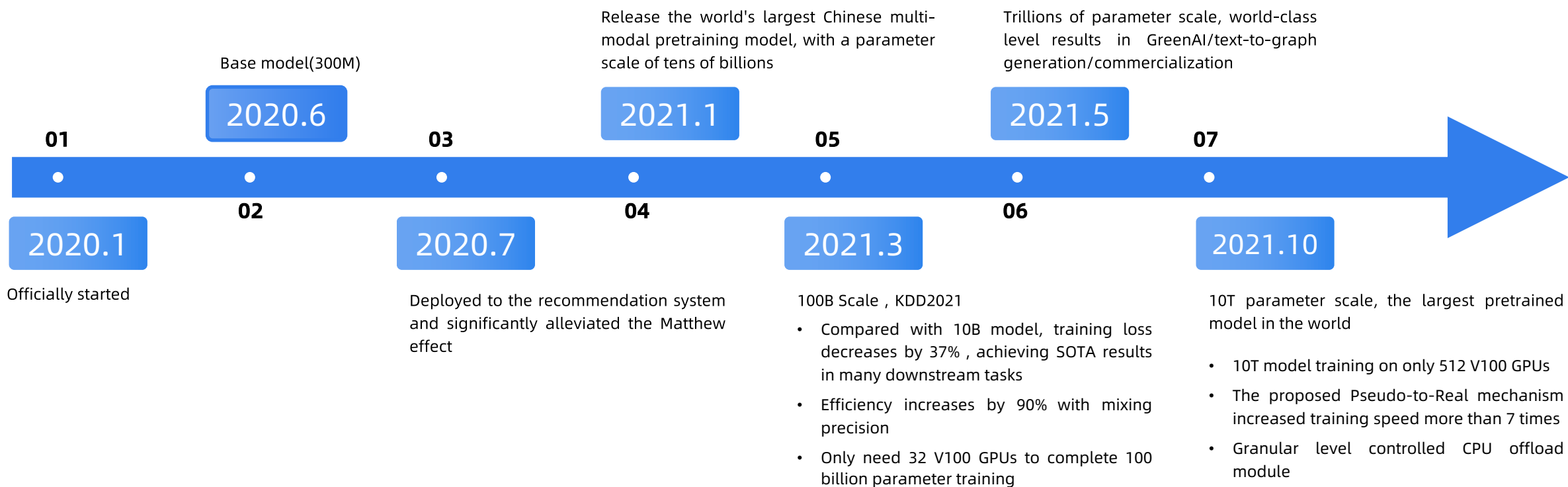
This is a colorful era, but also an era full of opportunities and challenges. In such an era that has not been seen in a century, and against the background of such an era, some people only lament that life is not at the right time and doing nothing. There are also people who fight for their ideals and take the initiative to seize the opportunity to contribute their wisdom and strength to the continuous and continuous development of the Chinese nation. For example, the heroes in many TV series we see now are all for the development of the country and the nation. And hard work. Therefore, we should learn from their excellent qualities, so as to make our motherland stronger and stronger.

We should remember that the spirit of the times is always high-spirited, and our life will never be smooth sailing, but we must always maintain a heart full of hope for the future, and always have a passion for work. Heart, because only in this way can we be worthy of our hard work, the expectation of our family, and the company of our friends. We must be a positive person. No matter what difficulties we encounter, we must face it bravely and don't be afraid. Don't back down, don't give up, believe in yourself.

We are born at the right time, as the future builders and taxpayers of the motherland, we must not forget our responsibilities, let alone give up our mission. We must love the motherland, love the party, love the people, love the cause of socialism with Chinese characteristics, and make contributions to the prosperity of the motherland with practical actions. We do not follow the old road of isolation and rigidity, nor the evil road of changing the flag. We always adhere to the correct political direction and public opinion orientation. We stand firm on major issues of right and wrong, have a clear-cut stand, and dare to show our swords, and take responsibility and fight courageously on the wrong road. In the face of unhealthy trends, perseverance, high morale, and resolute struggle on the issue of violations of laws and disciplines, to ensure that the people live and work in peace, social stability and order, so that more reform and development results will benefit all people more equitably.

Multimodal Pretrained Model at Alibaba Group

- M6: Multi-Modality to Multi-Modality Multitask Mega-transformer
- A Chinese multimodal pretrained model over 65TB images and 4TB texts
- Demonstrate outstanding results in a series of downstream applications



Question Answering

Prompt:

出国留学的理由是什么? *回答:*

What is the reason for studying abroad? *Answer:*

Generated Text:

谢邀。这个问题我觉得我有资格回答一下，因为我就是一个留学生。首先说一下我的家庭背景吧，父母都是普通工薪阶层，没有什么特别的背景，但是我从小就很聪明，也很努力，所以从小学到高中都是班里前几名，虽然成绩一直不是特别拔尖，但还是可以保持在年级前五十的水平。大学的时候，我选择了出国读研究生，现在已经毕业两年多了，回想起来，当初选择出国的原因真的很简单，就是想去看看外面的世界，体验一下不一样的生活。

Thanks for your invitation. I think I can answer this question, as I am an international student. For starters, I'd like to talk about my family. My parents are all working-class people, and they have nothing special. Yet since I was a little child I have been very clever and hard-working, and thus I have always been the top students in my class. Although I was not the best, I could keep myself in the top 50 of the students of our grade. When I was in college, I chose to study abroad for graduate school, and now I have graduated from school for two years. Actually the reason for my studying abroad is quite simple. I just wanted to go outside and experience different life.

M6 is able to generate long answers in the style of forum discussion

Visual Question Answering



Prompt:

这是什么? 回答:

What is this? Answer:

Generated Text:

长城。长城是中国古代劳动人民智慧的结晶，是中华民族精神的象征，是世界文明的标志。它不仅仅是一种建筑形式，更是一个国家、一个民族的精神象征。

The Great Wall. The Great Wall reflects the great talent of Chinese people, and it is an important representation of the spirit of Chinese, and it is also a logo of human civilization. It is a form of architecture, and it is even a spiritual representation of a country and a people.



Prompt:

这里是哪儿? 回答:

Where is this? Answer:

Generated Text:

故宫博物院，位于北京市中心，是中国明清两代的皇家宫殿，也是世界上现存规模最大，保存最为完整的木质结构古建筑之一。

The Forbidden City. The Museum of the Forbidden City is located at the center of Beijing, and it is the palace of the Ming and Qing Dynasty. It is one of the largest and the most well-preserved wooden ancient buildings.



Prompt:

他的衣服是什么颜色的? 回答:

What color is his clothes? Answer:

Generated Text:

黑色。他的鞋子是白色。

Black. His shoes are white.

Prompt:

这个人的头盔是什么颜色的? 回答:

What color is this man's helmet? Answer:

Generated Text:

蓝色的。

Blue.

- **Q&A with visual context:** requires the model to generate answers, given an image and a question
- M6 is able to recognize general features and provide related knowledge based on its understanding

Chinese Poem Writer

Prompt:

见情郎 作者：唐 李白 正文：

Title: Dating Author: Bai Li (Tang Dynasty) Text:

Generated Text:

上马出东门， 摧车欲问道。
却顾所来径， 苍苍横翠微。
相去既远离， 衣带日以疏。
浮云卷水来， 纷纷予还往。
相见无杂言， 但道桑麻长。
安得此中人， 与之共同老。

I ride on a horse through the east gate, and get out of my cart to ask the way. Looking back at the way I come from, there are green trees standing by. We have been apart from each other by a long distance, and my clothes look larger and larger. Clouds gather water to come, going here and there. Despite prolonged separation, we don't have specific words when we finally meet each other, only discussing about everyday life. Oh! Where can I find such a lover, that we both grow old together?

- Ancient Chinese poetry has various specific formats
- We adopt the simplest constraints that
 - The poem shall be consisted of at least 4 lines.
 - The total number of lines shall be even.
 - Each line must have exactly 5 or 7 words.
 - All lines shall have the same number of words.

Text Summarizer

新闻内容 (News Article)

本报雅加达电记者报道：印尼中央统计局近日发布数据显示，有多达**82.85%**的印尼企业在新冠肺炎疫情严重冲击下营收减少，最严重的降幅甚至超过80%...

Our newspaper's Jakarta reporter Bian Chenguang reported: According to statistics released by the Indonesian Central Bureau of Statistics recently, as many as **82.85%** of Indonesian companies have reduced their revenue due to the severe impact of the new crown pneumonia epidemic. The most serious decline has even exceeded 80%...

本报雅加达电记者卞晨光报道：印尼中央统计局近日发布数据显示，有多达**79%**的印尼企业在新冠肺炎疫情严重冲击下营收减少，最严重的降幅甚至超过80%...

Our Jakarta telegraph reporter Bian Chenguang reported: According to statistics released by the Indonesian Central Bureau of Statistics recently, as many as **79%** of Indonesian companies have reduced their revenue due to the severe impact of the new crown pneumonia epidemic. The most serious decline has even exceeded 80%.

输出摘要 (Summary)

印尼**逾八成**企业营收减少

More than 80% of Indonesia's corporate revenues fell

印尼**近八成**企业营收减少

Nearly 80% of Indonesia's corporate revenues have decreased

Image Captioning/Description



Generated Text:

想拥有与女神同样的气场与魅力？粗高跟短靴会是不错的选择。舒适平稳的粗跟设计让曼妙与优雅回归到轻松的状态，在冬日的时光里自由行走，尽显女神魅力。

Want to have the charm of a beautiful lady? It may be a good choice to wear a pair of short boots with thick high heels. The thick heels help you walk stably and feel comfortable, and it helps you demonstrate grace and elegance. You can walk freely and confidently in winter, demonstrating the charm of a beautiful lady.



Generated Text:

北欧实木床，以简约为主的风格，彰显清新的气息。边角经过细心打磨，每一个细节都做到安全不伤手。线条流畅自然，给人舒服的视觉体验，给家居带来美丽清新的装饰。

The Nordic wood bed has a style of simplicity and demonstrates softness in color. The corners are rounded off and they will not hurt hands. Its outlines provide a comfortable visual experience and it is a beautiful home decoration.



百变女神海边度假长裙，让你美的不像话。
Variety goddess seaside resort long skirt, make you too beautiful to be true



LED强光头灯，夜钓必备
LED strong headlight, essential for night fishing



一款简约不失优雅气质的风衣，采用经典翻领设计，完美修饰脸型。腰间系带装饰，可根据自身需求调节松紧度，穿着舒适方便。两侧大口袋点缀，丰富层次感很实用。

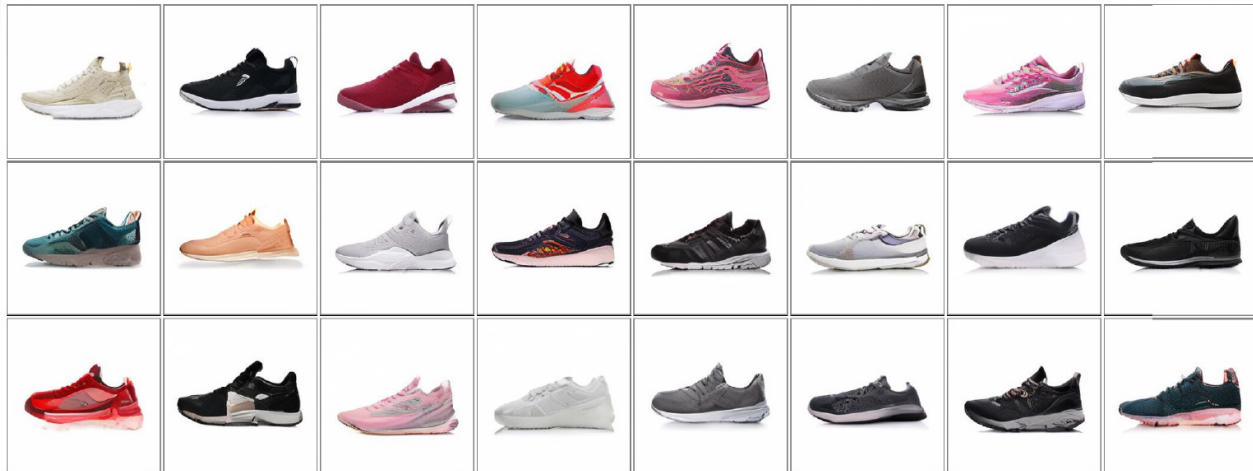
A simple yet elegant windbreaker, with a classic lapel design to perfectly decorate the face. The waist belt is decorated, the tightness can be adjusted according to your own needs, and it is comfortable and convenient to wear. The large pockets on both sides are embellished, and the rich layering is very practical.

- Generates captioning/description that describes the given image
- M6 is able to achieve high scores in grammar, correctness, and richness

Text-to-Image Generation in E-Commerce



sheep wool business casual suit (绵羊毛商务休闲西服套装).



shock absorption and breathable running shoes (减震透气跑鞋).

- Product titles and images from the mobile Taobao
- Generated images have high quality and resemble the real ones

Image Generation with Creativity

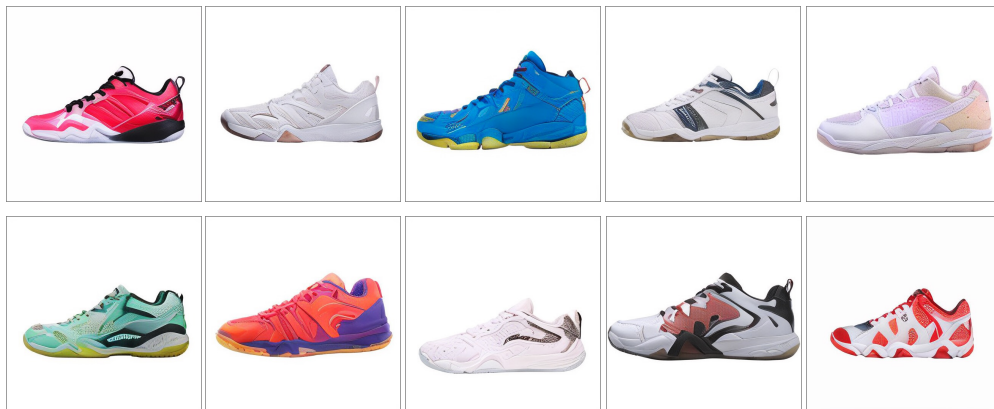
男女外套保暖棉袄连帽轻棉衣

Men's and women's hooded and cotton jackets

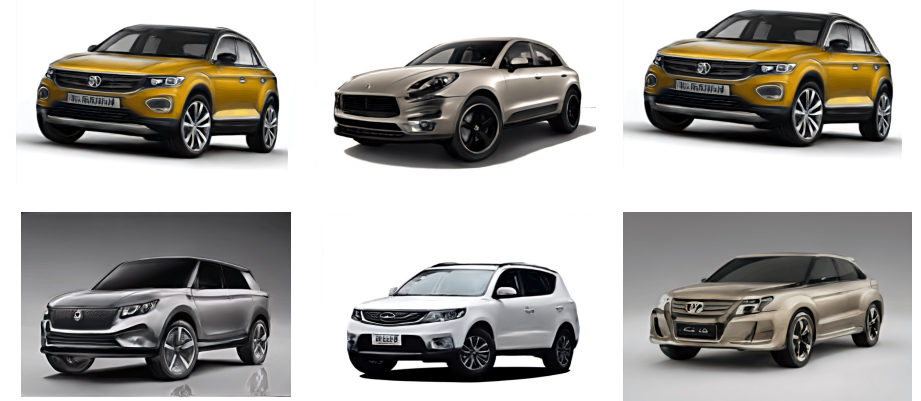


贴地飞行LITE耐磨羽毛球比赛鞋

Flying close to the ground LITE wear-resistant badminton competition shoes



Creative image synthesis for "business cars"



Creative image synthesis for "future cars"



Mobile APP Search at Alipay Platform

专科录取分数线 College entrance exam score

Baseline



M6



教师资格认定 Teacher Qualification Appraisal

Baseline



M6

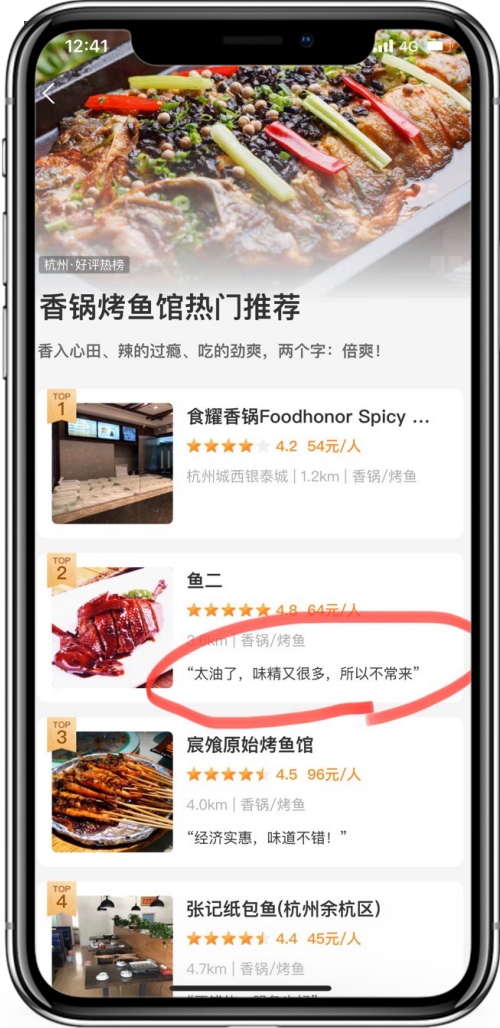


Sentiment Analysis

Choosing relevant and personalized store reviews is critical for recommendation. However, inconsistency between the star rating and selected reviews can be confusing. Through sentiment analysis, M6 can significantly improve the relevance of comments

	Sampling	Problematic Proportion	Inappropriate Recommendation Proportion
Before	1000	41/4.1%	11/1.1%
After	5000	103/2.06%	84/1.68%

Before	After
太油了，味精又很多，所以不常来 It's too oily and there is a lot of MSG, so I don't come often	超级好吃，而且非常划算哦！ Super delicious, and very cost-effective!
陈璐萍是好姑娘 Chen, Luping is a good girl.	超好吃的清风和布丁 Super delicious breeze and pudding



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What are blocking innovations?

- Searching IP is difficult:

Previously, to search related IP, it is a must to design handcrafted rules to select necessary information. Say, if you search IP about visual understanding, you need to write a keyword list (“ image classification” , “image captioning” , “object detection” , “image segmentation” , etc.) and complex rules for mapping.

- Understanding IP is not easy:

IPs/patents are mostly written in professional language, and most people except for the experts find them difficult to understand. Also, it is difficult for innovators to write the materials. See an example below:

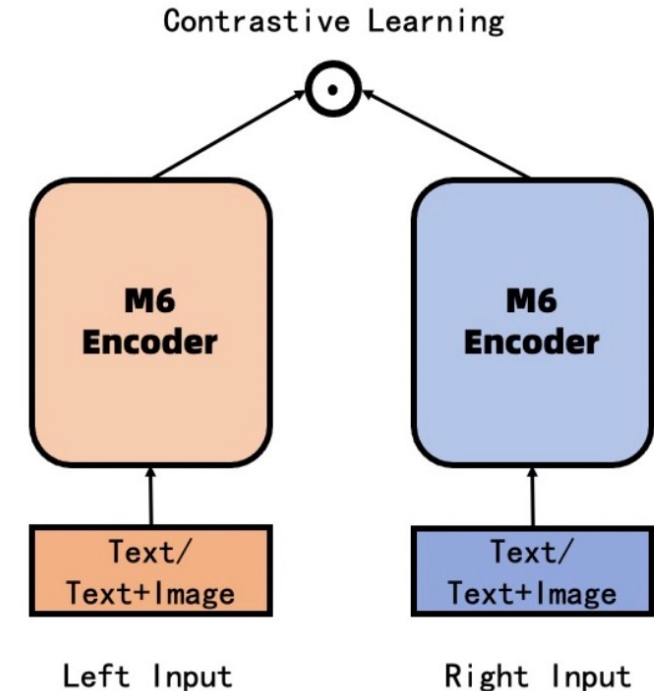
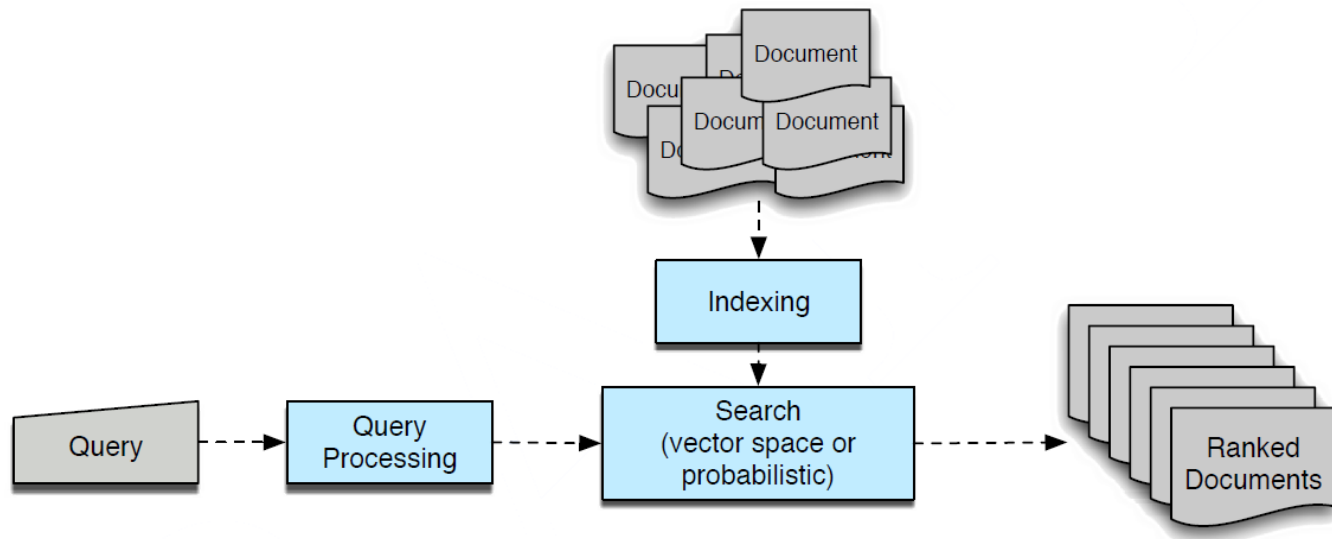
“A system comprising one or more computers and one or more storage devices storing instructions that, when executed by the one or more computers, cause the one or more computers to perform operations comprising:”

Accessibility to Users

Significance: Innovation accelerates the spread of IP.

Difficulty: It is still hard for effective information retrieval.

Key techs: Pretraining-based text Retrieval, multimodal retrieval, cross-modal understanding, etc.

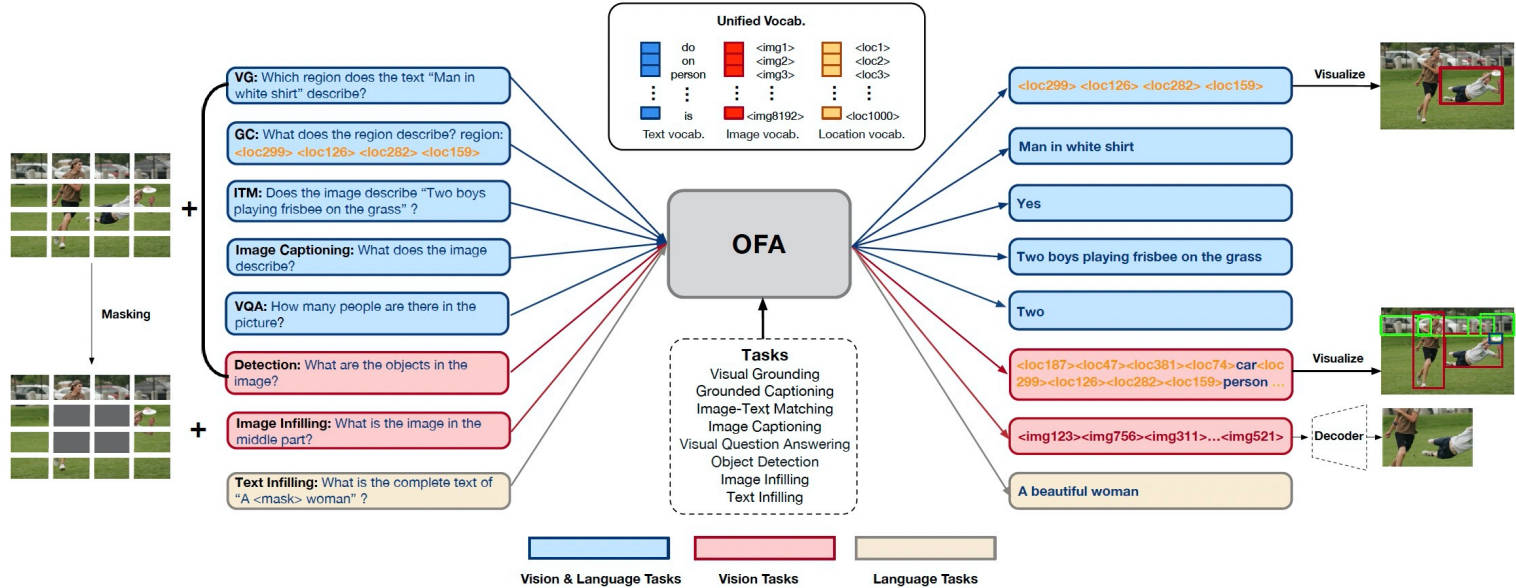


Expectations of Creators

Significance: Cutting-edge techs can help them get rid of the tedious work of writing.

Difficulty: It is hard to transfer oral expressions to professional language for IP.

Key techs: Large pretrained model for text style transfer, text-to-text generation, and even image-to-text generation, etc.

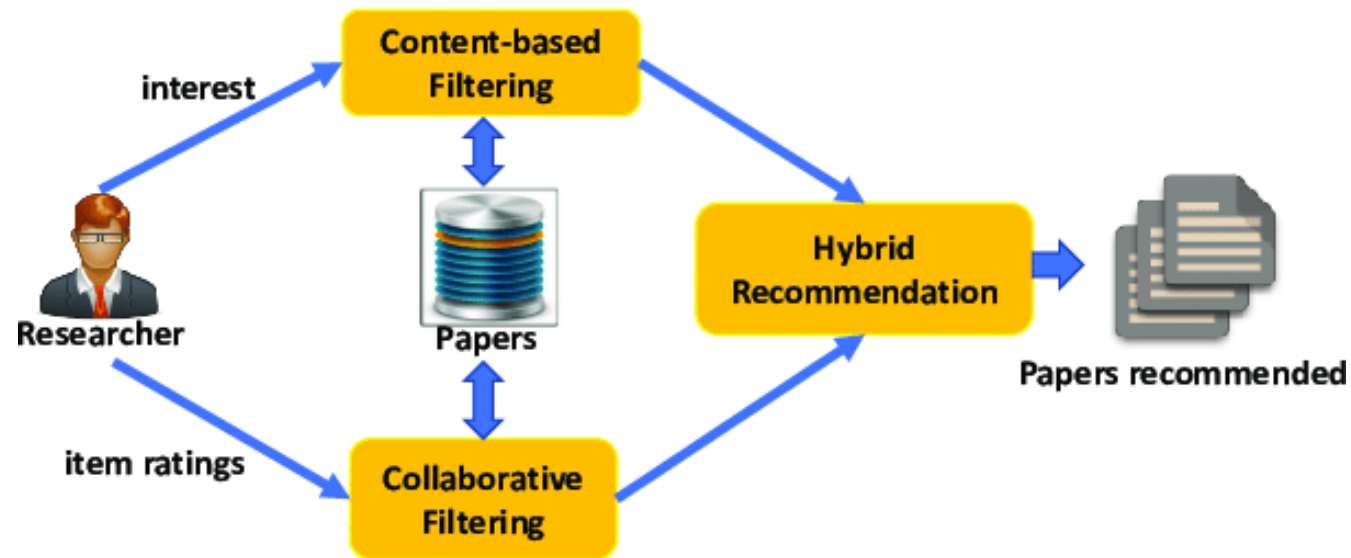


Expectations of Young Creators

Significance: New techs can help them obtain necessary information for IP creation efficiently.

Difficulty: it is hard to access information that they are essentially interested in.

Key techs: Personalized search and recommendation, based on large-scale pretraining.

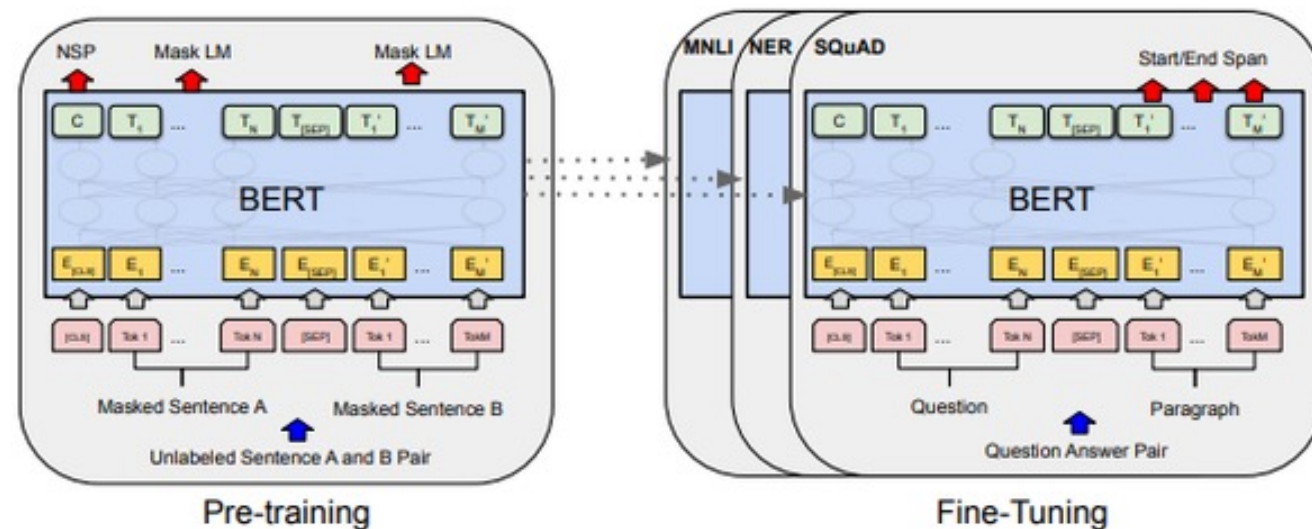


Expectations of Young Creators

Significance: Better understanding of IP can encourage innovation.

Difficulty: it is hard to understand contents of IP and thus hard to predict the trends of technology and business.

Key techs: key information extraction, text / multimodal classification, text-to-text transfer (from professional language to oral language), etc.



Thanks

