Northeastern University

Final Project

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Introduction

Machine learning and artificial intelligence (AI) have the potential to significantly boost workplace efficiency and supplement human labor. Resources can be devoted to more intellectually engaging jobs that call for traits like creativity when they are used to replace humans in routine or dangerous occupations. Automated machine learning is so pervasive today that they are used in a variety of different industries to help people complete their tasks more efficiently. In this report, we will take four companies as examples to describe in detail how AutoML plays an important role in the organization's operations and benefits society.

Since these four companies are from different industries, we could learn more about the benefits of AutoML for people and society. The four companies include 4M, AT&T, Flowcast, and Tala. In the case of each company, we will discuss the type of AutoML they are using, the benefits it brings, possible problems, and recommendations.

Case Study 1: 4M Analytics

As part of construction projects worldwide, stakeholders need accurate location information to map out the complex infrastructure system (pipelines, electricity, sewer, gas, drainage, and communications). To maintain and inspect this underground infrastructure effectively, it is essential to know its location; especially for new construction projects, accurate information about potential obstacles is necessary.

The purpose of Subsurface Utility Engineering (SUE) is to map and verify underground utilities and infrastructure. It is likely that records and precautions already exist for urban work, however, rural work presents a greater challenge as survey zones are orders of magnitude larger. SUE costs can reach tens of millions of dollars for major projects. Due to the painstakingly slow manual detection methods used in tracing the route of pipes and infrastructure across numerous miles of rural areas, the SUE surveying process can take several months to complete. Construction delays, change orders, claims, and budget overruns increase when underground utilities are not located according to records and building plans. Furthermore, relocating subsurface utilities and piping can cause significant delays and cost overruns. The number of underground utility damage incidents during construction in the U.S. in 2020 was more than 385,000.

Seeing a potential time and cost saving in SUE through the use of new technologies, 4M Analytics (4M), a US based start-up company with 100 team members developed a distinctive method for pinpointing underground utilities using new technologies. In 2020, the company launched commercial services in Texas after more than three years of research and development. It has already received seed funding of US $ 45.5 Million to expand worldwide and is already selling services commercially. Among its customers are the transportation, oil and gas, water, and

electricity sectors. Exodigo and CivilGrid are competitors with somewhat similar offerings. Initially, the company plans to focus on Texas projects, with plans to expand to other parts of the country.

4M delineates the SUE in an area of interest by combining advanced remote sensing technology, AutoML, artificial intelligence (AI), and computer vision in a data fusion engine which translates the data captured into meaningful insights. As a result, the areas requiring manual investigation are minimized. In simple terms, they sell under-earth maps through cloud-based service in a (Software as a Service) SaaS model in real-time that provides huge cost savings. Data from 4M is harvested, analyzed, and presented in a clear, precise utility conflict map of the most current and comprehensive subsurface utilities. Throughout the process of collecting and analyzing data, 4M automates much of what a client marks out as an area of interest or pipeline of interest. By combining the data sets with computer vision algorithms, the data fusion engine identifies and detects all surface unique phenomena which indicate subsurface utilities. By combining and mining data, the data fusion engine identifies patterns and determines the parameters and paths of pipelines and infrastructure. 4M adds the entire dataset to the growing database of surveys after rating all sources and resolving conflicts. Customers can obtain an interactive smart map of all underground utilities and structures from 4M Analytics (4M) that is highly detailed and highly accurate. Instead of typical SUE surveys that usually take several months to compile, 4M's solution takes just a few days to complete and provides builders with a real-time picture of the infrastructure beneath the surface before the planning phase even begins. In an unprecedented scale and at a low cost, 4M's actionable solution covers more area and has greater accuracy.

4M’s potential impact

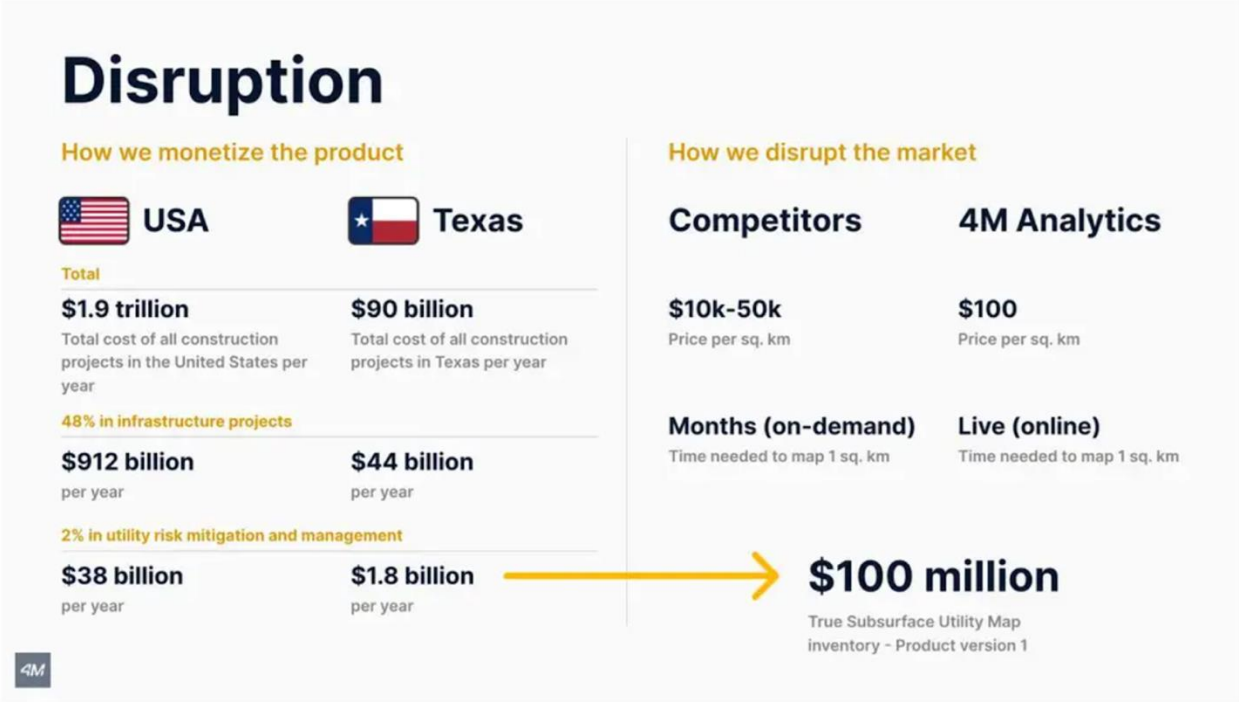


Figure 1

A strong background in data science and business intelligence enables 4M Analytics to offer two expert collections, including Robotics and Artificial Intelligence. The 4M team has the operational expertise and leadership experience needed to form a company that will succeed in the long run.

In regard to 4M scaling their company, further developing their products, and realizing their vision, they are well on their way in helping to support a global need by reaching their goal of creating a single global map of underground utilities and subsoil hazards that will revolutionize the infrastructure sector. We see 4M as the first mover. The company's unique product and strong founders will make them excel in the industry.

The North American artificial intelligence market is growing rapidly. There has been a dramatic increase in the amount of funding for artificial intelligence start-ups over the past decade, with the United States contributing a large share of the funding each quarter.

4M's growth and financial stability is propelled by such fundings. Our consolidated dashboard shows the immense funding in the US for AI start-ups has already passed 20 billion US dollars since 2020.

Case Study 2: AT&T

About the Company:

AT&T was founded in 1983. It is a multinational telecommunications company headquartered in Dallas, USA. Since it provides services globally, it has branch offices in almost all major cities of the countries it serves. With more than 200,000 employees globally, AT&T becomes the largest telecom company by revenue in the world. It is also ranked 13th in the Fortune 500 in 2022.

In 2015, the company's technical team tried to develop open-source software aimed at helping the company develop and contribute to society. This software later evolved into the H2O ai that the company is using today.

The Company's AutoML Tool:

Figure 2

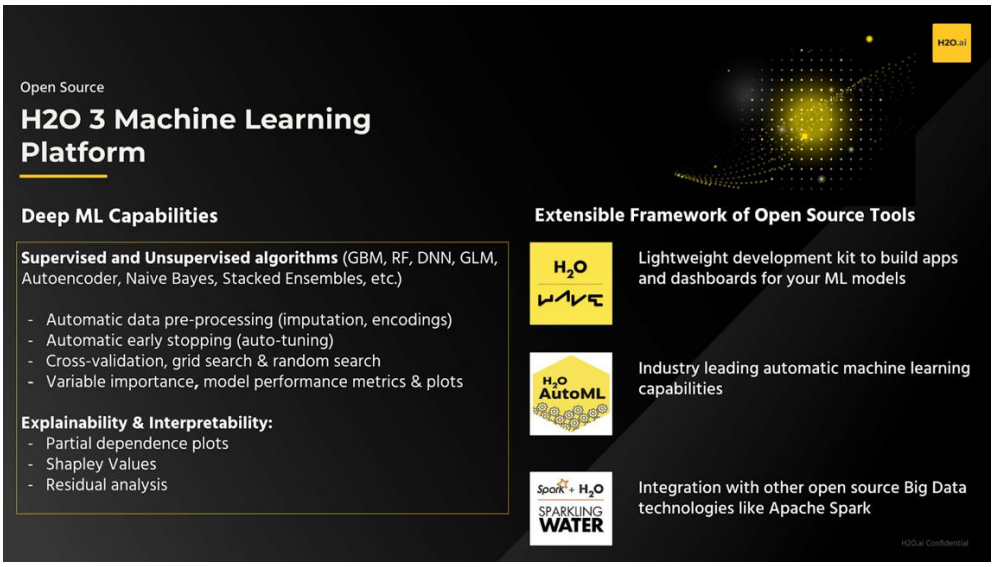


Figure 3

The AutoML used by AT&T is H2O.ai (Figure 2), a type of artificial intelligence that is now being used by many companies. H2O.ai is an open-source machine learning network which offers full tests of generally accepted machine learning algorithms. Because of the algorithm of H2Oai. can be widely accepted, AT&T researchers developed an automatic machine learning model specially for the company on the basis of H2Oai. As an open-source machine learning platform, H2O has many features (Figure 3). Its automated data processing is exactly what AT&T uses to prevent fraud. It is worth mentioning that PayPal also used this feature of H2O to prevent fraud. H2O's AI will upload the information collected on the user end to the cloud platform, and automatically use a large number of algorithms on the platform to determine whether there is any suspicious activity.

When using this AutoML in the early stages of 2021, the company is only using it to block fraud. For example, AT&T's AI system has reduced fraud by more than 80%, and fraud has always been a big problem in the United States that can easily cost billions of dollars. By connecting the local data with H2O ai.'s cloud server, the AI is able to find solutions for upcoming problems more efficiently.

AT&T's Contribution to the Society:

In addition to providing telecommunications services, AT&T also operates the largest trucking fleet in the United States. However, there are also some potential problems with the operation of trucks. For example, there can be a safety hazard after a truck's prolonged usage. When a truck breaks down, not only will additional repair costs be incurred, but it may also have a serious impact on traffic safety. The most common problem with cars are dead batteries, and AT&T used H2O ai. to build a model that predicts when the battery will fail. It should be noted that AT&T mechanics have found that the life of the battery is related to the use of the brakes. Therefore, the technicians believe that by predicting the time when the battery will fail, replacing the brakes while replacing the battery can minimize the loss of control of the truck and the failure of the battery. This change has greatly reduced the incidence of truck accidents on the road and the delay rate of cargo transportation.

With a huge fleet and a large number of employees, how to provide services to customers more effectively has become a problem that cannot be ignored. AT&T's employee team includes a large number of service technicians who have different skills, and these employees are located in various cities in the United States. By building a model through H2Oai to match local jobs with local service technicians, the commuting distance of employees has been shortened greatly. Since employees no longer need transportation to go to farther work sites, fuel consumption is also greatly reduced. This measure not only effectively helps employees and the company save costs, but also reduces exhaust emissions.

AT&T's Future Plan:

Figure 4

In the telecommunications business, the company aims to cover 200 million people with mid-band 5G by the end of 2023 and extend its fiber network from existing locations to roughly 50 million households (Figure 4).

Figure 5

On environmental issues, in addition to reducing exhaust emissions, AT&T has also formulated four plans (Figure 5).

- AT&T will work with leading technology companies in the market to further achieve emissions reduction goals.
- AT&T hopes to use 5G technology to help transportation, energy, and manufacturing to allocate resources effectively to reduce emissions.

- When helping customers solve problems, give priority to more environmentally friendly solutions.
- Enable technological innovations that fundamentally change the way work is done.

Case Study 3: Flowcast

The problem:

Access to finance, particularly for small and medium-sized businesses (SMBs), is crucial for economic growth in all nations but is especially so in developing ones. But because of the underdeveloped nature of their lending markets, financial institutions in these nations are generally hesitant to extend loans to businesses with little to no established credit history.

The Solution:

Flowcast, a company started by Ken So and Winnie Cheng focuses on providing technology to SMBs and lenders like banks and financial institutions which helps SMBs get funded.

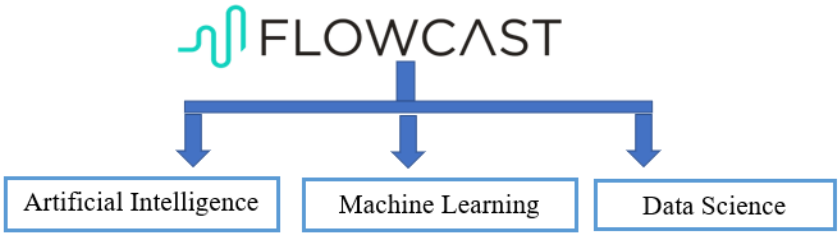


Figure 6. Flowcast and technologies it uses.

The company focuses on a data culture where it focuses on Artificial Intelligence, Machine Learning, and Data Science. Here, machine learning algorithms are used to create high-performing predictive models that reduce risk and unlock credit to businesses. These models have higher accuracy to predict whether a business would repay its loan, its likelihood of dilution, and the risk of delinquency. Apart from that, AI is used to measure risk and eliminates the influence of human

bias on credit underwriting decisions. Whereas Data science is used to analyze the datasets and apply predictive analytics.

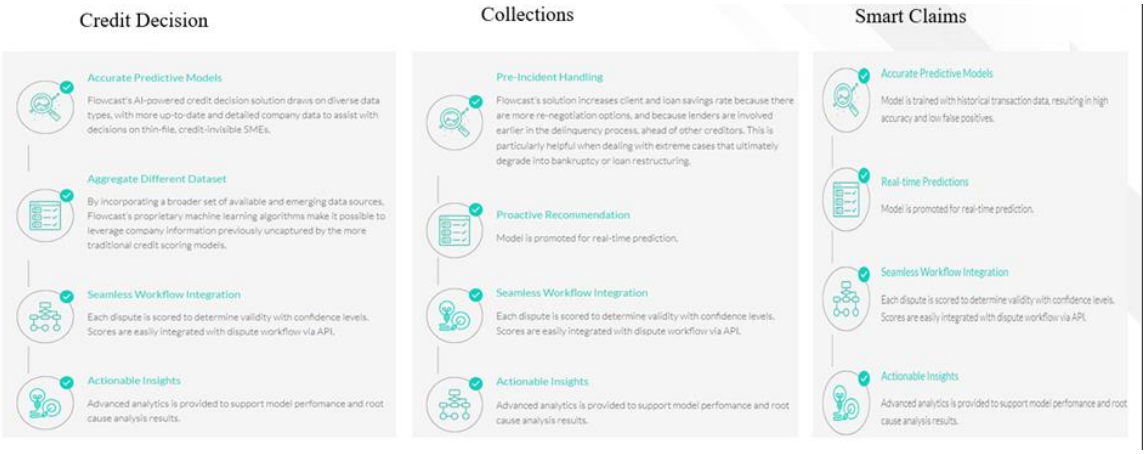


Figure 7. AI and Analytics in Products.

The organization is making use of all the above technologies to assist their customers by creating various solutions like Smart Decision which uses AI in decision making, Collections which makes use of Machine learning and assists in collecting debts from the businesses, Smart claims which focuses on deduction claims and is supported by predictive models and assisted with real-time predictions.

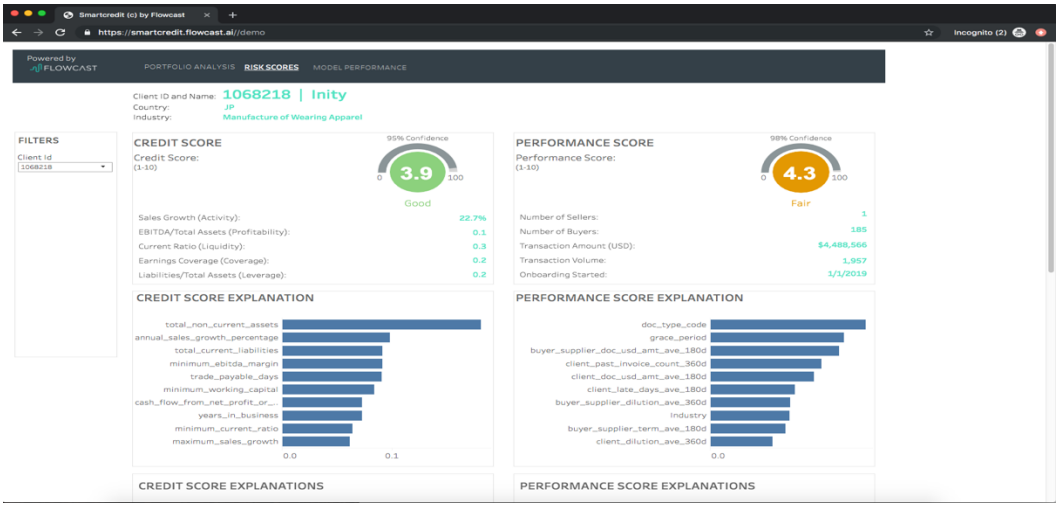


Figure 8. Smart Claims Dashboard.

By making use of all these technologies better decisions can be taken by the banks when funding a business. The Machine learning model will analyze the dataset of the borrower's business, and this will be accessed by the bank in terms of dashboards and analytics through Flowcast's API and would help in making better decisions.

Apart from the technologies and the solutions that the company provides, the staff size here is quite small. Flowcast has around 50 employees in total which provides such support. But as Industry 4.0 progresses ahead the company needs to work on this and employ more analysts to efficiently analyze the business data. Moreover, since they are dealing with such a large amount of data, they would require storage and it is recommended that they make use of cloud technology to store their data and also to make use of proper encryption as a security measure.

Finally, the firm helping out can be considered as a support to global needs because a $1.5 trillion loan gap exists between formal SMEs and their financial needs. As much as $600 billion, or 40%, of the difference, may be traced back to the Asia-Pacific area. Moreover, The Asian Development Bank found that 74 percent of all denied trade financing transactions originated from small and medium-sized enterprises (SMEs), of which 36 percent may be fundable. Having such a need globally for funding small businesses I believe what the organization is doing can help the economy grow within the respective countries as SMEs are the economic backbone of virtually every economy in the world. Furthermore, when these small businesses get funded then the number of jobs too would also increase which would also fulfill the employment need globally.

Case Study 4: Tala

The financial technology company Tala is situated in Los Angeles and provides mobile unsecured loans. Its smartphone application provides $10 to $500 loans to people in Mexico, the Philippines, Kenya, and India by analyzing their cell phone data to establish their creditworthiness. Casual interactions with fruit stand vendors and other small company owners in India and throughout West Africa in 2007 gave the Tala creator the concept for Tala. This was because these people lacked access to conventional financial institutions, which prevented them from successfully expanding their businesses and raising the standard of living for themselves and their families. Tala aims to provide microloans to underbanked people. Users must first download the free mobile app to submit a loan application through Tala. To avoid algorithmic bias in lending, Tala then uses machine-learning technology to scan cell phone data including users' device type, year of the operating system, and other installed apps, along with behavioral data including how users navigate the Tala app, location services, and several contacts.

Tala provides microloans based on machine learning technology, so tala is a data-driven company and by the nature of its business, the team at Tala is culturally diverse. Diversity and equity are key values for them, and employees believe these key values could power innovation. In terms of machine learning technology, Tala realized they could locate the community of unbanked consumers using machine learning powered by Amazon Web Services and provide them with a cutting-edge credit infrastructure that was created from the ground up. Moreover, Tala created a cutting-edge machine learning solution which was built on AWS infrastructure. They have implemented automated processes from beginning to end, utilizing machine learning at each stage of the decision-making process to decide whether to approve or deny a loan, determine the

size of the loan, or decide on collections. Machine learning is used throughout the entire process to automate as much as possible, lower costs, and provide better service to more clients. They also utilize Sage Maker for monitoring, model deployment, and automatic model retraining to respond quickly to changes in the environment. In order to adapt to the fast-changing industry and be the leading position in the Industry 4.0, Tala teamed up with Visa in May 2021 to create a platform where users may utilize stable coin USDC to integrate cryptocurrencies into transactions, including digital payments. Tala also mentioned that users would be able to transmit money across international borders using digital currencies, albeit these initiatives are still in the exploratory stage and have not yet been made functionally available to users.

The overarching objective of Tala is to establish itself as the go-to financial institution for the world's unbanked, rather than attempting to outcompete banks. Tala likewise desires to use microloans to reduce poverty. Tala is using machine learning technology to help the whole society and help people who are underbanked in an efficient way. The group of previously unbanked customers would get loans from Tala for the first time, enabling them to realize their full financial potential in the market, including the opportunity to engage as consumers and business owners and to give back to their local community.

While Tala has shown success in giving unbanked individuals microloans, difficulties do exist. They are unable to compel the borrower to repay the amount due to the unsecured nature of the credit. The maximum lending amount is presently $500, with a $50 average loan size. Fraud is likely happening since the loans they provide are unsecured.

Recommendations

4M Analytics:

Construction is one of the major economic drivers in the world, valued at $1.3 trillion in the United States and €1.7 trillion in Europe. Although it has been around for years, it is a market in desperate need of digital transformation, dogged by antiquated systems, stagnant productivity, manual labor, and low profitability. As a result of its collaboration with different organizations, both private and government, the company has saved billions of dollars and countless man hours over the past year. Now that the company has proven themselves capable and perfected their product, it is looking to take on new opportunities. According to projections, infrastructure market expenditures will grow by 46% between 2020 and 2025, and 4M Analytics wants to be in on this growth.

What is questionable is how 4M Analytics will be able to get the data as quickly as possible and manage the same service consistency with new opportunities in new environments that it needs to implement?

In the end, all businesses' growth depends on customers purchasing from a company and returning repeatedly. The cornerstone of any successful, long-term growth strategy is to make customers happy. 4M Analytics, through enabling technology leadership, must be best in class in these three key areas: understanding demand, nurturing brand, and differentiating themselves from the competition.

AT&T:

Given that AT&T has a large number of employees to manage around the world, they must improve the matching model of employees and jobs. In its current state, AT&T's employee and truck fleet management model has only been rolled out in the United States, so the company must roll out the technology to its service areas around the world. By increasing the coverage of 5G and fiber constructions, the AI on smart devices can upload data and problems to the cloud anytime, anywhere to find solutions.

AT&T can partner with companies that are also using H2O ai, which can further explore other functions of this AutoML. For example, Paypal also uses this method to detect financial fraud, so the two companies can communicate and cooperate to share their experience. What's more, AT&T can promote this accident-reducing technology to automakers, not just to its truck fleet, which can effectively reduce accidents caused by brake failure.

Flowcast:

Since Flowcast deals with huge amounts of data coming from various businesses to assess their credit history and generate reports they are in need to invest in Cloud technology to store such data. Furthermore, currently, the company has a total staff of around 50 members which includes the analysts as well, the company needs to hire more employees and should include analysts within them if they want to progress with Industry 4.0.

Moreover, when storing data security would be needed and this is something companies need to work on to secure their data from hacking or misuse. Finally, since the company creates models through machine learning it would be better if they make use of AutoML tools which create multiple models without human intervention.

Tala：

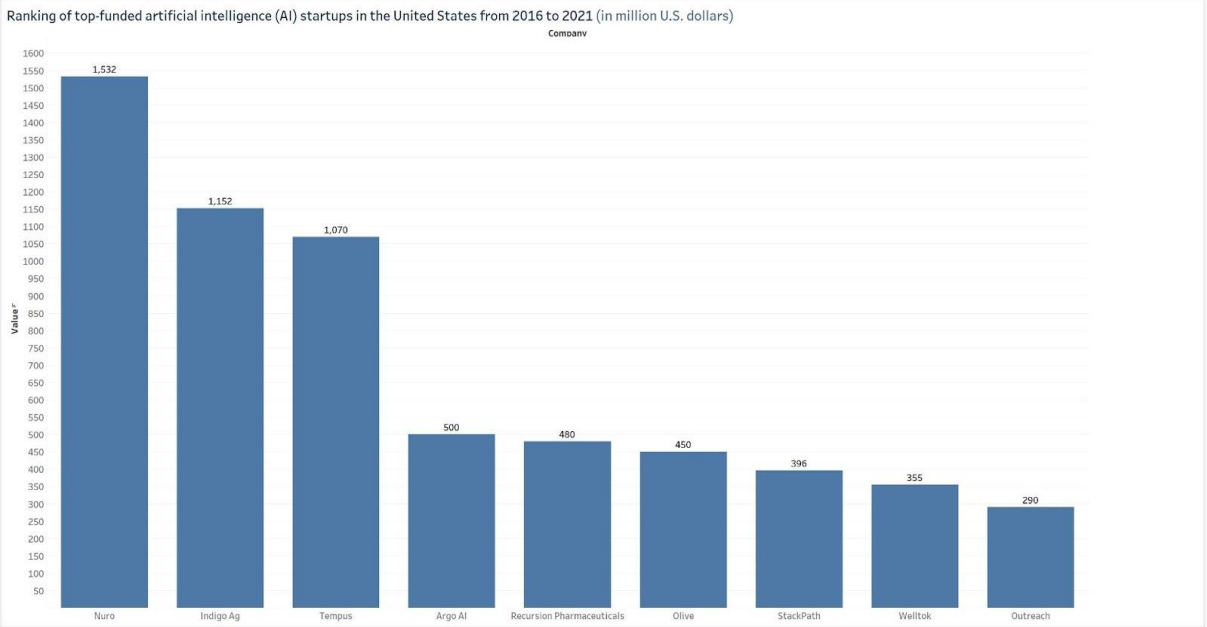
Tala's current challenge is that borrowers are unable to pay back their money on time, which results in fraud losses. Phone calls are one of Tara's main methods of getting in touch with past-due debtors and urging them to pay back their loans. However, this is a costly process, time-consuming, and the outcomes might not be clear-cut. To identify the debtors who will have the greatest increase in payback chance if given a phone call, the Tala data science team is currently developing an uplift model. To enhance the financial health of both borrowers and Tala, it is best if Tala can identify these borrowers and prioritize resources accordingly. I would recommend Tala is continuing to improve the model to achieve work efficiency.

Conclusion

Overall, by looking at the machine learning they use and what it does, we gain a better understanding of how AutoML can contribute to people and society. We can see the importance of machine learning and artificial intelligence to the development of society and its driving force from four companies. These four companies have used machine learning to not only change people's lives, and help the community, but also help people create a better economic and living environment.

Dashboard

4M

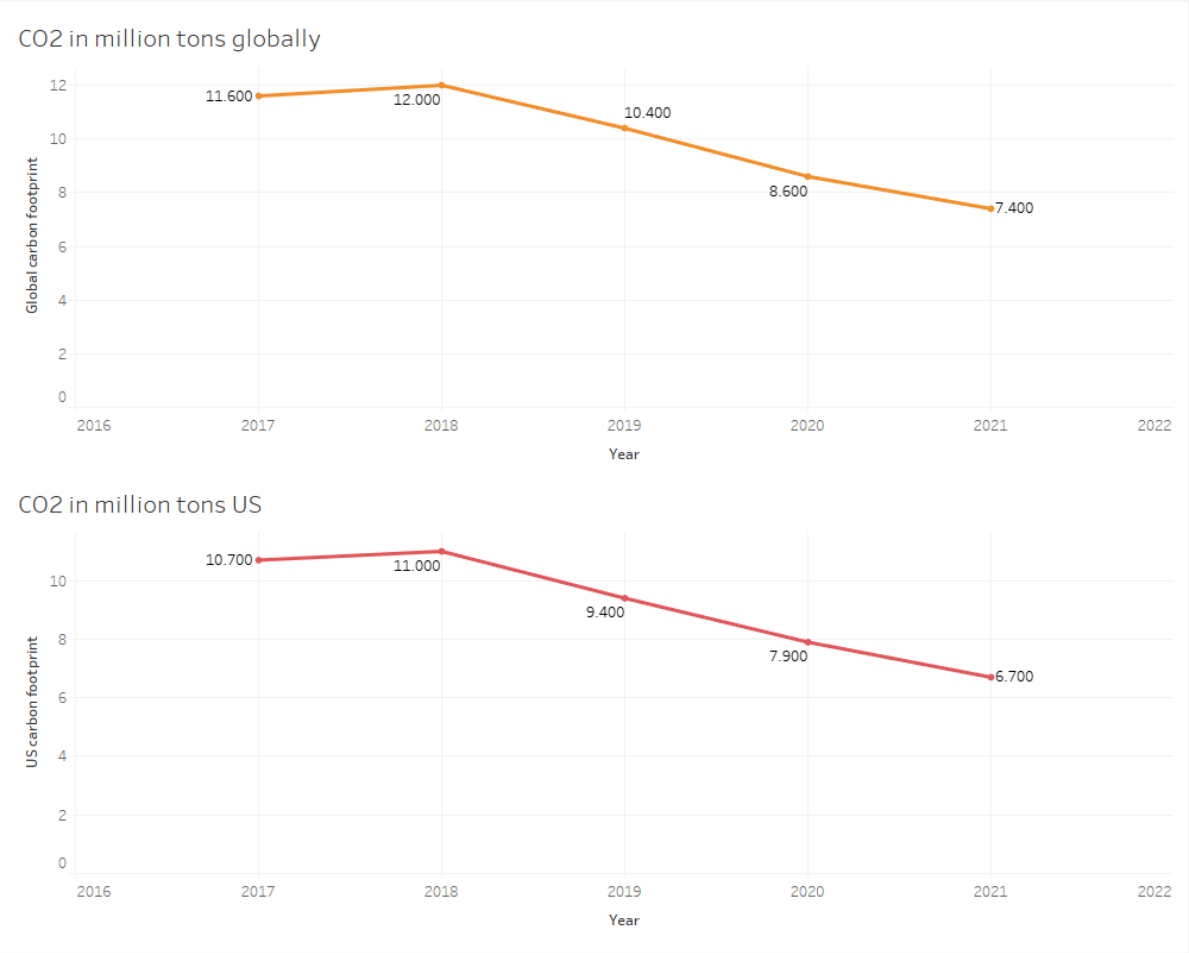


UiPath, a New York-based artificial intelligence start-up, was the top-funded artificial intelligence (AI) start-up company between 2016 and 2021, with almost two billion dollars in total equity funding. Other noteworthy U.S. AI start-ups included Nuro, Indigo Ag, and Tempus, which all received equity funding in excess of one billion dollars.

AI Funding

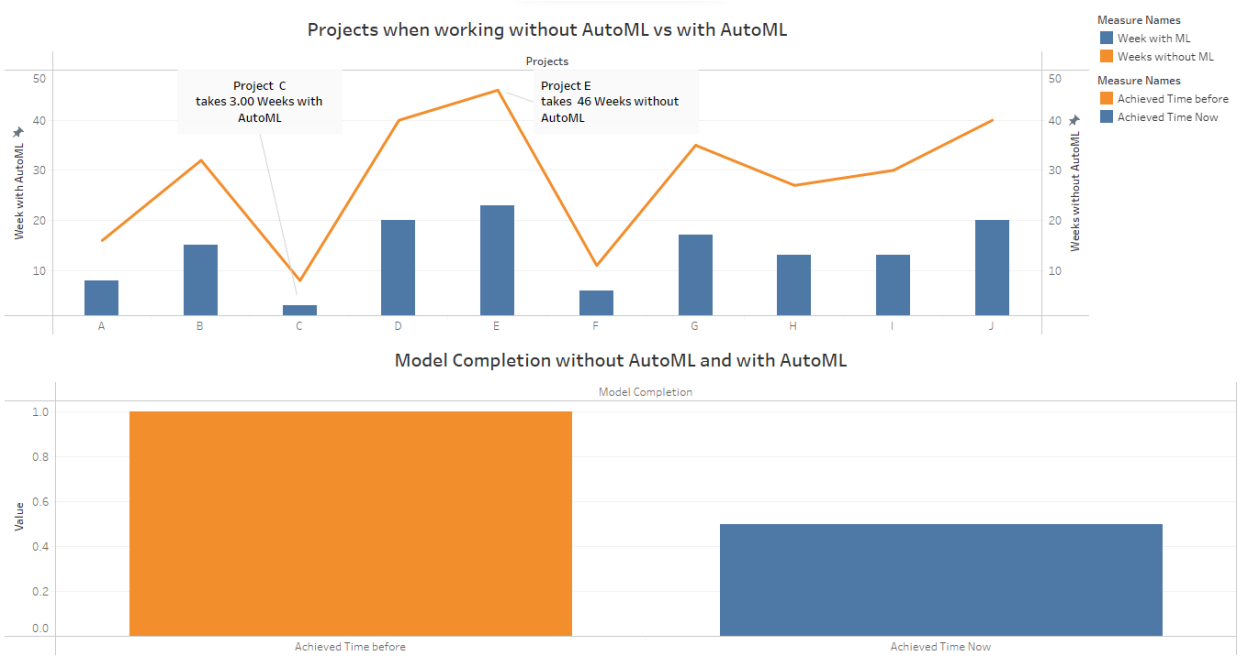
With a value that has already passed in 2020 by 20 billion US dollars, the North American artificial intelligence market is growing rapidly. There has been a dramatic increase in the amount of funding for artificial intelligence start-ups over the past decade, with the United States contributing a large share of the funding each quarter. Chinese investments in artificial intelligence are also noteworthy. 4M's growth and financial stability is propelled by such fundings.

AT&T



Based on data provided by AT&T, a Dashboard was created to observe whether the company has really contributed to environmental protection in the past five years. The upper line chart shows global carbon dioxide emissions trends, while the lower graph shows US carbon dioxide emissions trends. Both graphs clearly show a downward trend in CO2 emissions. On AT&T's official website, they have also mentioned that their goal is to cooperate with other companies and communicate how they could better environmentally friendly benefit the society. As a large company with a pivotal position in the United States, AT&T's contribution to society will inevitably lead other companies to make socially beneficial reforms.

Flowcast



As mentioned in the recommendation for flowcast, this dashboard represents a scenario if the company were to adopt the AutoML technology. Here in the dashboard, the first sheet represents how many weeks it takes to create a model for various banks with AutoML and without AutoML. It can be noticed that the line graph represents the time without AutoML and the Bar graph with AutoML. Furthermore, with AutoML the time to create models significantly decreases and this can increase the productivity of the team and the time to analyze a client's credit history.

The second sheet below shows the difference in model creation, and it can be noticed that around 50% of the job can be done by AutoML and this can prove a bigger success for the flowcast company.

Tala

Borrowers' inability to repay loans on time causes fraud losses, which is Tala's present problem. One of Tara's primary techniques of contacting past-due borrowers and pleading with them to repay their obligations is by phone. However, this method would be time-consuming and could not be efficient to let borrowers pay back successfully. Tala can find the debtors whose likelihood of payback will increase the most if they receive a phone call by using the Uplift model. Tala could prioritize resources more skillfully. We could see from the dashboard before using the uplift model, calling the top debtors will yield 90% of the additional revenue. This rate increased from 10% to 90%. Also, phone calls made to call random 100 borrowers could take 200 minutes before using the uplift model. When using the uplift model, the efficiency doubled. Previously, the repayment rate was 92% and after using the uplift model, the efficiency increased to 95%, which is a great progress.

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