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Unleash the power of AI in digital marketing! A taxonomy of artificial intelligence applications in the field of digital marketing

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Abstract

Artificial intelligence is a relatively new technology highly discussed both in the media and in the business world, especially for its ability to replicate human abilities. However, the number of successful applications from a business perspective are always difficult to find because of the tradeoff between expectation and the state of the art of the technology and the lack of awareness of the possible application. AI is such a broad field and we decided to analyze the digital marketing industry because of the natural presence of data and thus the multiple possibilities of application. I answer the research question: what application area of digital marketing fits AI and how the technology enhances human work in this field? We develop a taxonomy made by one dimension in the vertical axis to classify the applications along the phase of the marketing funnel and 4 dimensions on the horizontal axis to understand the nature of the application and which problem AI can solve.

1 Introduction

It's not a secret that artificial intelligence is one of the strongest technology trends that will affect our society and the business world. A lot of people compare the intelligent revolution with the digital revolution at the beginning of 2000 when the use of the internet technology started to spread around the world till the capillary distribution and impact it has achieved nowadays.

The Internet was the revolution of information creation and distribution, AI would be the revolution of intelligence thanks to the digital backbone created by the internet during these years. Artificial intelligence algorithms have the ability to learn from data and work in non structured and linear contexts opposed to classical if-else algorithms thanks to their unique ability to interpret the world through statistical techniques.

There are a lot of definitions of artificial intelligence, especially technical ones, but the one that perfectly fits the scope of this work and better represents the value of this technology is that AI, on an economic perspective, is basically prediction. Prediction is the process of filling in missing information. Prediction takes information you have, often called "data," and uses it to generate information you don't have. AI is the business of better predicting outcomes for the information you have (Agrawal et al., 2018). This is the intelligence all the people talk about and this is the promise of this technology to completely change society and the business world.

Professionals and companies will see their world changing again and faster than the previous 20 years of technological innovation thanks to the power of predictions, speed is never like now an important feature in an organization to gain advantage over the competition and deliver a better product, service or customer experience. For this reason we decided to pick one of the fastest growing sectors, digital marketing (discussed in session 1.1), to understand what application area of digital marketing fits AI and how the technology enhances human work in this field.

Understanding how prediction could be used in digital marketing and how it affects human work is a game changer for smart marketers who want to leverage this power to outperform competition and companies that want to restructure the workforce to survive and thrive in the intelligent revolution. The problem is, as described in section 1.2, that artificial intelligence is still an immature technology surrounded by hype, lack of awareness and low practical attitude.

1.1 Overview of digital marketing

It's more than a decade since the birth of the term digital marketing. With the advent of the internet we had the explosion of multiple marketing channels where people consume their attention day after day. If in the 20th century we had TV for video content, journals for written and radio for audio, now we have multiple platforms for each kind of content and thousands, if not millions of different 'hosts' who create content to entertain, inform and inspire people who consume their attention on the medium. Each channel has its own rules, contest, type of content, demography, scope, and strategic positioning. If it's not enough, each channel is changing constantly in each of the instances we mentioned before defining the role of a marketer extremely tough and demanding.

What hasn't changed (and probably would never change) from the traditional forms of marketing is the consumer psychology and the steps you have to follow from gaining his attention (awareness state), converting the attention in interest (consideration), finally closing the sales (conversion) and eventually re-engage to convert again.

In order to assess the possible application of artificial intelligence we classified them in the vertical axes along the marketing funnel using the RACE methodology as a structure (Chaffey et al. 2016) shows the range of different marketing activities or operating processes needed to support acquiring new customers communicating with them on third party websites or social media, attracting them to a company website, converting website visits into sales and then using online media to encourage further sales. Each phase has the scope to move the consumer to the next one and it's dominated by different mediums because of the features they have.

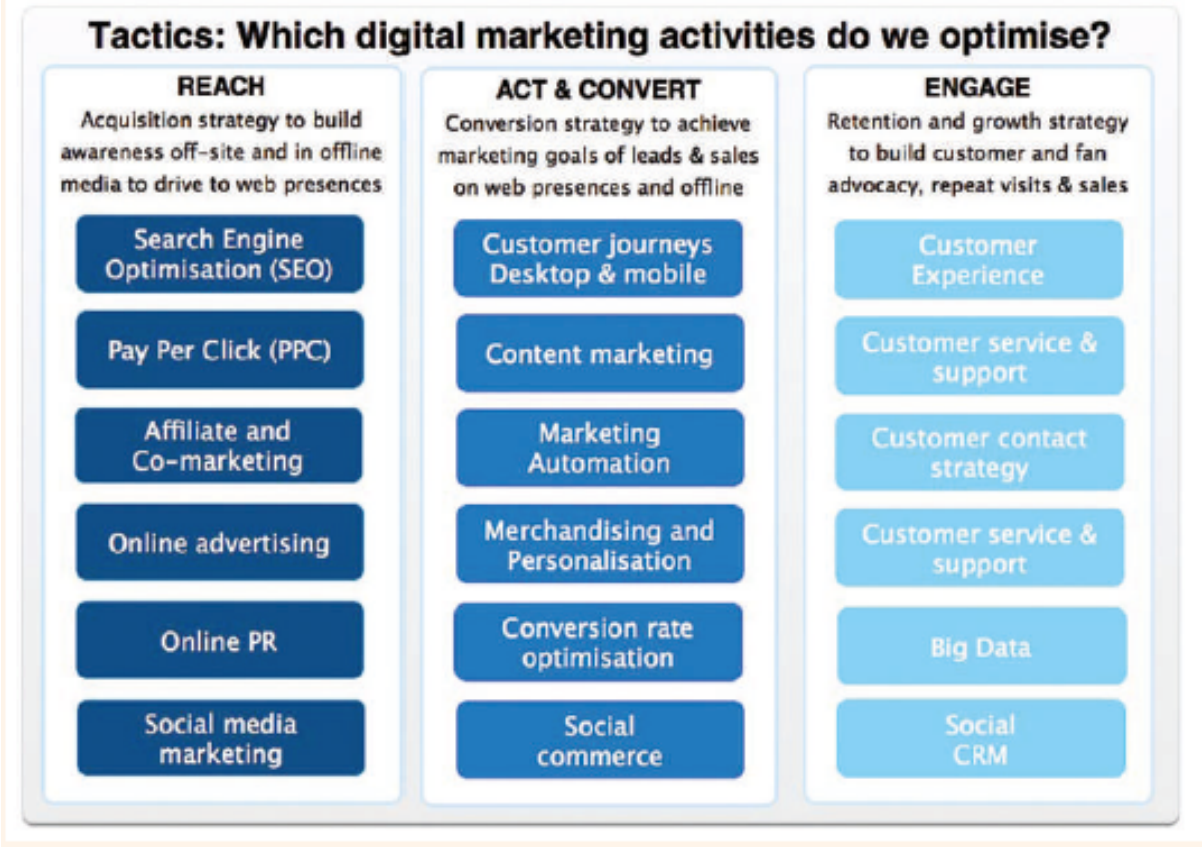

Figura 1.1

The reach phase is about acquisition strategy to build awareness in non proprietary digital assets such as social media and drive traffic to proprietary such as a landing page or a website. In the following section we describe briefly each activity and introduce where the advantages of prediction are.

1.1.1 SEO

According to Google's Search Engine Optimization Starter Guide (2010), 'SEO is a series of modifications and techniques, which make it easier for search engines to crawl, index and understand the content of a website'. The art of SEO is writing online content optimized for specific keywords in order to intercept the research of people interested in the argument we are writing about and potentially a buyer for our products and services. When a person searches for something online that has a need that must be fulfilled, being found for a specific key intent keyword is the holy grail of inbound marketing. SEO became very competitive in the last years due to the increasing presence of people online, very often resulting in an optimization battle between companies to achieve a better ranking of few positions in the serp.

Basically there are two kinds of optimization you can make: on-page and off-page (Zilincan et al., 2015). On-page SEO includes the elements that are in direct control of a publisher such as contents, titles, domain name, URL structure, headings, internal links, meta tags, page speed, structured data and sitemap. Off-page SEO includes elements influenced by readers, visitors,and other publishers such as link building (the more people link to your website and the higher SEO score you gain which often result in better ranking). In section 2 we analyze machine learning applications for both kinds of optimization, for example text formatting tools for a better on-page positioning and machine learning ranking analysis to understand the potential of SEO for your company before investing money.

1.1.2 Online Advertising

As people spend more time on the internet, online advertising has become one of the leading industries of our society. Many of the business models of the greatest internet firms today have advertising at the core. Google uses cookies and sponsor content on searches to effectively target user needs with SEM, Facebook uses social media data to track preferences and interests and allow advertisers to capitalize on them. Unlike traditional offline advertising PPC has two main advantages: laser focused targeting and the possibility to track everything about your direct response campaigns (even if find that superior tracking technology may not increase profits if combined with reduced consumer switching costs online (Calvano et al., 2011).

Before the web you could basically advertise on generalist media trying to appeal to a very small fraction of the audience that sees your ads, now you have an astonishing level of granularity. Moreover the vast presence of data and standardization allowed big tech firms and advertisers, as we see in the following sections, to use the power of machine learning to predict user segments and continually optimize performance as you receive feedback from your campaign. On the targeting issue, now we can use tracking tools such as Google Analytics, Facebook Pixel, Hootjar etc. that can even understand the behavior of targeted people on our web page such as how many text they really read (through web page scrolling tracking) or which conversion effectively bring per customer segment, not to mention the possibility of retargeting on people that show an interest but it’s not ready to buy in that precise moment.

1.1.3 Social Media Marketing

Social media is without a doubt one of the places where people spend a great part of their online time. Social media is the online place where people engage with peers, content creators and brands or (Saravanakumar et al., 2017) in any kind of online media that stimulates participation, openness' conversation, Connecters and sense of community. For the sake of my analysis, social media is extremely interesting because of the richness of data people voluntarily decide to share for free.

Social media is putting online conversations that previously were private between close friends and family of an incredible commercial value such as opinions (about a brand, a product or a topic), preferences (sports, hobby, sexual orientation) or personal information (work, sexual orientation, family).

There are numerous ways firms can use social media strategically to increase their business: account based marketing, market research, opinion mining, customer engagement etc. and machine learning is a perfect fit to augment each of this activity due to the large presence of data and the effectiveness of the technology to analyse and classify objects.

1.1.4 Customer journey and Customer Experience

The term Customer Journey comprehends every interaction a consumer has with a brand from awareness to the decision to purchase. Lemon and Verhoef (Lemon et al., 2016) conceptualize customer experience as a customer journey with the firm over time: from pre-transaction (including search) to transaction to post-transaction. Nowadays a well orchestrated and personalized customer experience is one of the most important strategic objectives managers and executives have, especially nowadays where digital is so fragmented into channels and offline is often isolated from the online. 'Customers now interact with firms through myriad touch points in multiple channels and media, and customer experiences are more social in nature. These changes require firms to integrate multiple business functions, and even external partners, in creating and delivering positive customer experiences' (Lemon et al., 2016)

As mentioned, customer experience is such a delicate and complex topic where a technology like artificial intelligence could result as a sharp tool to orchestrate channels, remember conversations through multichannels and deliver a personalized 1-to-1 conversation thanks to the data collected. Interaction data (data directly collected from interactions between brand and consumer or first party data) play a major role to analyze customer behavior and preferences and deliver a personalized experience.

1.1.5 Content Marketing

Content marketing is a marketing strategy to drive demand and awareness of products and services through the strategic use of content to inform, persuade and activate consumers. In the digital world everyone is consuming a large volume of content in different kinds of forms and formats. Content marketing is a very broad term and can be easily confused by simple information (news, journal articles) or corporate communication. The scope of content marketing is purely commercial and it's driving demand as mentioned before. Content marketers must be able to both produce content (blog posts, podcasts, video etc..) and use channels to drive the attention to them. In this section of the analysis we watch for applications that are useful for the first part

of the content marketing activity: create content especially written. Nowadays there are a lot of tools and machine learning algorithms that can complement the ability of humans in generating smarter content at faster speed.

1.1.6 Marketing Automation

Marketing automation is a very powerful digital activity that leverages the power of segmentation and personalization to drive a higher conversion. There are a lot of marketing automation examples: from personalizing the offers in each newsletter according to people data to content and product recommendation. The power of the digital world with respect to the physical one is of course the possibility to deliver a handmade message at scale to each user provided that you have enough data to do so. The majority of segmentation is if else based and the potential of artificial intelligence is obvious in this activity. Instead of segmenting people (or performing tests) on the basis of simple demographics data and category belonging you can use advanced segmentation such as behavioral data analysis or SVM to achieve an even higher performance.

1.1.7 Customer Service

It doesn't really need explanations, customer service is how you serve your clients in moments of need. It is an obvious and easy task for a little e-commerce or store but it's science as the business gets bigger. Efficient customer service costs lots of money because it requires human workers, very often 24/7 availability, a good automation strategy and continuous feedback and improvement.

The real problem is usually the tradeoffs between automation and human effort. If you delegate too many tasks to the call center you will soon overload it and increasing the number of people is expensive. On the other hand if you automate too many tasks the quality of the service will decrease, customers get angry and frustrated very quickly because they want to resolve the problem immediately. Of course artificial intelligence, as described at the beginning of this section as the technology that can mimic human ability, has huge potential to improve the tradeoffs between automation and human workers and so delivering an acceptable customer service at scale.

1.1.8 CRM and Customer Contact Strategy

Customer relationship manager or CRM is the place where you keep the information about potential and existing clients up to date. This information is extremely valuable for two kinds of reasons: customers' contacts are one of the most valuable assets a firm owns and the data are structured and easy to export and manage.

From the value point of view in the CRM data you can spot vital information to conduct your business and make profits: from understanding the most important clients with a higher LTV to analyzing customers features to better positioning your brand and understanding your target audience. On the other hand the structure imposed by the CRM is extremely valuable from a machine learning perspective: it's very rare to have cleaned structured data ready to use. According to Ilyas and Chu (Data Cleaning) lots of surveys show that the most important problems data scientists face is actually data quality.

On the other hand the speed of the feedback, the availability of data and the possibility to measure and store every interaction between our company (and marketing campaign) and the consumer permitted performance never seen before. The digital world allowed companies like Facebook (the first company that had a team dedicated to growth) to acquire a billion users in less than a decade, breaking every possible record achieved before.

1.2 The AI market maturity (hype cycle and awareness problem) and the value of the thesis

The reason we decided to take an analysis in digital marketing is because AI is still an immature technology and needs lots of structured data to be effective and generate return on investment. There are a lot of sectors in which the availability of data and the nature of the business struggle with an effective implementation of machine learning algorithms and the analysis could result in a fruitless effort due to the lack of use cases.

My intuition on the potential of the sector is confirmed by an analysis of more than' 400 AI use cases, across 19 industries and 9 business functions of McKinsey & Co. It indicates that the greatest potential value of AI pertains to domains related to marketing and sales (Chui et al. 2018), through impacts on marketing activities such as next-best offers to customers (Davenport et al. 2011), programmatic buying of digital ads (Parekh 2018), and predictive lead scoring (Harding 2017)'.

The real problem in the adoption of artificial intelligence is the hype that peaked some years ago and scarce data literacy companies have especially at the executive level. The confusion of the market mixed by the lack of technology and statistics knowledge caused huge financial crashes and opened a new phase of the artificial intelligence market. Nowadays buyers and investors started to investigate the real value of the AI application and how it could unlock return on investment or achieve strategic goals even if some noise still persists especially in less digitized firms according to McKinsey state of AI survey (8).

Another McKinsey research (9) suggests that ‘the gap between leaders and laggards in adopting analytics, within and among industry sectors, is growing. We’re seeing the same thing on the ground. Some companies are doing amazing things; some are still struggling with the basics; and some are feeling downright overwhelmed’. Interestingly the pain point that divided leaders from laggards is the maturity of the data culture in the company and so the ability of employees to successfully choose the right use cases for their business processes.

It’s really use cases and applications the main focus of this analysis, in a market where employees and executives struggle to find the connection between data and business value, the link between human and machines ability to maximize performance, a taxonomy of artificial intelligence application is extremely valuable to make order. For this reason, in this analysis, we try to find the answer to the research question: What application area of digital marketing fits AI and how technology enhances human work in this field?

2 Related Research and literature review

The number of scientific papers focused on AI technology has risen exponentially in the last years as the development of artificial intelligence became interesting both on a technical and economic point of view. As Artificial Intelligence Impact on Digital Marketing Research pointed out (GkikasProkopis et al.): ‘There are numerous scientific publications regarding artificial intelligence (AI) across the disciplines. However, referring to digital marketing aspects, this number remains small’. There are few papers which address a specific area of digital marketing such as CRM or marketing automation evaluating the single performances of algorithms in the sub area but lack a taxonomy of the application to understand how AI intersects digital marketing and how it affects human work.

Davenport (How artificial intelligence will change the future of marketing) proposes a ‘multidimensional framework for understanding the impact of AI involving intelligence levels, task types, and whether AI is embedded in a robot’ which addresses very well how the technology could enhance marketing related activity but lack the missing link with business value focusing on a higher level perspective to evaluate the intelligence behind the technology and his consequences.

In ‘Application of AI technology in the modern digital marketing environment’ Kiran Nair and Ruchi Gupta made an exploration of the various applications of artificial intelligence (AI) to social media and digital advertising professionals and agencies. The paper is for sure innovative for the topic of the content and can serve as a useful guide for social media marketers to implement AI applications to impact digital

marketing strategies better but lack the rigorous classification of a taxonomy (and the inputs for a continuous future development) and how AI affects human work properly.

2.1 SEO

The literature here is very limited and few papers attempt to analyze the intersection between machine learning and search engine optimization even if there's strong faith and enthusiasm about the potential of AI in SEO: results of 2017 SEO Proficiency in Marketing Survey showed that 96% SEO experts states that SEO strategy can benefit more if associated with AI, 73% agreed that AI can analyze the data for SEO needs, 61% said that AI can help locate anomalies in their SEO strategy and fix it, 58% believe that AI allows their SEO strategy to beat its competitors, 49% even think that AI can beat Google RankBrain technology, and 41% considered that AI eliminates the need for exact phrases as keywords' (Yuniarthe et al. 2017). As described in the introduction there are two kinds of optimization you can make to improve your SEO: off-site and on-site.

On-site SEO is about optimizing your web pages such as html tag, keyword and topics selection in order to gain a better ranking and more traffic. SEO is getting harder and more complex as the Google brain behind it evolves and becomes smarter. Here prediction (AI technology) is basically applied in three ways: data mining to improve the decision making process in selecting keywords and topics, page optimization to discover the hidden technical problems that keep your traffic down and content optimization (which will be addressed in the content marketing section because it is more an acting and converting issue rather than a reach one). Both the categories are dominated by no code plug and play software that allows non data scientists to use the power of machine learning even if there are some exceptions for large corporations that use custom models.

In improving decision making there are many tools, one very famous is 'Can I Rank' which creates a keyword difficulty score to allow the user to judge which exact keyword will work for their specific website. The analysis is all done by a machine-learning system that focuses heavily on data as opposed to strict opinions. Here the use of machine learning and a large amount of data helps marketers to better understand which keywords to focus on and not to waste their precious time in effortless work which is often the case in SEO related activity due to the uncertainty of search engines practices and the incredible amount of content already published. On the other hand the unique ability of humans to understand context and target needs can further filter the proposed keyword to achieve an even better assessment.

As mentioned before keyword and popularity prediction is mostly done by plug and play tool but is not always the case especially if we are talking about large corporations which need a custom approach. For example in 'Application of Artificial

Intelligence (AI) in Search Engine Optimization (SEO)' (Yuniarthe et al.) describes an 'innovative approach based on Machine Learning Techniques, the KNearest Neighbor Algorithm to estimate the Internet Popularity that a bank (ODbank) is likely to achieve based on its size and efforts in Internet presence'. It's still based on keyword searches and competition but it's optimized to understand which effort with which results a SEO activity could bring before making the investment.

Secondly the page optimization problem. Very often website traffic is limited technical issues such as a missing tag, poor image optimization, duplicate (etc..) which are very difficult to find especially when the number of content is important. Here the ability of machines to quickly scan a large amount of content and use pattern recognition to spot technical errors is vital not to waste hours (if not days) of time for the SEO team. Again the high level view of humans is indispensable to distinguish errors that are essential for the current marketing strategy (maybe the optimization is not worth the price of doing it) from the ones that must be addressed. A tool worth mentioning is Market Brew which 'provides the user with a precise description of what distinguishes the first result from the second one; such as the HTML content or even the META description. Another is WordLift which helps you speak Google's native language by converting your content into a format easily understood by search engines: structured data. In this way you avoid misinterpretation from search engines to maximize the probability of having meaningful traffic.

On the other hand AI applications on Off-site SEO are less effective because of the nature of the practice. The majority of the off site work is about content distribution, social media marketing (which I analyze later in this work) and link building. AI doesn't directly affect this SEO practice but can be useful. For example Watson Analytics, which processes text, can search for industry terms used by relevant bloggers and influencers.

2.2 Online Advertising

Opposed to SEO, online advertising is rich in machine learning applications. I would even say that machine learning is the reason why the ADV industry became so big and digital marketing so effective. Big internet players such as Google and Facebook thrive thanks to the huge amount of data they are able to collect and deploy though Cookies and FB Pixel. Predictive analytics in targeting is for sure the holy grail of digital marketing, having hundreds of instances per user is very effective to segment and predict which people will click. It is true that big players have an advantage and have yet deployed very sophisticated algorithms but even marketers in a big corporation often have enough data to consider a machine learning approach. Nowadays, with the cookieless future at the door it is even more important to have an asset of first party data and an intelligent segmentation strategy that is not dependent on third party data of big players.

Intelligent targeting can be basically divided in two categories: user centric and content centric. ‘Applications of machine learning to user and content-based approaches hold advantages over traditional market segmentation as contents consumed and shared by individuals are more important in predicting target audiences and their purchasing behavior than demographic and geographical data alone’. In particular user centric is about extracting relevant information about the user for a better targeting while content centric is about showing relevant advertising only on relevant content to intercept a need. User centric, in turn, is divided in behavioural targeting and user profiling while content centric in contextual advertising and real time bidding (Identifying machine learning techniques for classification of target advertising, Jin-AChoiaKihoLimb). Optimization in a domain with a huge amount of information is the field where prediction does its best and there’s no way for a human to do better. Performance marketing is a number game and machines are better at iterating fast and learning from mistakes. This isn’t the end of advertisers but a new beginning. Machines are great with numbers but not good enough with creativity even if they can help in the creative process.

In the creation of advertisements often agencies and researchers use ‘research tests’ to understand what emotions or reactions ads generate. They basically interview a group of selected people after showing them the creation. Nowadays a technology called emotion recognition (or affective computing) using convolutional neural networks (CNN) is able to match in real time face expression to the principal emotions (anger, surprise, disgust, enjoyment, fear, and sadness) and so understand at scale what emotions are provoked by an ad. ‘Ad-induced emotions have been shown to shape consumer behavior in a significant manner. Although this key observation was made nearly three decades ago, computational advertising methods till recently have matched low-level visual and semantic properties between video segments and candidate ads. Recent work indicates a shift form the traditional thinking by emphasizing that ad-evoked emotions can change brand perception among consumers’. (Multimodal Emotion Recognition from Advertisements with Application to Computational Advertising, Abhinav Shukla). Nowadays it’s still a technology in its infancy even if the first use cases with a positive ROI are borning in different industries led by specialized artificial intelligence companies such as Affectiva or Mad Street Den even with plug and play solutions.

Finally the creative part where the power of machine learning can even augment human work in creating new pieces of advertisement such as copy and visual content. As written earlier, creativity is probably one of the skills that more defines humans and is more distant from the cold numeric performance of machines. Having said there some approaches that can help human in the creative process: machine learning applications in AD creation refers to the use of NLP and deep learning technologies to generate individually tailored advertising designs or materials comprising text, images, or other creative elements (Qin & Zhibin Jiang et al. 2017) . Moreover,

recently two technologies entered the market that can help humans even with intuition. The first one is natural language processing with millions of parameters (NLP is not new but the intuition of a correlation between the number of information and intelligence is quite recent with the development of large models such as GPT-3) and the other one is Generative adversarial network (GAN): 'Given a training set, this technique learns to generate new data with the same statistics as the training set. For example, a GAN trained on photographs can generate new photographs that look at least superficially authentic to human observers, having many realistic characteristics' . What is interesting about large NLP models such as GPT-3 is that they are trained with a vast amount of written information on the internet and they are basically able to predict what words best fit the request you make through a statistical optimization. In this way if you are stuck with a headline or you face the writer's block you can just ask, with simple natural language, as you were in a conversation, to find an ending of the story briefly explaining the plot. Quite the same happens with images. In arts like fashion, Fs-GANs have been implemented for imaginary pictures of the models without hiring a photographer, makeup artists, also cut down the studio costs (Singh, Bajpai, Vijayarajan & Prasath, 2019). Fashion advertising companies using GANs have various groups of models increasing people who resemble models. Landscapes, portraits, album covers can be created using GAN (Generative adversarial network: An overview of theory and applications Author links open overlay panel, Alankrita Aggarwala Mamta Mittal Gopi Battineni).

2.3 Social Media Marketing

The reference here is of course Twitter because it's text based and text is far easier to analyze than any other form of content. Basically we would divide the topic of social media listening in two categories: text based and image/video based. The first one is dominated by sentiment analysis: 'alternatively mentioned as opinion mining is a research area which aims to analyze people's sentiments or opinions toward entities such as topics, events, individuals, issues, services, products, organizations, and their attributes. Sentiment analysis should be treated as a branch of machine learning, data mining, natural language processing, and computational linguistics, which also borrows elements from sociology and psychology' (Yue et al., 2018). Nowadays we are shifting in a world dominated by visual content and limiting the analysis only on text would be approximate. 'Sentiment analysis of such large scale visual content can help better extract user sentiments toward events or topics, such as those in image tweets, so that prediction of sentiment from visual content is complementary to textual sentiment analysis' (You 2018). Use cases are multiples and vary from industry to industry, the more important are: corporate and personal reputation, brand positioning, and trend discovery. Reputation and trust is increasingly important in the online world, the ability to monitor what people say (especially negative) gives you the advantage of understanding the problem and reacting immediately to the information. Of course the same is valid for public people. If a picture of a famous politician spreads in a

funny meme associated with something that undermines his reputation is a serious problem and must be addressed immediately. What really augments the abilities of humans is the fact that machine learning is able to understand at scale what people say (and think) and elaborate a more intelligent strategy to react to the information as soon as possible.

2.4 Customer Journey

‘Customer journey analysis is a hot topic in marketing. Especially nowadays where customers interact multiple times before a purchase and through multiple channels the ability to spot patterns for a better experience (and conversion) is extremely valuable. ‘To the best of our knowledge, a data-driven approach to analyze the customer journey is still missing. For instance, web analytics tools like Google Analytics provide an oversimplified version of the user behavior, focusing more on the frequency of page visits rather than discovering the process of the visit itself. Through process mining it is possible to (i) discover the process that better describes the user behavior, (ii) find useful insights, (iii) discover and compare the processes of different behavioural clusters of users. Especially in a high velocity and traffic environment, for example a digital product in a growth phase, the ability to iterate fast and gauge feedback to better improve conversion is vital for the life of the project (Collis et al. 2016), a machine learning approach can be the new advantage in the hand of entrepreneurs that want to scale quickly. Humans will probably always be better at coming up with high level intuition but machines can complement them and maximize the performance in low detail optimization because they are able to iterate faster. ‘Firstly, through process mining, it is possible to identify particular customer journey paths that can be enforced to optimize some KPIs (Key Performance Indicators). Then, with recommender systems algorithms, it is possible to recommend to users particular actions that will optimize the selected KPIs, using the customer journey as an implicit user feedback. Finally, the results can be analyzed to discover the new customer journey model and check if the recommendations were actually able to divert the journey in the desired way’.

2.5 Content marketing

As in the advertising section artificial intelligence can augment human work improving productivity with an intelligent content generation (or correction), completely automate the editing, translation and curation jobs made by journalists and professionals or improve decision making for a better content strategy analyzing web data and extracting important information. In content augmentation, as in the copywriting section, large NLP models are changing the way people generate new ideas, create summaries or write from scratch news articles or spreadsheet reports. In news selection and content editing, machine learning even succeeds in fully automated teams of journalists. Microsoft, for example, sacks journalists to replace them with a

machine learning software which can curate and edit news in the Edhe browser: ‘Around 27 individuals employed by PA Media – formerly the Press Association – were told on Thursday that they would lose their jobs in a month’s time after Microsoft decided to stop employing humans to select, edit and curate news articles on its homepages’ (TheGuardian, 15). The same happened for translations: from free software like Google translator (which became extremely accurate when they switched from a machine learning to a deep learning approach) to niche software specifically designed and trained to perform well with ancient or oriental language . Finally in the decision making section we find different no code tools which allow us to use the power of prediction to take better decisions analyzing web data: Crayon for example uses artificial intelligence and machine learning to give you competitive intelligence on exactly what your competitors are doing online. You'll be able to see how the main pages of a company's website change over time, which in turn reveals insights about their content marketing strategy, targeting, and messaging. This kind of information can be a goldmine of ideas for your content marketing efforts.

2.6 Marketing automation

In an area where automation and personalization are a central topic there’s a lot of potential to exploit. The first interesting field is A/B testing. As in the customer journey section a fully automated A/B testing in a high traffic contest could be extremely valuable. Claeys et al. (2017) ‘propose a dynamic assignment strategy based on a visitor segmentation determined automatically from the visitors navigation and characteristics’ using a two step method. ‘The first one searches the most homogeneous subgroups into the visitors according to their navigation on the website (navigation, interest ...) and their own characteristics (e.g., localisation, navigator used...) using clustering algorithms and non-parametric regression trees. The second step uses a specific assignment strategy to each of them (i.e., a bandit algorithm for each group) to actually make the test’.

Secondly the use of conversational marketing for lead generation. The classic approach to direct marketing and advertising is to push an advertisement (usually text based) with a persuasive copy to make users react and perform a particular action (buy a product, book a demo or a sales call, fill a form etc...). Direct marketing usually has a very poor conversion rate, something in the middle of 5% and 1% with exceptions. The goal of course is to increase the conversions of some percentage which can be vital to breaking the money spent in adv. The problem with this approach and where AI is changing the game is the fact that the remaining 95-99% of people are interested in making the action but are still not ready for it because of a lack of information, trust or bad timing. With conversations you can retain part of the people who leave forever because you can actually talk with them in real time with an AI agent (usually a NLP engine connected to the knowledge base to store valuable information of the news consumer) and answer even to the most difficult

questions and doubts, personalize the messaging according to their preferences, create trust because of the humanization of the conversion funnel (Cancel et al., 2019). Here artificial intelligence is an extension of human knowledge which allows a real time conversation. Of course humans create segmentations and design the optimal answer to each conversation but machine learning can understand user requests interpreting human language and connect them with the optimal answer (entity understanding).

Third, a task as simple as optimizing the sending time and headlines of emails can boost the open rate (and so the total number of conversions) in a significant way. Of course performing a series of tests is still a good method to optimize a campaign but a machine learning algorithm with well developed data strategies, especially with very large lists, can achieve an impressive performance optimizing both timing and headlines. A service like Mailgun 'sends billions of messages a month to people around the world, and many of these recipients are subscribed to multiple senders on our platform, which means we have substantial data about their engagement behaviors (how many times, and at what times, that person opens or clicks a message.) When you send a message using STO, our algorithm analyzes the data we have on hand for a given recipient to identify the optimal time to deliver to that particular inbox. Our sending pipeline then holds on to that message until the determined time, at which point we will deliver the message'. For headlines the concept is quite similar but of course we have text generation in the middle of the process and not just a simple regression. Harley Davidson for example published a case study in the Harvard Business review about its work with Albert, an AI marketing platform, to optimize email conversions. 'How exactly did Albert drastically increase business in just three months? It began by scrubbing through the customer data from Jacobi's customer relationship management (CRM) system. It looked for shared characteristics of previous valuable customers, as well as potential customers who have exhibited purchase intent (people who were in the top 25% of time spent on the website, people who placed a product in their shopping cart online, etc.). Using the patterns it discovered, Albert created micro-segments of lookalike users that were then used to test thousands of aspects of the campaign to optimize it'. The result was a 183% increase in user transactions and a 25% increase in overall ROI.

Fourth is an application that we see each time we do shopping in the biggest e-commerce store: the product recommendation. Product recommendation is designed to increase as much as possible the mean order suggesting services and products that can be useful for the user. In offline stores we see the sales assistant proposing new items, online a sophisticated algorithm with a well designed data strategy does the same. Here artificial intelligence does the same as a shop assistant but is far more accurate for the hundreds of data points in the hand of the online service and does it at scale. The only thing which lacks potential is the way in which you propose new items. A human person in empathic and with intuition can understand the situation in which you can be more aggressive and the one you can't because you affect customer satisfaction. The approach to suggestion can work differently depending on

multiple variables such as data availability, goal, budget etc.. It used to have a regression approach aiming to predict the interests of the users such as collaborative filtering but this method suffers from data sparsity. More sophisticated approaches are classification based such as ‘Support Vector Machine (SVM) along with a fuzzy decision support system (Roy et al., 2006).

Fifth dynamic pricing or price discrimination using an economic terminology. Very often pricing and promotion is based on impulsive intuit and doesn't consider data driven decisions and intelligent segmentation. ‘Dynamic pricing is a strategy for enterprises to dynamically adjust commodity prices based on customer demand, their own supply capacity and other information to maximize revenues and some scholars also call it personalized pricing’ (Yin et al., 2020). Of course this is a regression application which use the power of machines to navigate in real time a huge amount of data and spot hidden information otherwise impossible to the human mind. ‘The basic principles of the market segmentation and limited rationing strategy are as follows: using different channels, different times, and different energy expenditures, customers have different price tolerance psychologies; companies have developed special product and service portfolios; and companies differentiate pricing based on different product configurations, channels, customer types, and times. The dynamic marketing strategy takes advantage of the powerful advantages of the Internet to quickly and frequently implement price adjustments based on changes in supply and inventory levels to provide customers with different products’.

2.7 Customer Service

Customer service is often the pain point of a lot of organizations that try to maximize customer experience but don’t have enough resources to support one-to-one customers. ‘Traditional customer service has two problems: First, staff usually receive repetitive questions asked by a variety of customers, which can be cost-effectively answered by machines. Second, it is difficult to support 7×24 services, especially for most non global businesses. Therefore, chatbots can be a great way to supplement customer service offerings since they are more economical and indefatigable, and free up support staff to answer much higher value queries’(Cui et al. 2017). Automation plays an important role to maximize the efficiency of customer service but you have to deal with the eternal tradeoff of experience vs efficiency. As in lead generation chatbot the most advanced conversational agents connect and enrich the knowledge base fine tuning the communication for a real 1-to-1 real time personalized conversation.

Full automation here is not possible because for the most advanced request you always need a human agent but with an intelligent data strategy you can minimize the tradeoffs we mentioned later. Unfortunately it is not easy to understand where automation should and should not be applied because it’s difficult to have enough

quality feedback in a reasonable amount of time. ‘In this context, service providers face the challenge of measuring chatbot service encounter satisfaction (CSES), as most approaches are limited to post-interaction surveys that are rarely answered and often biased’(Feine1 et al., 2018). Fortunately written text, even its quick answer and reply context is dense with emotional connotation which is perfect for a sentiment analysis approach. For better fine tuning the experience/efficiency tradeoff sentiment analysis could be leveraged in different ways. First of all with a segmentation of most frequent negative sentiment queries you can spot conversations that are better suited to do by a human. Secondly, if it is not not feasible to delegate to the human agents the entire conversation due to high volume it’s at least possible to apply sentiment analysis in real time and connect only frustrated users to human workers. Customer service is exactly the place where you can spot how artificial intelligence and humans are complementary and not one the substitute of the other. Artificial intelligence can scale but work only in a very niche and limited context, humans can’t scale but have a general purpose intelligence to address high level discussions.

2.8 Customer contact strategy

CRM, ERP and are a goldmine of information to augment the performance of a contact strategy, both for time optimization and messaging personalization. The real problem here is having a single customer view of each client and as much relevant information as possible to allow machine learning algorithms to do a great work. According to Paschen et al. 2020, ‘AI influences the pre-approach and approach stages of the sales funnel in several ways. First, AI can automate some of the routine tasks around making contact, such as scheduling meetings or sending follow-up emails. This frees up sales professionals and allows them to spend time and energy on other value-add contributions. Second, AI enables the creation and delivery of highly tailored and personalized communications to sales leads based on an analysis of the lead’s behavior or profile. This is known as targeted advertising. Targeted advertising can take a number of forms, including retargeting in which AI can discern the content that is likely to appeal to a lead based on previously consumed content. Ideally, these tailored approaches will lead to greater engagement and ultimately conversions along the B2B sales funnel’.

Again leveraging lots of data sources, machine learning is far better than humans at understanding what to prioritize, furthermore in a complex sales pipeline it’s very difficult for a sales representative to deal with a huge amount of contacts. Again we see how we can use machines to give superpowers to humans in their work. Sales jobs used to be part prospecting and contacting (very often repetitive and frustrating) and part human connection and empathy during the actual sales. The salesforce of tomorrow will find a perfect fit between AI and humans to achieve an efficiency never seen before. ‘AI is poised to set off a series of fundamental changes to the B2B sales process. These profound changes will affect the nature of human work,

specifically human intelligence and decision making (Syam & Sharma, 2018). B2B sales professionals will be supported by AI and may even relinquish some of the tasks previously performed by people. The trouble is that executives eager to adopt these new technologies are unclear about the contributions that AI may bring to the B2B sales process and the role that sales professionals play in the AI-enabled sales funnel. This understanding is even more critical when adopting AI means relinquishing some degree of human decision making and control'.

2.9 CRM

There are several machine learning applications that can be applied to customer relation management, mainly for customer retention and decision making. Narendra Singh . Singh et al, 2020 classifies them along the customer life cycle: customer identification, customer attraction, retention and development. In customer identification and attraction you have the basic information of your client base which can be leveraged to understand needs and new profitable segmentation. 'It is crucial to analyze the buying behavior and then identify customers' requirements based on demographics factors such as gender, age, and income that divides the target customers into segments based on these factors to enhance profitability of any business. Customer segmentation has a significant impact on CRM. Dividing customers into various groups that could share analogous desires, and the company can market to each group differently and emphasis on the needs of each kind of customer. Both supervised and unsupervised approaches are used here to have the maximum efficiency in tailoring the best message at the best audience possible'. We analyzed the customer segmentation and outreach machine learning based approach in customer contact strategy even if they mainly use CRM data. In this section we give priority to KPI based segmentation to better assess the marketing strategy and audience targeting. KPI prediction is a regression approach to better understand the potential value of each group of customers. The most important KPI are lifetime value, mean order and cost per acquisition. Predicting these kinds of KPI is vital for the health of a digital business in order to assess what their key target clients are in order to effectively design an acquisition campaign and improve profitability. Finally we have churn prediction: 'Churn prediction problem is one of the most important appli-cations of analytical CRM in finance. Banks would be interested to know their about-to-churn customers and the proposed rule extraction approach not only provide better predictions but also comprehensibility of the system is improved. Feature selection using SVM-RFE algorithm in the first phase reduces the dimen-sionality of the data by yielding the key attributes in the data.Thus, less number of rules and smaller rules are extracted result-ing in the improvement of the comprehensibility of the system (Farquaad et al. 2014).

REACH	ACT	CONVERT	ENGAGE
SEO	Customer Journey	Marketing Automation	Customer Service
Online Advertising	Content Marketing	-	Customer Contact Strategy
Social Media Marketing	-	-	CRM

Figura 1.2

3 Research Approach

To organize knowledge on artificial intelligence application in digital marketing, we use the method for taxonomy development proposed by Nickerson , who defines a taxonomy as a set of dimensions. Each dimension consists of “mutually exclusive and collectively exhaustive characteristics in a way that each object under consideration has one and only one” characteristic in every dimension. The taxonomy development method proceeds in three stages.

In the initial stage, a meta characteristic and ending conditions are defined according to the purposes of the taxonomy to be developed. According to Nickerson, ending conditions should meet both subjective and objective features. Subjective criteria are: concise, robust, comprehensive, extendible and explanatory. A taxonomy is concise when it contains a limited number of dimensions and a limited number of characteristics in each dimension, an extended number of features is not useful for future researchers who consult the taxonomy because the number of features create complexity and cognitive overload. A taxonomy is robust when it contains enough dimensions and characteristics to clearly differentiate the objects of interest. ‘A taxonomy with few dimensions and characteristics may not be able to adequately differentiate among objects’. For example, a taxonomy with only one dimension and few characteristics is difficult and could be useful for a researcher to make a better sense and comprehension of a particular subject. A taxonomy is comprehensive: it can classify all known objects within the domain under considerations and includes all dimensions of objects of interest. It is extendible: a’ useful taxonomy should allow for inclusion of additional dimensions and new characteristics within a dimension when new types of objects appear. A taxonomy that is not extendible may soon

become obsolete'. A taxonomy is explanatory: a useful taxonomy does not include every possible characteristic of the object in consideration (otherwise couldn't be concise because the features can be very numerous if not infinite) but include only the ones that are useful to understand the subject of interest. 'A taxonomy that simply describes objects may be of interest initially but will have little value in understanding the objects being classified'. While objective criteria are: 'All objects or a representative sample of objects have been examined (1), no object was merged with a similar object or split into multiple objects in the last iteration (2), at least one object is classified under every characteristic of every dimension (3), No new dimensions or characteristics were added in the last iteration (4), no dimensions or characteristics were merged or split in the last iteration (5), every dimension is unique and not repeated (6), every characteristic is unique within its dimension (7), each cell (combination of characteristics) is unique and is not repeated (8).

In the main stage, the taxonomy is developed. Taxonomy objects (here application cases), dimensions, and characteristics are identified during inductive, deductive and intuitive iterations. 'The inductive approach involves observing empirical cases, which are then analyzed to determine dimensions and characteristics in the taxonomy. The deductive approach derives a taxonomy not from empirical cases but instead from theory or conceptualization. It identifies dimensions and characteristics in the taxonomy by a logical process derived from a sound conceptual or theoretical foundation. The intuitive approach is essentially ad hoc. The researcher uses his or her understanding of the objects to be classified to propose a taxonomy based on the researcher's perceptions of what makes sense. There is no explicit method in this approach. Several other approaches were found that did not fall into these categories including morphological analysis and the use of existing taxonomies. In the final stage, the taxonomy is evaluated against ending conditions'.

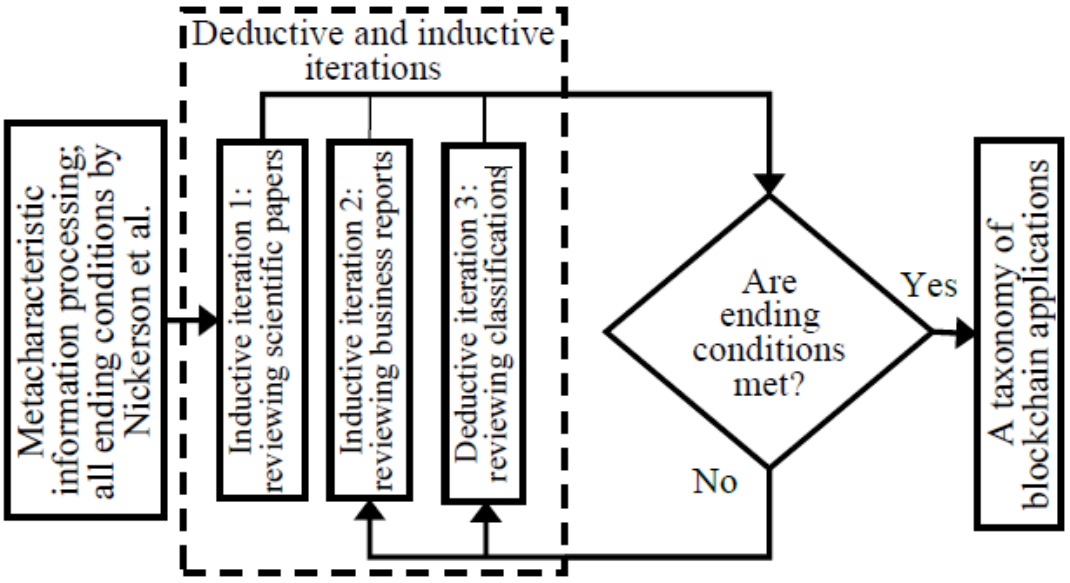

Figura 1.3

3.1. Development of the taxonomy of blockchain applications

The objective of the taxonomy is to classify machine learning applications in the digital marketing sector according to the funnel stage and how the technology enhances human work in this field. The meta characteristic serves as the basis for identification of further dimensions and characteristics. Therefore, we selected the position in the funnel phase according to RACE methodology (and the individual activities such as SEO, ADV, CRM etc..) as the meta characteristic, which we put in the y axes. While on the x axis we put the other characteristics of machine learning application both for a work transformation perspective (human augmentation and type of problem solved) and for an information prediction point of view (main type of content used, plug-and-play, output).

We developed the taxonomy in four iterations. The first one was inductive analyzing the scientific literature of machine learning application, the second one was intuitive putting together my knowledge of the AI market and the information we gained though the previous interaction, the third one was deductive based on the literature that study how artificial intelligence augment the human work and finally the fourth one which was intuitive. In the first iteration we researched in Google Scholar strings 'Artificial Intelligence application in digital marketing AND machine learning application in digital marketing' plus specific query for each of the activity in the vertical axes 'machine learning application in search engine optimization AND machine learning application in online advertising AND machine learning application in social media marketing AND machine learning application in customer journey AND machine learning application in content marketing AND machine learning application in marketing automation AND machine learning application in customer service AND machine learning application in customer contact strategy AND machine learning application in custom relationship management'. In the RACE methodology there were more activities such as online PR or affiliate marketing but we found no application in those particular areas so we decided not to put them in the list otherwise the classification would not satisfy the conditions described by Nickerson. Voluntary che classification does not include strictly technical characteristics (even if they are sometimes mentioned in the literature review) like algorithmic approach (SVM, decision trees, convolutional neural network, etc...) or learning method (supervised, unsupervised or reinforcement learning) for a simple reason: an application could have multiple algorithmic approaches and and learning methods even if the scope and how the technology augment the human work is the same. Including technical characteristics would only result in adding useless features and compromise the conciseness of the taxonomy. For this reason the next iteration was an intuitive one. Instead of adding to the classification the technical features we mentioned above we include in the taxonomy the 'plug-and-play' and 'output' characteristics which

describe at high level the typology and the complexity of the application. In the third iteration We researched in the scientific literature the queries ‘How machine learning augments human work AND How machine learning transforms human work ’. From the research we found deductively another feature (‘problem solved by AI’) and created the basis for the fifth (and last) intuitive iteration ‘human augmentation’. All ending conditions proposed by Nickerson were fulfilled after the fifth iteration as follows: First, all found machine learning application cases described in the scientific literature or business reports can be classified into an application case in the taxonomy. Second, each dimension is unique and mutually exclusive, and each characteristic is unique within its dimension. Third, all application cases were classified with a single characteristic for each dimension. Fourth, the taxonomy is concise— consists only of meaningful dimensions that classify application cases. Fifth, the taxonomy is robust— differentiates each application case from all others. Sixth, the taxonomy is explanatory, comprehensive, and extensible—highlights the main features of each application case and can be extended when new application cases arise.

4 Taxonomy

The taxonomy is made of 5 dimensions and 19 characteristics. The first dimension is ‘Type of Analytics’ and describes, as the name suggests, which kind of analytics was used to analyze the data and apply prediction. As described in the previous chapter we avoided further technical classification because it is out of the scope of the taxonomy and would damage his integrity. Broadly speaking analytics can be of 4 different types: text based, image or audio based, number based (predictive analytics) and audio based. Text based algorithms which extract information from a text document and in certain cases create new text, their algorithms are sometimes called ‘natural language processing’ and ‘natural language generation’ because they have the ability to comprehend and manipulate human language. Image and video based algorithms are often called computer vision and usually convolutional neural networks is the algorithm approach used by engineers and researchers. And finally predictive analytics which basically deal with numbers and it’s often associated with a regression, some example, outside the marketing space, could be predictive maintenance or stock price forecasting. Digital marketing is about content and it’s possible form (text, audio, image, video), analyzing which analytics is applied most in a particular area of RACE is of interest for future research to bridge the gap between technology and business value and to understand which type of content is most analyzed to drive results.

The second dimension is the plug-and-play availability. Plug and play is a term usually used in the hardware industry to describe an external peripheral that can be

put in communication with a hardware or a software without the need of specific procedure of configuration or installment by the user. The USB drive is the perfect example of plug and play, you just have to put the peripheral in the computer and you can extend its memory without a configuration. The same applies for machine learning applications and the marketing technology stack. Some applications can be easily plugged in the current technology, others must be adapted or fine tuned from case to case. In this context we define plug and play an application that doesn't need developers or data scientists to be inserted in the current workflow. We considered plug and play applications both the tools that have a 'piece of machine learning' inside the software, for example an email marketing software which optimizes the sending time with just one click and no code application which allows no IT experts to use the technology. It's not always easy to understand whether an application is or is not plug and play, especially if we consider that as technology progresses more and more applications are becoming plug-and-play for the democratization of use and the obvious commercial benefits. We took in analysis websites like google search, my knowledge and experience in the field, product hunt and scientific literature (unfortunately very few materials available here) to spot whether a plug and play version is available. Often the distinction is tricky because the plug-and-play version is slightly different from the other one and, if relevant with the scope of the analysis, we put both the applications in the taxonomy.

The third dimension is work augmentation. This dimension is the result of an intuitive iteration and so was designed analyzing the features of the applications listed underlining how prediction changes the task previously done only by human intelligence. The related characteristics are four: enhance decision making, enhance marketers productivity, improve direct performance and full automation. Enhanced decision making is a very numerous feature in my taxonomy, the scientific literature talks extensively about how machine learning can augment decision making and the applications listed are an example. In general the ability of machines here is the ability to make sense of a large quantity of content in real time to give to humans a sense of what would take a lot of time (and a lot of errors) otherwise or what would be impossible to elaborate for a human mind because of the numerous dimensions involved. In churn rate prediction for example a complex algorithm makes sense of the state of customer health putting together dozens of variables from historic data to engagement. The second one is enhancing human productivity. In the work process humans often have two kinds of problems that can cause lots of damage to their company (or in their lives): making silly mistakes due to repetitive work and what is called the writer's block. Hyperautomation, which is basically the union of classical RPA with an intelligent layer, and prediction can automate part of the task leaving to humans only the creative process. For example in the SEO activity, technical feature optimization allows humans to focus their work on the content creation rather than the technical features that can be better assessed by machine. On the other hand, the ability of machines to generate new content thanks to statistical techniques mixed with a degree of randomness gives the machine the

power to generate new ideas as in the case of ads creation or content augmentation to write better headlines. Thirdly we have applications that directly affect performance because of numerical optimizations. Without surprise is the most numerous feature in this dimension confirming the thesis of XXX which states that artificial intelligence applications, at least nowadays, are very good at strictly narrow optimization instead of general purpose jobs. One example is dynamic pricing that through intelligent segmentation of the demand can increase the profit of a few percentage points. Fourth, we have full automation. Full automation is the kind of feature that people are scared of because it can entirely automate all the tasks that constitute a job or a profession. The taxonomy clearly shows that these kinds of applications exist but are very rare compared to the full number of applications listed. Interestingly both of them are in the content marketing activity and involve natural language processing algorithms.

The fourth dimension is the kind of problem solved by artificial intelligence and has five different features. This dimension is due to an intuitive iteration analyzing non-scientific works such as the one of the investor David Kelnar. The first characteristic is reasoning: the ability to solve problems through logical deduction. Reasoning involves tasks which are based on learning a body of knowledge and then formulating a process where the machine can simulate an expert in the field. As an expert to become one has to read, interpret and master a body of knowledge and have enough flexibility to apply that knowledge. The same does the machine through training and feature engineering. The second characteristic is Knowledge: the ability to represent knowledge about the world (the understanding that there are certain entities, events and situations in the world; those elements have properties; and those elements can be categorised). Classification tasks such as dividing the engaged customers from one that are at risk of churn fall in this category. This is the ability of artificial intelligence to make order in the world and put objects in precise categories to enhance the decision making of humans. The third one is planning: the ability to set and achieve goals (there is a specific future state of the world that is desirable, and sequences of actions can be undertaken that will affect progress towards it. This is the case of reinforcement learning where the agent is not explicitly told what to do but has to achieve a final state by trial and error balancing the learning through positive (reward) and negative (punishment) feedback. In the A/B testing case for example the software tries an hypothesis and evaluates whether it's good for the traffic maximization or bad. The following hypothesis would be the basis on all the previous hypotheses till a state of optimal performance. The fourth is communication: the ability to understand written and spoken language. This is exactly the case of natural language generation and big models such as GPT-3. The algorithm is trained for a relatively long time on a big volume of written information created by humans until it is able to replicate human language in a very big variety of contests. Finally we have perception: the ability to deduce things about the world from visual images, sounds and other sensory inputs. Oppositely to common beliefs, machines are often better than humans in many applications that involve observation. Algorithm and high

definition cameras can analyze the aggregation of every group of pixels to spot important characteristics and, even more importantly, they can do the activity at scale with a very high velocity.

The fifth is the output generated by the prediction application. As We mentioned before, classifying the algorithm approaches of the application would make this analysis lose consiviness, there are a lot of different approaches for the same application. Anyway, to have a reference of how the algorithm worked behind the application we decided to limit the features to three: classification, regression and generation. The main goal of a classification problem is to identify the category/class to which a new data will fall under. Regression is when an exact value must be inferred from data and similar characteristics while content generation is when a new piece of information is generated thanks to the training work he made in the past.

Figura 1.4

			Ind1			Int2		Int4				D3					Int2		
			Main type of analytics			Plug-and-Play [1]		Work Augmentation				Problem AI solves					Output		
			TA [2]	CV [3]	PA [4]	Y	N	EDM [5]	EP [6]	CRO [7]	AUT [8]	R [9]	K [10]	P [11]	C [12]	P [13]	CL	RG	GEN
Reach	SEO	Keyword discovery	x			x		x					x						x
		SEO popularity prediction		x			x	x				x						x	
		Technical features optimization		x		x			x			x					x		
	Online Advertising (PPC)	Intelligent targeting (user centric)		x		x			x				x				x		
		Intelligent targeting (content centric)	x				x		x						x		x		
		AD reaction study (affective computing)			x	x		x							x		x		
		AD copy generation	x			x			x										
		AD image generation		x		x			x										x
	Social media marketing	Social listening (sentiment analysis)	x			x		x					x						x
		Social listening (images and video)		x		x		x							x		x		
Act	Customer journey	User behaviour identification through web log			x	x		x	x			x					x		
	Content marketing	Content and news classification	x				x						x				x		
		Content augmentation	x			x			x	x		x			x			x	
		Content curation and editing	x			x											x		
		Transaltion	x			x		x		x									
Convert	Marketing automation	Intelligent A/B testing			x		x		x					x			x		
		Conversational lead generation	x				x		x						x				
		E-mail send time optimization			x	x			x					x			x		
		E-commerce product recommendation			x	x			x						x				
		Dynamic pricing			x		x			x									
		Multiple headline testing			x	x								x			x		
Engage	Customer service	NLP Chatbot for answering customer questions	x				x												
		Sentiment analysis on customers answers to extract meaningfull information	x			x				x		x					x		
	Customer contact strategy	Customer contact timing optimization for sales rep			x	x		x				x					x		
		Intelligent segmentation and approach			x	x			x				x				x		
	CRM	Customer churn rate prediction		x			x	x								x			x
		Client KPI prediction to understand better target	x				x	x				x					x	x	

Meta characteristic: RACE

- SEO
- Online advertising
- Social Media Marketing
- Customer Journey
- Content Marketing
- Marketing Automation
- Customer Service
- Customer contact strategy
- CRM

First dimension, types of analytics:

- Text Analytics
- Computer Vision
- Predictive Analytics

Second dimension, plug-and-play integration:

- Available
- Not Available

Third dimension, work augmentation:

- Enhance decision making
- Enhance productivity
- Conversion rate optimization
- Full automation

Fourth dimension, problem solved by AI:

- Reasoning
- Knowledge
- Planning
- Communication
- Perception

Fifth dimension:

- Classification

- Regression
- Content generation

The application listed in the taxonomy are: Keyword discovery, SEO popularity prediction, Technical features optimization, Intelligent targeting (user centric), Intelligent targeting (content centric), AD reaction study (affective computing), AD copy generation, AD image generation, Social listening (sentiment analysis), Social listening (images and video), User behaviour identification through web log, Content and news classification, Content augmentation, Content curation and editing, Transaltion Intelligent A/B testing, Conversational lead generation E-mail send time optimization, E-commerce product recommendation, Dynamic pricing, Multiple headline testing, NLP Chatbot for answering customer questions, Sentiment analysis on customers answers to extract meaningful information, Customer contact timing optimization for sales rep, Intelligent segmentation and approach, Customer churn rate prediction, Client KPI prediction to understand better target.

5 Discussion and Conclusion

We are only at the very beginning of the power of artificial intelligence and its possible application in marketing or in any other fields. The good news is that technology is changing at an exponential level, digitalization, algorithms efficiency and computing power availability are all strong hard trends condemned to grow inevitability and very soon we would be able to create a far more complete taxonomy. We have seen how prediction is changing the role of marketers and how human work can be augmented through the use of technology. How artificial intelligence is clearly complementary to human intelligence and not a substitute apart from rare cases which can eventually increase in the future. This work fills the gap between the current state of artificial intelligence and the possible application in the digital marketing space. The taxonomy accounts for 27 application cases into five dimensions and 17 features. Overall, the taxonomy consolidates extant knowledge of artificial intelligence application in the field to calm the hype and uncertainty about the current market and foster development of more realistic use cases and future approaches.

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