Monthly Newsletter

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UPCOMING EVENTS

Millennium Consulting's Unit4 Financials Global Conference

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DATA SCIENCE & BI

DRIVING BLACK FRIDAY SALES THROUGH MACHINE LEARNING & AI

Securing a discount on Black Friday has become an annual tradition for millions of shoppers across the world. Retailers plan months in advance to maximize profits on one of the biggest spending days of the year.

Black Friday and Cyber Monday provide retailers with the ideal sales opportunity; however, many fail to achieve its full potential due to a lack of preparation. This is often due to insufficient investment in machine learning, a technology that has significantly altered the playing field. The technology has two primary uses – predicting demand and personalising the customer shopping experience. From supply chain and inventory management, to accurately predicting shopping patterns and handling customer queries, Al powered by machine learning has had a massive impact in ensuring businesses maximise sales potential.

Predicting demand

Retailers have traditionally used Black Friday and Cyber Monday to clear old stock at a reduced price, however, due to an increase in available data, it's now possible to predict what consumers will spend their money on with greater accuracy than ever before. This means that pricing, inventory and distribution can all be managed more efficiently.

Managing stock inventory based on insights, pricing and distribution is nothing new for the retail sector but Al allows it to be performed more efficiently due to larger data volumes. By anticipating trends, machine learning and Al tools can enable retailers to more effectively capitalise on spikes in demand.

Personalised shopping

Attracting new buyers is the ultimate goal for Black Friday campaigns, however, targeting existing customers offers greater sales potential. Al-driven customer analytics can be used to develop customer view and purchasing patterns, which then generate relevant customised offers. Online retailers have used recommendation engines for many years. They were originally restricted to predicting future customer purchasing patterns by analysing past shopping habits but nowadays data from a wide variety of third-party sources based upon age, location, preferences, lifestyle choices etc. allows retailers to target customers via email campaigns, display ads etc.

Chatbots

Retailers also use machine learning techniques to convert more shoppers by using chatbots. They can answer questions about product specifications thereby reducing fall out rates leading to an increase in sales conversion up to 20% in some instances.

Having started in the USA, Black Friday has now spread across the globe and looks likely to grow further. Data Scientists and Machine Learning Engineers will continue to think of new unique ways to measure and predict behavior more accurately, set prices at levels that will appeal to consumers and advertise in targeted relevant locations.

Black Friday provides retailers with the opportunity to increase sales and acquire more customers plus acquire valuable data for future growth. However, if they fail to invest in appropriate technology led by the right people, they will run the risk of missing the opportunity it offers.



DATA SCIENCE & BI

INTERVIEW CHEAT SHEET - DATA SCIENCE & MACHINE LEARNING

Based upon feedback shared from clients and not be accurate. candidates, we created a Data Science and Machine There are various types of selection bias including Learning Cheat Sheet for junior/entry level roles. The sampling bias (a non-random sample of a population), cheat sheet contains some of the most common time interval (a trial may be terminated early at an auestions asked and brief answer to each. These extreme value), data (subsets of data chosen to answers should be expanded upon with examples support a conclusion) and attrition (discounting data taken from your previous experience.

1) What is Data Science?

Data Science is a combination of various tools. algorithms, and machine learning principles that aims to discover patterns from the raw data. This is different from a traditional statistician's role as it focuses around predicting trends rather than explaining them.

2) Can you give examples of some of the key Python skills needed for data analysis?

- Knowledge of lists, dictionaries, tuples, and sets.
- Advanced knowledge of N-dimensional NumPy Arravs.
- Advanced knowledge of Pandas dataframes.
- Comfortable performing element-wise vector and matrix operations on NumPy arrays.
- Knowledge using Scikit-learn.
- Comfortable profiling the performance of a Python script and optimizing bottlenecks.

3) Why is data cleaning important for analysis?

Cleaning data from multiple sources helps to transform it into a format that data analysts or data scientists can behave differently. Something that works for one model in machine learning.

project?

- Understand the Business problem
- Explore the data and become familiar with it.
- Clean the data.
- Run the model, analyze the result and amend the Overfitting is a statistical modeling error which occurs achieved.
- Validate the model using a new data set.
- Start implementing the model and track the result to analyze the performance of the model over the period of time.

5) What is Selection Bias?

decides who is going to be studied instead of the algorithm does not fit the data well selection process being random. This may result in the enough. Specifically, underfitting occurs distortion of statistical analysis, due to the method of if the model or algorithm shows low collecting samples. If the selection bias is not variance but high bias. considered, then some conclusions of the study may

that did not run to completion).



6) What is the purpose of A/B Testing?

A/B testing, also known as split testing, is a marketing experiment wherein you "split" your audience to test a number of variations of a campaign to determine which performs better.

A/B testing can be valuable because audiences work with. This helps to increase the accuracy of the company may not necessarily work for another. It is useful for figuring out the best online promotional and marketing strategies for your business. It can be used to 4) What steps are involved in a typical analytics test everything from website copy to sales emails to search ads.

7) What are the differences between overfitting and underfitting?

approach until the best possible outcome is when a function is too closely fit to a limited set of data points. It is caused by a model being excessively complex. A model that has been overfit has poor predictive performance, as it overreacts to minor fluctuations in the training data.

Underfitting refers to a model that can neither model the training data nor generalize to new data. This arises when a statistical model or machine learning algorithm cannot capture the underlying trend of the Selection bias is an error that occurs when a researcher data. Underfitting occurs when the model or the



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INTERVIEW CHEAT SHEET - DATA SCIENCE & MACHINE LEARNING

8) What is Cluster Sampling?

study the target population spread across a wide area are provided, there is no specific way to compare and simple random sampling cannot be applied. The whole population is subdivided into clusters, or groups, and random samples are then collected from each group.

9) What is Systematic Sampling?

Systematic sampling is a random sampling technique which is often chosen due to its simplicity and its periodic quality. In systematic random sampling, the researcher randomly picks the first item or subject from the population. The list is then progressed in a circular manner so once you reach the end of the list, it is In deep learning, a model learns to perform progressed from the top again.

10) What is Machine Learning?

Machine Learning is the study and construction of algorithms that can learn from and make predictions on data. Closely related to computational statistics, it is used to devise complex models and algorithms that lend themselves to a prediction which in commercial use is known as predictive analytics.

Unsupervised learning?

classification to map input to output labels, or layer can use. They are excellent tools for finding regression, when mapping input to a continuous output. patterns which are too complex or numerous for a Common algorithms in supervised learning include human programmer to extract and teach the machine logistic regression, naive bayes, support vector to recognize. machines, artificial neural networks, and random forests.

The most common tasks within unsupervised learning a biological Neural Network. It consists of inputs which are clustering, representation learning, and density get processed with weighted sums and Bias, with the estimation. In all of these cases, the researcher will be help of Activation Functions. looking to learn the inherent structure of data without

using explicitly provided labels. Some common algorithms include k-means clustering, principal Cluster sampling is used in statistics when it is difficult to component analysis, and autoencoders. Since no labels model performance in most unsupervised learning methods.

12) What is Deep Learning?

Deep learning is a machine learning technique that teaches computers to learn by example. Deep learning is a key technology behind driverless cars and voice control in devices like phones, tablets and hands-free speakers. Deep learning is getting lots of attention as it's achieving results that were not possible before.

classification tasks directly from images, text, or sound. Deep learning models can achieve state-of-the-art accuracy, sometimes exceeding human-level performance. Models are trained by using a large set of labeled data and neural network architectures that contain many layers.

13) What are Artificial Neural Networks?

Artificial neural networks are one of the main tools used in machine learning. They are brain-inspired systems 11) What is the difference between Supervised and which are intended to replicate the way humans learn. Neural networks consist of input and output layers, as well as (in most cases) a hidden layer consisting of units Supervised learning is typically used in the context of that transform the input into something that the output

Artificial Neural Networks works on the same principle as





ERP & ACCOUNTING SOFTWARE

WORKPLACE AI IS CHANGING ERP SYSTEMS

processes, it will learn on the job and eventually ability for machines to alert people to problematic situabecome more independent, leading to more tions. Now that nearly everyone has a mobile autonomous ERP systems.

The rise of machine learning and AI in the workplace has been well-documented over the past few years, There are many different models that companies can and the growth of the machine is unquestionable. use to implement AI in the workplace. As the options However, recent shifts in AI technology are now continue to specifically impacting ERP systems.

workplace for many years. In fact, the dream (or embedded AI platforms, for example: nightmare) of thinking machines has been in the human mind for many years. So, why all the noise about it now? Al in the workplace learns on the job This is because several different technological Deploying AI in the workplace will likely progress very advancements are coming together to drive Industry much like the relationship between a supervisor and a digital transformations. These include:

cost of systems have reached a level where many AI those with more experience to one where it can make algorithms can run in real time. The most obvious decisions independently. example of this in the consumer space is the increase in devices that process real-time speech.

the physical world than ever before via IoT, which spend time supervising its work and training it how to means they can operate on up-to-date information. handle known situations. At this stage, the machine Soon, nearly everything will have a sensor that machines helps with repetitive tasks but requires guidance when can use as a decision input.

-to-machine trust technologies means that machines complex planning algorithms or predictive capabilities. can trust each other like never before. This reduces the The computer makes suggestions for need for manual validation and verification.

As AI becomes more embedded in workplace Mobile alerts: Mobile technology is greatly improving the device, the machines can easily phone a friend when things get too touah.

increase, there will likely be a growing trend of AI as a service, where the implementation of AI isn't something the end user has to think about as long We have been discussing and researching AI in the as it achieves results. SAP and Google have developed

new employee. This occurs in three phases where the employee, in this case an Al-enabled process or bot, Computational capability: The availability and power/ works its way up from a position of dependence on

Phase 1: Dependent AI

In the early days, it will be unclear what tasks the AI Connected machines: Systems are more connected to co-worker is qualified to perform, so it will be critical to exceptions occur. This is like how most of us interact with Machine trust: The rise of blockchain and other machine computer systems today, especially if they have

actions to perform, and we accept or reject them.

ERP & ACCOUNTING SOFTWARE

WORKPLACE AI IS CHANGING ERP SYSTEMS CONTINUED

Phase 2: Interdependent AI

Computers are starting to learn how to solve problems based on historical patterns without requiring instructions at every step. This is where machine learning comes in, as the machine looks at how similar situations were dealt with and applies similar logic, although not necessarily the same. This is known as training the mode, feeding the machine with lots of high-quality historical data so it can find patterns of behaviour that it can apply. This is similar to when you have an employee who has been on the job for six months. You may still choose to check his work or require approval for certain actions, but you can delegate more control to them as you become more confident in the recommendations. Most AI in the workplace capabilities are at this point today and it's a lack of high-quality data to properly train the model that most commonly prevents adoption at scale. So, the training data often needs to be cleansed to remove behaviour that the machine doesn't need to learn.

Phase 3: Independent AI

The final stage of AI occurs when the machine is actually dealing with both known and unknown situations and can reliably make decisions and recommendations that are as good as or better than a human would make. This is known as the *Singularity*, where machine intelligence moves ahead of human intelligence. We are some ways away from seeing this type of AI in commercial enterprise software. But research labs are working on it, and it is coming.

So, what does all of this have to do with ERP systems? Vendors are beginning to use AI capabilities to take on tasks in ERP systems that have traditionally required human effort. For example, AI may be used to perform repetitive tasks to correct mistakes or remedy situations where rules were applied inconsistently. They can also be used to replace manual efforts that introduced latency into the process. For example, the SAP S/4HANA ERP suite incorporates machine learning capabilities and predictive analytics to enable businesses to tap into real-time insights and apply them automatically to particular business contexts.

Using AI to take on these types of tasks enables systems to operate much closer to real time by keeping the digital version of events in line with the physical. Over time, it's realistic to envision being able to move to a *darkened ERP* world, or *intelligent ERP*, where humans only get involved via critical exceptions or key performance indicator violations.



ACCOUNTING PROCESSES FROM PAST TO PRESENT

Accounting records have been kept since mankind first started trading and recording transactions on clay tablets in Mesopotamia and Egypt between 3,300 to 2000 BC. Paper based double-entry bookkeeping was first pioneered during medieval times by the Romans and the Middle Eastern Jewish community as they moved toward a money-based economy. Traders came to rely upon accurate bookkeeping to record transactions financed by bank loans and as industrial activity grew it became clear that accounting processes were needed for accurate recording and efficient processing.

During the 1880s, the American William Burroughs invented an adding machine that allowed accountants to perform mathematical calculations more efficiently than manual based methods. By the turn of the 19th century Herman Hollerith had developed a machine that recorded data by punching hole patterns into cards which could be called up and read. He subsequently took this concept to the private sector and founded International Business Machines (IBM). By 1907 many commercial organisations were actively using punch-card machines for accounting purposes.

In the 20th century computers were built which made a significant impact on accounting departments allowing automated data capture, validation and transaction matching.





ERP & ACCOUNTING SOFTWARE ACCOUNTING PROCESSES FROM PAST TO PRESENT CONTINUED

At the end of the second world war the UNIVersal Automatic Computer (UNIVAC) was developed which allowed data storage on magnetic tapes rather than on punch-cards. In 1955, a UNIVAC was purchased to run payroll for a General Electric factory which was the first time a company had bought a computer purely for accounting purposes.

It took 40 hours to complete the payroll calculations, a process that can nowadays be performed in less than a second.

Mainframe computers became widely used during the 1960s and 70s with dumb terminals used for transactional processing and running reports. In the late 70s the personal computer emerged with Visicalc the first spreadsheet which allowed financial modelling. During the same period Peachtree Software launched an accounting product designed for personal computers which allowed companies to computerise accounting at a fraction of the cost of purchasing a mainframe computer.

By the mid-1980s personal computers replaced mainframe computers for many organisations and new accounting software was being used by millions of businesses. Accounting software was typically held on company premises requiring onsite maintenance and support.

A proliferation of new accounting software vendors appeared throughout the 1980s with functionality developed for accounts payable, accounts receivable, general ledger and fixed assets etc.

In 2000 Optical Character Recognition (OCR) and Intelligent Data Capture (IDC) emerged to automate the accounts payable process and replace manually intensive data entry methods. Business rules were introduced which recognised commonly used document fields and mapped them to accounting software database structures. The software was also developed to integrate with digital e-commerce platforms allowing transactions to be mapped directly to underlying databases avoiding the need for manual intervention.

Analytic tools provide sophisticated reporting capability and the ability to slice and dice data and produce detailed reports and dashboards.

The future for accounting is likely to involve Artificial Intelligence (AI), machine learning and Blockchain technology which will reduce the need for manual intervention, provide greater accuracy and increased security thereby encouraging worldwide commercial growth.



TECHNOLOGY

ELON MUSK UNVEILS NEW TESLA CYBERTRUCK

On 21 November Tesla CEO Elon Musk unveiled the company's first electric pickup truck referred to as a Cybertruck at an event near the company's SpaceX factory in Los Angeles, USA. The distinctive-looking truck has an unusual angular, wedge-like body and is made from stainless steel. Tesla shares fell by 6.1% after the event and with its distinctive futuristic angular design the Cybertruck was greeted with cheers but also some bemusement and derision.

The truck remains in development and is not scheduled to be available until late 2021 although Tesla is accepting pre-orders for the new vehicle and has so far received 150,000. The product launch was regarded by some as Musk's attempt to pre-empt the introduction of similar vehicles by competitors who have started targeting this growing market.

During the product launch Musk attempted to demonstrate the vehicles strength and durability by having Franz von Holzhausen, Tesla's Design Chief, attack the vehicle with a sledgehammer claiming it was virtually bulletproof. Unfortunately, whilst demonstrating the shatterproof quality of the "armored" glass von Holzhausen broke both truck windows although Musk was quick to gloss over this deficiency. "Yup. Sledgehammer impact on door cracked base of glass, which is why steel ball didn't bounce off. Should have done steel ball on window, *then* sledgehammer the door. Next time...," tweeted Musk.

The truck will be able to seat up to six adults with a 3,500-pound capacity payload and 100 cubic feet of storage space. It is 6.5 feet long and will have a 17-inch touchscreen in the centre of the dashboard. Starting at \$39,900 there will be three options available differentiated by possible mileage; 250, 300 or 500 miles.

Musk has intended to develop a Tesla pickup truck for many years and his plans are now being realised. He is reported as saying that the pickup truck is his favourite project amongst the range of Tesla vehicles under production and in 2018 announced that the truck had taken on a "futuristic-like cyberpunk, *Blade Runner*" design.

Whilst Tesla's domestic vehicles have experienced production challenges, delays and proved unprofitable the new Cyber truck has the potential to change this due to the growing demand for pickup trucks in the US which command high selling prices and profit margins.

In 2017, Tesla unveiled the Model 3 car, which it described as the "first mass-market electric vehicle". It has been a first mover in the production of long-range electric vehicles and has now identified the potential market for electric pickup trucks. The pickup market represents a major opportunity for Tesla as its battery technology improves thereby allowing vehicles to carry heavier loads over longer distances. However, the established vehicle manufacturers have also caught on to the potential of this market and Ford now has an all-electric F-150 in production whilst General Motors plans to launch its own electric pickup truck in 2021. This means that for the first time Tesla may find that their product is not first to market and may be joining an already crowded market for electronic trucks.



ECONOMY & POLITICS ONLY ONE IN 20 BLACK FRIDAY DEALS ARE GENUINE

Only 5% of Black Friday deals are genuine, according to new research by Which?.

After checking 83 items on sale on Black Friday last year, the consumer group found that nearly all were cheaper or available for the same price at other times of the year. Announcing the finding, it claimed the annual shopping event was "all hype".

The consumer champion told The Sun it is concerned that shoppers are at risk of being confused by Black Friday offers that might not be as good as they sound. The Guardian added that there are "signs of fatigue" among both shoppers and retailers over the annual shopping sale.

One example Which? highlighted was the Samsung soundbar – a supposed Currys PC World Black Friday deal last year at £299. Researchers found that the price dropped by a further £49 during the month after Black Friday and was priced at £279.97 on at least 13 occasions in the following six months.

At John Lewis, a De'Longhi coffee machine was offered at £399 on Black Friday, but it was then discounted to £368, and Amazon priced its Echo (2nd Gen) at 39% cheaper on Black Friday, when it had been cheaper on at least 13 occasions before the big date.

Diane Wehrle, insights director at Springboard, said that "the prevalence of discounting from retailers throughout the year" and "scepticism surrounding whether Black Friday discounts are better than those being offered generally" means consumers are "paying less attention to this period as a whole".



In response to the claims, Currys PC World said: "When we launched our Black Friday event last year 40% of those products were the lowest price they had ever been."

John Lewis said: "We offer our customers the best value on the high street all year round, including during the Black Friday period."

Amazon commented: "We seek to offer our customers great value thanks to low prices all year round as well as a number of fantastic seasonal deals events."

In a separate blow for Black Friday, the online security company, SonicWall, told Retail Insight Network that yearon-year ransomware attacks in the UK during the seven-day sale period multiplied by 12 times last year.





ECONOMY & POLITICS

FLEXIBLE WORKING - ISSUE OR OPPORTUNITY FOR EMPLOYERS?

A new survey has found that more than four in ten employers say they need help implementing flexible working as the demand for flexible hours rises.

The research, conducted by <u>workingmums.co.uk</u>, found that 85% of employers expect demand for flexible working to increase. The poll of 200 employers found that 37% of employers say there is demand for flexible working from all groups of employees, while 35% say demand is mainly from parents and 23% say it is mainly from mums. However, 31% of employers polled say they are getting more dads asking for flexible hours, 20% are getting more older workers and 29% are getting more non-parents.

The findings also suggest that employers see flexible working as a way to address skills shortages. Over half (56%) of employers say they are having trouble finding people with the right skills. To reach a wider candidate base, many employers are making clear in their job adverts that they support flexible working - 62% already mention that they are open to flexible working in their job adverts and 71% say they intend to do so in the future.

Flexible working is also a key factor in recruiting a more diverse workforce, the findings show. Nearly half - 48% of employers - have been actively trying to recruit more women in the past 12 months and 47% say they aim to actively recruit more women in the next year. In addition, 24% are actively recruiting older workers now and 32% say they may need to actively recruit older workers in the future.

"The survey throws up some interesting results," said Gillian Nissim, founder of <u>workingmums.co.uk</u>. "Particularly interesting is the number of employers who say they need more support to deal with the demand for flexible working. This shows that there needs to be some carrot along with the stick of stronger enforcement of flexible working legislation and new rights for employees.

"The world of work is changing very fast and many employers have adapted on an ad hoc basis, which can build up problems for the future. They need help to take a step back and strategise for the future."



ENVIRONMENT 6 RECYCLING FACTS THAT WILL MAKE YOU THINK TWICE

The more people know about recycling, the more they are do it. Recycling not only keep waste from landfill, it also provides raw materials to create new product. The following 7 facts will hopefully help to convince you to recycle as much as possible.

1. Using Recycled Paper Saves Water, Not Just Trees

When you use recycled paper, you are contributing to saving 30,000 litres of water per ton of paper produced. You're also offsetting the 900,000,000 trees per year chopped down to make new paper.

2. The Amount of Plastic Bottles Sent to Landfill Each Year is Enough to Circle the Planet Four Times On average, 8 billion pounds of plastic bottles are produced in the United States alone. If all of them had been recycled, the resulting material could have been used to create 22 million size XL T-shirts. Recycling a single plastic bottle can conserve enough energy to light a 60W light bulb for up to 6 hours. It takes 75% less energy to make a plastic bottle from recycled plastic compared with using 'virgin' materials (source: WRAP)

3. Each Year we Throw Away Over 600 Million Batteries

Over 20,000 tonnes of batteries are sent to landfill site in the UK each year. It takes 50 times more energy to make a battery than it gives during its life. Every person in Britain uses about 10 batteries a year.

4. It Takes Centuries for a Disposable Nappies to Break Down in a Landfill On average, one baby will go through 8,000 nappies. Cloth nappies are not as convenient, but they are reusable.

5. 25 Billion Polystyrene Cups are Thrown Away Each Year

It takes polystyrene more than 500 years to decompose in a landfill. A coffee mug can be washed and reused for years generating no waste.

6. Recycling Aluminium Cans Saves 95% of the Energy Used to Make New Cans

When you recycle just one aluminium can, you save enough energy to power a 100-watt light bulb for 20 hours. Thanks to state-of-the-art automated sorting and separating equipment, recycling facilities can process more than 3,500 pounds of aluminium cans per hour and send the aluminium to be reused in other products. Recycling aluminium drink cans saves up to 95% of the energy needed to make aluminium from its raw materials. Making one aluminium drink can from raw materials uses the same amount of energy that it takes to recycle 20

Each recycled, re-purposed or reused item is an item that does not end up in a landfill. We have one earth, and we all should work together to take care of it.



www.millenniumconsulting.co.uk/green-agenda