Informacioni inženjering

skripta 2021/2022

predmet:

Engleski jezik za inženjere

Data scientists are expected to know a lot—machine learning, computer science, statistics, mathematics, data visualization, communication, and deep learning.

ENGLESKI JEZIK ZA INŽINJERE 1 **smer: Informacioni inženjering**
školska godina 2021/2022 fond časova 2+0
predmetni nastavnik: Ivana Mirović, kabinet 109, blok F

termin za konsultacije: četvrtak 13h

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http://ivanamirovic.wix.com/pocetna

III semestar – stručni kurs engleskog jezika

PREDISPITNE OBAVEZE: Test **40 poena**
Proverava se:
1) novi vokabular
2) gramatika: pasivne rečenice, relativne rečenice *(reduced relative clauses: active and passive),* vremenske rečenice *(reduced time clauses: active and passive*), glagoli: *allow, let, prevent, cause, make* i sl.
3) upotreba veznika

Predispitni test se može polagati samo jednom u toku semestra stoga se skreće pažnja studentima da se pripreme za polaganje.

ISPIT: maksimalno **60 poena**. Ispit je usmeni. Student izvlači ispitno pitanje (naslov jednog od tekstova koji smo radili tokom semestra) i odgovara na pitanja u vezi tog teksta.

Za studente koji su redovni i aktivni na nastavi tokom semestra postoji mogućnost da umesto usmenog rade nešto od sledećeg:
- Prezentacija (naučno-popularna tema po izboru)
- Projekat (digitalni članak sa linkovima)
- Prezentovanje nekog od ponuđenih tekstova iz drugačijeg ugla

Aktivnost na času može doneti dodatne bodove (max 10).

FORMIRANJE KONAČNE OCENE: prema skali koja je prihvaćena na Fakultetu.
(51 – 100 poena)

Plan rada 2021/ 2022

14. 10. – uvodni cas

21. 10. – Which Engineering Degree Should You Choose
https://interestingengineering.com/which-engineering-degree-choose

28.10. - Computer Applications
- Passive

04. 11. - Linux
- Locating information in the text.
- Language study: - + *allow* and *prevent*
  cause and effect

11. 11. neradni dan

18. 11. - Here's how to find a job you really love

https://www.weforum.org/agenda/2018/10/here-s-how-to-find-a-job-you-really-love/

- Digitally enhanced article

25. 11. - 10 skills you'll need to survive the rise of automation

https://www.weforum.org/agenda/2018/07/the-skills-needed-to-survive-the-robot-invasion-of-the-workplace
- Discussion: skills/ jobs of the future

02. 12. – Big Data, Questionable Benefits and My Girlfriend's Magic Ring
https://www.scientificamerican.com/article/big-data-questionable-benefits-and-my-girlfriends-magic-ring/
- Upotreba veznika

09.12. - Artificial intelligence has a problem with grammar
https://www.economist.com/books-and-arts/2021/02/25/artificial-intelligence-has-a-problem-with-grammar
- Time clauses
- Reduced time clauses

16. 12. What Is Machine Learning, and How Does It Work? (+ Video)
https://www.scientificamerican.com/video/what-is-machine-learning-and-how-does-it-work-heres-a-short-video-primer/
- reduced relative clauses

23. 12. - predispitna obaveza – TEST

30.12. – What is the Internet of Things?

https://www.weforum.org/agenda/2021/03/what-is-the-internet-of-things?fbclid=IwAR3VU1wumADaQbKhsxzJu4N7jBxy3SFeoX8jONw0KOv2LoUUSxhgxkT7_0w

13.01 – 4 key areas where AI and IoT are being combined

https://www.visualcapitalist.com/aiot-when-ai-meets-iot-technology/

20.01. – New Optimization Algorithm Exponentially Speeds Computation
https://spectrum.ieee.org/tech-talk/computing/software/new-optimization-algorithm-exponentially-speeds-computation

24.01. - prezentacije, pitanja, priprema za ispit

Which Engineering Degree Should You Choose?

By **Trevor English**

July 09, 2017

Engineering as a profession is very diverse and it naturally branches out into many different industries. Each specialty of engineering cumulatively contributes to nearly every aspect of our physical world. For a high school student interested in STEM or even someone looking to go back to school, the choices for which engineering degree to get can be rather daunting. You can always change your mind after the first year or two, but sometimes it ends up costing you extra money and definitely extra stress. The key to success in engineering is figuring out which degree path suits you best and which one will eventually lead you into a sustainable career. Let's take a look at all of the different choices that you have when determining which engineering degree to get.

Biomedical Engineering Degree

Common Fields: *electronics, mechanical connections, and biological devices*

Biomedical engineering is possibly the most specialized and niche disciple in engineering. It doesn't quite fit into any other category but it also incorporates a lot of skills from other areas. To work in the biomedical field, you will need to have a strong interest in anatomy and physiology while also having a good idea of mechanical design and engineering. You will likely be working closely with mechanical and electrical concepts and trying to incorporate your designs into the human body. Doctors and surgeons consistently rely on biomedical advances to help save the lives of their patients. Biomedical engineers are behind advances in anything from hip replacements to pacemakers.

Chemical Engineering Degree

Common Fields: *chemistry, mathematics, life sciences, and lab work*

Chemical engineering has seen huge growth in recent years due to the increase in chemically engineered products implemented in daily life and in industry. Chemical engineering doesn't quite require that much explanation, but you will likely be working inside of a lab designing new chemicals or synthesizing compounds. Everything in the world is made up of some form of chemical, compound, or element, and chemical engineers can work with any of it. From working on the next clean biofuel to revolutionizing skincare, you can do it with chemical engineering.

Civil Engineering Degree

Common Fields: *mechanics of materials, hydraulics, geotechnics, and statics*

Civil engineering is the oldest form of engineering, with a close second being mechanical. Civil engineers deal with urban planning, pipe networks, water treatment, structural design, and any combination therein. Civil engineering has a close relation with the construction industry and often will involve a lot of opportunities for hands-on work in the civil engineering career you choose. As a civil engineer, you have the option of working with chemicals in water treatment or designing the next world famous bridge. All in all, if you don't like designing machines and want to focus on more solid designs, then civil engineering might be the way to go.

Electrical Engineering Degree

Common Fields: *circuits, electronics and computers*

Commonly referred to as double E's, electrical engineers work with electronics, circuits, and computers. Given modern advances and trends, you can likely see how electrical engineering is an in-demand career path. If you decide to choose electrical engineering as a degree path, you need to be prepared for working primarily with electronics and the technology within that industry. Given current advances in technology, electrical engineering is fast paced and is constantly innovating. If you want to lean further from electrical and more into computers, you can always choose a more specialized degree in computer science or computer engineering.

Mechanical Engineering Degree

Common Fields: *stress analysis, thermodynamics, fluid dynamics, mechanical design*

Mechanical engineering is by far the most popular of all of the engineering disciplines. This is mostly because the degree is so broad. With a mechanical engineering degree, you could end up working in any field, from aerospace to air conditioner design. Mechanical engineering focuses on the design, manufacturing, and maintenance of mechanical systems. Mechanical engineers are constantly tasked with improving the function of machines or running analysis on complex components. While your options with a degree in mechanical engineering can be diverse, you can also choose aerospace, robotics, or industrial engineering depending upon the specialty you want to work in. However, if you haven't made it that far in your life planning yet, a degree in mechanical engineering will set you down the right path.

https://interestingengineering.com/which-engineering-degree-choose

UNIT 3

Computer Applications

STARTER

1 Work in groups. List as many uses as you can for computers in one of these areas.

1 supermarkets
2 hospitals
3 airports
4 police headquarters

READING

2 Study this diagram. Using only the diagram, try to list each stage in the operation of this computerised speed trap to make an explanation of how it operates. For example:

1 Camera 1 records the time each vehicle passes.

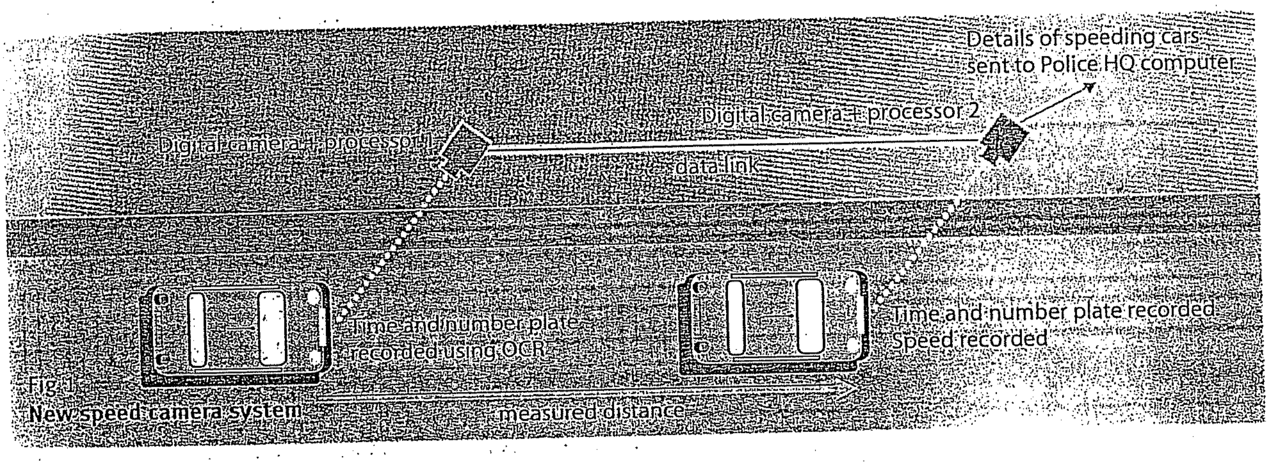


Fig 1
New speed camera system

3 Part 1 of the text describes the system which predates the one shown in Fig 1. Does it contain any information that may help complete your explanation? Read it quickly to find out. Ignore any information which is not helpful to you.

In the last ten years, police have installed speed trap units on many busy roads. These contain a radar set, a microprocessor and a camera equipped with a flash. The radar sends out a beam of radio waves at a frequency of 24 gigahertz. This is equivalent to a wavelength of 1.25 cms. If a car is moving towards the radar, the reflected signal will bounce back with a slightly smaller wavelength. If away from the radar, the waves will reflect with a slightly longer wavelength. The microprocessor within the unit measures the difference in wavelength between outgoing and returning signals and calculates the speed of each vehicle. If it is above the speed pre-set by the police, the camera takes a picture of the vehicle. The information is stored on a smart card for transfer to the police computer. The owner of the vehicle can then be traced using the Driver and Vehicle Licensing Centre database.

4 Part 2 describes the new system. Read it to complete the stages in your explanation.

Some drivers have now got used to these traps. They slow down when they approach one to ensure that the camera is not triggered. They speed up again as soon as they have passed. This is known as 'surfing'. One way of outwitting such motorists is a new computerised system. This consists of two units equipped with digital cameras positioned at a measured distance apart. The first unit records the time each vehicle passes it and identifies each vehicle by its number plates using optical character recognition software. This information is relayed to the second unit which repeats the exercise. The microprocessor within the second unit then calculates the time taken by each vehicle to travel between the units. The registration numbers of those vehicles exceeding the speed limit are relayed to police headquarters where a computer matches each vehicle with the DVLC database. Using mailmerge a standard letter is then printed off addressed to the vehicle owner.

LANGUAGE WORK Present passive

Study these sentences:

1 The radar sends out a beam of radio waves.
2 The information is stored on a smart card.

In 1 the verb is active and in 2 it is passive, the Present passive. Why is this so? What difference does it make? In 1 the agent responsible for the action is included – the radar. In 2 the agent is not included although we know what it is – the microprocessor. The passive is often used to describe the steps in a process where the action is more important than the agent and where the agent is already known to the reader. If we need to add the agent, we can do so like this:

3 The information is stored on a smart card *by the microprocessor*.

5 Describe the operation of the new speed trap by converting each of these statements to the Present passive. Add information on the agent where you think it is necessary.

1 The first unit records the time each vehicle passes.
2 It identifies each vehicle by its number plates using OCR software.
3 It relays the information to the second unit.
4 The second unit also records the time each vehicle passes.
5 The microprocessor calculates the time taken to travel between the units.
6 It relays the registration numbers of speeding vehicles to police headquarters.
7 A computer matches each vehicle with the DVLC database.
8 It prints off a letter to the vehicle owners using mailmerge.

6 With the help of this diagram, sequence these steps in the operation of an EPOS till. Then write a description of its operation in the Present passive.

a The scanner converts the barcode into electrical pulses.
b The branch computer sends the price and description of the product to the EPOS till.
c The scanner reads the barcode.
d The branch computer records the sale of the product.
e The till shows the item and price.
f The checkout operator scans the item.
g The scanner sends the pulses to the branch computer.
h The till prints the item and price on the paper receipt.
i The branch computer searches the stock file for a product matching the barcode EAN.

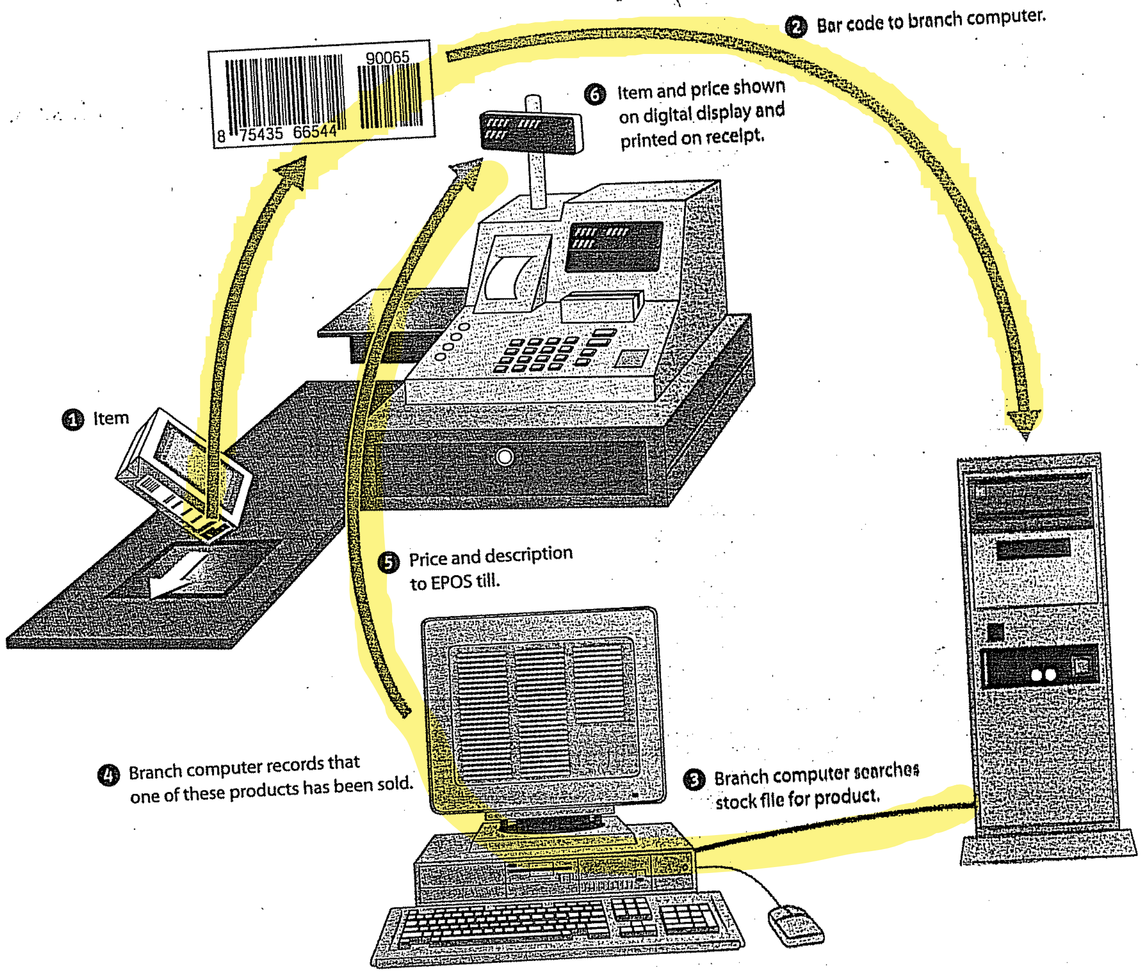


Fig 2
Operation of EPOS till

SPECIALIST READING

A Find the answers to these questions in the following text.

1. What did Linus Torvalds use to write the Linux kernel?
2. How was the Linux kernel first made available to the general public?
3. What is a programmer likely to do with source code?
4. Why will most software companies not sell you their source code?
5. What type of utilities and applications are provided in a Linux distribution?
6. What is X ?
7. What graphical user interfaces are mentioned in the text?

LINUX

Linux has its roots in a student project. In 1992, an undergraduate called Linus Torvalds was studying computer science in Helsinki, Finland. Like most computer science courses, a big component of it was taught on (and about) Unix. Unix was the wonder operating system of the 1970s and 1980s: both a textbook example of the principles of operating system design, and sufficiently robust to be the standard OS in engineering and scientific computing. But Unix was a commercial product (licensed by AT&T to a number of resellers), and cost more than a student could pay.

Annoyed by the shortcomings of Minix (a compact Unix clone written as a teaching aid by Professor Andy Tannenbaum) Linus set out to write his own 'kernel' – the core of an operating system that handles memory allocation, talks to hardware devices, and makes sure everything keeps running. He used the GNU programming tools developed by Richard Stallman's Free Software Foundation, an organisation of volunteers dedicated to fulfilling Stallman's ideal of making good software that anyone could use without paying. When he'd written a basic kernel, he released the source code to the Linux kernel on the Internet.

Source code is important. It's the original from which compiled programs are generated. If you don't have the source code to a program, you can't modify it to fix bugs or add new features. Most software companies won't sell you their source code, or will only do so for an eye-watering price, because they believe that if they make it available it will destroy their revenue stream.

What happened next was astounding, from the conventional, commercial software industry point of view – and utterly predictable to anyone who knew about the Free Software Foundation. Programmers (mostly academics and students) began using Linux. They found that it didn't do things they wanted it to do – so they fixed it. And where they improved it, they sent the improvements to Linus, who rolled them into the kernel. And Linux began to grow.

There's a term for this model of software development; it's called Open Source (see www.opensource.org/ for more information). Anyone can have the source code – it's free (in the sense of free speech, not free beer). Anyone can contribute to it. If you use it heavily you may want to extend or develop or fix bugs in it – and it is so easy to give your fixes back to the community that most people do so.

An operating system kernel on its own isn't a lot of use; but Linux was purposefully designed as a near-clone of Unix, and there is a lot of software out there that is free and was designed to compile on Linux. By about 1992, the first 'distributions' appeared.

A distribution is the Linux-user term for a complete operating system kit, complete with the utilities and applications you need to make it do useful things – command interpreters, programming tools, text editors, typesetting tools, and graphical user interfaces based on the X windowing system. X is a standard in academic and scientific computing, but not hitherto common on PCs; it's a complex distributed windowing system on which people implement graphical interfaces like KDE and Gnome.

As more and more people got to know about Linux, some of them began to port the Linux kernel to run on non-standard computers. Because it's free, Linux is now the most widely-ported operating system there is.

[Adapted from 'Smooth Operator' by Charles Stross, Computer Shopper magazine, November 1998]

B Re-read the text to find the answers to these questions.

1 Match the terms in Table A with the statements in Table B.

Table A	
a	Kernel
b	Free Software Foundation
c	Source code
d	Open Source
e	A distribution
f	X

Table B	
i	A type of software development where any programmer can develop or fix bugs in the software
ii	The original systems program from which compiled programs are generated
iii	A complete operating system kit with the utilities and applications you need to make it do useful things
iv	A standard distributed windowing system on which people implement graphical interfaces
v	An organisation of volunteers dedicated to making good software that anyone could use without paying
vi	The core of an operating system that handles memory allocation, talks to hardware devices, and makes sure everything keeps running

2 Mark the following statements as True or False:

a Linux was created in the 1980s.
b Minix was created by a university student.
c Linux is based on Unix.
d Minix is based on Unix.
e Linux runs on more types of computer than any other operating system.

LANGUAGE WORK   Verbs + object + infinitive; Verbs + object + *to*-infinitive

New developments in computing are often designed to make something easier. These verbs are often used to describe such developments:

allow let
enable permit
help

Study these examples:

1 A GUI *lets you point* to icons and click a mouse button to execute a task.
2 A GUI *allows you to use* a computer without knowing any operating system commands.
3 The X Window System *enables Unix-based computers to have* a graphical look and feel.
4 Voice recognition software *helps disabled users (to) access* computers.

***Allow, enable* and *permit* are used with this structure:**

verb + object + *to*-infinitive

***Let* is used with this structure:**

verb + object + infinitive

***Help* can be used with either structure.**

4 Complete the gap in each sentence with the correct form of the verb in brackets.

1 The Help facility enables users .... (get) advice on most problems.
2 Adding more memory lets your computer .... (work) faster.
3 Windows allows you .... (display) two different folders at the same time.
4 The Shift key allows you .... (type) in upper case.
5 The MouseKeys feature enables you .... (use) the numeric keypad to move the mouse pointer.
6 ALT + TAB allows you .... (switch) between programs.
7 The StickyKeys feature helps disabled people .... (operate) two keys simultaneously.
8 ALT + PRINT SCREEN lets you .... (copy) an image of an active window to the Clipboard.

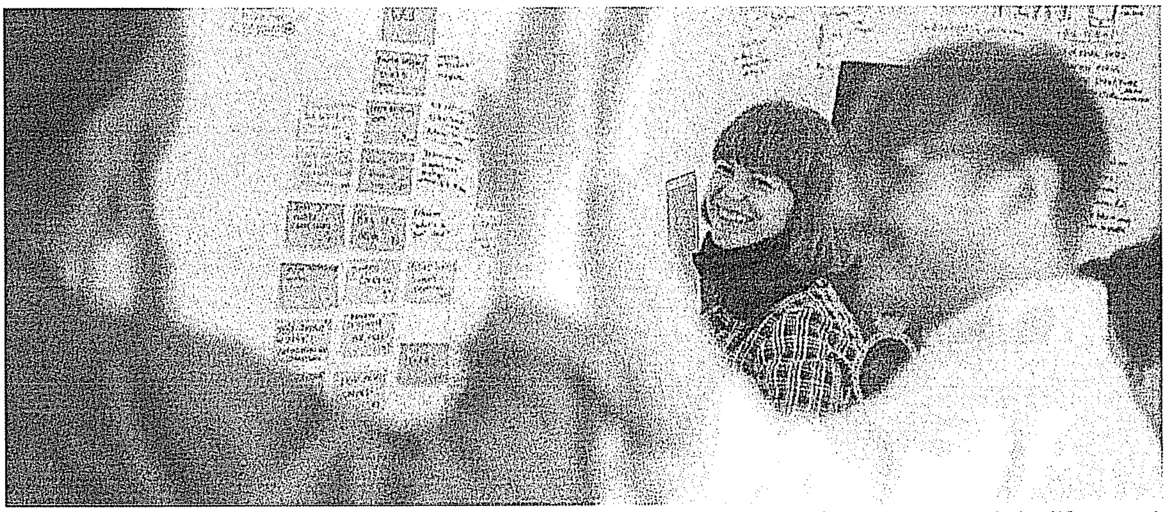
LANGUAGE WORK Cause and effect (2) links using *allow* and *prevent*

What is the relationship between these events? 1 The scanner finds a match for your fingerprint. 2 The keyboard is unlocked. 3 You can use the PC. **1 and 2 are cause and effect. We can link them using the methods studied in Unit 18. In addition we can use an *if*-sentence. Note that the tenses for both cause and effect are the same. For example:** If the scanner finds a match for your fingerprint, the keyboard is unlocked. **2 allows 3 to happen. We can link 2 and 3 using *allow* or *permit*.** The keyboard is unlocked, *allowing/permitting* you *to use* the PC.	**What is the relationship between these events?** 4 The scanner does not find a match for your fingerprint. 5 The keyboard remains locked. 6 You cannot use the PC. **We can show that 4 and 5 are cause and effect using the methods studied in Unit 18. We can also use *therefore*.** The scanner does not find a match for your fingerprint, *therefore* the keyboard remains locked. **5 prevents 6 from happening. We can link 5 and 6 using *prevent* or *stop*.** The keyboard remains locked, *preventing* you *(from) using* the PC. The keyboard remains locked, *stopping* you *(from) using* the PC.

4 Put the verbs in brackets in the correct form in this descripti of how smart cards work.

Smart cards prevent unauthorised users ....[1] (access) system and permit authorised users ....[2] (have) access to a wide range of facilities. Some computers have smart card readers ....[3] (allow) you ....[4] (buy) things on the Web easily and safely with digital cash. A smart card can also send data to a reader via an antenna ....[5] (coil) inside the card. When the card comes within range, the reader's radio signal ....[6] (create) a slight current in the antenna ....[7] (cause) the card ....[8] (broadcast) information to the reader which ....[9] (allow) the user, for example, ...[10] (withdraw) money from an ATM or ....[11] (get) access to a system.

Here's how to find a job you really love



Building a meaningful and satisfying career is at the top of many people's life goals.
Image: REUTERS/Thomas Peter
30 Oct 2018

Like many millennials, I have often received career advice along the lines of "follow your passion". Although it sounds great, it is hard to put into practice. One can't help but notice the dissonance between the current emphasis on passion at work, and the lack of avenues to build meaningful careers.

The term "follow your passion" has increased nine-fold in English books since 1990. Yet many are not even sure what their passion is. Recently, Stanford psychologist Carol Dweck asked her students, "How many of you are waiting to find your passion?". Dweck's point was that passion is not something you just come across. Instead, it's nurtured and developed over time through trial and error, grit and resilience. If we quit every time we encounter a stumbling block and blame it on a lack of passion, we are never going to grow and develop as professionals. This issue of personal growth and responsibility is becoming ever more pressing as technological change is transforming the way we work. In addition, increasing life spans are dramatically lengthening our careers, making it all the more important to find work that is fulfilling.

The World Economic Forum's "Future of Jobs Report 2018" examines how technology is changing the very nature of work. It highlights the new skills we will need for the jobs of the future, and examines how artificial intelligence can augment existing jobs, create new tasks, and open up an entirely new range of livelihoods for workers. Crucially, the report recommends taking personal responsibility for our lifelong learning and career development. Change begins with personal transformation.

To see how this works in practice, consider the Japanese philosophy of "Ikigai". "Ikigai" means "a reason for being." According to this concept, the secret to finding meaningful work is identifying what you love, what you are good at, what the world needs and what you can get paid for. In your ideal job, these four factors converge, and passion meets practicality.

Unfortunately, most schools and colleges of today are not designed to inspire "ikigai" in students. They do their best to standardize creativity and mass-produce mediocrity, leaving their students frustrated and dissatisfied. It can be deeply unsettling to graduate from such an education system and then be bombarded with recommendations to "follow your passion". How are we supposed to follow our passion without any institutional, cultural or systemic encouragement, career support or mentoring?

This problem is particularly acute in Asian countries, despite the great innovators that the region has produced. Unfortunately, exceptions don't disprove the norm. We need to do better if we want to meet the challenges of the future, especially as the average career is likely to increase by years and even decades.

In their book "The 100-Year Life – Living and Working in an Age of Longevity", Lynda Gratton and Andrew Scott make three key points. First, people have a real shot at living up to or more than 100 years. Second, the longevity of companies will shrink. Third, the whole concept of retirement and savings will change. The traditional three-stage life — full-time education leading to full-time work leading to full-time retirement — will give way to something a great deal more fluid, flexible, and multi-staged.

Keeping the 100-year life in mind, one of the most important skills of the 21st century will be the ability to reinvent oneself quickly and repeatedly. Even with the best technologies available for free, it can be very hard and lonely to do this alone. Instead, we should harness the power of communities and data science. Peer-to-peer skill sharing can help people discover themselves, and then build careers that have a purpose and meaning. That's what we are trying to do in our small way at Network Capital, a mentoring community.

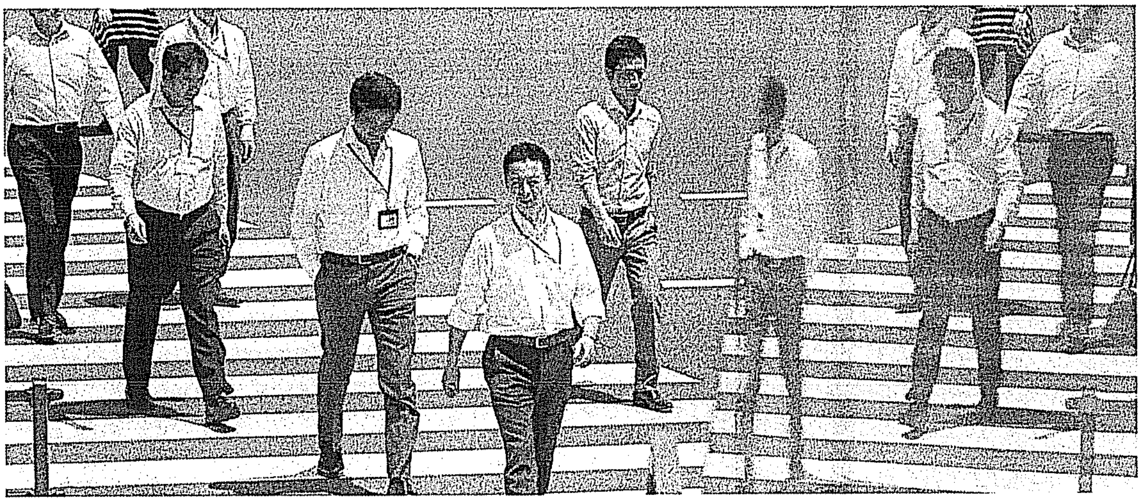
Personal responsibility coupled with the shared accountability of communities will help us embrace the Fourth Industrial Revolution equitably and sustainably. And that's when "Follow your passion" will have concrete meaning.

Written by

Utkarsh Amitabh, Founder, Network Capital (Mentors Across Borders), Network Capital

. https://www.weforum.org/agenda/2018/10/here-s-how-to-find-a-job-you-really-love/

10 skills you'll need to survive the rise of automation



With the rise of the robots, comes of the rise of soft skills.

Automation is coming to the workplace. Millions of jobs will be destroyed, but many jobs will also be simultaneously created in the process as well.

For those in the workforce – or for those just joining it for the first time – the big question is: what skills are needed to navigate this monumental shift in the economy? How will humans create value in an increasingly automated world?

The human touch

It can be daunting to think about automation's role in the future – but if you're a bookkeeper, legal secretary, insurance underwriter, credit analyst, or any other person in a job with high automation potential, it would be prudent to be thinking long and hard about what you can offer beyond your existing set of skills and competencies.

Here's just a quick look at automation potential of select positions, according to a study by Oxford University:

Position	Chance of Automation	Position	Chance of Automation
Telemarketer	99%	Physician	0.4%
Tax Preparer	99%	Dentist	0.4%
Insurance Underwriter	99%	Computer Systems Analyst	0.7%
Bookkeeping Clerk	98%	Registered Nurse	0.9%
Legal Secretary	98%	Teacher	1.0%
Credit Analyst	98%	Microbiologist	1.2%
Loan Officer	98%	Pharmacist	1.2%
Real Estate Broker	97%	Sales Manager	1.3%
Payroll Clerk	97%	Engineer	1.4%
Accountant	94%	CEO	1.5%
Budget Analyst	94%	PR Manager	1.5%
Pharmacy Technician	92%	Architect	1.8%

So how do we set ourselves up for future success in a world where even real estate brokers are likely to be automated?

It starts with soft skills

There are many considerations for career success during a time of significant change.

However, there's a good case that skills – especially soft skills – are the most important foundation to build upon. These include things like the ability to communicate and work well with others, solve problems, and think outside of the box, as well as other aspects of emotional intelligence.

Here are some skills that experts say should be prioritized:

1. Complex Problem Solving
It's true that AI can solve problems that humans cannot – but it also goes the other way. When problem solving needs to span multiple industries or when problems are not fully defined, humans can work backwards to figure out a solution.

2. Critical Thinking
Machines are getting better at aspects of critical thinking, but humans are still able to connect, interpret and imagine concepts in a world full of ambiguity and nuance. A lawyer can pinpoint the exact positioning to make a case for a client, or a marketer can figure out an overarching message that can resonate with consumers.

3. Creativity
Creativity requires a degree of intuitive randomness that cannot yet be imitated by AI. Why did the architect design the building a certain way, and why did the musician improvise by playing a chord out of key? It's hard to explain why to a computer – it just feels right.

Other important soft skills to consider?

People management, coordinating with others, decision-making, negotiation, and serving others will all be important going forward as well.

In short, for those looking to future proof their careers, building competencies in areas that machines will be unlikely to tackle effectively (i.e. complex problem solving, creativity) is likely the best recipe for success.

Today's infographic comes to us from Guthrie Jensen, and it summarizes the skills needed in 2020 and beyond to take advantage of the shifting landscape of work.

https://www.weforum.org/agenda/2018/07/the-skills-needed-to-survive-the-robot-invasion-of-the-workplace

Big Data, Questionable Benefits and My Girlfriend's Magic Ring

Wearable devices that track our health may do more harm than good

- By John Horgan on September 30, 2021

My girlfriend, "Emily," who likes to hack her health, recently purchased a clever little gadget called the Ōura Ring. From the outside, it looks like an ordinary silver ring, but it's lined with sensors that monitor heart rate, respiration, temperature, body motion and other variables. Algorithms analyze data and draw conclusions, displayed on her iPhone. The ring tells Emily how much exercise and sleep she's getting, and it advises her, in a gently bossy way, on how she might change her routines to be healthier. Maybe go to sleep a little earlier tonight, exercise a little more tomorrow. The Ōura app even provides recordings of boring stories, read by someone with a wonderfully soporific voice, to help her fall asleep.

The ring is an almost magical piece of engineering. All that sensory and analytic power packed into that tiny, elegant package! And the logic behind the ring seems, at first glance, unassailable. The ring transmits more and more data from users to its maker, Ōura, which keeps refining its algorithms to make its "precise, personalized health insights" more accurate. Ideally, the ring will help you cultivate healthier habits and alert you to problems requiring medical intervention. That's Emily's hope. But when she urged me to get an Ōura Ring, I shook my head and said, No way. I worry that the ring is making her unhealthily anxious about her health. (Emily disagrees; see her response below.)

A technology reviewer for the *New York Times* touches on my concerns. "I can't say whether the Ōura Ring has made me healthier, but it has made me more health-conscious," Justin Redman writes. "I looked to my Ōura Ring data each morning for an affirmation that I was okay (and didn't have COVID-19). That eventually led to a somewhat unhealthy dependency on the ring and its data. Before you purchase a device like this, you need to ask yourself whether you'll use the data to make better choices, or whether it will cause you unnecessary stress."

We should ask ourselves this question about all our digital devices. On balance, are they good for us? We live in the age of "big data," in which companies gather more and more information about us via the internet, smartphones and other technologies. Health and fitness devices such as the Ōura Ring and Fitbit are just one manifestation of this trend. The market for "wearable" health-tracking devices is growing fast, according to a recent report in a health care–business journal, with tech giants such as Google, Amazon and Apple as well as smaller companies such as Ōura, competing for customers. "Demand has skyrocketed during the COVID-19 pandemic and is only expected to accelerate in 2021," the report states.

Devices such as the Ōura Ring are supposed to empower us, by giving us more control over our health, and fitness trackers do apparently nudge some users into exercising more. A recent meta-analysis of 28 studies involving 7,454 healthy adults concludes that "interventions using smartphone apps or physical activity trackers have a significant small-to-moderate effect in increasing physical activity," equal to 1,850 steps per day. But a 2019 review in the *American Journal of Medicine* found "little benefit of the devices on chronic disease health outcomes. Wearable devices play a role as a facilitator in motivating and accelerating physical activity, but current data do not suggest other consistent health benefits."

Researchers have raised concerns about devices that monitor diet and exercise. A 2016 study in the Journal of the American Medical Association found that subjects wearing devices that track calorie intake and exercise lost less weight than controls. In 2017 psychologists at Virginia Commonwealth University associated such devices with an increased risk of "eating disorder symptomology." "Although preliminary, overall results suggest that for some individuals, these devices might do more harm than good," the researchers state.

My guess is that a growing number of people will become dependent on health-tracking devices, even if they doubt the benefits. Consider this recent review of the Ōura Ring. The reviewer, Chris, says he hoped the ring would help him "identify things I've been doing wrong and fix them so I could sleep like a baby and become superhuman." That didn't happen, he acknowledges; after 11 months, neither his sleep nor any other components of his health improved.

Chris nonetheless compulsively checks his ring's output every morning, in the same way that he checks Instagram and other social media sites. Just as likes and positive comments give him a "dopamine hit," so do Ōura data indicating that he got a good night's sleep. If he lost the ring, Chris says, he would buy a new one. Will the Ōura Ring and other devices empower consumers by helping them to take charge of their health? I doubt it. But the devices certainly empower and enrich the companies that make them. The data we generate with our digital devices help companies make them even more addictive.

"Emily" responds: *"I don't think your observations of my use of the Ōura Ring are fair. The ring helps me track the details of my sleep and heart rates so I'm learning about my energy and stress patterns, and it's definitely helped me. I'm not dependent on it—that's your fear. And if I was, I'd rather be dependent on this than on a lot of other things. It's another tool, like an exercise bike or anything else. I'm giving it the two months that Ōura suggests I give it. That will provide a baseline for my activity and sleep goals using my own metrics, rather than comparing me to everyone else the way most medicine does.* That *is the future of wearable tech."*

VEZNICI

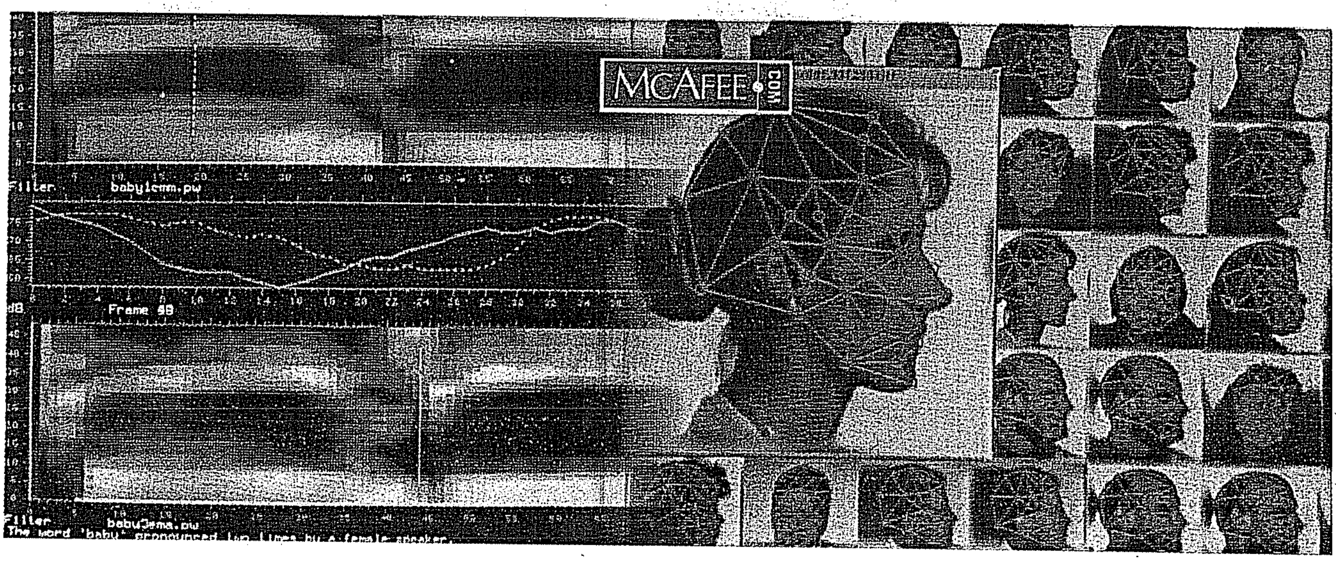
Upotreba veznika

5 Decide on the relationship between these events. Then lin them using structures from this and earlier units.

1 Anti-virus program
- a A user runs anti-virus software.
- b The software checks files for virus coding.
- c Coding is matched to a known virus in a virus database.
- d A message is displayed to the user that a virus has been found.
- e The user removes the virus or deletes the infected file.
- f The virus cannot spread or cause further damage.

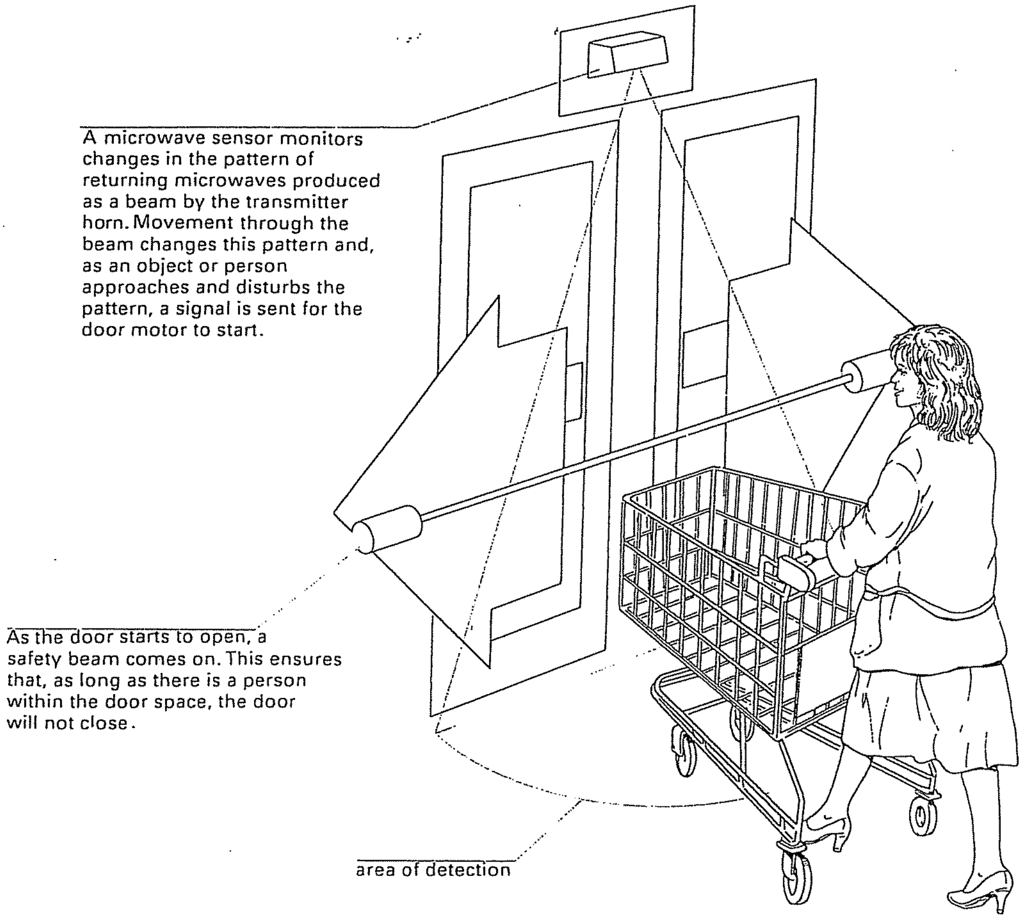
2 Face recognition
- a You approach a high-security network.
- b Key features of your face are scanned.
- c The system matches your features to a database record (authorised staff.
- d Your identity is verified.
- e You can log on.
- f Your identity is not verified.
- g You cannot use the system.

3 Voice recognition
- a Computers without keyboards will become more commor
- b These computers are voice-activated.
- c The user wants to log on.
- d She speaks to the computer.
- e It matches her voice to a database of voice patterns.
- f The user has a cold or sore throat.
- g She can use the system.
- h Stress and intonation patterns remain the same.



Task 7

Study this diagram, which explains the operation of automatic doors. Then turn to the next page and link each set of statements using words or phrases of your own to make your own explanation. Omit unnecessary words and make any other changes required.



1 Automatic doors are used in places such as airports, supermarkets, and hospitals.
Traditional doors would be a nuisance in these places.

2 Automatic doors are fitted with a microwave sensor.
The sensor detects movement.

3 The doors are switched on.
A microwave transmitter sends out a microwave beam.

4 The beam is in a semicircular pattern.
The doors open when you approach from any angle.

5 The microwaves are reflected back to the sensor.
The reflected microwaves are analysed by a microprocessor.

6 A person or object moves towards the doors.
The waves are reflected back to the sensor at a different frequency.

7 The microprocessor detects this change.
The microprocessor instructs the motor to open the doors.

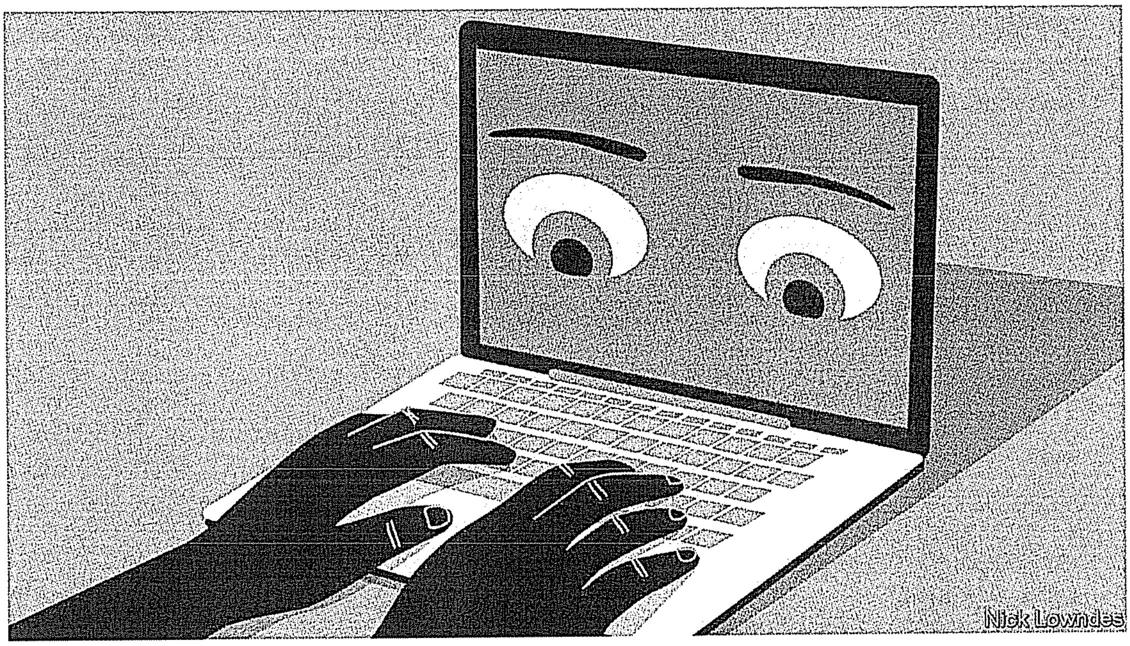
8 The doors are fitted with a time-delay mechanism.
The doors remain open for about four seconds before closing again.

9 A person remains standing in the doorway.
A safety beam prevents the doors from closing.

The Economist
Books & arts Feb 27th 2021 edition

Johnson
Artificial intelligence has a problem with grammar

The hitch illuminates the nature of language



Feb 25th 2021

If you frequently Google language-related questions, whether out of interest or need, you've probably seen an advertisement for Grammarly, an automated grammar-checker. In ubiquitous YouTube spots Grammarly touts its ability not only to fix mistakes, but to improve style and polish too. Over more than a decade it has sprawled into many applications: it can check emails, phone messages or longer texts composed in Microsoft Word and Google Docs, among other formats.

Does it achieve what it purports to? Sometimes. But sometimes Grammarly doesn't do what it should, and sometimes it even does what it shouldn't. These strengths and failings hint at the essence of language and the peculiarity of human intelligence, as opposed to the artificial sort as it stands today.

Begin with the strengths. In a rough piece of student writing, Johnson counted 14 errors. Grammarly flagged five. For example, it sensibly suggested inserting a hyphen in "post cold war [world]". It spotted a missing "the" in the phrase "with [the] European economy". And it noticed an absent "about" in "wondering [about] the state of Europe". By using Grammarly, the author of this essay could have avoided some red ink.

On the other hand, Grammarly has a problem with false positives, calling out mistakes that are not. The other two suggestions were not disastrous, but neither did they relate to "critical errors" as Grammarly maintains. In the assertion that enlargement had "created a fatigue" within the European Union, Grammarly needlessly suggested deleting the "a". In another errorridden sentence it recommended removing a comma, which fixed none of the problems. This false-positive tendency is not a deal-breaker for reasonably skilled writers who just want a second pair of eyes; you can dismiss any suggestion you like. But truly struggling scribblers might not know when Grammarly's ideas would make their prose worse rather than better.

Then there are the false negatives, or the mistakes Grammarly fails to notice. Depending on the text, Grammarly can seem to miss more errors than it marks. The company's chief executive, Brad Hoover, describes it as a "coach, not a crutch"—which sets expectations more appropriately than some of the ads do.

Artificial-intelligence systems like Grammarly are trained with data; for instance, translation software is fed sentences translated by humans. Grammarly's training data involve a large number of standard error-free sentences (so it knows what good English should look like) and human-corrected sentences (so the software can find the patterns of fixes that human editors might make). Developers also manually add certain rules to the patterns Grammarly has taught itself. The software then looks at a user's prose: if a string of words seems ungrammatical, it tries to spot how the putative mistake most closely resembles one from its training inputs.

All this shows how far artificial "intelligence" is from the human kind (which Grammarly wants to correct to "humankind"). Computers outpace humans at problems that can be cracked with pure maths, such as chess. But grammar is the real magic of language, binding words into structures, binding those structures into sentences, and doing so in a way that maps onto meaning. And at this crucial structure-meaning interface, machines are no match for humans. Computers can parse (grammatical) sentences fairly well, labelling things like nouns and verb phrases. But they struggle with sentences that are difficult to analyse, precisely because they are ungrammatical—in other words, written by the kind of person who needs Grammarly.

To correct such prose requires knowing what the writer intended. But computers don't work in meaning or intention; they work in formulae. Humans, by contrast, can usually understand even rather mangled syntax, because of the ability to guess the contents of other minds. Grammar-checking computers illustrate not how bad humans are with language, but just how good.

This article appeared in the Books & arts section of the print edition under the headline "The human touch"

https://www.economist.com/books-and-arts/2021/02/25/artificial-intelligence-has-a-problem-with-grammar ima audio

TIME CLAUSES

LANGUAGE WORK Time clauses

What is the relationship between each of these pairs of actions?

1 a You click on a URL.
  b Your browser sends it to a DNS server.
2 a The packets are passed from router to router.
  b They reach the Web server.
3 a The packets may travel by different routes.
  b They reach the Web server.
4 a The individual packets reach the Web server.
  b They are put back together again.

Each pair of actions is linked in time. We can show how actions are linked in time by using time clauses. For example:

We can use *when* to show that one action happens immediately after another action:

1 *When* you click on a URL, your browser sends it to a DNS server.

We can use *once* in place of *when* to emphasise the completion of the first action. It often occurs with the Present perfect. For example:

Once the DNS server has found the IP address, it sends the address back to the browser.

We can use *until* to link an action and the limit of that action:

2 The packets are passed from router to router *until* they reach the Web server.

We can use *before* to show that one action precedes another:

3 The packets may travel by different routes *before* they reach the Web server.

If the subjects are the same in both actions, we can use a participle:

The packets may travel by different routes *before* reaching the Web server.

We can use *as* to link two connected actions happening at the same time:

4 *As* the individual packets reach the Web server, they are put back together again.

5 Link each pair of actions using a time clause.

1 a You use a search engine.
  b It provides a set of links related to your search.
2 a With POP3, email is stored on the server.
  b You check your email account.
3 a You have clicked on a hyperlink.
  b You have to wait for the webpage to be copied to your computer.

4 a You listen to the first part of a streamed audio file.
b The next part is downloading.

5 a The graphics can be displayed gradually.
b The webpage is downloaded.

6 a You receive an email message.
b You can forward it to another address.

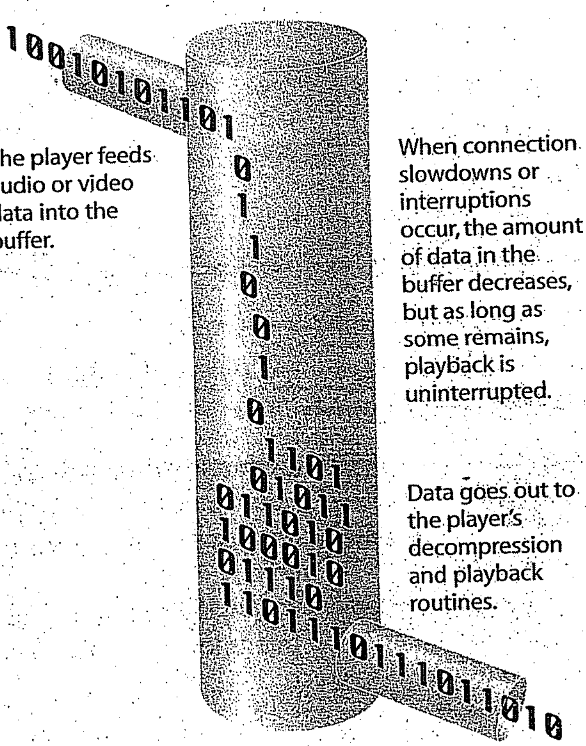
7 a You click on a hyperlink.
b The browser checks to see if the linked webpage is stored in the cache.

8 a You can bookmark a webpage to make it easier to find in the future.
b You find a webpage you like.

9 a You type in a Web address.
b You should press the Enter key.

10 a You click on the Home button.
b The browser displays your starting webpage.

6 Fill in the gaps in this description of buffering, a way of ensuring that Web video runs smoothly.



Streaming is a way of dealing with bandwidth problems ....[1] you download video from the Internet. One key to successful streaming is the process of buffering. ....[2] you download a movie, the video player stores part of the movie in memory ....[3] playing it. Imagine the buffer as a container filled from the top as shown in Fig 3. ....[4] the container is full, the player sends data on for playback from the bottom. Data keeps coming in ....[5] a clip plays. The user can view the beginning of the movie ....[6] the rest of the clip downloads. ....[7] connection slowdowns or interruptions occur, the amount of data in the buffer decreases but as long as some remains, playback is uninterrupted. Playback continues at a steady rate ....[8] the buffer is empty.

Fig 3
Video buffering

What Is Machine Learning, and How Does It Work?

- By Michael Tabb, Jeffery DelViscio, Andrea Gawrylewski on September 29, 2021

Machine learning is the process by which computer programs grow from experience. This isn't science fiction, where robots advance until they take over the world. When we talk about machine learning, we're mostly referring to extremely clever algorithms.

In 1950 mathematician Alan Turing argued that it's a waste of time to ask whether machines can think. Instead, he proposed a game: a player has two written conversations, one with another human and one with a machine. Based on the exchanges, the human has to decide which is which.

This "imitation game" would serve as a test for artificial intelligence. But how would we program machines to play it? Turing suggested that we teach them, just like children. We could instruct them to follow a series of rules, while enabling them to make minor tweaks based on experience.

For computers, the learning process just looks a little different. First, we need to feed them lots of data: anything from pictures of everyday objects to details of banking transactions. Then we have to tell the computers what to do with all that information. Programmers do this by writing lists of step-by-step instructions, or algorithms. Those algorithms help computers identify patterns in vast troves of data. Based on the patterns they find, computers develop a kind of "model" of how that system works.

For instance, some programmers are using machine learning to develop medical software. First, they might feed a program hundreds of MRI scans that have already been categorized. Then, they'll have the computer build a model to categorize MRIs it hasn't seen before. In that way, that medical software could spot problems in patient scans or flag certain records for review.

Complex models like this often require many hidden computational steps. For structure, programmers organize all the processing decisions into layers. That's where "deep learning" comes from. These layers mimic the structure of the human brain, where neurons fire signals to other neurons. That's why we also call them "neural networks."

Neural networks are the foundation for services we use every day, like digital voice assistants and online translation tools. Over time, neural networks improve in their ability to listen and respond to the information we give them, which makes those services more and more accurate.

Machine learning isn't just something locked up in an academic lab though. Lots of machine learning algorithms are open-source and widely available. And they're already being used for many things that influence our lives, in large and small ways.

People have used these open-source tools to do everything from train their pets to create experimental art to monitor wildfires. They've also done some morally questionable things, like create deep fakes—videos manipulated with deep learning.

And because the data algorithms that machines use are written by fallible human beings, they can contain biases. Algorithms can carry the biases of their makers into their models, exacerbating problems like racism and sexism.

But there is no stopping this technology. And people are finding more and more complicated applications for it—some of which will automate things we are accustomed to doing for ourselves--like using neural networks to help run power driverless cars. Some of these applications will require sophisticated algorithmic tools, given the complexity of the task.

And while that may be down the road, the systems still have a lot of learning to do.

https://www.scientificamerican.com/video/what-is-machine-learning-and-how-does-it-work-heres-a-short-video-primer/ ima video

RELATIVE CLAUSES

LANGUAGE WORK Relative clauses with a participle

Relative clauses with a participle are often used in technical descriptions. They allow you to provide a lot of information about a noun using as few words as possible.

Study these examples from the Task 3 text.

1 The technology *needed to set up a home network*
2 PCs *equipped with Ethernet adapters*
3 Network modem *allowing clients to access the Internet simultaneously*
4 Data line *linking client to server*

We can use the passive participle as in examples 1 and 2.

1 The technology needed to set up a home network
= technology *which is needed*
2 PCs equipped with Ethernet adapters
= PCs *which are equipped*

We can use an active participle as in examples 3 and 4.

3 Network modem allowing clients to access the Internet simultaneously
= modem *which allows clients to access the Internet simultaneously*
4 Data line linking client to server
= data line *which links client to server*

4 Complete these definitions with the correct participle of the verb given in brackets.

1 A *gateway* is an interface (enable) dissimilar networks to communicate.
2 A *bridge* is a hardware and software combination (use) to connect the same type of networks.
3 A *backbone* is a network transmission path (handle) major data traffic.
4 A *router* is a special computer (direct) messages when several networks are linked.
5 A *network* is a number of computers and peripherals (link) together.
6 A *LAN* is a network (connect) computers over a small distance such as within a company.
7 A *server* is a powerful computer (store) many programs (share) by all the clients in the network.
8 A *client* is a network computer (use) for accessing a service on a server.
9 A *thin client* is a simple computer (comprise) a processor and memory, display, keyboard, mouse and hard drives only.
10 A *hub* is an electronic device (connect) all the data cabling in a network.

5 Link these statements using a relative clause with a participle.

1 a The technology is here today.
  b It is needed to set up a home network.
2 a You only need one network printer.
  b It is connected to the server.
3 a Her house has a network.
  b It allows basic file-sharing and multi-player gaming.
4 a There is a line receiver in the living room.
  b It delivers home entertainment audio to speakers.
5 a Eve has designed a site.
  b It is dedicated to dance.
6 a She has built in links.
  b They connect her site to other dance sites.
7 a She created the site using a program called Netscape Composer.
  b It is contained in Netscape Communicator.
8 a At the centre of France Telecom's home of tomorrow is a network.
  b It is accessed through a Palm Pilot-style control pad.
9 a The network can simulate the owner's presence.
  b This makes sure vital tasks are carried out in her absence.
10 a The house has an electronic door-keeper.
  b It is programmed to recognise you.
  c This gives access to family only.

PROBLEM-SOLVING **6** Work in two groups, A and B. Group A, list all the advantages of a network. Group B, list all the disadvantages. Then together consider how the disadvantages can be minimised.

Group A Advantages of a network	Group B Disadvantages of a network

What is the Internet of Things?

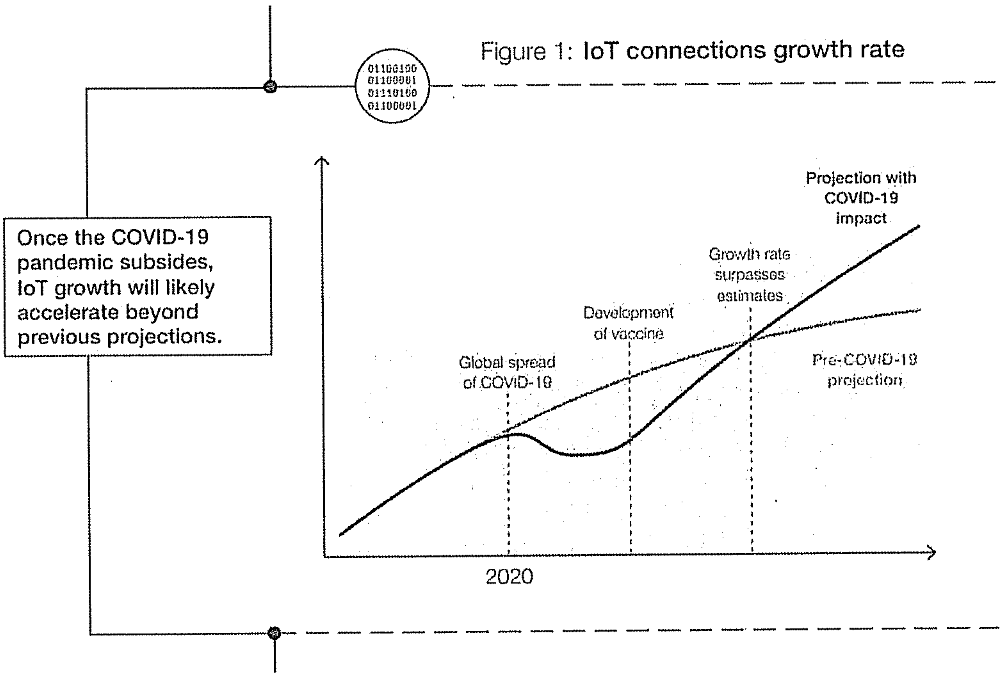
31 Mar 2021

Natalie Marchant

From soil moisture sensors being used to optimize farmer's yields, to thermostats and thermometers, the Internet of Things (IoT) is transforming the way we live and work.

Billions of networked 'smart' physical objects around the world, on city streets, in homes and hospitals, are constantly collecting and sharing data across the internet, giving them a level of digital intelligence and autonomy. And already, there are more connected devices than people in the world, according to the World Economic Forum's State of the Connected World report

The digital transformation that is taking place due to emerging technologies, including robotics, the IoT and artificial intelligence, is known as the Fourth Industrial Revolution - and COVID-19 has accelerated the use of these technologies.



How COVID-19 has sped up the adoption on IoT technologies.

Image: World Economic Forum

A brief history of the IoT

The concept of adding sensors and intelligence to physical objects was first discussed in the 1980s, when some university students decided to modify a Coca-Cola vending machine to track its contents remotely. But the technology was bulky and progress was limited.

The term 'Internet of Things' was coined in 1999 by the computer scientist Kevin Ashton. While working at Procter & Gamble, Ashton proposed putting radio-frequency identification (RFID) chips on products to track them through a supply chain.

He reportedly worked the then-buzzword 'internet' into his proposal to get the executives' attention. And the phrase stuck.

Over the next decade, public interest in IoT technology began to take off, as more and more connected devices came to market.

In 2000, LG announced the first smart refrigerator, in 2007 the first iPhone was launched and by 2008, the number of connected devices exceeded the number of people on the planet.

In 2009, Google started testing driverless cars and in 2011, Google's Nest smart thermostat hit the market, which allowed remote control of central heating.

Everyday uses

Connected devices fall into three domains: consumer IoT, such as wearables, enterprise IoT, which includes smart factories and precision agriculture, and public spaces IoT, such as waste management.

Businesses use IoT to optimize their supply chains, manage inventory and improve customer experience, while smart consumer devices such as the Amazon Echo speaker, are now ubiquitous in homes due to the prevalence of low-cost and low-power sensors.

Cities have been deploying IoT technology for more than a decade - to streamline everything from water meter readings to traffic flow.

"In New York City, for example, every single building (so more than 817,000) was retrofitted with a wireless water meter, starting back in 2008, which replaced the manual system where you had to walk up to a meter read the numbers and generate bills that way," says Jeff Merritt, the World Economic Forum's head of IoT and Urban Transformation.

In medicine, the IoT can help improve healthcare through real-time remote patient monitoring, robotic surgery and devices such as smart inhalers.

In the past 12 months, the role of the IoT in the COVID-19 pandemic has been invaluable.

IoT applications such as connected thermal cameras, contact tracing devices and health-monitoring wearables are providing critical data needed to help fight the disease, while temperature sensors and parcel tracking will help ensure that sensitive COVID-19 vaccines are distributed safely.

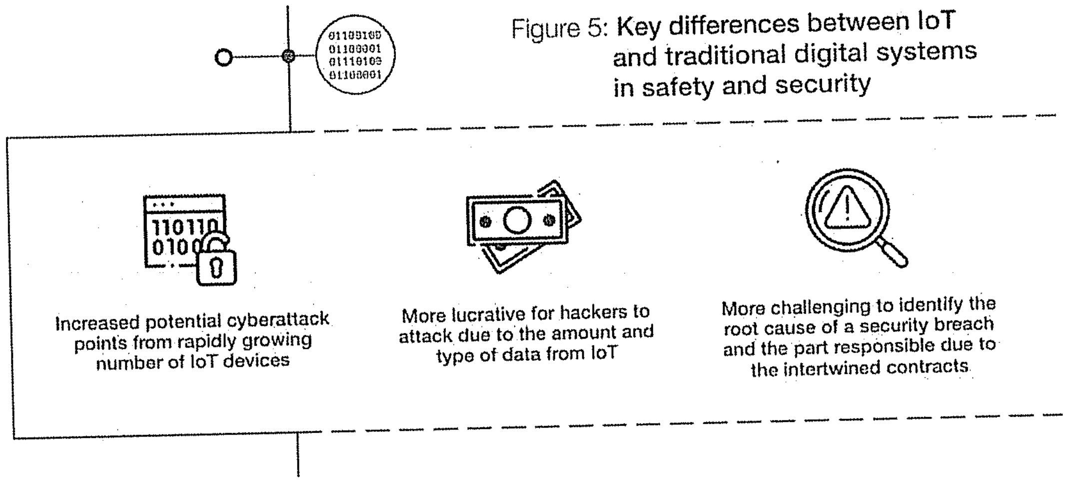
Beyond healthcare, IoT has helped make COVID disrupted supply chains more resilient, automated activities in warehouses and on factory floors to help promote social distancing and provided safe remote access to industrial machines.

The future of IoT

The range of potential IoT applications is "limited only by the human imagination" - and many of these applications can benefit the planet, as well as its people.

These include promoting more efficient use of natural resources, building better, fairer "smart cities", and developing clean, affordable energy alternatives.

IoT smart roads that connect with self-driving cars could improve driver safety and optimize traffic flow, potentially reducing the average commute time by 30 minutes. Emergency responder times could also be cut significantly. Real-time crime mapping and predictive policing tools could also help prevent crime.



IoT has safety and security risks.

Image: World Economic Forum

But for all the benefits, IoT technologies can also be misused and risks include security and privacy issues, cybercrime, surveillance at work, home or in public spaces and control of mobility and expression.

Effective technology governance mitigates risks and reduces the potential harms to society while also helping to maximize the technology's positive impacts.

Industry leaders will come together from April 6-7 for the World Economic Forum's Global Technology Governance Summit, *which is dedicated to ensuring the responsible design and deployment of emerging technologies through public-private collaboration.*

https://www.weforum.org/agenda/2021/03/what-is-the-internet-of-things?fbclid=IwAR3VU1wumADaQbKhsxzJu4N7jBxy3SFeoX8jONw0KOv2LoUUSxhgxkT7_0w

AIoT: When AI Meets the Internet of Things

Published on August 12, 2020
By **Iman Ghosh**

The Internet of Things (IoT) is a technology helping us to reimagine daily life, but artificial intelligence (AI) is the real driving force behind the IoT's full potential.

From its most basic applications of tracking our fitness levels, to its wide-reaching potential across industries and urban planning, the growing partnership between AI and the IoT means that a smarter future could occur sooner than we think.

This infographic by TSMC highlights the breakthrough technologies and trends making that shift possible, and how we're continuing to push the boundaries.

AI + IoT = Superpowers of Innovation

IoT devices use the internet to communicate, collect, and exchange information about our online activities. Every day, they generate **1 billion GB** of data.
By 2025, there's projected to be 42 billion IoT-connected devices globally. It's only natural that as these device numbers grow, the swaths of data will too. That's where AI steps in—lending its learning capabilities to the connectivity of the IoT.
The IoT is empowered by three key emerging technologies:

- Artificial Intelligence (AI)
  Programmable functions and systems that enable devices to learn, reason, and process information like humans.
- 5G Networks
  Fifth generation mobile networks with high-speed, near-zero lag for real time data processing.
- Big Data
  Enormous volumes of data processed from numerous internet-connected sources.

Together, these interconnected devices are transforming the way we interact with our devices at home and at work, creating the AIoT ("Artificial Intelligence of Things") in the process.

The Major AIoT Segments

So where are AI and the IoT headed together?

There are four major segments in which the AIoT is making an impact: wearables, smart home, smart city, and smart industry:

1. Wearables

Wearable devices such as smartwatches continuously monitor and track user preferences and habits. Not only has this led to impactful applications in the healthtech sector, it also works well for sports and fitness. According to leading tech research firm Gartner, the global wearable device market is estimated to see more than **$87 billion** in revenue by 2023.

2. Smart Home

Houses that respond to your every request are no longer restricted to science fiction. Smart homes are able to leverage appliances, lighting, electronic devices and more, learning a homeowner's habits and developing automated "support."

This seamless access also brings about additional perks of improved energy efficiency. As a result, the smart home market could see a compound annual growth rate (CAGR) of 25% between 2020-2025, to reach **$246 billion**.

3. Smart City

As more and more people flock from rural to urban areas, cities are evolving into safer, more convenient places to live. Smart city innovations are keeping pace, with investments going towards improving public safety, transport, and energy efficiency.
The practical applications of AI in traffic control are already becoming clear. In New Delhi, home to some of the world's most traffic-congested roads, an Intelligent Transport Management System (ITMS) is in use to make 'real time dynamic decisions on traffic flows'.

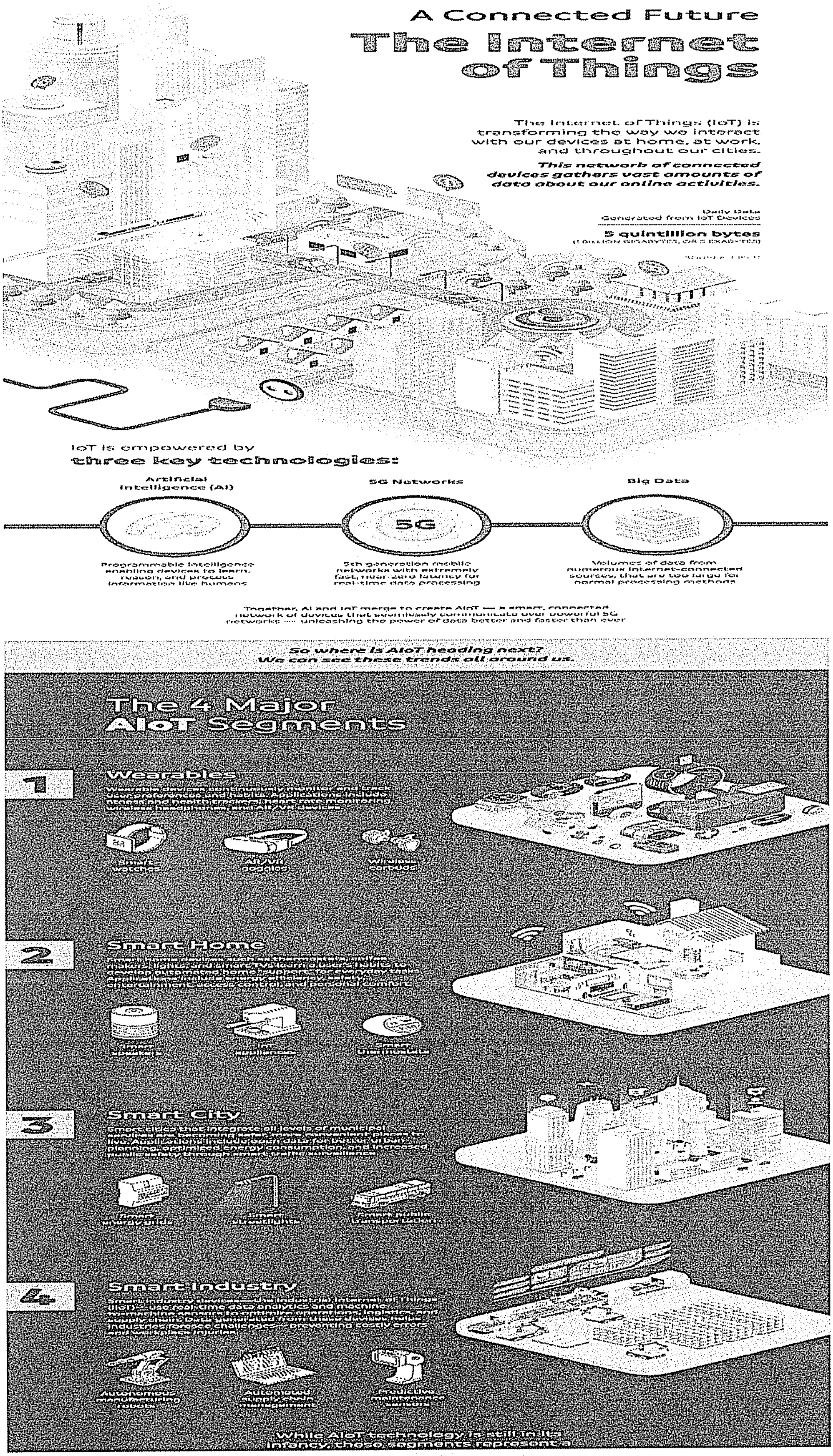
4. Smart Industry

Last but not least, industries from manufacturing to mining rely on digital transformation to become more efficient and reduce human error.
From real-time data analytics to supply-chain sensors, smart devices help prevent costly errors in industry. In fact, Gartner also estimates that **over 80%** of enterprise IoT projects will incorporate AI by 2022.
AIoT innovation is only accelerating, and promises to lead us into a more connected future.

The AIoT fusion is increasingly becoming more mainstream, as it continues to push the boundaries of data processing and intelligent learning for years to come.

> *Just like any company that blissfully ignored the Internet at the turn of the century, the ones that dismiss the Internet of Things risk getting left behind.*

—Jared Newman, Technology Analyst

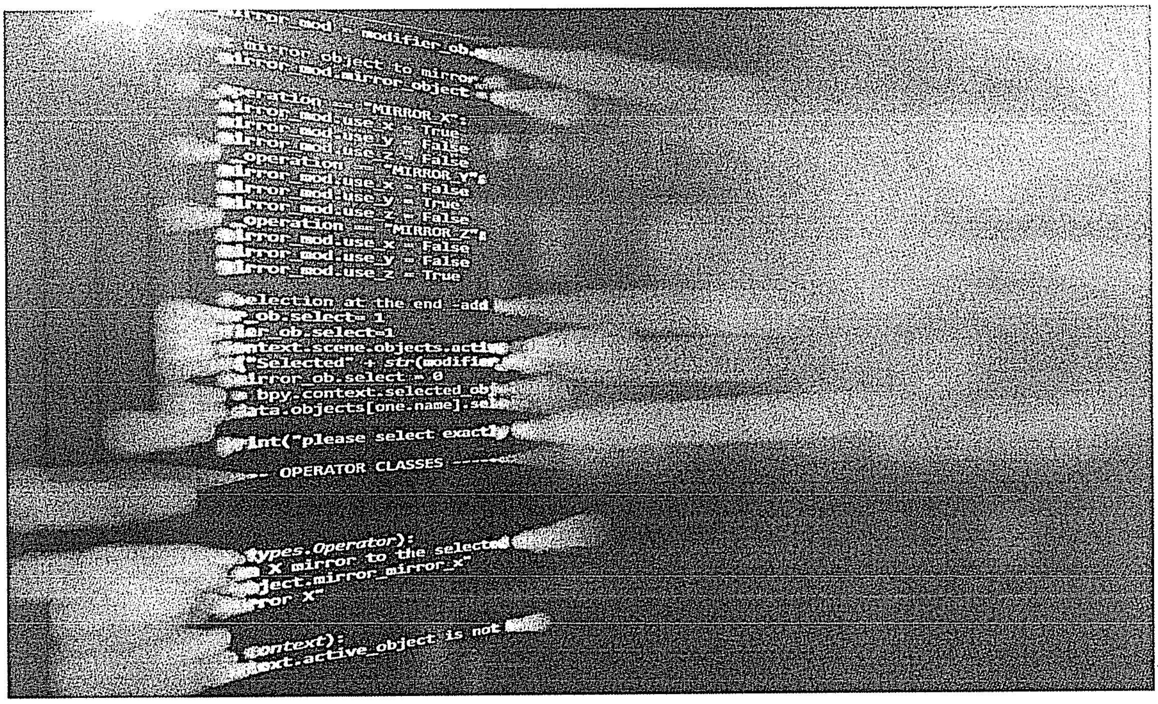

A Connected Future
The Internet of Things
The Internet of Things (IoT) is transforming the way we interact with our devices at home, at work, and throughout our cities.
This network of connected devices gathers vast amounts of data about our online activities.
Daily Data Generated from IoT Devices
5 quintillion bytes
IoT is empowered by
three key technologies:
Artificial Intelligence (AI)
5G Networks
Big Data
5G
Programmable intelligence enabling devices to learn, reason, and process information like humans
5th generation mobile networks with extremely fast, near-zero latency for real-time data processing
Volumes of data from numerous internet-connected sources, that are too large for normal processing methods
So where is AIoT heading next?
We can see these trends all around us.
The 4 Major
AIoT Segments
1
Wearables
2
Smart Home
3
Smart City
4
Smart Industry
Autonomous manufacturing robots
Predictive maintenance
While AIoT technology is still in its infancy, these segments represent a

from IEEE Spectrum https://spectrum.ieee.org/tech-talk/computing/software/new-optimization-algorithm-exponentially-speeds-computation

New Optimization Algorithm Exponentially Speeds Computation

Finding the optimal solutions to complex problems can be dramatically faster

By Charles Q. Choi



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A new algorithm could dramatically slash the time it can take computers to recommend movies or route taxis.

The new algorithm, developed by Harvard University researchers, solves optimization problems exponentially faster than previous algorithms by cutting the number of steps required. Surprisingly, this approach works "without sacrificing the quality of the resulting solution," says study senior author Yaron Singer, at Harvard University.

Optimization problems seek to find the best answer from all possible solutions, such as mapping the fastest route from point A to point B. Many algorithms designed to solve optimization problems have not changed since they were first described in the 1970s.

Previous optimization algorithms generally worked in a step-by-step process, with the number of steps proportional to the amount of the data analyzed. For example, a movie-recommendation algorithm might sequentially look at every film similar to one a person liked.

However, previous optimization algorithms had a diminishing-returns property: As they progressed, the relative gain from each step became smaller and smaller. This meant that for optimization problems involving vast amounts of data, finding the best solutions could prove extraordinarily computationally expensive.

In experiments, Singer and study coauthor Eric Balkanski found their algorithm could analyze a data set with 1 million ratings of 4,000 movies from 6,000 users and give similar movie recommendations to state-of-the-art algorithms while working 20 times faster. In addition, using a data set of 2 million taxi trips from the New York City Taxi and Limousine Commission, the new algorithm could pick the best locations for taxis to cover the maximum number of potential customers six times faster than previous algorithms.

Whereas prior optimization algorithms solved problems by progressing step-by-step in a single direction, the new algorithm works by sampling a variety of directions in parallel. Based on that sample, it discards less optimal directions and chooses the most valuable directions to progress toward solutions. This act of adaptively evolving what data the algorithm works on helps solve the problem of diminishing returns.

This strategy works given two different aspects of the algorithm's objectives. The researchers called these aspects curvature and homogeneity.

With the movie-recommendation problem, objectives with high curvatures are films that are very similar to ones a person has watched—for instance, if you enjoyed *Die Hard*, recommendations will likely include its sequels. With the taxi-dispatch problem, objectives with high curvatures are locations where taxis could respond to customers within 30 seconds. The milder the curvature —for instance, a taxi response time of five minutes instead of 30 seconds—the faster the algorithm could work.

With the movie-recommendation problem, objectives with high homogeneity assume there are many films that one could recommend—for example, if you enjoyed *Die Hard*, high homogeneity assumes similar action movies such as *Lethal Weapon* would make good recommendations. With the taxi-dispatch problem, high homogeneity assumes customers are distributed relatively equally across locations. The greater the homogeneity, the faster the algorithm could work.

This new approach could work on other problems, including identifying new drugs, discovering drug-drug interactions from online health forums, and developing sensor arrays for medical imaging.

"The fact that we can literally get exponential speedups in running time opens opportunities for applications in health care, computational biology, machine learning, and data mining that were too costly to consider before," Singer says.

Balkanski and Singer are now exploring optimization problems on which their strategy can apply. They also plan to write code for GPUs so that others can implement their work. "In general, the algorithms are extremely simple and are implementable in a few lines of code," Singer says.

The scientists detailed their findings at the Association for Computing Machinery's Symposium on Theory of Computing (STOC) in Los Angeles on 28 June. They will also present their work at the International Conference on Machine Learning (ICML) in Stockholm on 12 July.