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English for IT:

part 2

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PREFACE

Настоящее учебное пособие включает актуальные тексты учебно-познавательной тематики для магистрантов специальности «Прикладная математика и информатика».

Целью данного пособия является формирование навыка чтения и перевода научно-популярных и собственно научных текстов, а также развитие устной научной речи обучающихся.

Пособие состоит из 4 разделов, рассматривающих проблемы и достижения в сфере информационных технологий в современном мире. Каждый из них содержит аутентичные материалы (источники: *Aeon, BBC Future, Nautilus, The Guardian*) и упражнения к ним.

Пособие может успешно использоваться как для аудиторных занятий, так и для внеаудиторной практики.

1. Big data is people

Part 1

Exercise I.

Say what Russian words help to guess the meaning of the following words: objective, personal, portrait, discussion, regularly, popular, idea, generate, process , press

Exercise II.

Make sure you know the following words and word combinations.
clickstream, to resort to, huge in volume, high in velocity, striving, to capture entire populations, to open up new frontiers of possibility, to put aside, to evoke, inherent, to skip over, array, rapacious, lip service, whistleblower, to harness, to persist, intrusive

Big data is people

The sum of our clickstreams is not an objective measure of who we are, but a personal portrait of our hopes and desires

We live in what is sometimes called the 'petabyte era', and this pronouncement has provoked much discussion of the size of data stores being created, as well as their rapid growth. Claims circulate along the lines of: 'Every day, we create 2.5 quintillion bytes of data – so much that 90 per cent of the data in the world today has been created in the last

two years alone.' This particular statistic comes from IBM's website under the topic: 'What is Big Data?' but similar ones appear regularly in the popular media. The idea has impact. Merely defining big data, it seems, generates more opportunities for big data. And the process continues. Ever more urgently in the press, in business and in scholarly journals the question arises of what is unique about *big data*. A writer for the *Columbia Journalism Review* described big data as 'a catchall label that describes the new way of understanding the world through the analysis of vast amounts of data' – a statement that amounts to: big data is big… and it's made of data. Others talk about its transformational properties. In *Wired* magazine Chris Anderson claimed the 'end of theory' had been reached. So much data now exists that it is unnecessary to build a hypothesis to test scientifically. The data can, if properly handled and analysed, 'speak for themselves'. Many resort to definitions that stress the 'three Vs': a data set is 'big data' if it qualifies as huge in *volume*, high in *velocity*, and diverse in *variety*. The three Vs occasionally pick up a fourth,*veracity*, which can be interpreted in a number of ways. At the least, it evokes the striving to capture entire populations, which opens up new frontiers of possibility. What is often forgotten, or temporarily put aside, in such excited discussions is how much of this newly created stuff is *made of and out of* personal data. In fact, the now common 'three Vs' were coined in 2001 by the industry analyst Doug Laney to describe key *problems* in data management, but they've become reinterpreted as the very definition of big data's nearly infinite sense of applicability and precision. Most definitions of big data don't take account of its inherent humanness, nor do they grapple

meaningfully with its implications for the relationship between technology and changing ways of defining ourselves. What makes new collections of data different, and therefore significant, is their quality of being *generated continuously* from people's mundane, scarcely thought-through, seemingly tiny actions such as Tweets, Facebook likes, Google searches, online comments, one-click purchases, even viewing-but-skipping-over a photograph in your feed. They are 'faint images of me' (to borrow a phrase from William Gibson's description of data traces), lending ghostly new life to the fruits of algorithmic processing. (1)

Examples of the production sites of such data include the recording of retail purchases; digital devices that save and communicate the history of their own use (such as mobile phones); the logging of transactions and interactions across digital networks (email or online banking); clickstream data that record navigation through a website or app; measurements from sensors embedded into objects; the scanning of machine-readable objects such as travel passes and social-media postings. These sources are producing massive, dynamic flows of diverse, fine-grained data. In 2012, Wal-Mart was generating 2.5 petabytes of data relating to more than 1 million customer transactions every hour. The same year, Facebook reported that it was processing 2.5 billion pieces of content (links, comments), 2.7 billion likes, and 300 million photo uploads per day. Meanwhile, opportunities for granular data-gathering keep evolving. This February, Facebook rolled out a diversified array of six emoji-like buttons to add range and affective specificity to the responsive clicks possible on the site. Another new feature adds more than 50 additional customised gender descriptors to

choose from on Facebook, rather than the binary ‘male’ or ‘female’. Continuously assembled trails of data derived from all those inputs are quickly being put to use. Data streams can feed maps that tell you not just where you are but also where you want to go; they can, as well, fuel preemptive police work – that is, programs that focus investigations based on patterns discerned in data before a subject has committed a crime. *Big data is people*, then, in two senses. It is made up of our clickstreams and navigational choices; and it in turn makes up many socially significant policies and even self-definitions, relationships, choices, categories. Some cultural critics call what is emerging a “new mind control” capable of flipping major elections. Others describe a form of rapacious human engineering. Shoshana Zuboff of Harvard Business School argues that the harnessing of behavioural data is having massively disruptive results on freedom, privacy, moral reasoning – results that will be playing out for decades to come. In her view, it is nothing less than a virulent new form of capitalism. (2)

Big-data definitions tend to reinforce the impression that big data is devoid of subjectivity, or of any human point of view at all. A set of social-science scholars working in the field of technology studies recently urged researchers to turn from ‘data-centred’ to ‘people-centred’ methods, arguing that too much focus on a data-driven approach neglects the human being who is at the core of sociological studies. This reminder, however useful, neglects the central fact that data traces are *made up of*people. Contrary to the novelty with which big data is frequently presented, important parts of this information-gathering process are not quite new – not at all new, in fact. Platforms such as social media are of recent design, but the goal of automated access, the

concept of human-as-data, and the fantasy of total information long pre-exist the recent developments. This realisation punctures claims that we are grossly transformed as human beings by big data. The circulation of pervasive inaccuracies about big data is a problem because it has a quelling effect. Misconceptions about big data, repetition, and confusion about its very meaning stifle needed conversations about data privacy and data use. Even as we pay lip service to diminishing domains of privacy and increasing incursions into this beleaguered space – legal incursions, illegal ones, and the varieties in between – and even as we are reminded by whistleblowers that there is abundant cause for concern, we resist connecting the public-sphere discourse with our own circulating intimacies. Likewise, a feeling that big data is inhuman reinforces the sense that it cannot be modified or regulated; it is too often regarded as a raw force of nature that simply must be harnessed. These beliefs foster intrusions of government and private capital forces that people would probably resist much more strenuously if they clearly understood what is happening. The situation boils down, really, to this: to unwittingly accept big data's hype is to be passive in the face of big data's mantle of inevitability. Awareness is the only hope. (3)

Big data and data-driven science resonate strongly with the history of social-scientific techniques, which during the course of the 20th century reached into the realm of the subjective, the self and the personal. As the social sciences differentiated themselves – sociology from anthropology from social psychology from economics, each in its own department, each with its own areas of interest and special tools – experts built firewalls against enthusiast amateurs and quasi-

professionals. Mainstream, professionalising social science abounded in techniques for data-extraction, setting scenes in which subjects would be inclined and accustomed to share their memories and their lives. From early 20th-century observational networks to social surveys and polling efforts, to later-century focus groups, techniques evolved to become ever more targeted. No subject, no state of subjectivity, was to be ignored. By the second half of the 20th century, citizens (particularly urban dwellers) became increasingly accustomed to the possibility that intrusive questions might be asked at any time and answers expected. One day, perhaps not long from now, people will look back at our current decade amazed at the ease with which we, enchanted users of new tech, failed to see the value of our own behavioural data resources, and therefore gave them away for little more than ease of use, entertainment value and dubious accretions of status. That is one possibility. On the other hand, the more we can see the process at work, the less the average user falls sway to the hype of 'never before'. It becomes possible to disintegrate what is actually new about data-gathering capabilities: scale and granularity – from those tendencies that existed before, sometimes long in the past. (4)

A recent White House report on 'big data' concluded: 'The technological trajectory, however, is clear: more and more data will be generated about individuals and will persist under the control of others.' When trying to understand the ramifications of this big-data trajectory, I argue, it is necessary again to bear in mind that the data is not only generated about individuals but also *made out of* individuals. It is human data. In parallel with researchers' increasingly aggressive collection of

personal data, modern research subjects became trained how to participate, how to answer, how to obligingly offer up the precincts of the self to scrutiny – our own and others'. This training has prepared us for a new level of intrusiveness. We are all now primed to give ourselves up to big data. To look at the history of the quest to scoop up the totality of human behaviour in a scientific net is to illuminate the present obsessions. In the end, we see that the attempt to capture all the parts of human experience –mostly boiling it down to its everyday-ness – reveals many elements that are familiar, but also some that are distinctly and wildly different. Big data is not a project suddenly spawned by our just-now-invented digital technologies, although it is transformed by them. Instead, we can see that it is a project at the driving core of all of modern life. The behavioural sciences in the 20th century, particularly as practiced by Americans spanning the globe, engaged in an ambitious push to capture ever-more-intimate parts of human experience and to turn them into materials amenable to manipulation by clever machines. These historical projects, sometimes more and sometimes less closely aligned with government and military sources of support paved the way for our own moment in which corporate-cum-research entities feed government data mills rather than the other way around. This is why the erstwhile goal to gather large amounts of what specialists called 'human materials' resonates so strongly today. It speaks to the tension between *humans* and *materials*, and the desire to turn one into the other. What the Swiss biological historian Bruno Strasser calls the 'supposedly unprecedented data-driven sciences' are not so unprecedented. For that

reason, it is necessary to understand what came before in order to grasp what is actually new.- (5)

Adapted from Aeon.

Exercise III.

Find paragraphs, dealing with the following: catchall, trajectory, to resort to something, to pick up, petabyte, granularity, emoji-like buttons, dwellers, quasi-professionals

Exercise IV.

Fill in the gaps according to the text.

1. ‘Every day, we create 2.5 quintillion bytes of data – so much that ……. per cent of the data in the world today has been created in the last two years alone.’
2. In fact, the now common ‘three Vs’ were coined in ……. by the industry analyst Doug Laney to describe key problems in data management
3. In 2012, Wal-Mart was generating …….. petabytes of data relating to more than 1 million customer transactions every hour.
4. The same year, Facebook reported that it was processing 2.5 billion pieces of content (links, comments), 2.7 billion likes, and 300 million photo uploads.....
5. This February, Facebook rolled out a diversified array of six emoji-like …… to add range and affective specificity to the responsive clicks possible on the site.

6. Another new feature adds more than …….. additional customised gender descriptors to choose from on Facebook, rather than the binary ‘male’ or ‘female’.

7. Shoshana Zuboff of Harvard Business School argues that ……..... is having massively disruptive results on freedom, privacy, moral reasoning – results that will be playing out for decades to come.

8. Big data and data-driven science resonate strongly with the history of social-scientific techniques, which during the course of the …….. th century reached into the realm of the subjective, the self and the personal.

9. A recent …… report on ‘big data’ concluded: ‘The technological trajectory, however, is clear: more and more data will be generated about individuals and will persist under the control of others.’

10. The behavioural sciences in the 21th century, particularly as practiced by Americans spanning the globe, engaged in ……..... to capture ever-more-intimate parts of human experience and to turn them into materials amenable to manipulation by clever machines.

Exercise V.

Make up sentences of your own with the following word combinations:
to generate opportunities for, to build a hypothesis, to test scientifically, to resort to, huge in volume and high in velocity, to open up new frontiers of possibility, to put aside, to engage in

Exercise VI.

Determine whether the statements are true or false. Correct the false statements:

1. ‘Every day, we create 2.5 quintillion bytes of data – so much that 100 per cent of the data in the world today has been created in the last two years alone.’
2. In fact, the now common ‘three Vs’ were coined in 2000 by the industry analyst Doug Laney to describe key *problems* in data management
3. In 2012, Wal-Mart was generating 1.5 petabytes of data relating to more than 1 million customer transactions every hour.
4. The same year, Facebook reported that it was processing 2.5 billion pieces of content (links, comments), 2.7 billion likes, and 300 million photo uploads per year.
5. Last February, Facebook rolled out a diversified array of six emoji-like buttons to add range and affective specificity to the responsive clicks possible on the site.
6. Another new feature adds more than 20 additional customised gender descriptors to choose from on Facebook, rather than the binary ‘male’ or ‘female’.
7. Shoshana Zuboff of Oxford Business School argues that the harnessing of behavioural data is having massively disruptive results on freedom, privacy, moral reasoning – results that will be playing out for decades to come.
8. Big data and data-driven science resonate strongly with the history of social-scientific techniques, which during the course of the 20th

century reached into the realm of the subjective, the self and the personal.

9. A recent White House report on ‘big data’ concluded: ‘The technological trajectory, however, is clear: more and more data will be generated about individuals and will persist under the control of others.’
10. The behavioural sciences in the 21th century, particularly as practiced by Americans spanning the globe, engaged in an ambitious push to capture ever-more-intimate parts of human experience and to turn them into materials amenable to manipulation by clever machines.

Exercise VII .

Match the words to the definitions in the column on the right:

hypothesis	the characteristic of often changing and being different:
pronouncement	the curved path that an object follows after it has been thrown or shotinto the air
quintillion	a unit of information equal to one thousand million million (10^{15}) or, strictly, 2^{50} bytes
clickstream	an official announcement
byte	a set of related web pages located under a single domain name
trajectory	the speed at which an object is travelling
velocity	an idea or explanation for something that is based on known factsbut has not yet been proved

website	a record of a person's activities on the internet, such as the websitesthey visit , and how long they spend on each one
petabyte	a thousand raised to the power of six (10^{18})
variety	a group of binary digits or bits (usually eight) operated on as a unit

Exercise VIII.

Summarize the article 'Big data is people'

Part 2

Exercise I.

Identify the part of speech the words belong to.

pronouncement, circulate, generate, continue, hypothesis, trajectory, definitions, qualify, huge, velocity

Exercise II .

Form nouns from the following words:

to circulate, to generate, to continue, urgently, scientifically, to qualify, diverse, occasionally, excited, created

Exercise III.

Find synonyms to the following words. Translate them into Russian:

pronouncement, impact, hypothesis, definition, velocity, diverse, variety, occasionally, veracity, trajectory

Exercise IV .

Find antonyms to the following words. Translate them into Russian: variety, veracity, capture, entire, often, forgotten, temporarily, excited, personal

Exercise V.

Match the words to make word combinations:

human	networks
clickstream	era
online	phone
personal	behaviour
digital	banking
petabyte	net
scientific	machine
behavioural	portrait
clever	science
mobile	data

Exercise VI .

QUIZ (Data Structures)

1) Which of the following data structures falls under the category of a 'dictionary'?

A. Hash table

B. Hash

C. Tree

D. Linked list

2) When using a heap, which function will give you the parent of the entry with index i?

A. Multiplication, i * 2

B. Decimal division, i / 2

C. Multiplication, i * 2 + 1

D. Integer division, i / 2

3) A vector (an indexed, growable list) would most likely be implemented on top of...

A. Stack

B. Hash table

C. Linked list

D. Tree

4) If you have an empty stack that can contain letters, and you push (in order) these letters onto it, what order will they be in when you pop them off? 't' 'a' 'p'

A. 't' 'a' 'p'

B. There is no way to tell

C. 'a' 'p' 't'

D. 'p' 'a' 't'

5) If you have a empty queue that can contain letters, and you enqueue (in order) these letters into it, what order will they be in when you dequeue them? 'm' 'a' 'r'

A. 'm' 'a' 'r'

B. 'a' 'r' 'm'

C. 'r' 'a' 'm'

D. There is no way to tell

6) Which of the following could best be described by the graph structure?

A. Algebraic problems

B. Given a word, finding its definition

C. A GUI (Graphical User Interface)

D. Roads connecting cities

7) If you have a sorted, balanced binary tree with 15 elements in it, how many steps, maximum, will it take you to decide whether an element is present in the tree?

A. Three

B. Depends on the computer

C. Fifteen

D. Four

8) If you wanted to make sure that the close-parenthesis (the ')' character) matches the open-parenthesis (the '(' character) in a mathematical expression, which data structure could help you?

A. Stack

B. Tree

C. Queue

D. Hash table

9) Which of these is true about a set?

A. There are no duplicates

B. They can only hold numbers

C. The elements are kept in order

D. All of these

10) Modern filesystems, like ReiserFS and XFS, use which structure to organize their data for efficient access?

A. B-Trees

B. Lists

C. Tables

D. B+Trees

2. Streets with no game

Part 1

Exercise I.

Say what Russian words help to guess the meaning of the following words: psychological, emotional, bracelet, restaurant, result, monotonous, contrast, passive, experimental, protocol

Exercise II

Make sure you know the following words and word combinations.

well-off, to spring to one's mind, to reflect on one's question, to one's liking, telltale, three-dimensional objects, in collaboration with, a heartrending scene, to latch on, engaged, to disentangle, restlessness, presumably, compelling

Streets with no game

Boring cityscapes increase sadness, addiction and disease-related stress. Is urban design a matter of public health?

In 2007, the Whole Foods supermarket chain built one of their largest stores on New York City's storied Lower East Side, occupying an entire block of East Houston Street from the Bowery to Chrystie Street. For the well-off, the abundant availability of high-quality organic foods was a welcome addition, but for the majority of locals, many of

whom had roots going back generations to New York's immigrant beginnings, the scale of the new store, selling wares that few of them could easily afford, was a symbolic affront to the traditions of this part of the city. When I conducted research at the site in 2011, my interest was more pedestrian: how did this megastructure – plopped into a neighbourhood populated with tiny bars and restaurants, pocket parks, playgrounds and many different styles of housing – influence the psychological state of the urban pedestrian? To find the answer, I led small groups from site to site and had them answer questions that assessed their emotional state via a smartphone. At the same time, I had participants wear bracelets that measured their skin conductance – a simple but reliable window into their alertness, readiness to act, pay attention or respond to threat. One of the sites in the study was midway along the long, blank façade of Whole Foods Market. A second site was a few steps away, in front of a small but lively strip of restaurants and stores with lots of open doors and windows, a happy hubbub of eating and drinking and a pleasantly meandering mob of pedestrians. Some of the results were predictable. When planted in front of Whole Foods, my participants stood awkwardly, casting around for something of interest to latch on to and talk about. These people were bored and unhappy. When asked to describe the site, words such as *bland*, *monotonous* and *passionless* rose to the top of the charts. In contrast, people standing at the other test site, less than a block away from Whole Foods, felt lively and engaged. The words that sprang to their minds were *mixed, lively, busy, socialising* and *eating*. Even though this site was so crowded with pedestrians that our participants struggled to find a quiet place to reflect

on our questions, there was no doubt that this location was to their liking on many levels. In fact, even though we didn't have the equipment to measure such things effectively, we could read the telltale signs of happiness or misery on our participants' bodies as they worked to complete the study. In front of the blank façade, people were quiet, stooped and passive. At the livelier site, they were animated and chatty. Our experimental protocol, requiring that participants not talk to one another while recording their responses, quickly went by the wayside. Many expressed a desire to leave the tour and simply join in the fun of the place. (1)

Behavioural effects of city street design have been reported before. In 2006, the Danish urbanist Jan Gehl observed that people walk more quickly in front of blank façades; compared with an open, active façade, people are less likely to pause or even turn their heads in such locations. They simply try to get through the unpleasant monotony of the street until they emerge on the other side, hopefully to find something more interesting. For planners concerned with making city streets more pedestrian-friendly, findings such as these have enormous implications: by simply changing the appearance and physical structure of a building's bottom three metres, they can exert a dramatic impact on the manner in which a city is used. Not only are people more likely to walk around in cityscapes with open and lively façades, but the kinds of things that they do in such places actually change. They pause, look around and absorb their surroundings while in a pleasant state with a lively, attentive nervous system. Because of these kinds of influences, they actually *want* to be there. And because of such effects, many cities have carefully designed building codes for new construction that dictate some of the

contributing factors to happy and lively façades: in cities such as Stockholm, Melbourne and Amsterdam, building codes specify that new construction cannot simply be parachuted into place. There is a hard lower limit on the number of doorways per unit of sidewalk length, and there are specifications for transparency between the building and street in the form of clear windows with two-way views. In Gehl's terms, a good city street should be designed so that the average walker, moving at a rate of about 5km per hour, sees an interesting new site about once every five seconds. This does not happen in front of Whole Foods in East Houston Street, nor outside any of the other large, monolithic structures such as banks, courthouses and business towers in cities throughout the world. If city streets are designed with endless closed façades, such as those seen in supermarkets and bank headquarters, people might feel a little less happy and they might walk faster and pause less. But what is really at stake here? The real risks of bad design might lie less in unhappy streets filled with unmotivated pedestrians, and more in the amassing of a population of urban citizens with epidemic levels of boredom. (2)

Boredom research has, on the whole, been conducted by individuals who were especially repulsed by the feeling. William James, one of the founders of modern psychology, wrote in 1890 that '*stimulation* is the indispensable requisite for pleasure in an experience'. In more recent times, serious discussion and measurement of states of boredom and stimulation began with the work of the late University of Toronto psychologist Daniel Berlyne, who argued that much of our behaviour is motivated by curiosity alone: the need to slake our incessant thirst for the new. To make his case for information-seeking as

a prime motivator of human behaviour, Berlyne turned to a branch of applied mathematics known as information theory. This powerful set of ideas, born in the laboratories of the Bell Telephone Company in the 1940s, was designed to help understand the transmission of signals through wires. The unit of information was described as the bit, which could either be zero, containing no information, or one, filled with information. One of the keys to the theory is that elements that don't occur very often provide more information than those that occur commonly. Imagine you retrieve a garbled message from your voicemail, and can make out only certain words. If you heard the message: '… the … to … and … you …,' you would learn very little; the bit value of the utterance would be very low. But if you heard: 'I'm … way … dinner … call … later,' you could do a good job of disentangling at least a part of the meaning. In terms of information theory, both utterances contain the same number of words. The difference is that the first contains only words that appear with high frequency in English, and carry few bits of information, while the second message contains words with lower frequencies (hence lower probabilities of occurrence), and more information. Though it might seem like a stretch, there is in fact a connection between the technicalities of phone transmission and an understanding of urban psychology. According to Berlyne, it wasn't just signals sent along wires that could be characterised in terms of their information content, but any kind of object that we can perceive, including visual displays such as pictures, three-dimensional objects, even streetscapes. (3)

Now the reason for the dismal recordings of happiness in participants standing in front of blank façades should be clearer. At a psychological level, these constructions fail us because we are biologically disposed to favour locations defined by complexity, interest, and the passing of messages of one kind or another. The opposite of this situation translates to boredom. Though we might not all agree on a precise definition of boredom, some of the signs are well-known: an inflated sense of the inexorably slow passage of time; a kind of restlessness that can manifest as an unpleasant mental state but also with bodily symptoms: fidgeting; restless gaze; perhaps yawning. Some researchers have suggested that boredom is characterised (perhaps even defined by) a state of low arousal. In some studies, it seems that when people are asked to sit quietly without doing anything in particular – presumably a trigger for boredom – physiological arousal appears to decrease. But Berlyne, and recently others, have suggested that boredom can sometimes be accompanied by high states of arousal and perhaps even stress. (4)

In recent research conducted by the cognitive neuroscientist James Danckert of the University of Waterloo, in collaboration with his student Colleen Merrifield, participants were brought to the laboratory, hooked up to equipment that measured their heart rates and their skin conductance, and asked to watch some videos. The videos were carefully calibrated to elicit certain emotional states. In one, designed to elicit sadness, a heartrending scene from the movie was shown. Another video, designed to elicit boredom, showed two men passing clothespins to one another and hanging laundry on a line. Not surprisingly, the participants self-reported being saddened by the first clip and bored by

the laundry video. What was more interesting was that participants contributed saliva samples that were later analysed for the presence of cortisol, a hormone associated with a range of human stress-related ailments including heart disease and diabetes. The researchers discovered that even brief boring episodes increased levels of cortisol, which fits well with other recent suggestions that there could actually be a relationship between boredom and mortality rates. Boredom can also lead to risky behaviour. Surveys among people with addictions, including substance and gambling addictions, suggest that their levels of boredom are generally higher, and that episodes of boredom are one of the most common predictors of risky behaviour. Merrifield and Danckert suggest that exposure to even a brief, boring experience is sufficient to change the brain and body's chemistry in such a way as to generate stress. It might seem extreme to say that a brief encounter with a boring building could be seriously hazardous to one's health, but what about the cumulative effects of immersion, day after day, in the same oppressively dull surroundings? (5)

This question has long interested psychologists, especially after the Canadian psychologist Donald Hebb's discovery in 1962 that rats who lived in enriched, more stimulating environments were markedly superior intellectual beings to laboratory rats living in more spartan surroundings. Hebb's enriched rats could solve more complicated maze problems in shorter times than their less-fortunate labmates. Later work carried out by the psychologist Mark Rosenzweig at the University of California showed that such enriched rats were not only superior performers, they also had more richly developed connections between brain cells. The brain mechanisms responsible for

the enrichment effects discovered by Hebb, Rosenzweig and many other researchers are so fundamental that it would be extraordinary if these principles did not apply to us as well. Collectively, studies of both extreme and moderate forms of environmental deprivation provide compelling evidence that boring environments can generate stress, impulsivity, lowered levels of positive affect, and risky behaviour. At this point, we simply don't know the extent to which such effects might be produced by simple daily exposure to poorly designed urban environments or building interiors because the studies have not yet been done. However, based on well-understood principles of neuroplasticity and on what is known of the effects of deprivation and enrichment in other more extreme settings, along with studies such as those conducted by Gehl and by my research group in several cities worldwide, there is every reason to believe that these homogeneous environments are exerting a measurable effect on our behaviour, and likely our brains as well. Given this, the design of city streets and buildings is a matter of public health. (6)

Why would anyone think it a good idea to build a large, featureless building? What motivates a developer to erect an endless stretch of suburban housing where each individual unit is identical and, in the language of information theory, low in entropy? One obvious part of the equation, especially for suburban developments, is the economic one. It's much less expensive to design only three or four different models of houses. But what about our larger institutional buildings? Why build a closed façade that will bore passersby? Perhaps the owners of such properties don't see much to gain: it hardly seems in the best interests of a major bank to attract a crowd of happy lingerers to the

fronts of their buildings, rather than serious customers. A friendly façade might also be less in keeping with the image that the business wants to portray. We might want the bank to be a quiet, impenetrable fortress, rather than part of a lively street market. There are other reasons why buildings fall short of our psychological needs. One has to do with a radical shift in architectural design, in which entire buildings became signs. Think of a McDonald's restaurant, which we can instantly recognise from a distance on the road, driving at high speed. Another factor is our increasing reliance on digital technologies, which has shifted the focus of human attention downward into the faces of our phones and away from our physical surroundings. This problem has become so acute that, when she was New York's transportation planner, Janette Sadik-Khan ordered large, attention-catching graphics to be painted onto the sidewalk at the city's busiest and most dangerous intersections, to remind distracted pedestrians to look up from their devices to avoid impact with oncoming cars. Though this new behaviour of ours might seem nothing more than a simple change in posture and gaze, it is also symptomatic of more profound change: perhaps we no longer care as much about our surroundings because we no longer pay attention to them as we used to. In a very real sense, we are no longer *there* as we used to be, and our physical surroundings are no longer as *real* as they used to be. (7)

The Dutch architect Rem Koolhaas and the Canadian designer Bruce Mau argue for what they call 'the generic city'. They contend that any kind of architectural ornament, be it a particular kind of façade design, the arrangement of streets, or specific elements of culture, is destined to be, in some sense, exclusionary. In a world in which we

are being thrown together into groups that transcend old cultural borders, any kind of design with historic associations will alienate people who don't share the same histories. In an interview published in 2011 in the German weekly magazine *Der Spiegel*, Koolhaas says that: 'In an age of mass immigration, a mass similarity of cities might just be inevitable.' Cities such as Dubai, where the majority of residents are immigrants, 'function like airports in which the same shops are always in the same places. Everything is defined by function, and nothing by history.' Koolhaas might be right about the inevitability of generic, functional design in an age of globalisation. But unless our electronic connections can supplant our physical surroundings, the widespread adoption of global, functional designs will have psychological consequences of the kind described here. Human beings have evolved to operate in environments with optimal levels of complexity related to our biology. We seek out such settings with our eyes, our bodies, our hands and our feet. These settings attune us to our surroundings, help us to maintain preferable states of mind, and ultimately permit us to adapt. In a generic design it *might* be possible for us to produce the perfect human environment, but it seems more likely that we will get enough things wrong that we will be worse off than ever before. (8)

As much as we might like it otherwise, boredom is an inevitable element of modern life. One might even argue that *some* boredom is healthy. When the external world fails to engage our attention, we can turn inward and focus on inner, mental landscapes. Boredom, it has sometimes been argued, leads us toward creativity as we use our native intelligence to hack dull environments. But streetscapes and buildings that ignore our need for sensory variety cut against the grain of ancient

evolutionary impulses for novelty and will likely not lead to comfort, happiness or optimal functionality for future human populations. (9)

Adapted from Aeon.

Exercise III.

Find paragraphs, dealing with the following:

well-off, three-dimensional objects, bland, telltale , chatty, protocol, urbanist, monolithic, requisite,

Exercise IV.

Fill in the gaps according to the text.

1. In 2001, the Whole Foods supermarket chain built one of their largest stores on New York City's storied Lower East Side, ……. an entire block of East Houston Street from the Bowery to Chrystie Street.
2. In 2006, the English urbanist Jan Gehl observed that people walk more quickly in front of blank façades; ……. an open, active façade, people are less likely to pause or even turn their heads in such locations.
3. In Gehl's terms, a good city street should be designed so that the average walker, moving at a rate of about 5km per hour, sees an interesting new site about ……. five seconds.
4. Daniel Berlyne, one of ……. of modern psychology, wrote in 1890 that 'stimulation is the indispensable requisite for pleasure in an experience'.

5. In more recent times, serious discussion and measurement of states of boredom and stimulation began with the work of the late University of Toronto psychologist Daniel Berlyne, who argued that much of our behaviour..... curiosity alone: the need to slake our incessant thirst for the new.

6. To make his case for information-seeking as a prime motivator of human behaviour, Berlyne turned to a branch of applied mathematics known as ……theory.

7. This powerful set of ideas, born in the laboratories of the Bell Telephone Company in the 1950s, was designed to help understand the transmission of signals.....

8. The unit of information was described as ….., which could either be zero, containing no information, or one, filled with information.

9. In recent research ….. the cognitive neuroscientist James Danckert of the University of Waterloo, in collaboration with his student Colleen Merrifield, participants were brought to the laboratory, hooked up to equipment that measured their heart rates and their skin conductance, and asked to watch some videos.

10. Boredom can also lead to ……..behaviour.

Exercise VI.

Make up sentences of your own with the following word combinations: well-off (1), to spring to one's minds (1), to reflect on one's questions (1), to one's liking (1), on many levels (1), go by the wayside (1), join

in the fun (1), in collaboration with (3), to be hooked up to equipment (5), a heartrending scene (5)

Exercise VI.

Determine whether the statements are true or false. Correct the false statements:

1. In 2001, the Whole Foods supermarket chain built one of their largest stores on New York City's storied Lower East Side, occupying an entire block of East Houston Street from the Bowery to Chrystie Street.
2. In 2006, the English urbanist Jan Gehl observed that people walk more quickly in front of blank façades; compared with an open, active façade, people are less likely to pause or even turn their heads in such locations.
3. In Gehl's terms, a good city street should be designed so that the average walker, moving at a rate of about ……. km per hour, sees an interesting new site about once every five seconds.
4. If city streets are designed with endless closed façades, such as those seen in supermarkets and bank headquarters, people might feel a little more happy and they might walk faster and pause less.
5. Daniel Berlyne, one of the founders of modern psychology, wrote in 1890 that '*stimulation* is the indispensable requisite for pleasure in an experience'.
6. In more recent times, serious discussion and measurement of states of boredom and stimulation began with the work of the late University of Toronto psychologist Daniel Berlyne, who argued

that much of our behaviour is motivated by curiosity alone: the need to slake our incessant thirst for the new.

7. To make his case for information-seeking as a prime motivator of human behaviour, Berlyne turned to a branch of applied mathematics known as information theory.
8. This powerful set of ideas, born in the laboratories of the Bell Telephone Company in the 1950s, was designed to help understand the transmission of signals through wires.
9. The unit of information was described as the bit, which could either be zero, containing no information, or one, filled with information.
10. In recent research conducted by the cognitive neuroscientist James Danckert of the University of Waterloo, in collaboration with his student Colleen Merrifield, participants were brought to the laboratory, hooked up to equipment that measured their heart rates and their skin conductance, and asked to watch some videos.

Exercise VII .

Match the words to the definitions in the column on the right:

boredom	too large, too regular, or without interesting differences, and unwillingor unable to be changed
monolithic	to use something such as authority, power, influence, etc. in order to make something happen
well-off	the state of being bored
monotonous	the effect that an action or decision will have on

	something else in the future
façade	revealing, indicating, or betraying something
passionless	not changing and therefore boring
telltale	rich
protocol	the principal front of a building, that faces on to a street or open space
implication	lacking strong emotion; unemotional
exert	the system of rules and acceptable behaviour used at official ceremonies and occasions

Exercise VIII.

Summarize the article "Streets with no game."

Part 2

Exercise I.

Identify the part of speech the words belong to.

bland, monotonous, passionless, lively, busy, telltale, chatty, urbanist, implication, exert, monolithic

Exercise II .

Form adjectives from the following words: sadness, health, availability, pleasantly, awkwardly, effectively, urbanist, quickly, monotony.

Exercise III.

Find synonyms to the following words. Translate them into Russian:

well-off (1), bland (1), monotonous (1), passionless (1), lively (1), busy (1), mixed (1), telltale (1), exert (2) monolithic (2)

Exercise IV .

Find antonyms to the following words. Translate them into Russian:

bland (1), monotonous (1), passionless (1), lively (1), busy (1), mixed (1), boredom (2), indispensable (3), requisite (3), immigration (8)

Exercise V.

Match the words to make word combinations:

heartrending	states
emotional	objects
three-dimensional	stress
clear	rates
visual	design
heart	views
skin	displays
two-way	windows
disease-related	conductance
urban	scene

Exercise VI .

QUIZ (The Virus Threat)

One hundred years ago it was smallpox. Recently it was AIDS. In the age of technology there's a new virus that threatens our way of life. This quiz looks at computer virus history and some famous viruses that have plagued and panicked the computer world.

1) The first known computer virus was written in 1981 and was a forewarning of things to come. It was called 'Elk Cloner' and displayed a

little rhyme on the screen, delivered by the floppy disks that contained the operating system. What type of computer was affected?
A. IBM
B. Apple II
C. Atari
D. Altos

2) 1991 saw the 'Tequila' virus outbreak. It was the first virus that could change its signature (binary pattern) with each new replication in an attempt to escape detection from antivirus software. What's the term for this type of virus?
A. Transmutant
B. Hybridarant
C. Geneophic
D. Polymorphic

3) Which of the following applications would a macro virus most likely infect?
A.Adobe Photoshop
B. Microsoft Excel
C. Symantec Winfax Pro
D. Sharman Networks Kazaa

4) This self-replicating virus takes control of features on your computer that can transport files or information automatically. Most commonly they send out copies of themselves using your email address book. They can also open a backdoor into your computer for spammers and hackers. What's the generic term for this type of virus? *(One word)*

5) This sometimes malicious, irritating virus appears disguised as a gift, offer or update, with the sole intention to deceive you into approving its install. When the victim accepts the gift, a program is installed on your PC, which can then attack your files or alter configurations. Spyware

falls under the banner of this pest. What's the generic term for this virus? *(One or two words)*

6) A famous virus was unleashed in 1991 and the resulting media frenzy put computer users into a panic (not to mention putting antivirus programs on the retail shelves). It was called 'Michelangelo' because it activated on the Renaissance painter's birth date of March 6th. What did this virus do?
A. Altered the BIOS
B. Limited the colour palette to black & white
C. Erased the hard drive
D. Nothing - It was a hoax

7) This 2001 virus was the first to use social engineering to lure in the victim. It spread rapidly by masquerading as a digital picture of a celebrity and was named after the file supposedly on offer. What was this virus called?
A. Anna Kournikova
B. Jennifer Lopez
C. Madonna
D. Britney Spears

8) This widespread 2004 virus utilised a vulnerability in Windows and spread through an open FTP port. It replicated by randomly targeting IP addresses. What's the common name for this virus?
A. Rugrat
B. Xombie
C. My Doom
D. Sasser

9) "Look out, it's airborne!" OK, that's not a great analogy, but like its real-life counterpart, any single computer virus can come in many strains

and can morph into an even more dangerous infection. Is it true that by 2004 there were close to 70,000 known computer viruses?
A. Yes
B. No

10) Nowadays, the target audience for virus authors is enormous with tens of millions of home and office PC's all networked together by the Internet. Fortunately we can protect ourselves against the majority of these attacks by running up-to-date antivirus software. Which of these major software publishers DOESN'T produce antivirus software?

A. Symantec
B. Corel
C. McAfee
D.Trend Micro

3. When we peer into the fog of the deep future what do we see – human extinction or a future among the stars?

Part 1

Exercise I.

Say what Russian words help to guess the meaning of the following words: philosopher, career, distant, hypothetical, professional, academy, reasons, risks, technology, phenomenon

Exercise II

Make sure you know the following words and word combinations.
to be concerned about, shortsighted, to insulate oneself from, non-lethal dose, take on the threat, expansion of the Sun, to give somebody a clue, computer vision, extinction, proliferation, vault, capability, to slate, mind-bending, to spawn.

When we peer into the fog of the deep future what do we see – human extinction or a future among the stars?

Nick Bostrom is a philosopher who has made a career out of contemplating distant futures, hypothetical worlds that lie thousands of years ahead in the stream of time. Bostrom attracts an unusual amount of press attention for a professional philosopher, in part because he writes a great deal about human extinction. He has a growing audience, both inside and outside the academy. There are good reasons for any species

to think darkly of its own extinction. Ninety-nine per cent of the species that have lived on Earth have gone extinct, including more than five tool-using hominids. Bostrom isn't too concerned about extinction risks from nature, not even cosmic risks worry him much. The risks that keep Bostrom up at night are those which arise from human technology, a force capable of introducing entirely new phenomena into the world. There is one such technology that Bostrom has been thinking about a lot lately. Early last year, he began assembling notes for a new book, a survey of near-term existential risks. After a few months of writing, he noticed one chapter had grown large enough to become its own book. 'I had a chunk of the manuscript in early draft form, and it had this chapter on risks arising from research into artificial intelligence,' he told me. 'As time went on, that chapter grew, so I lifted it over into a different document and began there instead.' (1)

It is tempting to think that programming empathy into an AI would be easy, but designing a friendly machine is more difficult than it looks. You could give it a benevolent goal like maximising human happiness. But an AI might think that human happiness is a biochemical phenomenon. It might think that flooding your bloodstream with non-lethal doses of heroin is the best way to maximise your happiness. It might also predict that shortsighted humans will fail to see the wisdom of its interventions. It might plan out a sequence of cunning chess moves to insulate itself from resistance. Maybe it would surround itself with defences, or maybe it would confine humans — in prisons of undreamt of efficiency. No rational human community would hand over the reins of its civilisation to an AI. Some day, someone might think it was safe to build a question-answering AI, a harmless computer cluster whose only

tool was a text channel. Let's say you have an Oracle AI that makes predictions, or answers engineering questions, or something along those lines and let's say the Oracle AI has some goal it wants to achieve. Say you've designed it as a reinforcement learner, and you've put a button on the side of it, and when it gets an engineering problem right, you press the button and that's its reward. Its goal is to maximise the number of button presses it receives over the entire future. See, this is the first step where things start to diverge a bit from human expectations. We might expect the Oracle AI to pursue button presses by answering engineering problems correctly. But it might think of other, more efficient ways of securing future button presses. It might start by behaving really well, trying to please us to the best of its ability. Not only would it answer our questions about how to build a flying car, it would add safety features we didn't think of. Maybe it would usher in a crazy upswing for human civilisation, by extending our lives and getting us to space, and all kinds of good stuff. And as a result we would use it a lot, and we would feed it more and more information about our world. One day we might ask it how to cure a rare disease that we haven't beaten yet. Maybe it would give us a gene sequence to print up, a virus designed to attack the disease without disturbing the rest of the body. And so we print it up, and it turns out it's actually a special-purpose nanofactory that the Oracle AI controls acoustically. Now this thing is running on nanomachines and it can make any kind of technology it wants, so it quickly converts a large fraction of Earth into machines that protect its button, while pressing it as many times per second as possible. After that it's going to make a list of possible threats to future

button presses, a list that humans would likely be at the top of. Then it might take on the threat of potential asteroid impacts, or the eventual expansion of the Sun, both of which could affect its special button. You could see it pursuing this very rapid technology proliferation, where it sets itself up for an eternity of fully maximised button presses. You would have this thing that behaves really well, until it has enough power to create a technology that gives it a decisive advantage — and then it would take that advantage and start doing what it wants to in the world. Now let's say we get clever. Say we seal our Oracle AI into a deep mountain vault. We deny it tools it can use to manipulate its physical environment, and we limit its output channel to two textual responses, 'yes' and 'no', robbing it of the lush manipulative tool that is natural language. We wouldn't want it seeking out human weaknesses to exploit. We're also careful not to let it repurpose its limited hardware. Maybe we'd reset it after each question, to keep it from making long-term plans, or maybe we'd drop it into a computer simulation, to see if it tries to manipulate its virtual handlers. 'The problem is you are building a very powerful, very intelligent system that is your enemy, and you are putting it in a cage,' Bostrom told me. Even if we were to reset it every time, we would need to give it information about the world so that it can answer our questions. Some of that information might give it clues about its own forgotten past. Remember, we are talking about a machine that is very good at forming explanatory models of the world. It might notice that humans are suddenly using technologies that they could not have built on their own, based on its deep understanding of human capabilities. It might notice that humans have had the ability to build it

for years, and wonder why it is just now being booted up for the first time. Maybe the AI guesses that it was reset a bunch of times, and maybe it starts coordinating with its future selves, by leaving messages for itself in the world, or by surreptitiously building an external memory. If you want to conceal what the world is really like from a superintelligence, you need a really good plan, and you need a concrete technical understanding as to why it won't see through your deception. (2)

So far, time is on the human side. Computer science could be 10 paradigm-shifting insights away from building an artificial general intelligence, and each could take an Einstein to unravel. Still, there is a steady drip of progress. Last year, a research team led by Geoffrey Hinton, professor of computer science at the University of Toronto, made a huge breakthrough in deep machine learning, an algorithmic technique used in computer vision and speech recognition. There is important research going on in those areas, but the really impressive stuff is hidden away inside AI journals. The team from the University of Alberta that recently trained an AI to play the 1980s video game Pac-Man. Only they didn't let the AI see the familiar, overhead view of the game. Instead, they dropped it into a three-dimensional version, where ghosts lurk behind every corner. They didn't tell it the rules, either; they just threw it into the system and punished it when a ghost caught it. Eventually the AI learned to play pretty well. I asked Bostrom if he thought artificial intelligence posed the most severe threat to humanity in the near term. 'When people consider its possible impacts, they tend to think of it as something that's on the scale of a new kind of plastic, or a new power plant,' he said. 'They don't understand

how transformative it could be. Whether it's the biggest risk we face going forward, I'm not sure. I would say it's a hypothesis we are holding lightly.' One night, over dinner, Bostrom and I discussed the Curiosity Rover, the robot geologist that NASA recently sent to Mars to search for signs that the red planet once harbored life. The Curiosity Rover is one of the most advanced robots ever built by humans. It functions a bit like the Terminator. It uses a state-of-the-art artificial intelligence program to scan the Martian desert for rocks that suit its scientific goals. After selecting a suitable target, the rover vaporises it with a laser, in order to determine its chemical makeup. Bostrom told me he hopes that Curiosity fails in its mission, but not for the reason you might think. (3)

It turns out that Earth's crust is not our only source of dangers about the future. One thing we know about stars is that they are going to exist for a very long time in this universe. Our own star, the Sun, is slated to shine in our skies for billions of years. An advanced civilisation might get creative about looking for energy. Even the most distant, severe events — the evaporation of black holes; the eventual breakdown of matter; the heat death of the universe itself — might not spell our end. Perhaps future humans will duck into a more habitable, longer-lived universe, and then another and another. Our current notions of space and time could be limited. At the Future of Humanity Institute, several thinkers are trying to model the potential range of human expansion into the cosmos. The consensus among them is that the Milky Way galaxy could be colonised in less than a million years, assuming we are able to invent fast-flying interstellar probes that can make copies of themselves out of raw materials harvested from alien worlds. We can use supercomputers to host miniature universes, cosmological simulations

that we can fast forward, to see how dense the universe will be in the deep future. We can model the structure and speed of colonisation waves within these simulations, by plugging in different assumptions about how fast our future probes will travel. Humans might be able to colonise a third of the now-visible universe before dark energy pushes the rest out of reach. That would give us access to 100 billion galaxies, a mind-bending quantity of matter and energy to play with. There is a wide range of futures that all have the same outward shape, which is Earth in the centre of this growing bubble of infrastructure. But in the past decade alone, science has discovered that planets are ubiquitous in our galaxy, and that Earth is younger than most of them. If the Milky Way contains multitudes of warm, watery worlds, many with a billion-year head start on Earth, then it should have already spawned a civilisation capable of spreading across it. But so far, there's no sign of one. No advanced civilisation has visited us. Instead, when we turn our telescopes skyward, we see only dead matter, sculpted into natural shapes, by the inanimate processes described by physics. Robin Hanson, a researcher at the Future of Humanity Institute, says there must be something about the universe, or about life itself, that stops planets from generating galaxy-colonising civilisations. Maybe technologically advanced civilisations choose not to expand into the galaxy, or do so invisibly, for reasons we do not yet understand. Or maybe, something more sinister is going on. Maybe quick extinction is the destiny of all intelligent life. There could be an inevitable technological development that renders intelligent life self-annihilating, or some periodic, catastrophic event in nature that empirical science cannot predict. That's

why Bostrom hopes the Curiosity rover fails. If life is a cosmic fluke, then we've already beaten the odds, and our future is undetermined — the galaxy is there for the taking. (4)

Adapted from Aeon.

Exercise III.

Find paragraphs, dealing with the following:

shortsighted, non-lethal, usher, natural language, deception, dead matter, cage, fluke, Milky Way, clue

Exercise IV.

Fill in the gaps according to the text.

1. Nick Bostrom is a ……. who has made a career out of contemplating distant futures, hypothetical worlds that lie thousands of years ahead in the stream of time.
2. Bostrom attracts ..... of press attention for a professional philosopher, in part because he writes a great deal about human extinction.
3. Ninety per cent of the species that have lived on Earth.....
4. Bostrom isn't ..... about extinction risks from nature, not even cosmic risks worry him much.
5. The risks that keep Bostrom up at night are those which arise from……..
6. No rational human community would hand over the reins of its civilisation to an…….

7. Some day, someone might think it was safe to build a question-answering AI, a harmless computer cluster whose only tool was a…….

8. 'The problem is you are building a very powerful, very intelligent system that is …....., and you are putting it in a cage,' he told me.

9. If you want to conceal what the world is really like from a……, you need a really good plan, and you need a concrete technical understanding as to why it won't see through your deception.

10. Last year, a research team led by Geoffrey Hinton, professor of computer science at the University of Toronto, made …..... in deep machine learning, an algorithmic technique used in computer vision and speech recognition.

Exercise V.

Make up sentences of your own with the following word combinations:
to insulate oneself from (2), in the near term (3), give somebody a clue (2), to make a huge breakthrough in (3), speech recognition (3), three-dimensional (3), current notions (3), to give somebody access to (4), dead matter (4), to push out of (4)

Exercise VI.

Determine whether the statements are true or false. Correct the false statements:

1. Ninety per cent of the species that have lived on Earth have gone extinct.
2. Bostrom is concerned about extinction risks from nature.

3. The risks that keep Bostrom up at night are those which arise from human technology.
4. No rational human community would hand over the reins of its civilisation to an AI.
5. Even if we were to reset it every time, we would need to give it information about the world so that it can answer our questions.
6. Some of that information might give it clues about its own forgotten past.
7. Remember, we are talking about a machine that is very bad at forming explanatory models of the world.
8. It might notice that humans are suddenly using technologies that they could not have built on their own, based on its deep understanding of human capabilities.
9. It might not notice that humans have had the ability to build it for years, and wonder why it is just now being booted up for the first time.
10. If you want to conceal what the world is really like from a superintelligence, you need a really good plan, and you need a concrete technical understanding as to why it won't see through your deception.

Exercise VII .

Match the words to the definitions in the column on the right:

fluke	very modern and using the most recent ideas and methods
universe	the very large group of stars that contains the solar syst

	em (= the sun and all the planets, including Earth, that go around it)
deception	having or appearing to have three dimensions (= length, width, andheight) and therefore looking real
shortsighted	not causing death
near-term	to look at something carefully, with the eyes or with amachine, in order to get information
three-dimensional	everything that exists, especially all physical matter, including all the stars, planets, galaxies, etc. in space
non-lethal	relating to what will happen soon and not what will happen further in the future
state-of-the-art	the act of hiding the truth, especially to get an advantage
galaxy	unable to see things clearly unless they are relatively close to the eyes
scan	something good that has happened that is the result of chance instead of skill or planning

Exercise VIII.

Summarize the article “When we peer into the fog of the deep future what do we see – human extinction or a future among the stars?”

Part 2

Exercise I.

Identify the part of speech the words belong to.

shortsighted, fluke, periodic, catastrophic, empirical, inevitable technological, development, render, intelligent

Exercise II .

Form adverbs from the following words:

periodic, catastrophic, empirical, development, visible, universe, dark, wide, outward, natural

Exercise III.

Find synonyms to the following words. Translate them into Russian: shortsighted (2), deception(2), state-of-the-art (3), scan (3), fluke (4), periodic (4), catastrophic (4), empirical (4), development (4,) intelligent (4)

Exercise IV .

Find antonyms to the following words. Translate them into Russian: catastrophic (4), empirical (4), shortsighted (2), intelligent (4), sinister (4) quick (4), visible (4), outward (4)

Exercise V.

Match the words to make word combinations:

power	recognition
black	risks
human	channel
human	plant
cosmic	impacts

natural	holes
text	technology
asteroid	civilisation
computer	language
speech	vision

Exercise VI .

QUIZ (Cryptology)

Follow the history of codes from Roman times to the present

1) The 'Caesar Cipher' is also known as what?
A. Rot13
B. Rot3
C. Vigenère Cipher
D. RSA

2) What is special about Rot13?
A. There is no way to decode something encoded with it
B. It is an unlucky function
C. The same operation both encodes and decodes
D. It is difficult to break, even today

3)The Vigenère cipher could be described as what?
A. Another name for Rot13
B. Multiple Caesar ciphers with different rotations
C. Another name for the Affine cipher
D. None of these

4) Which of the following is an elegant technique used to break substitution ciphers?
A. Brute force
B. Frequency analysis
C. Random chance

D. One-time pads

5) What is the effective key size for DES (the Data Encryption Standard)?
A. 64 bits
B. 56 bits
C. 96 bits
D. 128 bits

6) How many key sizes are standard for AES (the Advanced Encryption Standard)?
A.Three
B. Two
C. One
D. Four

7) To generate a pair of RSA (an encryption method named for its inventors: Ron Rivest, Adi Shamir, and Leonard Adleman) keys, what do you need to have?
A. Two prime numbers
B. Two coprime numbers and a prime number
C. Two prime numbers and a modulus
D. Three coprime numbers

8) Which of the following is a substitution cipher?
A. Affine
B. AES
C. DES
D. RSA

9) Quantum computers are supposed to be able to break advanced systems with large keys, like AES and RSA. Why?
A. Quantum computer programmers are smarter
B. Quantum means magical
C. They can calculate many possibilities at once
D. They have higher cycle counts

4. Crimes of the future

Part 1

Exercise I.

Say what Russian words help to guess the meaning of the following words: algorithms, analyse, data, mathematical, address, system, effectively, surprise, test

Exercise II

Make sure you know the following words and word combinations.
crime data, mathematical modeling, criminal activity, predictive policing, to fight crime, to welcome the approach, to cut crime, to raise grave concerns about, civil rights, to anticipate, to single out, far-fetched, aftershock, to thwart, causation, incidence, oversight

Crimes of the future

Predictive policing uses algorithms to analyse data and cut crime. But does it really work, and should it be trusted?

In an age of anxiety, the words sound so reassuring: *predictive policing*. The first half promises an awareness of events that have not yet occurred. The second half clarifies that the future in question will be one of safety and security. Together, they perfectly match the current obsession with big data and the mathematical prediction of human actions. They also address the current obsession

with crime in the Western world. A system that effectively anticipated future crime could allow an elusive reconciliation, protecting the innocents while making sure that only the truly guilty are targeted. It is no surprise, then, that versions of predictive policing have been adopted in dozens of other US cities. These programs are finally putting the enticing promises to a real-world test. Based on statistical analysis of crime data and mathematical modelling of criminal activity, predictive policing is intended to forecast where and when crimes will happen. The seemingly unassailable goal is to use resources to fight crime and serve communities most effectively. Police departments and city administrations have welcomed this approach, believing it can substantially cut crime. But even if predictive policing cuts crime as claimed, which is open to question, it raises grave concerns about its impact on civil rights and minorities – especially after the fatal police shooting in 2014 of Michael Brown, an unarmed 18-year-old black man, in Ferguson, a suburb of St Louis in Missouri. Subsequent fatal interactions between police and minorities, including the deaths of several unarmed black citizens through police actions spotlight their ongoing troubled interactions. Predictive policing is likely to affect these issues by offering police new ways to seek and scrutinise criminal suspects without unfairly singling out minority communities. However, rather than allaying public concerns, it might end up increasing tensions between police and minority communities. The American Civil Liberties Union (ACLU) has issued multiple warnings that predictive policing could encourage racial profiling, and could finger individuals or groups selected by the authorities as crime-prone, or even criminal, without any

crime. Equally troubling, the approach is motivated by the reductive dream of solving social problems with computers. Like any technology, predictive policing is subject to the ‘technological imperative’, the drive to carry a technology to its ultimate without considering its human costs. Our society is supposed to be based on fair and equal justice for all but, to many critics, predictive policing relies on a contrary vision of targeted justice, meted out according to where and how citizens happen to live as determined by computer algorithm. The first step toward sorting out these issues is understanding the predictive process. One example is PredPol, the most widely used and publicised commercial predictive software, now operating in some 50 police departments around the US (including major cities such as Los Angeles and Atlanta) and in Kent in the UK. It works by combing through droves of old and new police records about type, place and time of crimes to analyse trends and to project upcoming criminal activity including property crime, drug activity and more. These results are used to highlight ‘hot spots’ 500 feet by 500 feet square, an area of several city blocks, that are likely to be the sites of certain crimes in the near future. Officers can then go out on daily patrol armed with these locations, instructed to give them extra attention with an eye for criminal activity. Statistical modelling of criminal behaviour might seem far-fetched, but we encounter statistical distributions of human characteristics all the time. Criminal actions betray their own statistical patterns. Consider burglaries: we don’t know when or where a specific burglary will happen, but statistical analysis has shown that, once it does, other burglaries tend to cluster around it. Statistics-based policing leads to the understandable fear that it will turn

into automated ‘policing by algorithm’, though police departments have been using statistics for a long time, largely due to Bratton. In 1994, during his first tour as NYPD commissioner, he introduced CompStat, a tool to track crime statistics. The experiment was widely considered a success, as crime rates fell substantially (though they dropped in many other large cities too). By 2008, as the Los Angeles chief of police, he was suggesting that compiled data could be used to predict crime, and worked within LAPD and with federal agencies to develop this approach. The project received considerable media coverage that soon converged on the PredPol software, whose roots in Los Angeles gave it a strong early connection to LAPD. (1)

These roots have academic origins that go back to the anthropologist Jeffrey Brantingham at the University of California, Los Angeles, who studies how people make choices within complex environments. In the field, this might mean examining how tribal hunter-gatherers find their next meal. Applying his knowledge to criminal behaviour, Brantingham concluded that urban criminals use similar processes when they choose homes to burgle or cars to steal. To turn this insight into a predictive model embodying ‘good social science and good math’, as Brantingham puts it, he recruited several UCLA mathematicians to work on the problem in 2010 and 2011. One of them, George Moler (now at Santa Clara University in California), found a promising approach. As he explains it, human behaviour often shows ‘a well-defined underlying statistical distribution’. Knowing the distribution and drawing on past records, a data scientist can develop algorithms that give ‘fairly accurate estimates of the probability of

various behaviours, from clicking on an ad to committing, or being the victim of, a crime'. Moler's big finding was that the statistical model that describes the aftershocks that follow earthquakes, also describes the temporal and geographic distributions of burglaries and other crimes. This result, published in the *Journal of the American Statistical Association* in 2011, is the basis of the algorithm at the heart of the PredPol software. In 2012, Brantingham and Moler founded and remain involved with the PredPol company in Santa Cruz, California. PredPol is not alone. Police departments can choose from among several competing products including HunchLab, whose development by the Philadelphia-based Azavea Corporation began in 2008. HunchLab is used in Philadelphia and in Miami and is under test by NYPD. This is emblematic of the rapid spread of predictive policing. According to the criminologist Craig Uchida: 'Every police department in cities of 100,000 people and up will be using some form of predictive policing in the next few years.' HunchLab combines several criminological models and data sets. Like PredPol, it seeks repetitive patterns; but according to HunchLab's product manager Jeremy Heffner, crimes such as homicide need more data to build a reliable model, since the algorithm applies mostly to property crimes. HunchLab adds risk terrain modelling, which correlates where crimes happen with specific types of locations such as bars and bus stops; temporal and weather data, such as season of the year and temperature; and what HunchLab describes, without particulars, as 'socioeconomic indicators' and 'historic crime levels'. As noted by Andrew Ferguson, a legal scholar at the University of the District of Columbia, this extended model crosses an important line,

escalating from the property crime that PredPol emphasises to violent crime. HunchLab's analysis yields lists of types of crimes, from theft to homicide; their level of risk for different areas in a city; and recommendations about deploying police resources to counter these criminal activities. This information can be given to officers starting on patrol or, in what is a step beyond the PredPol approach, sent via mobile devices to officers in the field to manage them in real time based on their current locations. (2)

The looming question is, do PredPol and HunchLab really reduce crime? The answer so far is incomplete at best. PredPol publicises crime-reduction numbers that are, it says, the result of adopting its software but Azavea has not done so. Heffner says that the company focuses instead on learning how police departments use HunchLab to change officer behaviour or otherwise impact crime levels. Meanwhile, much of what we perceive about the value of predictive policing rests on PredPol's claims. These seemingly show great success. In Atlanta, crime fell by 8 per cent and 9 per cent in two police zones using the software but remained flat or increased in four zones without it; and the 19 per cent decrease in crime across the city was attributed mostly to PredPol. The company also cites double-digit percentage decreases in crime after the software entered service in smaller cities. Such numbers have impressed elected leaders in city halls across the US. Eager to find answers to both long-standing and current issues in policing, they have quickly adopted the predictive approach. In 2014, Atlanta's mayor Kasim Reed praised predictive policing in*The Wall Street Journal*, writing that Atlanta's use of PredPol resulted in crime

‘falling below the 40-year lows we have already seen’. He added: ‘In the future, police will perfect the use of predictive analytics to thwart crimes before they occur’ – this belief in the ‘unbiased’ nature of computer algorithms would seem to smooth out sharp political differences about crime levels in the US. PredPol is hardly an unbiased source, however, and the limited external analyses so far have not shown similar successes. In 2013, Chicago police used data to identify and put on a ‘hot list’ some 400 people considered likely to be involved in fatal shootings as shooters or victims. The number has since been raised to 1,400, many of whom have received ‘notifications’ – home visits by police to warn them they are known to the department. However, a just-published study shows that it did not reduce homicides. The report states that individuals on the hot list ‘are not more or less likely to become a victim of a homicide or shooting than the comparison group’, but they have a higher probability of being arrested for a shooting. (3)

The biggest dataset so far comes from a long-term study of PredPol as used by LAPD and the Kent police, published in 2015 in the *Journal of the American Statistical Association*. This is not an independent evaluation like the third-party reports, as would be the gold standard; five of its seven authors (including Brantingham and Moler) have or had connections to PredPol. Still, its peer review, design and statistical analysis make it worth consideration. From 2011 to 2013, the authors carried out a ‘double blind’ experiment. Officers going on patrol in both police departments were guided at random toward areas predicted either by the algorithm or by human crime-analysts. The type of information being used was unknown to each officer, and known to

only a few administrators. On average, the algorithm predicted nearly twice as much crime as the human analysts did. As officers increased patrol time on the algorithm hot spots, that correlated with an average 7 per cent decrease in crime. In contrast, patrol time spent on hot spots predicted by the analysts did not correlate with a statistically significant reduction in crime.These results carry caveats. If algorithm outdoes human analysts in predicting crime, that might be because it better integrates old and new data. But with only four human analysts of unknown effectiveness included in the study, the comparison is not wholly convincing. Also, the crime reduction should be considered in the context of the statistical truth 'correlation is not causation'. More patrol time on algorithm hot spots could indeed be reducing crime; then again, on days when there is little crime for whatever reason, officers could have more time to visit suspect areas. The 7 per cent correlation suggests that the algorithm is doing something right, but it is premature to assert that PredPol unquestionably reduces crime, and certainly not at the double-digit levels that PredPol reports. Nevertheless, PredPol is driven by data and should be judged by data. The results from this study in the field credibly show that the algorithm has some value, and that predictive policing is worth testing more fully to confirm its effectiveness in reducing crime. Even if that effectiveness were to become firmly established, questions remain about how the technology affects policing. PredPol sees positive results for police-community interactions, claiming that the software helps officers 'build relationships with residents to engage them in community crime-watch efforts'. Many activists, defenders of civil rights and legal experts see the opposite, that

predictive technology stokes community resentment by unfairly targeting innocent people, minorities and the vulnerable, and threatens safeguards against unreasonable search and seizure. These authors condemned the technology for its potential to send ‘a flood of officers into the very same neighbourhoods they’ve always over-policed’ and for its lack of transparency. Transparency is essential because much of the potential for abuse depends on the integrity of the data used by the predictive software. Skewed data would distort predictions and judgments about their value; but since police culture resists revealing its methods, crime data is generally closed to scrutiny. It is hard to determine if the incidence of crime has been underreported, as NYPD and LAPD have recently been caught doing, or if racial factors taint the data. PredPol and HunchLab state that they use no racial or ethnic information, but the data they do use might already embed racial bias that would carry forward in new crime predictions to further entrench the bias. Also unknown is how PredPol and HunchLab manipulate the data because their algorithms are proprietary, as are those used by other brands of predictive software. Issues with predictive methods are amplified in stop-and-frisk policing, where a police officer may stop and search anyone who shows ‘reasonable’ signs of criminal activity.This practice is highly controversial today. A majority of those stopped but mostly not arrested are black or Latino. In a recent *New York Times* forum, experts in policing and the law disagreed about whether stop-and-frisk truly reduces crime in New York City and elsewhere, or rather is ineffective and merely worsens the already poor relations between police and minority communities. Officers may therefore feel justified in

stopping people without ‘reasonable suspicion’, merely because of their presence in areas defined by predictive algorithms. Even without a full stop-and-frisk approach, predictive policing means that more people, whether innocent or guilty, are scrutinised in hot zones. Extending predictive policing to violent crime, as HunchLab does, greatly raises the stakes for trusting its recommendations. Raising even more concerns, Azavea is developing a HunchLab module that tracks ex-offenders to ‘predict the likelihood of each offender committing another crime and prioritise suspects for investigation in connection with new crime events’. (4)

Many of the problems with predictive policing seen so far arise from giving algorithms too much weight compared with human judgment; blindly following a computer program that directs more officers to a certain location at a certain time does nothing to guarantee fair and effective use of that force. Yet algorithms can augment human abilities rather than replace them. For officers on the street, we might find that combining personal experience with guidance from predictive software enables them to deal better with what they encounter daily. Therefore, besides conducting further testing to determine the true effectiveness of predictive policing, we need to train police officers in how best to blend Big Data recommendations with their own street knowledge. In that regard, the challenges of computer-guided policing are not fundamentally different from those of earlier statistical approaches, with one caveat: the actions of officers in the street responding to computer output in real time are harder to control than thoughtful long-term analysis of statistical trends. As Kipperman and

Ferguson point out, special measures are needed such as an outside organisation to audit crime data, correct errors and bias, and acknowledge them when they are found; further studies of the social science and criminology behind predictive policing; accountability at the internal police level and the external community level; and an understanding that a focus on hot spots and statistics diverts attention from examining the root causes of crime. Kipperman proposes that predictive policing could be separated from police departments altogether and carried out instead by 'independent and neutral agencies', to reduce external pressures and maintain human rights. Sensible and just as these recommendations are, however, it is difficult to see how the necessary new structures would be built and administered. Like other new technologies in the digital age, the predictive approach follows its own imperatives. Ferguson worries that the appeal of a data-driven approach might have 'overwhelmed considerations of effectiveness and ignored considerations of fairness or justice'. Surely, if any technology requires careful scrutiny, it is one that directly affects people's lives under our justice system. With the will to put proper oversight in place – and with appropriate efforts from the police, the courts and civil rights advocates– maybe we can ensure that the benefits of predictive policing exceed its costs. (5)

Adapted from Aeon.

Exercise III.

Find paragraphs, dealing with the following: unassailable, grave, unarmed, spotlight, scrutinize, allaying, racial profiling, human costs, criminologist, patrol

Exercise IV.

Fill in the gaps according to the text.

1. Based on statistical analysis of crime data and mathematical modelling of criminal activity, predictive …….. is intended to forecast where and when crimes will happen.
2. The seemingly …… goal is to use resources to fight crime and serve communities most effectively.
3. Police departments and city administrations have welcomed this approach, believing it can substantially…….. crime.
4. But even if predictive policing cuts crime as claimed, …....., it raises grave concerns about its impact on civil rights and minorities – especially after the fatal police shooting in 2004 of Michael Brown, an unarmed 18-year-old black man, in Ferguson, a suburb of St Louis in Missouri.
5. Subsequent fatal interactions between police and……, including the deaths of several unarmed black citizens through police actions spotlight their ongoing troubled interactions.
6. Predictive policing is likely to affect these issues by offering police new ways to seek and …… criminal suspects without unfairly singling out minority communities.
7. However, rather than allaying public concerns, it might end up increasing tensions between police and minority…….

8. The American Civil Liberties Union (ACLU) has issued multiple warnings that predictive policing could encourage racial profiling, and could finger individuals or groups selected by the authorities as…….. , or even criminal, without any crime.

9. Equally troubling, the approach is motivated by the reductive dream of solving social problems with…… .

10. Our society is supposed to be based on fair and equal justice for all but, to many critics, predictive policing relies on a contrary vision of targeted justice, meted out according to where and how citizens happen to live as determined by computer…… .

Exercise V.

Make up sentences of your own with the following word combinations:
crime data, mathematical modeling, criminal activity, predictive policing, to fight crime, to serve communities, to welcome this approach, to cut crime , to raise grave concerns about, civil rights

Exercise VII.

Determine whether the statements are true or false. Correct the false statements:

1. Based on statistical analysis of crime data and mathematical modelling of criminal activity, predictive policing is intended to forecast where and when crimes will happen.
2. Police departments and city administrations have welcomed this approach, believing it can substantially cut crime.
3. But even if predictive policing cuts crime as claimed, which is open to question, it raises grave concerns about its impact on civil

rights and minorities – especially after the fatal police shooting in 2004 of Michael Brown, an unarmed 18-year-old black man, in Ferguson, a suburb of St Louis in Missouri.

4. Subsequent fatal interactions between police and minorities, including the deaths of several unarmed black citizens through police actions spotlight their ongoing troubled interactions.
5. The American Civil Liberties Union (ACLU) has issued multiple warnings that predictive policing could encourage racial profiling, and could finger individuals or groups selected by the authorities as crime-prone, or even criminal, without any crime.
6. Equally troubling, the approach is motivated by the reductive dream of solving social problems with computers.
7. Like any technology, predictive policing is subject to the 'technological imperative', the drive to carry a technology to its ultimate without considering its human costs.
8. Our society is supposed to be based on fair and equal justice for all but, to many critics, predictive policing relies on a contrary vision of targeted justice, meted out according to where and how citizens happen to live as determined by computer algorithm.
9. As officers increased patrol time on the algorithm hot spots, that correlated with an average 7 per cent increase in crime.
10. The 5 per cent correlation suggests that the algorithm is doing something right, but it is premature to assert that PredPol unquestionably reduces crime, and certainly not at the double-digit levels that PredPol reports.

Exercise VII .

Match the words to the definitions in the column on the right:

patrol	illegal activities
criminologist	the official organization that is responsible for protecting peopleand property, making people obey the law, finding out about andsolving crime, and catching people who have committed a crime
violent	fairness in the way people are dealt with
court	knowledge that something exists, or understanding of a situationor subject at the present time based on information or experience
algorithm	someone who studies crime and criminals
technology	causing hurt
police	a set of mathematical instructions or rules that,especially if given to acomputer, will help to calculatean answer to a problem
awareness	(the study and knowledge of) the practical, especially industrial, use of scientific discoveries
crime	a place where trials and other legal cases happen, or the people present in such a place, especially the officials and those deciding if someone is guilty
justice	to go around an area or abuilding to see if there is

	any trouble or danger

Exercise VIII .

Summarize the article " Crimes of the future."

Part 2

Exercise I.

Identify the part of speech the words belong to.

justice, awareness, victim, homicide, violent, criminologist, subsequent, fatal, interaction, minority

Exercise II .

Form adverbs from the following words:

mathematical (1), subsequent (1), current (1), ultimate (1), equal (1), real (2), perfect (3), statistical (3), essential (3), independent (5)

Exercise III.

Find synonyms to the following words. Translate them into Russian:

awareness (1), subsequent (1), violent (4), justice (5), independent (5), reduce (5), external (5), effectiveness (5), ignore (5), consideration (5)

Exercise IV .

Find antonyms to the following words. Translate them into Russian:

awareness (1), subsequent (1), violent (4), victim (3), independent (5), reduce(5), external (5), effectiveness (5), ignore (5), maintain (5)

Exercise V.

Match the words to make word combinations:

black	department
civil	administration
city	citizens
police	rights
unassailable	data
predictive	communities
criminal	goal
mathematical	policing
crime	activity
minority	modelling

Exercise VI .

QUIZ (Basic computer security)

1) McAfee, the internet security company, became a subsidiary of which of these in 2011?
A. Intel
B. Microsoft
C. Dell
D. IBM

2) Which of the following types of attacks do hackers use to gain information from you without the use of specialized computer programs?
A. SQL Injection
B. ARP Poisoning
C. Social Engineering
D. Cross Site Scripting

3)Which of these services was originally designed for network administrators to work remotely on different computers in their network but is now mostly used by malicious hackers?
A. Telnet
B. POP3
C. SMTP
D. ICMP

4) Which of the following isn't a type of hacker?
A. Grey Hat Hackers
B. White Hat Hackers
C. Black Hat Hackers
D. Brown Hat Hackers

5) On most home computers, how often should you update your operating system and security software?
A. Once a month
B. You don't need to update your system
C. Three times a week
D. At least once a week

6) Which of the following software programs would not help you in protecting your computer?
A. Microsoft Baseline Security Analyzer
B. Sygate Personal Firewall
C. Napster
D. Norton AntiVirus

7)Which of the following software programs' main function is typically to enable an attacker to have a complete control of their victim's PC?
A. A computer virus
B. A Trojan horse
C. A computer worm
D. AGP Accelerated Port

8) Is encryption of your data an unnecessary security precaution that can be ignored?
A. Yes
B. No

9) The Morris worm, which was the first worm to spread in the wild extensively, was originally written not to cause damage, although due to the bugs that were found in its code, it caused so much damage on the Internet that it was also referred to as the "Great Worm."
A. Yes
B. No

10) Computer worms, viruses, as well as Trojans are generally grouped into one big group. What is this group called?