

Kognitív számítógépek

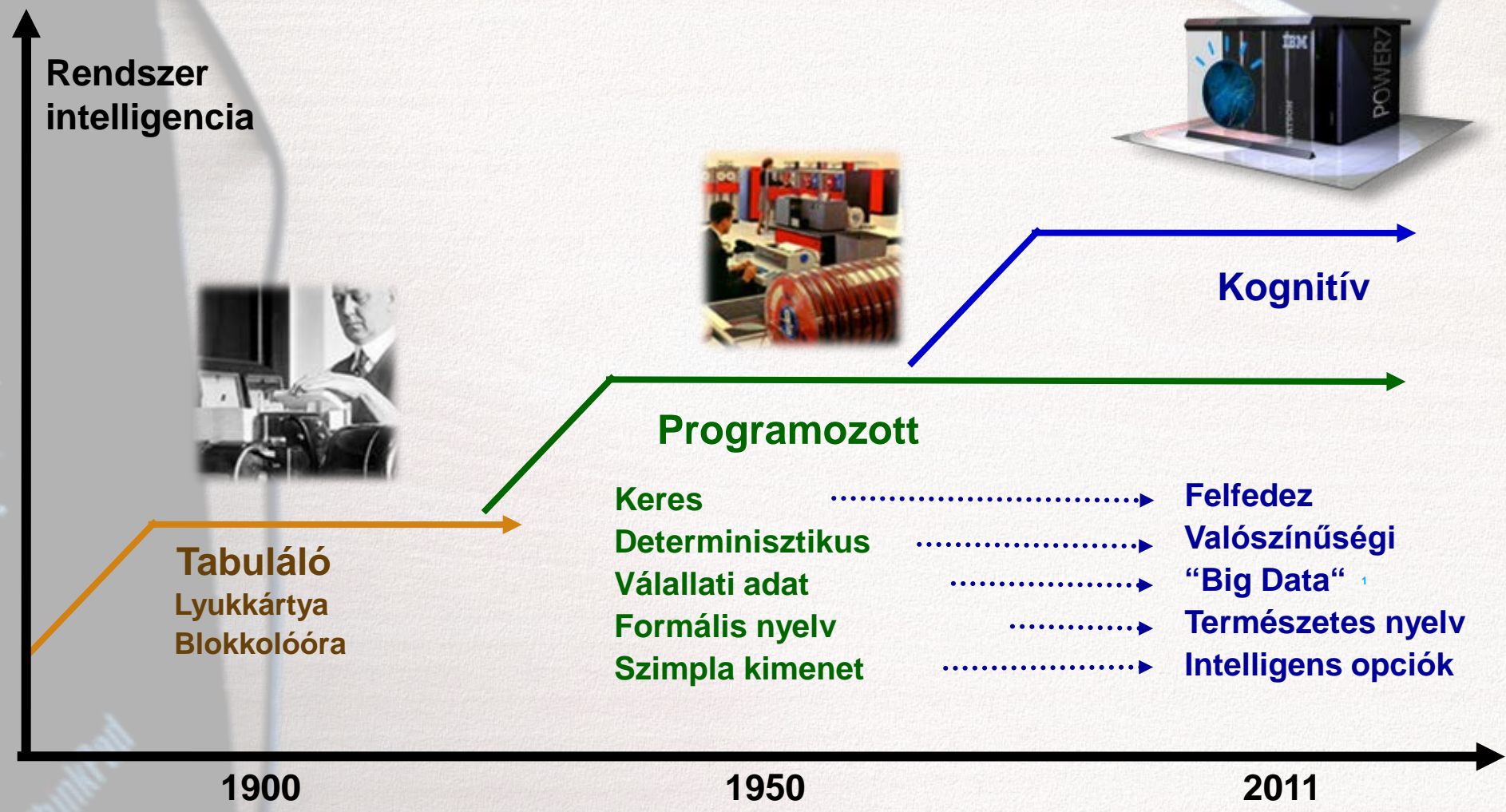
Új távlatok az (orvosi) informatikában



Gépi gondolkodás?



Kognitív korszak



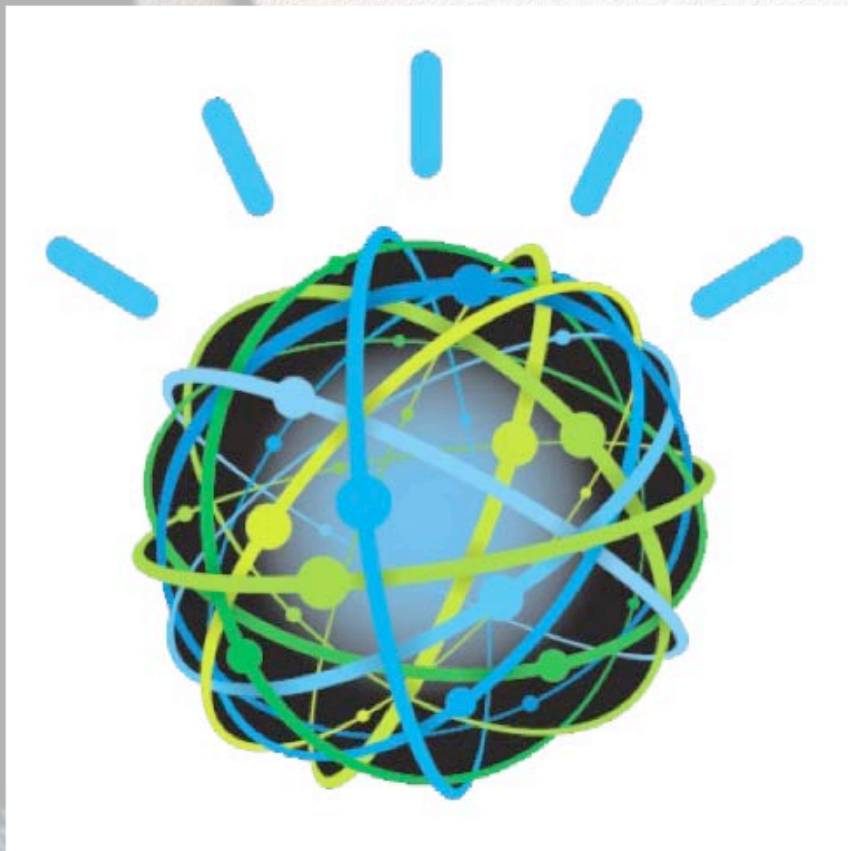
Tabuláló
Lyukkártya
Blokkolóóra

Programozott

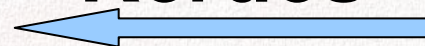
- | | | |
|-------------------------|--------|---------------------------|
| Keres |▶ | Felfedez |
| Determinisztikus |▶ | Valószínűségi |
| Vállalati adat |▶ | “Big Data” |
| Formális nyelv |▶ | Természetes nyelv |
| Szimpla kimenet |▶ | Intelligens opciók |

Kognitív

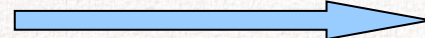
Deep QA ↔ keresés



Kérdés



Válasz



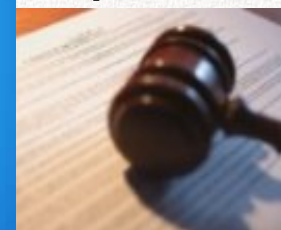
Ember+gép



Természetes nyelv



Gépi tanulás



**Hipotézis, bizonyíték,
felfedezés, döntés**

Watson "teste"



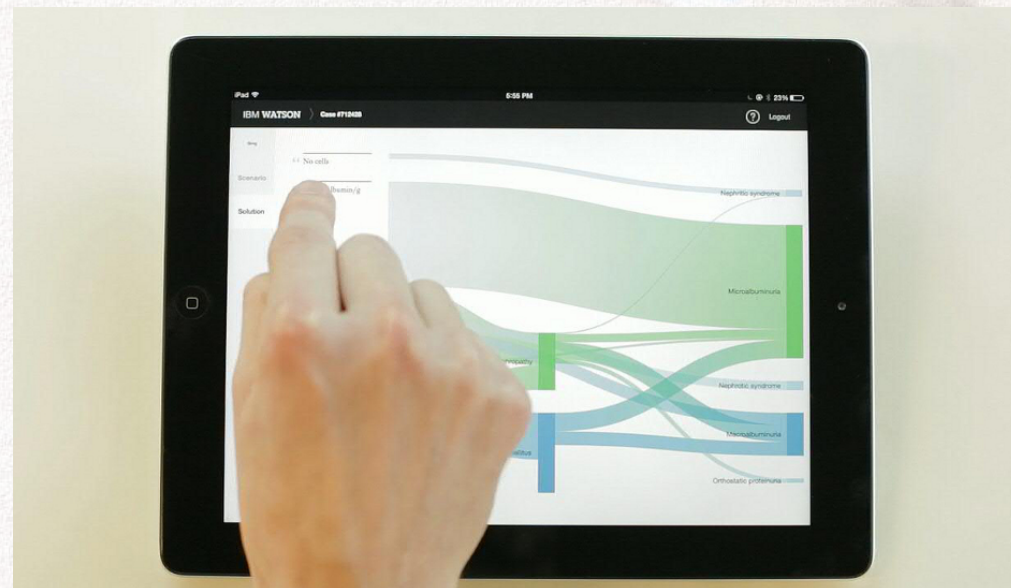
Watson alkalmazásai

- Ügyfélszolgálat
- Pénzügyi tanácsadás
- Kutatás
- Egészségügy



Watson az egészségügyben

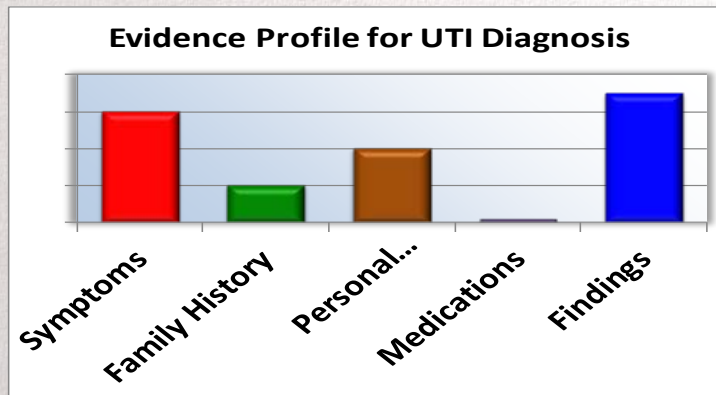
- Oktatás
- Ellátás
 - diagnózis
 - terápia





Dr. Watson


A 58-year-old woman presented to her primary care physician after several days of symptoms including **mouth, increased thirst, and frequent urination**. She had also had a **fever and "stuck" when she was swallowing**. She reported no **pain** in her abdomen, back, or chest, as well as **shortness of breath, diarrhea, or dysuria**. Her family history included **oral and esophageal candidiasis** in two sisters, **hemochromatosis** in one sister, and idiopathic **hypertension** in one sister. Her history was notable for **cutaneous lupus, hyperlipidemia, osteoarthritis, and recurrent urinary tract infections**, three uncomplicated cesarean sections, a left oophorectomy, and **hypothyroidism**, which had been diagnosed a year earlier. Her medications included **hydroxychloroquine, pravastatin, and alendronate**. A **urine dipstick was positive for leukocytes and nitrites**. The patient was given a prescription for ciprofloxacin for a urinary tract infection and advised to drink plenty of fluids. On a follow-up visit with her physician 3 days later, she reported continued weakness and dizziness despite drinking a lot of fluids. Her **supine blood pressure was 120/80 mm Hg**, and her **pulse was 88 beats per minute**. Her **systolic blood pressure was 84 mm Hg**, and her **pulse was 92 beats per minute**. Her **urine culture at her initial presentation had been cultured and grew more than 100,000 colony forming units of E. coli** is sensitive to ciprofloxacin.



Wellpoint Interactive Care

Watson onkológiai asszisztens:

- **Betegadatok, klinikai jegyzetek, tesztek, jelentések szintetizálása**
- **Hiányzó adatok azonosítása, tesztek javaslása**
- **Bizonyíték-alapú kezelési opciók összeállítása**

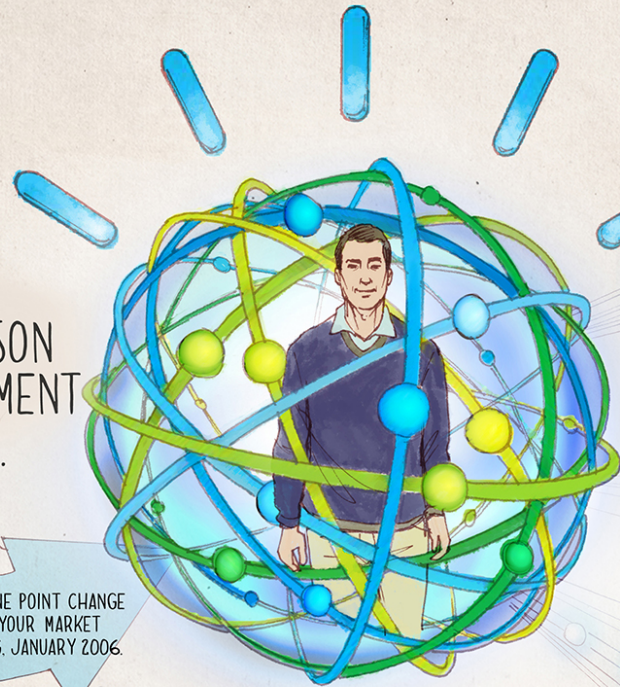
Treatment Plan	Confidence	Patient Preferences Match	
Treatment plan 1 Systemic Chemo: Cisplatin, Pemetrexed, Bevacizumab	95% 	Acceptable match with patient preferences	 EVIDENCE
Treatment plan 2 Systemic Chemo: Carboplatin, Paclitaxel, Bevacizumab	45% 	Unacceptable match with patient preferences	 EVIDENCE
Treatment plan 3 Systemic Chemo: Erlotinib	8% 	Preferred match with patient preferences	 EVIDENCE

Watson Engagement Advisor

DON'T JUST MEET CUSTOMERS' EXPECTATIONS. EXCEED THEM.



MEET
IBM WATSON
ENGAGEMENT
ADVISOR.



CUSTOMERS TODAY WANT MORE. DEMAND MORE. EXPECT MORE. YOURS INCLUDED.

COMPANIES THAT SATISFY MORE, WIN MORE. A ONE POINT CHANGE IN CUSTOMER SATISFACTION = 4.6% CHANGE IN YOUR MARKET VALUES. ACCORDING TO JOURNAL OF MARKETING, JANUARY 2006.

COGNITIVE TECHNOLOGY THAT THINKS AND BRIDGES THE GAP BETWEEN WHAT YOUR CUSTOMERS EXPECT AND THE SERVICES THAT YOU PROVIDE

WATSON ENGAGEMENT ADVISOR CAN:

- COMMUNICATE WITH CUSTOMERS IN NATURAL LANGUAGE
- LEARN FROM CUSTOMERS WITH EACH NEW INTERACTION

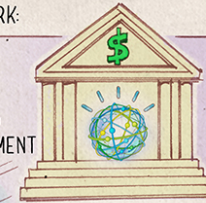
TO HELP YOUR BUSINESS:



- ENGAGE CUSTOMERS IN WAYS THEY LIKE
- EMPOWER CUSTOMERS AT THE POINT OF ACTION

EXAMPLES OF HOW IT CAN WORK:

BANK CUSTOMERS CAN USE WATSON TO BETTER UNDERSTAND THINGS LIKE RETIREMENT PLANNING.



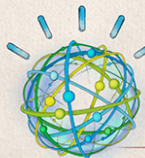
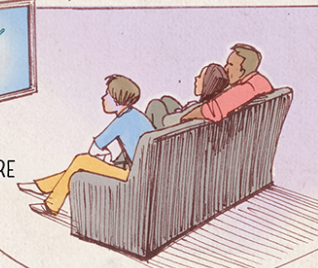
"WE'RE EXCITED TO EXPLORE HOW WATSON CAN HELP OUR EMPLOYEES PROVIDE BETTER ADVICE, FASTER, WITHOUT HAVING TO NAVIGATE THROUGH A LARGE DATABASE SEARCHING FOR ANSWERS" - ROYAL BANK OF CANADA



MOBILE CUSTOMERS ON THE GO CAN HAVE ISSUES RESOLVED FASTER WHEN REPS USE WATSON TO TROUBLESHOOT PROBLEMS.



CLIENTS AT COMPANIES SUCH AS NIELSEN CAN CREATE MORE EFFICIENT AND EFFECTIVE MEDIA PLANS.



WATSON'S THOUGHT PROCESS:

- IT UNDERSTANDS THE REQUEST IN CONTEXT
- IT GENERATES AND EXPLORES HYPOTHESES AGAINST THE DATA
- IT EVALUATES THOSE HYPOTHESES BASED ON MORE DATA
- IT LEARNS FROM ITSELF AS ONLY WATSON CAN DO
- IT THEN SHARES WITH YOU WHAT IT "THINKS"
- ALL IN SECONDS. ALL IN PLAIN ENGLISH

WATSON ENGAGEMENT ADVISOR. HOW MIGHT WATSON EMPOWER YOUR CUSTOMERS - AND YOU?





IBM WATSON

Watson Discovery Advisor

DISCOVER NEW INSIGHTS
LOCKED AWAY IN MILLIONS
OF PAGES. IN SECONDS.



IF YOU'RE
LIKE MANY
ORGANIZATIONS,
INSIGHT IS HARD
TO COME BY.



THE PROCESS IS
MANUAL AND SLOW.
IT'S FRAGMENTED
AND PIECE MEAL.
IT'S LIMITED TO A
NARROW POINT OF
VIEW. IN A WORD,
IT'S OUTDATED.

INTRODUCING IBM WATSON DISCOVERY ADVISOR.



WHEN INDUSTRIES
NEED ANSWERS,
WATSON DELIVERS
INSIGHTS YOU CAN
ACT ON. FASTER.

YOU ASK THE QUESTION. WATSON DISCOVERY
ADVISOR LOOKS FOR PATTERNS. THEN PROVIDES
RELEVANT RESPONSES BACKED BY EVIDENCE. ALL
OF WHICH CAN HELP YOU UNCOVER WHAT'S
LIKELY NEVER BEEN DISCOVERED.

IN THE PAST, TOOLS
PROVIDED A LIST OF
DOCUMENTS TO GO
THROUGH MANUALLY.
NOW WATSON CAN
SYNTHESIZE MILLIONS
OF PAGES FOR INSIGHT
WHERE IT'S NEEDED MOST.

IMAGINE INSTEAD
INSIGHT FROM
MILLIONS OF
PAGES. IN SECONDS
WITH TIMELY
UPDATES.



ACCELERATING
BREAKTHROUGHS
IN CLINICAL TRIALS
WITH THE GOAL OF
IMPROVING CARE.



"WATSON IS A POWERFUL TECHNOLOGY THAT
CAN HELP CLINICIANS RESEARCH MORE
HIGHLY TARGETED CLINICAL INFORMATION
TO IMPROVE OUTCOMES."
- ELSEVIER CLINICAL SOLUTIONS

ASSISTING WITH NEW DRUG
DISCOVERY IN PHARMA TO HELP
COMBAT DISEASE AND EASE PAIN.



EXPANDING RESEARCH
POSSIBILITIES IN EDUCATION
WITH UNIVERSITIES SUCH AS
NORTH CAROLINA STATE.



WATSON DISCOVERY ADVISOR.
WHAT MIGHT YOU DISCOVER NEXT?



IBMWATSON.COM

#1 Tapintás



Touch Part 1 of 5

5 PREDICTIONS THAT WILL CHANGE
OUR LIVES IN 5 YEARS.



WHAT MAKES DIFFERENT SURFACES
FEEL DIFFERENT TO THE TOUCH?

THE SURFACES OF
EVERYDAY OBJECTS
FORM A
**microscopic
landscape**
OF NEARLY ENDLESS
VARIETY.



AS OUR FINGERS **press, probe** OR **pass over**
OBJECTS, OUR NERVES
GENERATE PATTERNS OF
**ELECTRICAL
IMPULSES**
WHICH OUR BRAINS CAN
INTERPRET - CREATING
THE SENSATION OF TOUCH.



SOON **COGNITIVE COMPUTING** SYSTEMS
WILL BE ABLE TO UNDERSTAND THE WAY OUR
BRAINS EXPERIENCE TOUCH - AND RE-CREATE THAT
EXPERIENCE WITH LIFELIKE PRECISION USING
VIBRATION, PRESSURE AND MOVEMENT.

IN THE **FUTURE** ...

ONLINE SHOPPERS
WILL FEEL THE
QUALITY AND
FLOW OF A
GARMENT BY
STROKING A
PICTURE OF IT
ON THE SURFACE
OF THEIR PHONE.



ARTISANS
IN DEVELOPING
COUNTRIES WILL
ACCESS NEW
MARKETS BY
INVITING RETAILERS
TO EXPERIENCE
THEIR WARES
ONLINE.



DOCTORS
WILL BE ABLE TO
PROVIDE **HANDS-ON**
EXAMINATIONS
TO PATIENTS
IN REMOTE
LOCATIONS.

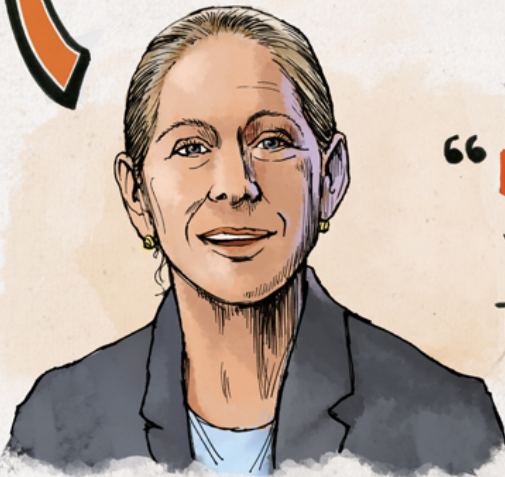


ADVANCED APPLICATIONS
WILL COMBINE TOUCH
WITH OTHER SENSES
TO DETERMINE,
FOR EXAMPLE, IF A
DRIVER IS TOO
TIRED TO DRIVE.



“ **FIVE YEARS FROM NOW,**
YOU WILL BE ABLE TO TOUCH
THROUGH YOUR PHONE. ”

ROBYN SCHWARTZ
RETAIL INDUSTRY EXPERT, IBM



#2 Látás

15 IN 5

Sight
Part 2 of 5

5 PREDICTIONS THAT WILL CHANGE OUR LIVES IN 5 YEARS.



HOW DO YOU KNOW?
FROM EXPERIENCE

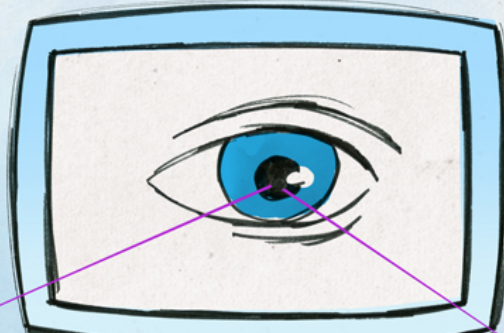
CAN YOU TELL...
A BEACH...



... FROM A SANDBOX?



TODAY'S COMPUTERS HAVE NO ABILITY TO UNDERSTAND THE CONTENT OR CONTEXT OF IMAGES. INSTEAD THEY MUST RELY ON TAGS OR TITLES PROVIDED BY HUMANS.



WHY

TEACH A COMPUTER TO SEE?



BECAUSE TODAY MUCH OF THE WORLD'S DATA IS CONTAINED IN IMAGES.

IN THE FUTURE ...



IS IT A FRECKLE OR SOMETHING MORE?

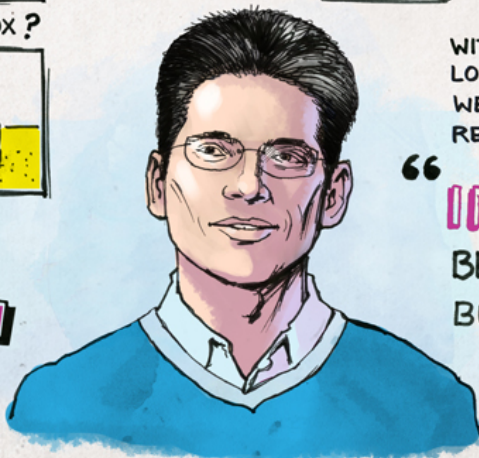
COMPUTERS WILL SCAN MEDICAL IMAGES TO HELP DOCTORS SEE PROBLEMS SOONER.

- COLOR
- SHAPE
- PATTERN
- DENSITY
- TEXTURE
- CONTEXTUAL RELATIONSHIPS



WITH COGNITIVE COMPUTING, HUMANS WILL NO LONGER NEED TO IDENTIFY IMAGES FOR COMPUTERS. INSTEAD, WE WILL SHOW THEM EXAMPLES AND THEY WILL LEARN TO RECOGNIZE NEW IMAGES FOR THEMSELVES.

“ IN FIVE YEARS, COMPUTERS WILL BE ABLE TO NOT ONLY LOOK AT IMAGES ... BUT UNDERSTAND THEM. ”



DR. JOHN R. SMITH
SENIOR MANAGER
INTELLIGENT INFORMATION MANAGEMENT, IBM



FIRST RESPONDERS WILL USE SYSTEMS THAT OBSERVE ACTION IN REALTIME, NOTICE WHEN SOMETHING IS WRONG AND COORDINATE A RESPONSE.



COMPANIES WILL OFFER INDIVIDUALIZED PRODUCTS AND SERVICES BASED ON THE PHOTOS YOU PIN, POST OR SHARE.

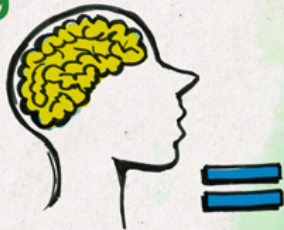


#3 Hallás



Hearing Part 3 of 5

5 PREDICTIONS THAT WILL CHANGE OUR LIVES IN 5 YEARS.



IN THE FUTURE ...

A BABY MONITOR WILL TELL YOU WHY THE BABY IS CRYING.

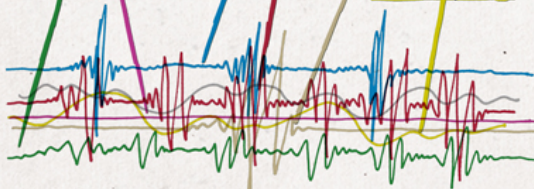
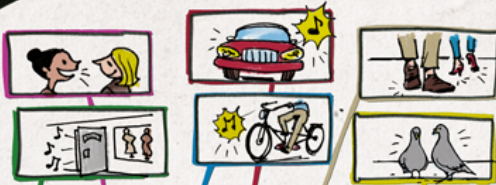


COMPUTERS WILL PREDICT MUDSLIDES AND FLOODS WITH SENSORS THAT HEAR THE TINY MOVEMENTS OF A MOUNTAIN.



SENSORS CAN HELP US HEAR PROBLEMS IN REMOTE PLACES, LIKE MOUNTAINS AND WATERWAYS.

OUR BRAINS CAN RECOGNIZE PATTERNS IN UNDIFFERENTIATED SOUND TO TELL US WHAT IS IMPORTANT.



THE WORLD IS AWASH IN SOUND.

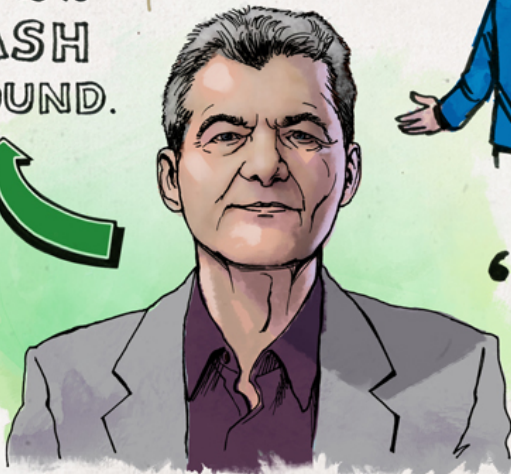
SOON COGNITIVE SYSTEMS WILL BE ABLE TO UNDERSTAND SOUNDS THE WAY OUR BRAINS DO. BUT WITH THEIR MASSIVE PROCESSING POWER AND VAST MEMORIES, THEY WILL BE ABLE TO GLEAN INSIGHTS FROM SOUNDS THAT OUR BRAINS CAN'T.



PHONES WILL HELP US SENSE MOODS BY DETECTING EMOTION IN OUR VOCAL PATTERNS.

“ IN FIVE YEARS, COMPUTERS WILL HEAR WHAT MATTERS. ”

DR. DIMITRI KANEVSKY
MASTER INVENTOR, IBM



#4 Ízlelés



Taste Part 4 of 5

5 PREDICTIONS THAT WILL CHANGE OUR LIVES IN 5 YEARS.

UNFORTUNATELY, OUR **LIFESTYLES HAVE EVOLVED** FASTER THAN OUR BRAINS.



WHEN FOOD WAS HARD TO COME BY, IT MADE SENSE TO EAT AS MANY CALORIES AS POSSIBLE.

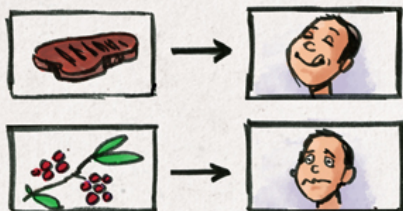


TODAY, FOOD IS MORE ABUNDANT, BUT OUR BRAINS STILL CRAVE HIGH-CALORIE FOODS.



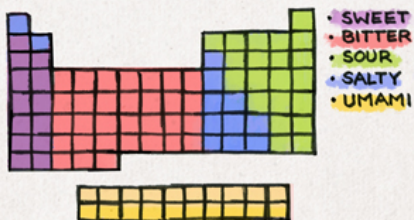
TASTES VARY AROUND THE WORLD: COGNITIVE SYSTEMS WILL LEARN TO ADAPT.

OUR SENSE OF TASTE HAS EVOLVED TO PROTECT US:



FOODS THAT CONTAIN THE MOLECULES OUR BODIES NEED TASTE GOOD, WHILE DANGEROUS COMPOUNDS OFTEN TASTE BITTER OR UNPLEASANT.

WHY DO SOME THINGS TASTE BETTER THAN OTHERS?



IN FIVE YEARS, **COGNITIVE** SYSTEMS WILL BE ABLE TO INVENT NEW RECIPES THAT APPEAL TO OUR SENSE OF TASTE - WHILE ALSO MEETING OUR NEED FOR FOODS THAT ARE HEALTHY, SUSTAINABLE AND AFFORDABLE.

IN THE FUTURE ...



PERSONALIZED WEB APPLICATIONS WILL OFFER **RECOMMENDATIONS** BASED ON OUR MEDICAL NEEDS AND FLAVOR PREFERENCES.

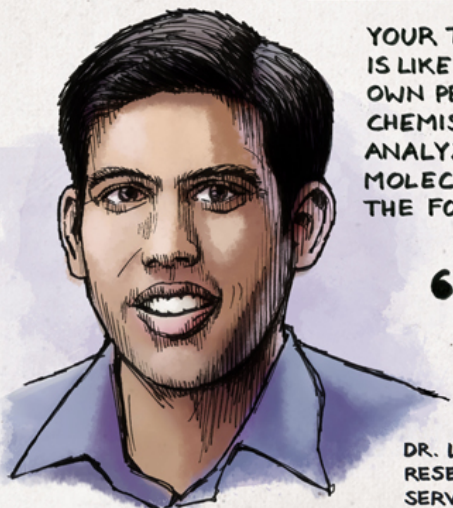
SCHOOL LUNCHES WILL BE **OPTIMIZED** FOR KIDS' PALETTES, MAKING VEGGIE DISHES ALMOST AS POPULAR AS DESSERT.



RECIPES WILL AUTOMATICALLY ADAPT TO INCORPORATE LOCAL, SEASONAL INGREDIENTS, MAKING AGRICULTURE MORE **SUSTAINABLE**.

“ **IN FIVE YEARS**, COMPUTERS WILL KNOW WHAT YOU LIKE TO EAT BETTER THAN YOU DO. ”

DR. LAV VARSHNEY
RESEARCH SCIENTIST
SERVICES RESEARCH, IBM

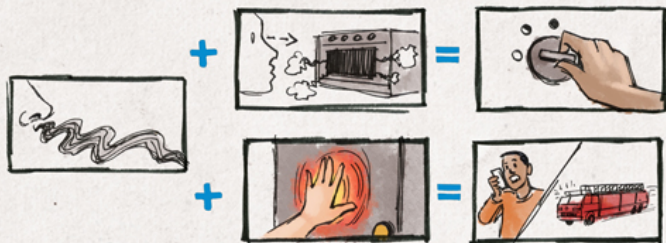


#5 Szaglás



Smell Part 5 of 5

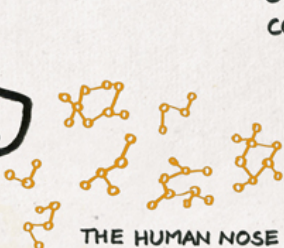
5 PREDICTIONS THAT WILL CHANGE OUR LIVES IN 5 YEARS.



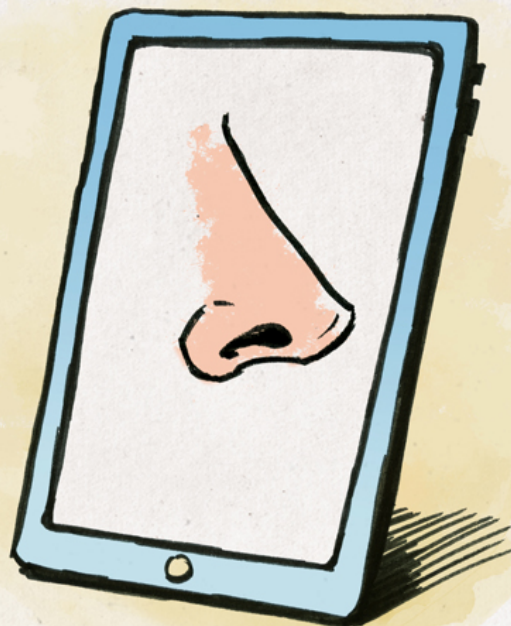
CONTEXT IS EVERYTHING:

OUR BRAINS COMBINE SENSE DATA FROM OUR NOSE WITH INPUT FROM OUR MEMORIES AND OUR OTHER FOUR SENSES TO HELP US MAKE DECISIONS.

HOW DO WE KNOW WHEN SOMETHING DOESN'T SMELL RIGHT?



THE HUMAN NOSE CAN DETECT UP TO A THOUSAND DIFFERENT CHEMICALS.



IN FIVE YEARS, **COGNITIVE COMPUTING** SYSTEMS WILL BE ABLE TO NOT ONLY RECOGNIZE ODORS, BUT PLACE THEM IN CONTEXT TO DRAW CONCLUSIONS AND TAKE ACTION.



FARMERS WILL PLANT SENSORS IN THEIR FIELDS TO SMELL WHEN THE CROPS ARE READY TO BE PICKED.

“ IN FIVE YEARS, COMPUTERS WILL HAVE A SENSE OF SMELL. ”

DR. HENDRIK HAMANN
RESEARCH MANAGER
PHYSICAL ANALYTICS, **IBM**



TINY SMELL **SENSORS** CAN BE PLACED IN PHONES, BUILDINGS, CARS - ALMOST ANYWHERE.

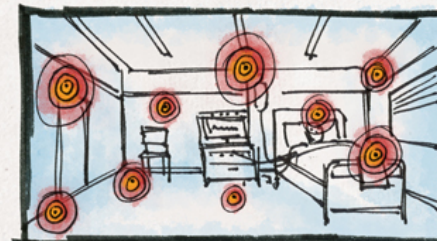
IN THE **FUTURE** ...



YOUR PHONE WILL BE ABLE TO SMELL WHEN YOU'RE GETTING SICK.



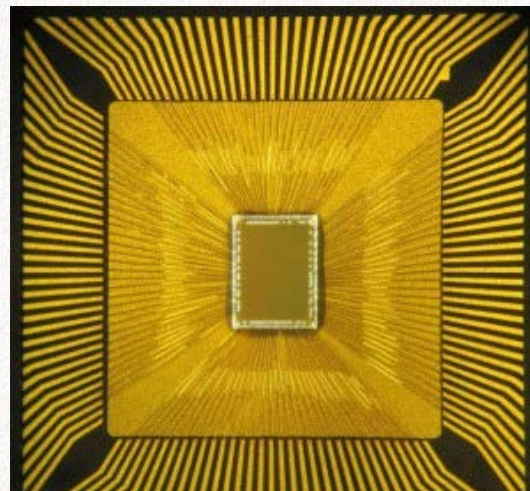
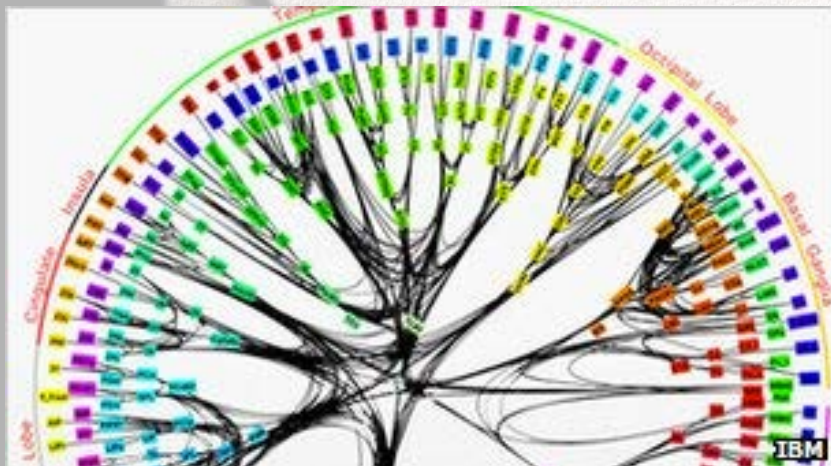
SENSORS WILL SNIFF OUT BACTERIA IN THE FOOD SUPPLY, **PREVENTING OUTBREAKS.**



HEALTHCARE FACILITIES WILL BE INSTRUMENTED WITH SENSORS TO **DETECT INFECTIONS.**

SyNAPSE – Systems of Neuromorphic Adaptive Plastic Scalable Electronics

DARPA: 2 l, 1 kW, 10 Mrd idegsejt, 100 Mrd szinapszis

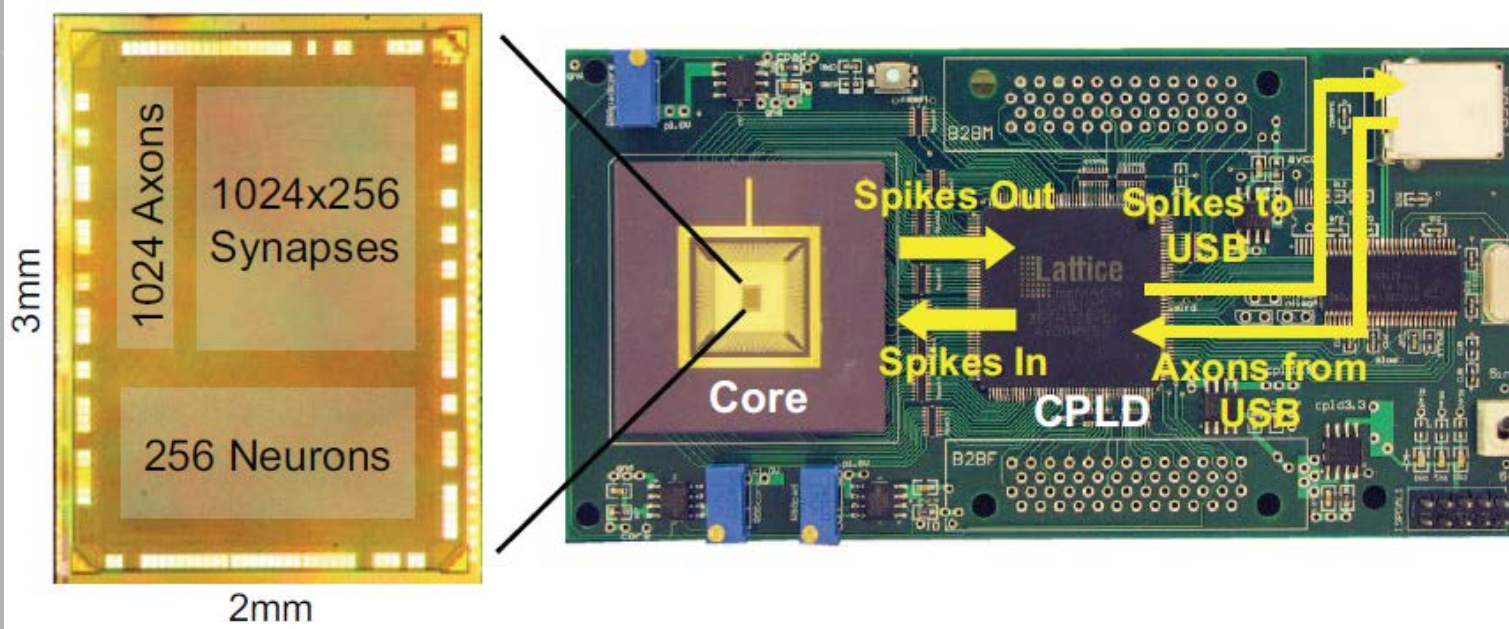


IBM szimuláció

2 Mrd idegsejt /
100 Mrd
szinapszis

BGQ (1.5M mag,
1.5 PB memria 6.3
M szál

Mindössze 1542-
szer lassabb a
valóságnál





IBM WATSON

K0570N0M 4 F1GY3LM3T !



ThinkPad