FEATURE ARTICLES

Beyond video games: New artificial intelligence beats tactical experts in combat simulation
PhysOrg.com, 27JUN2016

Researchers at the University of Cincinnati and their industry partner have developed an artificial system called ALPHA using a "Genetic Fuzzy Tree" (GFT) which is a subtype of fuzzy logic algorithms. To solve the processing challenge involved in handling hundreds of inputs, the system breaks up complex problems into many sub-decisions, and considers only the relevant variables for each sub-decision. Instead of numeric-based control, the team used language based control with if/then scenarios and rules that are able to encompass hundreds to thousands of variables. OPEN ACCESS TECHNICAL ARTICLE

Tags: Autonomous systems & robotics, Artificial intelligence, Featured Article

How well do facial recognition algorithms cope with a million strangers?

The MegaFace dataset contains 1 million images representing more than 690,000 unique people. It is the first benchmark that tests facial recognition algorithms at a million scale. Credit: University of Washington

PhysOrg.com, 23JUN2016
Researchers at the University of Washington conducted the MegaFace Challenge aimed at evaluating and improving the performance of face recognition algorithms at the million person scale. The algorithms were tested on verification and identification. All of the algorithms suffered in accuracy when confronted with more distractions, recognizing people across different ages and matching people who are in varying poses. OPEN ACCESS TECHNICAL ARTICLE

Tags: Imaging technology, Pattern recognition, Featured Article

S&T NEWS ARTICLES

ADVANCED MATERIALS

This message will self-destruct
Nanowerk, 27JUN2016

Using focused electron beam induced deposition (FEBID) a team of researchers in the US (Georgia Institute of Technology, AFRL,Wright Patterson AFB) has developed a "direct-write" additive lithographic technique that can be used to engineer nanoscale electronic properties of graphene. Researchers suggest the possibility of using FEBID for local "functional patterning" of other two-dimensional nanomaterials. TECHNICAL ARTICLE

Tags: Advanced materials

Borophene: A prospective extraordinary sodium anode material
Nanowerk, 23JUN2016

Finding a suitable anode material has been a long-standing critical task before the commercialization of sodium-based batteries. Researchers at Hong Kong University found that along the valley direction of borophene, the diffusion energy barrier for sodium is as low as 0.0019 eV, corresponding to ultrahigh sodium diffusivity, which is one to seven magnitudes higher than other previously reported 2D materials. TECHNICAL ARTICLE

Tags: Advanced materials, Battery

The discovery power of the gene chip is coming to nanotechnology
Nanowerk, 23JUN2016

To build the combinatorial libraries, researchers at Northwestern University used Dip-Pen Nanolithography to deposit onto a surface individual polymer "dots," each loaded with different metal salts of interest. The researchers then heated the polymer dots, reducing the salts to metal atoms and forming a single nanoparticle. The size of the polymer dot can be varied to change the size of the final nanoparticle. The libraries will enable scientists to rapidly make and screen millions to billions

of nanoparticles of different compositions and sizes for desirable physical and chemical properties.

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Artificial intelligence plus common sense

PhysOrg.com, 27JUN2016

Researchers in Austria used situation calculus to model deductions in a logic language that can describe the actions carried out by a given agent and their effects which enables robots to detect such errors and repair their belief system accordingly. They found that situation calculus can be used both for monitoring and diagnostic purposes as well as for autonomous decisions made by the robot. On the basis of knowing what the effect of a given action is, the robot learns to deduce what it needs to do next. The model has already proven successful in a trial. OPEN ACCESS TECHNICAL ARTICLE 1, OPEN ACCESS 2, 3, 4

Tags: Autonomous systems & robotics, Artificial intelligence

Infographic: The Future of Autonomous Underwater Vehicles

IEEE Spectrum, 27JUN2016

The development of AUVs has lagged because they face tough challenges unique to the aquatic environment. The first big problem is that water absorbs electromagnetic radiation waves, rendering conventional communication systems useless. This leads to the second big problem: navigation. Radio-based navigation systems such as GPS or radar are out. The infographic illustrates how AUVs may overcome these problems in the coming years.

Tags: Autonomous systems & robotics

Researchers creating improved interfaces to help machines and humans work together to complete

PhysOrg.com, 22JUN2016

To better understand the dynamics of trust between people and machines and accurately calibrate it, an international team of researchers (USA - MIT, Singapore) designed experiments involving human participants, explored how interface design could facilitate trust-reliability calibration and simulated a multi-task scenario involving search and detection tasks. The research could help inform robotics and artificial intelligence development across many domains, from military applications like the simulations in the experiments to medical diagnostics to airport security.

Tags: Autonomous systems & robotics, Artificial intelligence

Teaching machines to predict the future (w/ video)

MIT News, 22JUN2016

When we see two people meet, we can often predict what happens next. Researchers at MIT are developing an algorithm that can anticipate interactions more accurately than ever before. The algorithm employs techniques from deep-learning to teach computers to pore over massive amounts of data to find patterns on their own. Computer systems that predict actions would open up new possibilities ranging from robots that can better navigate human environments, to emergency response systems that predict falls.

Tags: Autonomous systems & robotics, Artificial intelligence

BIG DATA

Ten simple rules to use statistics effectively

PhysOrg.com, 20JUN2016

An international team of researchers (USA - Carnegie Mellon University, Johns Hopkins University, North Carolina State University, Harvard University, UC Berkeley, Canada) have published "Ten Simple Rules for Effective Statistical Practice" designed to help the research community—particularly scientists who aren't statistical experts or without a dedicated statistician as part of their team—understand how to avoid the pitfalls of well-intended, but inaccurate statistical reasoning. OPEN ACCESS TECHNICAL ARTICLE

Tags: Big data, Mathematics

BIOTECHNOLOGY

3D Brain-on-a-chip

Science Daily, 23JUN2016

To study brain cell's operation and test the effect of medication, the cells have to flourish within three-dimensional surroundings. Researchers in the Netherlands have developed a sieve with 900 openings, each of which has the shape of an inverted pyramid. On top of this array of pyramids, a micro-reactor takes care of cell growth. The technique has been tested with living cells from the brains of laboratory rats. Both the positioning of the cells and neuronal network growth have been tested.

Tags: Biotechnology

COMMUNICATIONS TECHNOLOGY

Whitepaper: Error-Free Communication in the Presence of Heavy Noise

IEEE Spectrum, 01MAR2016

This document highlights a new patented technology which proved, through a 1.2Vproof of concept system, that a BER=0, at 1Gbps and 100MHz channel, can be achieved even when Mean $S/(N+I)$ is near 0dB and Standard Deviation $S/(N+I)$ is as low as 1.8dB. *Free registration required to download the paper.* PAPER

Tags: Communications technology

> "There are three basic approaches to AI: Case-based, rule-based, and connectionist reasoning" MARVIN MINSKY

ENERGY

Eating air, making fuel
Science Daily, 23JUN2016

Researchers in Israel inserted the metabolic pathway for carbon fixation and sugar production into the bacterium E. coli, a known "consumer" organism that eats sugar and releases carbon dioxide. Although currently the bacteria release CO_2 back into the atmosphere, the team envisions that in the future their insights might be applied to creating microorganisms that soak up atmospheric CO_2 and convert it into stored energy or to achieving crops with carbon fixing pathways. OPEN ACCESS TECHNICAL ARTICLE

Tags: Energy

ENVIRONMENTAL SCIENCE

Better information needed to understand extreme weather
Science Daily, 23JUN2016

According to researchers in the UK, their annual report helps to explain if climate change has influenced either the magnitude or the probability of specific types of weather events. There is a wealth of data on extreme hot and cold events and they can be well captured in climate models. It is more difficult to examine extreme rainfall because there is a lack of accurate data, climate models can fail to represent them adequately, and their relationship with climate variability and change is often not well understood. TECHNICAL ARTICLE

Tags: Environmental science, Climatology

Warning from the past: Future global warming could be even warmer
Science Daily, 23JUN2016

The study by researchers in Denmark was based on reconstructions and climate modelling of a period of global warming 56 million years ago. In Palaeocene-Eocene Thermal Maximum (PETM) was triggered by massive releases of carbon into the atmosphere and climate researchers have long identified it as a time that could in some ways be analogous to today's global warming.

Tags: Environmental science, Climatology

Engineers develop new, low-cost way to capture carbon
Science Daily, 22JUN2016

A team of researchers in the US (Columbia University, Arizona State University) found that reducing water quantities in nanoconfinement could promote carbonate ions to hydrolyze H_2O into a larger amount of OH ions. This discovery also led the team to find a new nanostructured CO_2 sorbent that also binds CO_2 spontaneously in ambient air when the surrounding is dry, while releasing it when exposed to moisture. TECHNICAL ARTICLE

Tags: Environmental science

IMAGING TECHNOLOGY

Computer vision system studies word use to recognize objects it has never seen before
PhysOrg.com, 23JUN2016

The computer used by researchers in the UK for their study learned its vocabulary by being trained against all of the articles in Wikipedia and UMBC WebBase, a dataset with three billion English words. From those articles, it gleaned more than 300,000 object categories and discovered statistical associations between them. They found that semi-supervised, vocabulary-informed learning worked better and required fewer training examples than other learning techniques. OPEN ACCESS TECHNICAL ARTICLE

Tags: Imaging technology, Artificial intelligence

INFORMATION TECHNOLOGY

Analog computing returns
MIT News, 20JUN2016

In recent years, analog computers have proven to be much more efficient at simulating biological systems than digital computers. A team of researchers in the US (MIT, Dartmouth College) presented a new compiler for analog computers, a program that translates between high-level instructions written in a language intelligible to humans and the low-level specifications of circuit connections in an analog computer. The work could help pave the way to highly efficient, highly accurate analog simulations of entire organs, if not organisms. OPEN ACCESS TECHNICAL ARTICLE

Tags: Information technology

MICROELECTRONICS

The switch that could double USB memory
Science Daily, 24JUN2016

Researchers in Japan have developed a device that employs both magnetic and electronic signals, which could provide twice the storage capacity of conventional memory devices. In the two forms of strontium cobalt oxide, one is an insulating non-magnet while the other is a metal magnet. By changing the oxygen content in this compound, they could cause it to switch between the two forms. They developed a new method to use strontium cobalt oxide safely at room temperature in air.

Tags: Microelectronics, Information technology, S&T Japan

continued...

Remote control actuation goes down to the nanoscale

Nanowerk, 23JUN2016

An international team of researchers (Spain, the Netherlands) devised and demonstrated a novel approach to nanoactuation that relies on magnetomechanics instead of the conventional electromechanics utilized in micro and nanoactuated mechanical systems. The research opens up new avenues to future applications in biology, medicine and nano-robotics. TECHNICAL ARTICLE

Tags: Microelectronics, Nanotechnology

Tailored DNA shifts electrons into the 'fast lane'

Nanowerk, 20JUN2016

Scientists have theorized that over long distances electrons travel along DNA strands like particles, over shorter distances the electrons use their wave character. A team of researchers in the US (Duke University, Arizona State University) confirmed the theoretical predictions in their experiments tethering short DNA strands to eight guanine bases between two gold electrodes and measuring the amount of electrical charge flowing through the molecules. The findings provide insight into the design of tunable DNA nanoelectronics, and into the role of DNA electron transport in biological systems. TECHNICAL ARTICLE

Tags: Microelectronics

Featured Resource

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NEUROSCIENCE

Artificial synapse rivals biological ones in energy consumption

Science Daily, 20JUN2016

Using the e-Nanowire printing technique, researchers in South Korea have fabricated an organic nanofiber (ONF) that emulates morphology and important working principles and energy consumption of biological synapses. The energy consumption of the device can be reduced to a femtojoule level per synaptic event. The research opens new avenues for neuromorphic electronics and organic electronics. OPEN ACCESS

TECHNICAL ARTICLE
Tags: Neuroscience, Artificial intelligence

EvoNet: Evolutionary Synthesis of Deep Neural Networks

arXiv, 14JUN2016

Researchers in Canada synthesized deep neural networks via a novel evolutionary process from ancestor deep neural networks. The models are leveraged, along with computational environmental factor models, to synthesize new descendant deep neural networks with different network architectures in a random manner to mimic natural selection and random mutations. These 'evolved' deep neural networks (EvoNet) are then trained into fully functional networks. OPEN ACCESS TECHNICAL ARTICLE

Tags: Neuroscience, Artificial intelligence

PHOTONICS

New tool to measure polarization of light

Science Daily, 24JUN2016

The device, developed by researchers at North Carolina State University, incorporates three polarization detectors made of organic polymer conductors. Each of the detectors is sensitive to a specific orientation of polarization. As light enters the device, the first detector measures one orientation of the polarization, and the remainder of the light passes through. This is repeated with the subsequent detectors, effectively allowing each detector to take a partial polarization measurement of the same beam of light making the measurement more accurate. The device makes use of the unique properties of organic polymers, rather than traditional silicon. OPEN ACCESS TECHNICAL ARTICLE

Tags: Photonics

A photoswitch made using just one photosensitive molecule

PhysOrg.com, 21JUN2016

The sticking problem in photoswitch was caused by unwanted interactions occurring between the electrode and the molecule. To fix this problem, an international team of researchers (China, USA - Duke University, Northwestern University, University of Pennsylvania, Israel) placed three methylene groups between a graphene electrode and the molecule. This resulted in a photoswitch that could be turned "on" by exposure to normal light, and "off" by exposing it to UV light. TECHNICAL ARTICLE

Tags: Photonics, Microelectronics

QUANTUM SCIENCE

New, better way to build circuits for world's first useful quantum computers

Science Daily, 27JUN2016

Researchers at Pennsylvania State University developed a technique that uses both laser light and microwaves to

precisely control the switching of selected individual qubits from one quantum state to another without altering the states of the other atoms in the cubic array. The new technique demonstrates the potential use of atoms as the building blocks of circuits in future quantum computers. TECHNICAL ARTICLE

Tags: Quantum science

Physicists create a high-precision 'quantum ruler'

Nanowerk, 23JUN2016

If you take one part of Alice's entangled state, and another part from Bob, and do a joint measurement on them, the remaining parts of Alice's and Bob's states will also become entangled even though they never interacted. An international team of researchers (Russia, France, Canada) have devised a method for creating this special quantum entangled state. This state enables producing a high-precision ruler capable of measuring large distances to an accuracy of billionths of a metre. OPEN ACCESS TECHNICAL ARTICLE

Tags: Quantum science

Quantum computer makes first high-energy physics simulation

Nature News, 22JUN2016

Researchers in Austria have performed the first full simulation of a high-energy physics experiment—the creation of pairs of particles and their antiparticles—on a quantum computer. The researchers hope to scale up their techniques so that they can simulate the strong nuclear force. This may take years and will require not only breakthroughs in hardware, but also the development of new quantum algorithms.

Tags: Quantum science

S&T POLICY

Laser uranium enrichment technology may create new proliferation risks

EurekAlert, 27JUN2016

A new laser-based uranium enrichment technology may provide a hard-to-detect pathway to nuclear weapons production, according to a physicist at Princeton University. The paper explains the basic physics of the new uranium separation concept, which relies on the selective laser excitation and condensation repression of uranium-235 in a gas. Acquiring the key laser systems appears to be the main technological hurdle to states mastering this new enrichment process. OPEN ACCESS TECHNICAL ARTICLE

Tags: S&T policy, Military technology

China by the numbers

Nature, 22JUN2016

China invests more in R&D than the European Union does. Now it produces more research articles than any other nation, apart from the United States, and its authors feature on around one-fifth of the world's most-cited papers. The nation has created some unparalleled facilities. There's room for improvement within that bright picture. The scholarly impact of its papers is improving rapidly, yet it remains below the world's average.

Tags: S&T policy, S&T China

China's bid to be a DNA superpower

Nature News, 22JUN2016

Fueling the drive is a multibillion-dollar, 15-year precision-medicine initiative, which China announced in March and which rivals a similar initiative in the United States. If these efforts fulfill their goals, doctors envision being able to use a person's genome and physiology to pick the best treatments for his or her disease.

Tags: S&T policy, Biotechnology, S&T China

SENSORS

New mid-infrared laser system could detect atmospheric chemicals

MIT News, 28JUN2016

An international team of researchers (USA - MIT, Binghamton University, Germany) has developed a new system that makes use of a mid-infrared ultra-fast pulsed laser to generate the filaments, whose colors can reveal the chemical fingerprints of different molecules. According to the researchers, using their technique, virtually any kind of molecule can be detected including various biohazards and pollutants. With further development the team expects the same system to work at much larger scales. OPEN ACCESS TECHNICAL ARTICLE

Tags: Sensors

Tiny multi-function antenna for laptops

Science Daily, 24JUN2016

The device, developed by researchers in the UK, combines Wi-Fi, GPS and Bluetooth and 3G/4G LTE and WiGig 60GHz wireless standards in one unit. As the MIMO antenna system combines all the antennas as a single system, it fits into the extremely limited space of the hinge cavity replacing as many as five separate antennas found in standard laptops.

Tags: Sensors, S&T UK

Researchers discover new chemical sensing technique

Nanowerk, 23JUN2016

Researchers at the University of Houston developed a novel technique to simultaneously obtain chemical and refractive index sensing in 1-2.5 μm NIR (near infrared) wavelength range on nanoporous gold (NPG) disks, which feature high-density plasmonic hot-spots of localized electric field enhancement. Potential applications include improving downhole drilling analysis in the oil and gas industry and broadening the spectrum of solar light that can be harvested and converted to electricity. TECHNICAL ARTICLE

Tags: Sensors ■

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