Researchers Develop Automated Cell-Screening System

Carnegie Mellon News (09/08/08) Vaidya, Akanksha

Researchers at Carnegie Mellon University's Ray and Stephanie Lane Center for Computational Biology have developed an automated system that can analyze images of cells much faster and more accurately than humans. The technique, developed by robotics and machine learning professor Geoffrey Gordon, computational biology professor Robert Murphy, and recent Ph.D. graduate Shann-Ching Chen, will be capable of analyzing more than 100,000 cells, and will be able to establish relationships between those cells. Gordon says it is easier to classify cells by studying a group of cells instead of just a single cell, though it requires the computer to account for a large amount of information, which is difficult and time consuming. To solve this problem, the researchers developed a new reasoning methodology that is potentially far faster at reasoning through entire groups of cells. Murphy says the system describes the distribution of a given protein in each cell using numerical features, and then learns which features are associated with which subcellular pattern, similar to how humans may use color, smoothness, and shape to distinguish between fruits. The system relies on the protein distribution in cells to classify them into different groups. The researchers say the system, which also can recognize subtle differences between cells, could significantly change how biological research is done.

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Scottish Group Works on Photonic Microelectronics Project

Electronics Weekly (UK) (09/04/08) Begbie, Mark

Although microelectronics and photonics are generally seen as separate fields of study, the Scottish Consortium in Integrated Micro-Photonic Systems is attempting to integrate MEMS and micro-electronics. A research team is developing silicon MEMS devices and subsystems for use in high-performance miniaturized photonic systems. One project that is being worked on is a simple structure for optical microscanners, which would allow for optimal performance. Although bringing optical systems into the micro domain offers many opportunities, there are also major challenges that researchers must overcome. A single-unit system consisting of optic, MEMS, and electronic technologies must be extremely accurate and assembled in a way that does not damage any components. Potential uses for this technology include high-quality imaging in dental surgery, analysis of multi-analyte slides for disease detection, and testing individual cells passing through a microchannel.

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Phoenix Mars Lander Hits Snag

Aviation Week & Space Technology (09/03/08) Covault, Craig

A problem with the Thermal and Evolved Gas Analyzer system for the Phoenix Mars lander is troubling engineers. The system, designed to identify organics on Mars, is experiencing intermittent interference in the tubes that move gases from a baked soil sample into the mass spectrometer. Data shows that gas flow to the mass spectrometer has been erratic, even though vapors from all the heated soil samples have reached the spectrometer. The Phoenix Mars lander is also now processing a sample acquired from "Stone Soup," seven inches below the surface, and it recently delivered the sample to the Microscopy, Electrochemistry, and Conductivity system.

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Nanoelectronic Interface for Lab-on-a-Chip Devices

IET Nanobiotechnology (09/01/08) Vol. 2 , No. 3 , P. 55 ; Abraham, J. K. ; Yoon, H. ; Chintakuntla, R.

Edinburgh researchers studied the application of nanotechnology to solve problems in the current use of planar metallic microelectrodes in detection, diagnosis, and analysis. These issues include difficulty in selective integration with a cell, the size dependency of its impedance, and the amount of noise in the circuit because of that disparity. According to the researchers, a planar microelectrode array integrated with vertically aligned nanowires for lab-on-a-chip device applications improved impedance control because there was greater surface area. Using the template method, the team fabricated nanowire integrated microelectrode arrays on silicon and flexible polymer substrates, achieving a high degree of specific growth by controlling the nanowire synthesis parameters.

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Weight Watchers

SeparationsNow.com (09/01/08) Evans, Jon

A team of chemists from the Universitat Karlsruhe in Germany have discovered an effective technique for accurately measuring the molecular weight distribution (MWD) of synthetic polymers. The current method, size exclusion chromatography (SEC), separates the polymers by size, but their molecular weight is only indirectly related to size, creating the need for a calibration SEC step to accurately measure MWD. Barner-Kowollik and his team linked SEC to both an electrospray ionization (ESI) mass spectrometer (MS) and a refractive index (RI) detector to provide accurate data on both the polymer chain masses and the concentrations of the different polymer chains, which, when combined, give an accurate measure of the polymer's MWD. To work around chromatographic band broadening, which can interfere with measurements, the team combined the ESI-MS and RI data using a statistical technique called the maximum entropy procedure. After assessing the MWDs of a range of polymers, the scientists found their measurements up to 14 percent lower than the measurements reported by the manufacturers, which use the standard SEC method. Barner-Kowollik and his team are now attempting to apply their method to mixtures of polymers with variable endgroups.

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Biotech Firm to Apply Technology for Detecting Biological Warfare

Houston Business Journal (09/01/08) Perin, Monica

Fairway Medical Technologies received a three-year, $900,000 contract from the Department of the Navy to create optoacoustic technology for detecting chemical and biological agents in battlefeld conditions. According to Fairway President James Meador, the research will develop an instrument that uses laser light to create ultrasound waves that produce images as they travel through, for example, a body of water contaminated with a biological agent such as anthrax, smallpox, or bubonic plague. By attaching a nanoparticle of gold to the biosensor protein, Fairway's technology is able to amplify the sound wave and receive a signal louder and faster than current tests, which take hours or days to detect the same biological agents.

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Drug Discovery on a Chip

Chemistry World (09/08) Crow, James Mitchell

Microfuidics has helped U.S. researchers to identify drug leads. Stanford University scientists used a microfuidic device frst to confrm the use of the protein NS4B in the replication of the hepatitis C virus, and they then used microfuidics to screen 1,280 molecules to identify an NS4B inhibitor. In the device, reaction and analysis occurs in a fow layer of microchannels, separated by a fexible membrane from a control channel layer, which forms a series of unit cells on the surface of the chip. Each unit cell has a button membrane, which is able to trap the RNA bound to the NS4B so it can be measured.

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Salmonella Outbreak Thought to Be Over

Washington Post (08/29/08) P. D3

The Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration (FDA) announced on August 28 that a salmonella outbreak that sickened almost 1,500 people across the country is likely over. Strong evidence links the outbreak with jalapeno and serrano peppers from a farm in Mexico, but offcials said that the ultimate source may never be known. FDA and CDC offcials called for reforms of the nation's food safety system, including additional funding for state laboratories. This would allow for faster testing of samples of suspected pathogens. Other suggested reforms include the development of a faster system to trace produce to a specifc farm. The recent salmonella outbreak sickened people in 43 states and Washington D.C., the largest outbreak of food-related illness in 10 years.

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Tgen Find Promises Big Leap in Forensics

Arizona Republic (AZ) (08/29/08) Alltucker, Ken

Researchers from the Translational Genomics Research Institute said that it is possible to identify an individual based on a tiny DNA sample left at a crime scene, even if it is mixed with the DNA of hundreds of other people. “Genotyping microarrays” are typically used in a lab setting to search for a person’s disease triggers, but researchers said they can also be used for identification purposes. Police often have to discard DNA evidence from a crime scene if an individual’s DNA makes up less than 10 percent of a total mix. This means that police have had difficulty finding usable DNA from surfaces that are touched by a large amount of people, a problem that could be solved by the use of genotyping microarrays. However, researchers warn that it could be years before the technology is accepted and used in forensic science and law enforcement. Police would also need to have matching DNA from a suspect or a suspect’s relative in order to match it with the DNA sample from the crime scene. There are also several legal and ethical issues surrounding the technology’s use, because it could violate privacy laws.

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Recycled Cambridge Biosensor Technology Attracts Millions in Investment

Business Weekly (08/27/08) Vargas, Lautaro

Several global organizations are collaborating with Cambridge Medical Innovations (CMI), which was established by Inverness Medical Innovations after acquiring the failed Akubio. The U.S. Army Medical Research Institute of Infectious Diseases has given $3 million to CMI for the development of a handheld, low-power device capable of rapidly and accurately detecting biological agents. The U.K. government supplied 826,000 pounds to CMI to help expand handheld technology that could help diagnose diseases, such as malaria or meningitis, in the field or at a patient’s bedside by using blood or other samples. CMI has also licensed a suite of technology to TTP LabTech to focus on diagnostic tools for the professional and consumer sectors, particularly for detecting infections. CMI’s technology was developed at the University of Cambridge, and then under Akubio, which was formed primarily to develop acoustic detection technology that can “hear” and detect viruses and bacteria on a surface.

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Tiny Tactile Sensor for Robot Use

Nikkei Weekly (08/25/08)

The University of Tokyo and Matsushita Electric Industrial Co. have developed a sensor that can detect pressure and friction as human skin does. The research team, led by Isao Shimoyama, a professor at the University of Tokyo, plans to commercialize the sensor in a few years for use in robots, enabling them to touch people more gently and hold delicate items, even objects weighing as little as 1 gram. The sensor is made of silicon, processed by micro-electromechanical systems, and is about the size of grain of rice. Meanwhile, at the National Institute of Advanced Industrial Science and Technology, a research team has developed a tiny biosensor that could be attached to the tip of an endoscope and be used to help doctors visually detect cancer faster and earlier. The biosensor detects the presence of vascular endothelial growth factor, released by cancer cells to stimulate new blood vessels that feed the tumor.

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Finding Weapons

Chemical & Engineering News (08/25/08) Vol. 86 , No. 34 , P. 32 ; Kemsley, Jyllian

The Lawrence Livermore National Laboratory's Forensic Science Center (FSC) is responsible for detecting some 12,000 substances as part of its work with the Organization for the Prohibition of Chemical Weapons. FSC's innovations include the Easy Livermore Inspection Test for Explosives (ELITE), a palm-sized appliance that can identify more than 30 explosives. To use the device, users frst remove a tab from the system's card, swipe it across the suspicious material, and replace the tab into the card. One of two glass vials is broken to release a nucleophile that reacts with the phenyl group of trinitrotoluene (TNT) or comparable materials to create a complex that stains the card. If the test is negative, the user breaks the second vial to release a reagent that reacts with organic nitrite compounds to form a pink diazonium dye, which is capable of detecting chemical like RDX, HMX, ammonium nitrate, or pentaerythritol tetranitrate. FSC has also developed a low-power chemical vapor sensor that can identify several chemical substances, such as VX and mustard gas, in places like buildings and pipelines. The sensor unit features an array of microcantilevers that are each covered with a different polymer, says FSC scientist Bradley R. Hart, who led the device's development. The polymers react differently with individual compounds, and mixtures can be assessed by a computer program. Researchers now hope to cover the cantilevers with fctionalized aerogels or metal nanoparticles in a polymer matrix to enable the detection of very low concentrations of chemicals.

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Fingerprints Reveal More Than ID

Investor's Business Daily (08/13/08)

Researchers at Purdue University have developed a new fngerprint testing method which utilizes miniaturized mass spectrometers. The test can detect compounds at concentrations as small as fve parts per million. The method could be used to fnd drugs or explosives using only a person's fngerprint. The technology is also able to read fngerprints buried beneath other fngerprints. Researchers estimate that the new test may be made available within the next two years.

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Bioterrorism's Threat Persists as Top Security Risk

Wall Street Journal (08/04/08) P. A10 ; Gorman, Siobhan

Security offcials across the United States list bioterrorism as one of their top concerns. Since the 2001 anthrax attacks, the federal government has invested almost $50 billion in programs to fght the bioterror threat; however, experts contend that most cities have a hard time detecting lethal agents and issuing drugs to anyone who may have come into contact with them. Furthermore, hospitals claim that they would not be able to handle an infux of patients following an attack. The Department of Homeland Security is building a center that will combine biothreat data from federal agencies and convey it to different regions. DHS is also developing its BioWatch system, which deploys equipment to spot lethal agents in the air. However, William O. Jenkins Jr. of the Government Accountability Office says the new center might not live up to its expectations and the problem with the BioWatch system is that it needs as much as 34 hours to detect and verify a pathogen. A faster system will likely not be completed until 2010. New York is employing new sensors, which can detect agents in a shorter amount of time, and the federal BioWatch program intends to issue such sensors to more cities by 2010. New York also has a plan to dispense drugs as soon as a deadly agent is verifed.

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Modifications Abound

Scientist (08/08) Vol. 22 , No. 8 , P. 59 ; Perkel, Jeffrey M.

The National Institutes of Health recently launched a Roadmap Epigenomics Program that seeks to map epigenetic modifcations during normal development. This will help researchers understand how these processes can malfunction. Their tools include Chromatin immunoprecipitation (ChIP) with microarrays, ChIP-Sequence, HELP (Hpall tiny fragment enrichment by ligation-mediated PCR), and bisulfte conversion for methylation detection. Epigenetics comprises a variety of control mechanisms that do not fully depend on DNA sequence. Methylcytosine frequently marks transcriptionally silent DNA, and histone tails embedded with methyl, acetyl, and phosphate groups, among others, control how tightly DNA wraps around nucleosome spindles. The histone tails also determine how accessible DNA is to protein binding. Noncoding RNA may be the genetic intermediary that restricts these components to their appropriate genomic regions.

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Goodbye Paper

Lab Matters (Quarter 3, 2008) No. 3 , P. 15 ; Maddox, Nancy

A 2007 survey by the Association of Public Health Laboratories (APHL) found that 15 of 39 state public health laboratories are unable to conduct any automated electronic data exchange with outside associates, while 10 are unable to conduct automated electronic data exchange with state epidemiologists. For the past three years, Michelle Meigs, APHL's senior information program manager, has been working on the Public Health Laboratory Interoperability Project (PHLIP), a joint project between APHL and the Centers for Disease Control and Prevention. Meigs hopes that as many as 10 state public health laboratories (PHLs) will participate in PHLIP, whose goal is to enable all state PHLs to be able to exchange data with CDC labs and local partners by 2010. Meigs and her colleagues are attempting to develop business cases for electronic laboratory messaging that address the transmission of unsolicited lab test results from state PHLs to the CDC. The business cases will also include transmission of test orders and test results between state PHLs for routine service requests, for surge capacity, and continuity of operations, and between states PHLs and the CDC for service requests. PHLIP uses Health Level 7 message formats to structure data files. These files, in turn, rely on SNOMED Clinical Terms to describe clinical data and Logical Observation Identifiers, Names & Codes for lab procedures.

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"Ssh, gentlemen. I believe Watkins is on the verge of a new miracle drug."