Tomorrow's University:

ADVANCING INFORMATION EVERYWHERE

Computing has become ubiquitous in 21st century life, changing the way we work and learn, and even the way we interact with each other. NJIT researchers are working to create the tools to help the digital world function and to evaluate the impact of new technologies on society.

Studying New Media

A team of computer science researchers is studying how the collection of smart phones carried by people can be used for large-scale sensing of the physical world by leveraging the cameras, microphones, GPSs, accelerometers, and other sensors on the phones. Associate Professor **Cristian Borcea** *(below left)*, **Manoop Talasila** *(below center)*, doctoral student, and Associate Professor **Reza Curtmola** *(below right)*,

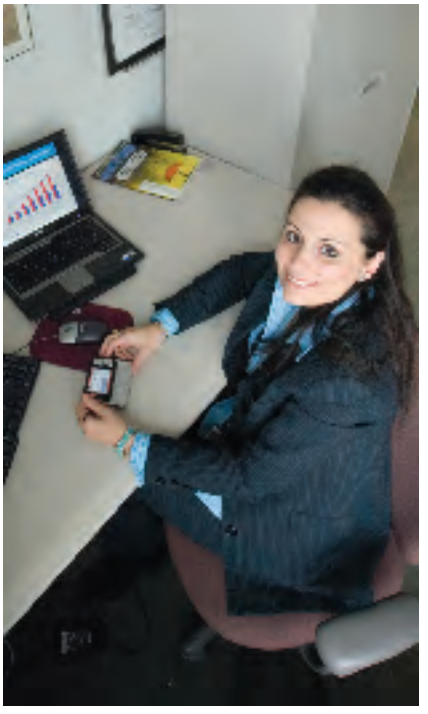
are collaborating with the University of Bologna, Italy, to find ways to manage and utilize the mobile crowd-sensing process. In order to verify that smartphone sensing is scalable, reliable, and cost-effective, they built and deployed McSense, a geo-social crowd sensing platform for smart cities. McSense has been deployed as an app for Android and is currently being tested by student volunteers.

Julia Mayer *(below)*, a doctoral student specializing in human-computer interaction, is researching social inference – the information that can be deduced about an individual's identity,

background, location and preferences from data available in social computing applications. She is working to evaluate the risks and benefits of social inference, and to develop user interfaces that would help users to manage social inferences. She is collaborating with **Richard Schuler**, PhD student in information systems, and **Quentin Jones**, associate professor of information systems.

Andrzej Zarzycki *(above)*, associate professor of architecture and design, combines crowd sourcing with gaming to develop the concept of augmented reality. In a paper, "Urban Games: Applications of Augmented Reality," presented at SIGGRAPH Asia 2012, he described augmented environments that integrate history/knowledge, tourism, gaming and everyday urban life. The project utilizes a mobile app called Mystery Spaces that encourages users to become urban explorers and discover the mystery of abandoned public infrastructure by navigating through forgotten and underappreciated public spaces. The project "gamifies" traditional sightseeing by awarding participants experience and discovery points, and encouraging authoring of the augmented reality environment content.

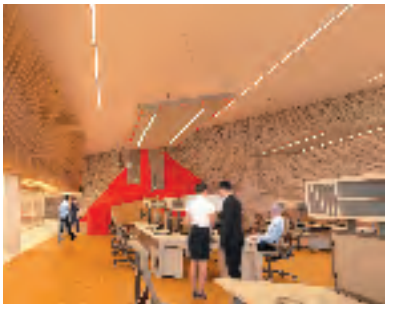
Professor of MIS **Katia Passerini** *(right)* won a Bright Idea Award sponsored by the Stillman School of Business at Seton Hall University and the NJPRO Foundation for her paper entitled, "The Next Web Apps Architecture: Challenges for SaaS Vendors," reviewing the dynamic evolution of the information technology industry with the advent of cloud computing and highlights key issues that will drive markets and business models on the cloud. Such issues are beyond technical, and include the emergence of marketplaces for services, the advent of the "utility" and on-demand model, the competition among large and small vendors, and the sustainability of profits for multiple service providers. She co-authored the article with Stephane Gagnon and Veronique Nabelsi of the University of Quebec, and Kemal Cakici of the International Finance Corporation (IFC).



An expert in digital forensics and steganography, **Frank Y. Shih** *(right)*, professor of computer science, is studying image forgery, which has been facilitated by advances in image-editing software. In collaboration with **Gavin Lynch**, doctoral student, and researchers at the Academia Sinica in Taiwan, he has developed an algorithm to detect copy-move forgery – forgery in which one region of an image is copied to another area of the image in an attempt to cover a potentially important feature. Experimental results show the new method is effective in identifying the size and shape of the duplicated region.

Advancing Digital Design

NJIT interior design students displayed their work at the 2013 NeoCON Student Work Exhibit in Chicago. **Peter Fritzky**'s Integrated Office Design *(above)*; **Mina Liba**'s designs *(left)* show a plan for a relocation of the **School of Art + Design**; and **Nora Hamade**'s take on the same project *(below)*.



Creating Business Applications

For the third consecutive year, **NJIT** hosted one of the international sites for Global Game Jam. Design and information technology students collaborated on interdisciplinary teams to create 11 games for various web and mobile platforms. Digital design students **Elvin Padilla**, **Rachel Corres** and **Danielle Esmaya** *(above)*, and IT student **Louis Arcilla** *(standing)* consult about their game submission. 2-D characters, called Lil Phobias *(right)*, created by Rachel Corres.

Of the 278 images selected for exhibit in the ACM/SIGGRAPH Curated Student Work Exhibit in Los Angeles, 48 were from the **College of Architecture and Design**, the work of 38 students. Shown here are some samples of the work that was displayed. **Interior Design** by **Amana Dewitt** *(above top)* and **Hsin Ting Hsieh** *(above bottom)*; **Digital Design** by *(right, top to bottom)*: **Brandon Simms**, **Elvin Padilla**, **Danielle Esmaya**, and **Kwasi Amankona**.

Developing New Technologies and Infrastructure

Assistant Professor of Management **James Cicon** *(below)* uses advanced computer methodologies to analyze the writing of investors, management, analysts, and others. Once quantified, the results are used as explanatory variables in existing models of corporate/market behavior. In one study, in collaboration with Georgia Institute of Technology, he examined whether "soft" information present in merger and acquisition announcement press releases contains incrementally valuable news relative to traditional hard data and analyst generated information. He found that expressions of managerial optimism are inversely related to performance, discounted by the market, which is meaningful information to investors.

Boil, Bubble, Toil and Trouble is the first book published by the Leir Center for Financial Bubble Research, directed by **William Rapp** *(above)*, Henry J. Leir Professor of International Trade and Business. An outgrowth of the 2nd Leir Conference on Bubbles and Government Policies, the book seeks to define a financial bubble and how to recognize a bubble before it bursts. Contributing authors include Rapp, Assistant Professor **Alan Yan**, Professor **Mark Somers**, **Danielle Viola, '13 MBA**, Professor **Rajiv Mehta**, Assistant Professor **Wei Xu**, and Professor **Michael Ehrlich**, associate director of the center.

Associate Professor of Finance **Zhipeng Alan Yan** *(right)* has established the LIXIN-NJIT Economic Risk Early Warning Center with a grant from Shanghai Lixin University of Commerce. An interdisciplinary research venue, the center will focus on methodologies of early warning for studying macroeconomic risk; industry risk identification and early warning, such as iron and steel, real estate and equipment management industries, and bank liquidity risk warning index system. His new book, *Swindlers, Fools and Maniacs*, looks at financial asset bubbles, crises, irrational investment behaviors and financial frauds in the 5000-year history of China.

Ali Akansu *(below)*, professor of electrical and computer engineering, studies financial applications for high performance signal processing. At the 38th IEEE International Conference on Acoustics, Speech and Signal Processing in Vancouver, Canada, he gave a tutorial with Professor Ilya Pollak of Purdue University on "High Frequency Trading and Signal Processing Models for the Microstructure of Financial Markets," and co-organized and chaired a special session on "Financial Signal Processing and Electronic Trading." He presented two papers on portfolio risk analysis with his doctoral students, **Mustafa Torun** and **Onur Yilmaz**.

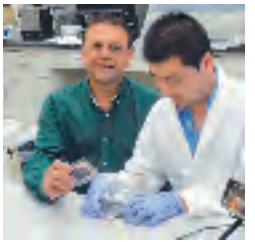
Mengchu Zhou, distinguished professor of electrical and computer engineering, will be leading the newly-established CSRZIC Laboratory for Rail System Network and Information Technologies.

Funded by the CSR Zhuzhou Electric Locomotive Research Institute Co., the center will utilize **NJIT's** expertise in signal processing to develop wireless communication and control technologies to allow passengers traveling on high-speed trains to communicate with each other and outside the trains via the Internet.

Distinguished Professor **Yeheskel Bar-Ness** *(left)*, executive director of the Elisha Yegal Bar-Ness Center for Wireless Communications and Signal Processing Research, gained two new patents to improve orthogonal space time codes and decode data transmissions. Co-inventors are his former doctoral students, **Amir Laufer'11** and **Kodzovi Acolatse '10**.

Abdallah Khreishah *(right)*, assistant professor of electrical and computer engineering, studies the latest work in computer networking with an emphasis on improving the flow of information. With a grant from the National Science Foundation, he is working to improve the capacity and energy efficiency of wireless networks with different processing capabilities.

Doctoral student **Zhiqian Wang** *(below right)*, working in collaboration with **Somenath Mitra** *(below left)*, distinguished professor of chemistry and environmental science, has developed a lightweight, flexible battery using carbon nanotubes along with printing methods that offers the potential for high throughput fabrication/manufacture of printed batteries and super capacitors. These new batteries have the potential to provide easy transportability and integration into small electronics, such as rollup displays, wearable devices, electronic identification tags, smart cards, and implanted medical devices. Their findings were recently published in the *Journal of Power Sources.*



Getting the Most Out of Data

Mei Liu *(left)*, assistant professor of computer science, is developing data-mining methodologies to uncover clinical knowledge from electronic medical records that improve the quality, safety and efficiency of healthcare. In a recent study, she demonstrated that electronic medical records can validate previously reported adverse drug reactions and report new ones. "Comparative Analysis of Pharmacovigilance Methods in Detection of Adverse Drug Reactions from Electronic Medical Records," published in the *Journal of the American Medical Informatics Association*, examined the use of retrospective medication orders and inpatient laboratory results documented in medical records to identify adverse reactions.

Associate Professor of Mathematical Science **Ji Meng Loh** *(right)* specializes in applied spatial data analysis and visualization and the development of statistical methodology to make better inferences from spatial data. In a recent study, he examined visitor volume to Morristown, NJ, on workdays, on weekends, and for the St. Patrick's Day Parade, by analyzing cellular data. In another study, funded by the Robert Wood Johnson Foundation's Healthy Eating Research and New Connections Program, he investigated the spatial relationship between fast food and schools, and the role of school and neighborhood segregation in shaping these relationships.

Lian Duan, assistant professor of information systems *(above left)*, with his graduate student **Yanchi Liu**, conducts innovative research on large-scale data mining, using correlated sets of arbitrary, rather than the more usual correlated pairs. In a recent study, he applied his technique to electronic health records to collect information about adverse reactions to drug therapies. His findings were published in the *IEEE Journal of Biomedical and Health Informatics*.

Jason Wang *(below)*, professor of computer science and director of the Data and Knowledge Engineering Laboratory, develops software tools and search engines to simplify — by analysis and classification —

huge amounts of biological data. A recent paper published by his research team in *OMICS: A Journal of Integrative Biology* outlines a method to distinguish between microRNA precursor transcripts which play an important role in biological processes such as cell proliferation, tissue differentiation, and embryonic development from similarly constructed pseudo pre-miRNAs. The project is part of a long-term initiative to build a cyber infrastructure for RNA data analysis and mining that would allow researchers to uncover patterns with potential applications in the detection of genetic diseases, the classification of DNA sequences, the prediction of RNA and protein secondary and tertiary structures, and rational drug design.

Doctoral student **Ankur Agrawal** *(below)* was nominated as a finalist in the student paper competition at the World Congress on Medical and Health Informatics for his paper "Identifying Problematic Concepts in SNOMED CT Using a Lexical Approach," which presents an innovative lexical methodology to identifying inconsistencies in large medical terminologies such as SNOMED CT with ease and efficiency. Agrawal is part of the research team led by Professor **Yehoshua Perl** *(right)* that focuses on large terminological databases. His work continues the team's ongoing efforts to develop a simplified, compact semantic network to organize the large, complex clinical databases used in hospitals.

Yi Chen *(below)*, associate professor of management, focuses her research on semi-structured data, such as databases, documents, workflows and social networks. She has an NSF CAREER grant and a Google Research Award to develop high quality keyword search results on semi-structured data in XML,

the ubiquitous mark-up language designed to store and transport data. The goal is to enable the vast amount of information in databases to become "Google-able." A second NSF project, also funded by an IBM Faculty Award, addresses mining and optimizing ad hoc workflows such as those in customer service, problem solving and decision-making.