EVALUATION OF RESEARCH, SCHOLARSHIP, OR CREATIVE ENDEAVOR

INTRODUCTION

Dr. Du's research area is in biometrics, digital image processing, pattern recognition, and their applications. In particular, Dr. Du has made significant contribution in iris recognition area. She is recognized nationally and internationally for her contribution in designing the world first non-cooperative iris recognition system. She has led her research team to participate in 2 international professional-level iris recognition competitions, organized by National Institute of Standards and Technology (NIST) in 2006 and 2008. Her research team received high marks in both competitions. She published 49 peer-reviewed research papers and applied for 10 patents. She was invited to give 18 talks in her research area in local, national, and international conferences/meetings/seminars. Her research projects have been supported by several internal and external projects. She is honored to be selected as a Young Investigators by ONR in 2007, the prestigious award for junior professors in USA. She received the Prestigious External Award Recognition at IUPUI in 2008. She and her students received the best paper reward in one of IEEE conferences in 2009. It is her goal to perform the world class research at IUPUI.

RECOGNITION BASED ON RESEARCH AND CREATIVE ACCOMPLISHMENTS

1. Young Investigator (YIP) Award, Office of Naval Research (ONR) 2007
   Brief info about this award: YIP is "designed to attract young scientists and engineers who show exceptional promise for outstanding research and teaching careers." The ONR YIP awardees are "considered to be the best and brightest young academic researchers this country has to offer" "She (Dr. Du) emerged successfully from a very competitive pool because of her academic achievements, her ability to contribute to the strength of the Nation's research and development, and the commitment to her expressed by the university administrators." (Quoted from the letter Rear Admiral Willaim Landay, Chief of Naval Research to Dr. Charles Bantz, Chancellor at IUPUI on June 19, 2007).

   Supplemental Information: IUPUI Chancellor Dr. Bantz wrote the congratulation letter to Dr. Du and said "This is a wonderful recognition of your work, especially given high level of selectivity associated with this designation. We are all proud of you and wish you all the best." There are news letters/reports by the Office of Naval Research, IUPUI, and other Medias that reported Dr. Du's award and her research in non-cooperative iris recognition area.

2. Prestigious External Award Recognition, IUPUI, 2008
   Brief info about this award: "recipients are faculty members who have been recognized by state, national, and international professional organizations for their academic achievements. They signify not only the 'best of the best' at IUPUI but the 'best of the best' to a braoder national audience as well." (Quoted from the booklet for the IUPUI Prestigious External Award Recognition in 2008)

3. Best Paper Award (with my students), IEEE Workshop on Computational Intelligence in Biometrics: Theory, Algorithms, and Applications, 2009
   Brief info about this award: This is a competitive best paper award based on peer-review comments and conference committee recommendation. IEEE Workshop on Computational Intelligence in Biometrics: Theory, Algorithms, and Applications is a bi-annual international conference. It is a top conference in biometrics area.

4. Congratulation letter from Chancellor Bantz for Dr. Du's grant from NIJ
   Brief info.: In January 2008, Chancellor Bantz wrote another letter to Dr. Du about her grant from NIJ, and said "I continue to be impressed by the creativity, innovation, and potential for impact evidenced by the work of our faculty in research.... the work of our faculty deserves to receive the kind of investment—both internal and external—that will propel IUPUI into the top ranks of world-class research universities. With your help and hard work, we will fulfill that ambition."

5. Interviewed by Science Magazine—the top journal across all academic areas in the world
   Brief info.: In March 2009, she was interviewed by the Science Magazine in the article named "Futuristic Scanners Hobbled by Eye Disease."

6. Patent license
   Brief info.: In June 2010, her seven patents (with her students) were licensed to the Passive Identification Technology, LLC. This news was in the IUPUI main webpage and Purdue School of Engineering and Technology's main webpage.

EXTERNAL GRANTS

1. Title: Selective Feature Based Iris Recognition for Non-cooperative User Identification
   Sponsor: ONR (Competitive Federal grant)
   My Role: PI
   Funding: $XXX (2007-2011)
   Significance: The proposed iris recognition system is the first of its kind, focusing on a new direction in iris recognition: robust and non-cooperative iris recognition. It provides a new means for surveillance and terrorist watch. It is expected to have a significant impact on the military, homeland security, and intelligence, such as border control, monitoring insurgent/terrorist/criminal activities, and remotely identifying people.
   Supported students in this grant: Craig Belcher, Luke Thomas, Zhi Zhou, Emrah Arslanturk, Tron Artavatkun, Kai Yang, and Yuchi Jin.
   Result: Applied for 7 provisional and PCT patents. Published 7 journal articles and 12 international conference papers (all peer-reviewed)

2. Title: Quality Measure Plug-in for Iris Recognition System", National Institute of Justice
   Sponsor: NIJ (Competitive Federal grant)
   My Role: PI
   Funding: $XXX (2008-2010)
   Significance: The proposed plug-ins have significantly enhanced the performance of existing iris recognition systems by increasing the accuracy, the flexibility, and the tolerance of low quality images, and enable the applications of iris recognition to more closely resemble real-life scenarios including non-cooperative situations. It can work virtually with all existing commercialized iris recognition systems. Deploying the proposed plug-in will not cost much money except an initial software/toolbox testing and debugging expense.
   Supported students in this grant: Zhi Zhou
   Result: Applied for 2 provisional and PCT patents. Published 4 journal articles and 5 international conference papers (all peer-reviewed)

   NOTE: Our research result and final report for this project has been highly remarked by the program manger Dr. William Fort at the Biometric Consortium Conference 2009. Our project

was one presented as one out of three example successful projects that NIJ has sponsored in the past.

3. Title: CSR-EHCS(EHS), SM: Development of SYMBIOTE, A reconfigurable Logic Assisted Data Stream Management System for Multimedia Sensor Networks
   Sponsor: NSF (Competitive Federal grant)
   My Role: Co-PI
   Funding: $XXX (2008-2010) (My share is $XXX)
   Significance: The PIs are confident that RL coprocessors can be extremely useful in data stream acceleration. However, the lack of comprehensive and demonstrative approaches in using RL coprocessors that provide a library of reusable hardware implementations of data stream operators, comprehensive cost models for query execution and query optimization techniques for RL coprocessor enabled computing platforms presents considerable challenges. The PI has expertise in multiprocessor system architectures, hardware/software codesign and reconfigurable computing while the co-PIs have expertise in spatial, spatio-temporal databases and image processing. Together the PIs have the joint expertise to provide potential solutions in order to overcome these challenges by developing the first-ever RLADSMS kernel. This research develops reduced-runtime hardware implementations of various data stream operators and functions and corresponding approximate query answering structures. As a result, this research furthers the understanding of hardware-oriented, reduced run-time data stream algorithms. This approach enables the application to utilize multicore multiprocessors as well as RL coprocessors to meet the stringent realtime requirements of multimedia sensor networks. Furthermore, the PIs outline novel query cost models that consider spatial complexity as an important cost metric for RL-coprocessor enabled data stream systems. Such cost models can guide query-planning, optimization and execution of data stream management systems on RL enabled computing platforms. Finally, this research creates the first ever RLADSMS kernel, a prototype system called SYMBIOTE and facilitates data acceleration approaches with the RLADSMS kernel to the application domain of vision based multimedia monitoring systems.
   Supported students in this grant: Francis Bowen
   Result: Published 1 peer-reviewed international conference paper.

4. Title: Biometric Data Safeguarding Technologies - Analysis and Best Practices
   Sponsor: Canada Department of Defense (Competitive International grant)
   My Role: Co-PI
   PI:IBG
   Funding: Canadian $XXX (2010-2011) (My share is US $XXX)
   Significance: This research helps Dr. Du build international collaborations with international researchers in Canada Department of Defense, Canada Border Service Agency, Royal Canadian Mounted Police, Information and Privacy Commissioner, IBG, and Univ. of Toronto. This project is an example of international collaboration with industry, academic and governmental agencies. This project is funded by the Canada Department of Defense. This is a pilot project and could result in multiple-year big project.

   Note: This project has been approved by Canadian government. It is still processing the paperwork.

5. Title: PI, “Automatic Image Processing System for Site Verification of Weigh-In-Motion Traffic Classification Data,” $XXX, direct cost, 2006-2009.
   Sponsor: Purdue University West Lafayette (Pass through from Competitive Indiana Department of Transportation Grant)

My Role: PI
Funding: $XXX, direct cost (2006-2009)
Significance: This study consists of two parts. The first part is to verify the accuracy of WIM vehicle classification and develop models for vehicle classification corrections using image processing technologies. The second part is to install and then evaluate a traffic surveillance system, i.e., the Transportable Infra-Red Traffic Logger (TIRTL). In the first part, the investigators collected video and WIM traffic data at WIM sites statewide. A digital image based vehicle monitoring and classification system was developed for verifying weigh-in-station data, in particular the vehicle classification counts. Based on the real world WIM and video traffic classification data, allocation factors were determined for correcting the unclassified vehicle counts associated with the WIM traffic data. In the second part of this study, a TIRTL system was installed to collect traffic data near a WIM site. Hourly traffic data was first gathered manually and by video cameras to verify the potential errors associated with the TIRTL vehicle counts. Large amount of daily WIM traffic data was also utilized as baseline data to evaluate the field performance of TIRTL and assess the impact of various weather conditions, such as fog, rain and snow, and thunderstorm on TIRTL's performance. The evaluation was based on the FHWA Scheme F Vehicle Classification and solely a data-driven process.
Supported students in this grant: Francis Bowen
Result: Applied for 1 provisional and 1 PCT patents. Published 1 peer-reviewed international conference paper.

INTERNAL GRANTS (PARTIAL LIST)

1. Title: Video-based Multimodal Detection of Human Deceit
   Program: IUPUI Release Time for Research (RTR)
   My Role: PI
   Funding: $XXX, direct cost, 2010
   Summary: In this research, we propose the video-based multimodal deceit detection system, where the system would perform deceit detection based on a person's body language, facial expression and eye movement. We will study how human experts perform deceit detection by combining multiple clues, such as posture, gesture, eye response, and facial expression, and design an automatic multimodal-based human deceit analysis and detection system. We will fuse all available clues to detect the deceit act/s from multiple people. While our ultimate goal is a video-based multimodal deceit detection system, with the support from this program, we will explore new method/system for feature extract and recognition for human deceit analysis and detection; and especially for fall 2010, our goal is to use released time to write high quality external proposals.
   Note: I am working on the project.

2. Title: Cancelable Biometrics
   Program: Center for Applied Cybersecurity Research (CACR), Indiana Univ.
   Funding: $XXX, direct cost, 2009~2011,
   My Role: PI
   Co-PIs: Dr. Xukai Zou and Mr. Scott Orr (CSCI, IUPUI)
   Summary: In this project, we propose a robust, secured, and cancellable biometrics method, which incorporates the encryption/key/key management into the cancellable biometric method design to provide the optimum solution. The PIs are experts in the field of biometrics, security, and network administration, which are essential for the success of this project.
   Note: We are still working on this project.

3. Title: Multimodal biometric system for exercise intensity evaluation

ProgramL IUPUI International Development Fund (IDF)
Funding: $XXX, direct cost, 2007-2008
My Role: PI
Co-PI: Dr. Jin-hua She, Tokyo University of Technology, Japan
Summary: In this project, we propose to design a multimodal biometric system to evaluate the exercise intensity of using the new-concept three-wheeled electric cart for walking-impaired people. The detected intensity level can also be used as the feedback to better control the motor strength to achieve optimal exercise/therapy result. The designed multimodal system can be extended for other kinds of exercise monitoring or intensity evaluation. It can be an effective tool to help more accurate diagnose, better therapy strategy development and evaluation, and better exercise performance. It is expected to be interested by orthopedics, therapists, medical doctors, sports doctors, and athletics and their coaches.
Note: This research has resulted in 1 international conference paper. We submitted 2 NSF proposals. Even though both proposals were not funded, we will continue working on other proposals.

4. Title: Robust Iris Recognition
   Program: IUPUI RSFG
   Funding: $XXX, direct cost, 2005~2006,
   My Role: PI (Dr. Eberhart is the faculty mentor).
   Summary: This research will study partial and non-orthogonal iris images and design a robust iris recognition system which is applicable to covertly identifying human beings. The ultimate goal is to apply iris recognition for Watchlists and surveillance.
   Note: The support from RSFG enabled me to receive ONR and NIJ grants.

PUBLICATIONS

In rank

Within the five years at IUPUI, Dr. Du has published (including recent accepted) many high quality referred papers (12 journal papers, 4 book chapters, and 33 refereed international conference papers). Most of her publications are with her graduate students. She has already had 7 provisional patents, and 3 PCT patent. Please find the list of the papers in the curriculum vita. Please find more details about the citation of Dr. Du's papers in Google Scholar (by input "Yingzi Du", for some papers, please put "Eliza Yingzi Du").

Notable Journal Articles

1. Title: Transforming Traditional Iris Recognition Systems to Work on Non-ideal Situations
   Authors: Z. Zhou, **Y. Du**, and C. Belcher (Zhou and Belcher are graduate students of Dr. Du; and Dr. Du is the correspondence author)
   Source: *IEEE Trans. On Industrial Electronics*, (8), 3203-3213, 2009
   This paper was a revision of our conference paper, which received the Best Paper award in IEEE Workshop on Computational Intelligence in Biometrics: Theory, Algorithms, and Applications in 2009.
   The method developed in this journal has applied for U.S. Provisional and PCT patent.
   This research result is also highly remarked by the NIJ Program Manger (who approved the grant for her research in iris image quality measure).
   Journal Impact Factor: 4.678 (highest impact factor among IEEE journals and No. 2 journal among all areas and all journals in electrical and electronic engineering discipline[1])

[1] Source: http://www.ieee.org/web/publications/journmag/journalcitations.html#journals

7 citations (about 1 year after publication).

2. Title: A Selective Feature Information Approach for Iris Image Quality Measure
   Authors: C. Belcher, and **Y. Du** (Note: Belcher is a graduate student of Dr. Du; and Dr. Du is the correspondence author)
   Source: *IEEE Transactions on Information Forensics and Security*, Vol. 3, No. 3, 572-577, 2008.
   This journal is a top quality journal in biometrics area.
   Note: This system and method developed in this journal has applied for U.S. provisional Patent in 2007and later the international provisional patent (PCT) in 2008.
   13 citations (about 2 years after publication).

3. Title: Video-based Non-cooperative Iris Image Segmentation
   Authors: **Y. Du**, E. Arslanturk, Z. Zhou, and C. Belcher (Arslanturk, Zhou, and Belcher are Dr. Du's graduate students; and Dr. Du is the correspondence author)
   Source: *IEEE Trans. On Systems, Man, and Cybernetics*, Part B, 2010 (in press)
   This journal is a top quality journal in biometrics area.
   Note: The method developed in this journal has applied for U.S. Provisional Patent in 2008 and later the international provisional patent (PCT) in 2009.

4. Title: Region-based SIFT Approach to Iris Recognition
   Authors: C. Belcher and **Y. Du** (Note: Belcher is a graduate student of Dr. Du; and Dr. Du is the correspondence author)
   Source: *Optics and Lasers in Engineering (Elsevier);* 47(1), 139-147, 2009
   11 citations (about 1 year after publication)

5. Title: Use of one-dimensional iris signatures to rank iris pattern similarities
   Authors: **Y. Du**, R.W. Ives, D.M. Etter, and T.B. Welch
   Source: *Optical Engineering*, Vol. 45, No. 3, 037201-1~10, 2006.
   29 citations (about 4 years after publication).

6. Title: Review of Iris Recognition: Cameras, Systems, and Their Applications
   Authors: **Y. Du**
   Source: *Sensor Review*, 26(1), 66-69, 2006.
   6 citations[2] (about 4 years after publication).

7. Title: A Survey and Comparative Analysis of Entropy and Relative Entropic Thresholding Techniques
   Authors: C. Chang, **Y. Du**, J. Wang, P. Thouin, and C. Yang,
   Source: *IEE Proceedings of Vision, Image, and Signal Processing*, 153(6), 837-850, 2006.
   24 citations (about 4 years after publication)
   Note: The software of the thresholding methods has over 16,000 downloads.
   Website:http://matlabdb.mathematik.unistuttgart.de/download.jsp?Search=77&SearchCategory=AuthorWithFiles&AuthorName=Yingzi+Du&MP_ID=253

Notable Peer-reviewed Conference Papers

1. Title: Transforming Traditional Iris Recognition Systems to Work on Non-ideal Situations
   Authors: Z. Zhou, **Y. Du**, and C. Belcher

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[2] Google scholar only showed 5. It missed the citation from the paper: TM Aslam, S.Z.Tan, and B.Dhillon, "Iris recognition in the presence of ocular disease," Journal of the Roayal Society Interface, Vol. 6, 489-493, 2009.

Source: IEEE Workshop on Computational Intelligence in Biometrics: Theory, Algorithms, and Applications, 2009.
Best Paper Award

2. Title: Information Distance Based Selective Feature Clarity Measure for Iris Recognition
   Authors: C. Belcher and **Y. Du**
   Source: Proceedings of SPIE, Vol. 6494, pp. 64940E1-E12, 2007.
   6 Citations (about 3 years after publication)

3. Title: Feature Information Based Quality Measure for Iris Recognition
   Authors: C. Belcher and **Y. Du**
   Source: Proceedings of IEEE International Conference on Systems, Man, and Cybernetics, 3339-3345, 2007.
   7 Citations (about 3 years after publication)

4. Title: Using 2D Log-Gabor Spatial Filters for iris recognition
   Authors: **Y. Du**
   Source: Proceedings of *SPIE*, Vol. 6202, pp. 62020F1-62020F8, 2006.
   8 Citations (about 4 years after publication)

RESEARCH CONFERENCE PRESENTATIONS

Dr. Du has presented 15 international conference papers in rank. She has been invited to give 18 seminars/presentations, including 2 invited panel presentations in international conferences, 2 invited presentations in NIST organized international competitions in iris recognition area, 1 invited talk by DOD, 2 invited talks by companies, 2 Indiana state level presentations, 5 invited seminars by other universities/organizations, and 4 invited seminars at IUPUI.) These presentations have helped her research in iris recognition being recognized nationally and internationally. In March 2009, the paper in Publication list Conference[14] has received the best paper award.

GRADUATE RESEARCH SUPERVISION

Dr. Du has graduated 4 master students (as main advisor) and 1 Ph.D. student (as co-advisor). Dr. Du is planning to recruit more Ph.D. and master students in the near future (please see the details in session 06).

Supervised Graduate Students in Rank

1. Emrah Arslanturk, Master thesis (received M.S. degree in May 2008)
   Thesis Title: Video Based Non-Cooperative Iris Processing Method for Iris Surveillance System
   My role: Thesis Advisor
   Emrah's master thesis work resulted in 1 journal article and 3 international conference papers with me (all published), and 1 provisional patent and 1 PCT patent.

2. Zhi Zhou, Master thesis (received M.S. degree in August 2008)
   Thesis Title: Iris Quality Filter and Segmentation Evaluation for Iris Recognition System
   My role: Thesis Advisor
   Zhi's master thesis work resulted in 1 journal article and 4 international conference papers as a major author (all published), 1 provisional patent, and 1 PCT patent. One of his conference paper received best paper award.

3. Craig Belcher, Master thesis (received M.S. degree in August 2009)
   Thesis Title: Non-ideal Iris Recognition and Image Quality Measure
   My role: Thesis Advisor

Craig's master thesis work resulted in 4 journal articles and 4 international conference papers as a major author(all published), 2 provisional patents, and 2 PCT patents. He received IUPUI Fellowship for his master study and Best Graduate student award in our department in 2009. I directly recruit him to his graduate study. He has work on McNair and MURI research projects under my supervision.

4. N. Luke Thomas, Master thesis (received M.S. degree in May 2010)
   Thesis Title: A New Approach for Human Identification Using the Eye
   My role: Thesis Advisor
   Luke's master thesis work resulted in 4 international conference papers as a major author (all published), and 1 PCT patent.

5. Xiaoli Jiao, Ph.D. dissertation (received Ph.D. degree in May 2010 from the Univ. of Maryland Baltimore County
   Thesis Title: Unsupervised Target Detection and Classification for Hyperspectral Imagery
   My role: Thesis Co-Advisor
   Xiaoli's Ph.D. thesis work results in 1 published journal article, 2 submitted journal articles, and 2 published international conference papers.

6. Zhi Zhou, Ph.D. dissertation (to be graduated in 2012)
   Thesis Title: To be decided
   My role: Thesis Advisor

7. Kai Yang, M.S. thesis (to be graduated in 2011)
   Thesis Title: To be decided
   My role: Thesis Advisor

8. Pavankumar Tunduri, Master project (graduated in May 2010)
   Project Title: Iris Image Processing
   My role: Project Advisor

9. Danny Iskandar, Master project (graduated in May 2007)
   Project Title: Iris Image Segmentation
   My role: Project Advisor

10. Francis Bowen, Ph.D. student
    Project Title: Traffic Image Processing
    My role: Project Advisor (Note: He is Dr. Rizkalla's student. He has worked with me as a Research Assistant for my NSF and INDOT projects.)

CONTRIBUTIONS TO THE GRADUATE PROGRAM

Dr. Du severed in graduate committee and graduate admission committee at the ECE department. She supports graduate students from her research grants. One of her graduate students is the first generation, low income in state student. She has successfully nominated two MS applicants for the IUPUI fellowship. She has been very active in demo her lab and research to potential graduate students to support the department/school recruiting activity.

Her student Craig Belcher was the recipient of IUPUI Fellowship and the Outstanding Graduate Student Award of ECE in 2009. Her student Zhi Zhou was the recipient of Starr Fellow in 2008. Most of graduate students were graduated from IUPUI.

All her graduate students are funded by her external/internal grants.

RESEARCH LABORATORY DEVELOPMENT

Dr. Du developed the Biometrics and Pattern Recognition Laboratory. This lab has been supported by her internal and external grants. It includes iris recognition system, fingerprint recognition device, 9 work stations, 3 laptops, several cameras, camcorders, and webcams. Her IRB for collecting biometrics data and workload have been approved in 2005 and 2008 respectively; and have been successfully renewed each year. This enables her research team to work on challenging biometrics data. She and her students developed the biometric data acquisition station, the remote iris recognition system, the iris image quality measure system, the traffic monitoring and classification system, and the real-time eye tracking system. This lab was selected as one of two labs in the School of Engineering and Technology to show the Purdue Trustees in 2007.

EVIDENCE OF INTERDISCIPLINARY ACTIVITIES (PARTIAL LIST)

Dr. Du's research area is in biometrics, which is a multidisciplinary subject. Current the biometrics course ECE 510 is cross listing with the Department of Computer Science CSCI 590. Dr. Du is teaching both departments and got very good feedback for this course.

Dr. Du has worked with the ME department in 2007~2009 to coordinate ECE/ME seminars.

Dr. Du is collaborating with the assistant Professors Dr. John Lee and Dr. Yuni Xia at the ECE and CS Departments respectively on the 2-year NSF sponsored project.

Dr. Du co-advised with Dr. Koskie at the ECE Department on senior design project in 2009.

Dr. Du has collaborated with associate professor Dr. WuDunn from the School of Medicine in IUPUI in the NSF iris recognition with disguise proposal (pending) in Dec. 2008. During the collaboration, they came up with a new approach for eye recognition. This innovative idea has applied for U.S. Provisional patent in Jan. 2009 and PCT in 2010. Dr. Du and Dr. WuDunn are the authors for this patent.

In Spring 2009, Dr. Du applied for the MURI project with associate profession Dr. LeBlanc from the School of Medicine in IUPUI. This project will be focused on medical image processing. The success of this project will provide valuable preliminary data for their NIH grant application.

In Spring 2009, Dr. Du worked with associate professors Dr. Mihran Tuceryan and Dr. Jiang Yu Zheng at the CS Department of IUPUI, dr. Fang Li at the Math Department, and Mr. Herbert Blitzer at Indiana Forensic Institute to apply for the NIJ funding. Even though this project was not funded, this is a very good collaboration experience.

In fall 2006, Dr. Du mentored a MURI project. This project supported 3 undergraduate students who are from EE, CE, and BME majors. In fall 2007, she worked with Dr. Duffy from Industry Engineering Department from Purdue University West Lafayette and mentored another MURI project, which supported 3 undergrads from EE, CE, and CS majors.

Dr. Du collaborated with Assistant Professor Ms. Heather Woodward (she is now an Assistant Professor at Purdue Univ. West Lafayette) and Associate Professor Ms. Jamie Workman at MET at IUPUI in health service related research and developed automatic hand hygiene monitoring system. This project was supported by NIH AHRQ.

Dr. Du is collaborating with Associate Professor Dr. MacDorman at the School of Informatics on the Android research and has submitted a proposal with him as Co-PI to NSF. Dr. Du works with Dr. Sivakumar S. Krishnan in noninvasive optical/infrared sensor design. Dr. Du worked with full professor Dr. Eberhart at ECE on a SBIR proposal in 2007 in multimodal biometrics system design.

In the INDOT sponsored project, Dr. Du worked with Dr. Jiang from Purdue University West Lafayette, and Dr. Li from INDOT for traffic monitoring project to help provide correct pavement information. Dr. Jiang and Dr. Li are civil engineering background.

Dr. Du has collaborated with Dr. Schneider at the Physiology department at the University of Maryland, School of medicine in Ca^{2+} spark detection in confocal imaging. She is planning to apply for NIH grant with Dr. Schneider in this area in the near future.

Dr. Du is a member of two signature centers: Transportation Active Safety Institute (TASI) and Androids research center. Both centers are multidisciplinary oriented.

Currently, Dr. Du, Dr. Zou and Mr. Orr (Department of Computer Science) are working on the Cancellable Biometrics Project, which is founded by the Center of Applied Cybersecurity Research at IU Bloomington.

Dr. Du has worked closely with her colleagues Dr. Stanley Chien, Dr. Russ Eberhart, Dr. Yaobin Chen, Dr. Wilson, Dr. Luzar, Mr. Gee, and Ms. Terri Talbert-Hatch for the DHS educational proposals.

International Collaborations:

Dr. Du is collaborating with Dr. Jin-Hua She in the Bionics department at the Tokyo Institute of Technology in Japan on the IUPUI international development fund (IDF) program. This project has resulted in the NSF PIRE proposal. Recently, Dr. Du, Dr. She, and two other Japanese professors co-authored a journal article and submitted it to the IEEE Trans. of Robotics.

In NSF PIRE proposal, Dr. Du has collaborated with a number of researchers and professors in and out of U.S.A. Dr. Du is the PI. At IUPUI, the Co-PIs are Dr. Stanley Chien (professor at ECE), Dr. Susan Sutton (Associate Vice Chancellor for International Fairs and Professor in Department of Anthology), and Dr. Pratibha Varma-Nelson (Director of IUPUI Center of Teaching and Learning, and Professor in Department of Chemistry). The senior personals are Dr. Yao Liang (Associate Professor at CS Department), Dr. Ulla Connor (Director of Indiana Center for Intercultural Commincation and Professor in Interculture Communication), and Dr. Rebecca Sloar (Professor at the School of Nursing). At Purdue, Dr. Vincent Duffy is the Co-PI (Associate Professor at the Department of Industry Engineering). At the Michigan State Univ, Dr. Guoliang Xing (Assistant Professor at the CS Department) is the senior personal. At VA Hospital, Dr. Jason Saleem is the senior personal. In Japan, we have following collaborators: Dr. She (Associate Professor at CS Department of Tokyo University of Technology), Dr. Yokota (Assistant Professor at Bionics Department of Tokyo University of Technology), Dr. Xin (Professor at Mechanical Engineering Department of Okayama Prefectural University), Dr. Kamamichi (Assistant Professor at

Robotics Department of Tokyo Denki University), and Dr. Shinshi (Associate Professor at Mechanical Engineering Department of Tokyo Institute of Technology).

In the Canada Department of Defense project, Dr. Du has collaborated with researchers from IBG, Univ. of Toronto, Canada Department of Defense, Canada Border Service Agency, Royal Canadian Mounted Police, and Information and Privacy Commissioner. This is not only an international collaboration project, but also an internationally founded research project. If this pilot project is successful, we may expect to work on multiple-year project for Canadian government agencies.

SUMMARY AND FUTURE DIRECTIONS

Dr. Du will continue working hard to produce more and better research results. She has been successful in grants applications. She will generate excellent research results and give satisfactory report to the funding agencies. She will apply for more grants to support more Ph.D., master, and undergraduate student research and studies. Dr. Du is planning to submit proposals to Department of Homeland Security, National Science Foundation, Department of Defense, National Institute of Health, National Institute of Justice, and other federal government agencies in the near future. She is also vigorous looking for funding from local government and industry. Over the past four and half years, Dr. Du has been working closely with her colleagues in research projects and proposal. In addition, Dr. Du has worked with her international collaborators in related research projects and proposals. In the future, Dr. Du will continue and expand her collaborations.