Jongseong Choi (Brad)

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RESEARCH INTERESTS

Computer Vision; Structural Health Monitoring; Smart Factory; Big Data; **Smart Cities**; Nondestructive Testing; Propulsion

EDUCATION

PhD., Mechanical Engineering, Purdue University, West Lafayette, Indiana, United States ..... (expected) 12/2019
- Dissertation: *Intelligent Facility Management: Computer-aided Lifecycle Structural Monitoring Framework using Big Visual Data*
- Advisor: Dr. Shirley J. Dyke

MSc., Mechanical Engineering, University of Mississippi, Oxford, Mississippi, United States 05/2014
- Thesis: *Parametric Scramjet Analysis*
- Advisor: Dr. Jeffrey A. Roux

BSc., Mechanical Engineering, University of Mississippi, Oxford, Mississippi, United States 05/2012

RESEARCH RECORD

Professional Research Projects

[R8] Integrating Human and Machine for Post-Disaster Visual Data Analytics ..... 01/2019 – Present
- Supported by NSF under Grant No. NSF-1835473
- Develop a visual data retrieving software to search for data based on visual similarity, using Siamese Network.
- My contribution includes developing similarity based image classification tool such as PyTorch and Tensorflow.
- 1 journal paper in preparation **[J9]**; 1 conference paper submitted **[C7]**

[R7] STORM: Safeguarding Cultural Heritage through Organisational Resources Management ..... 04/2017 – Present
- Collaboration with European Union Grant No. H2020 n. 700191
- Develop automated monitoring system for graffiti in a community
- My contribution includes developing a unique graffiti detector working with 3D point cloud generated from a large number of images capture in community.
- 1 conference paper published **[C5]**; 1 journal paper submitted **[J7]**

[R6] RETH: Resilience ExtraTerrestrial Habitat ..... 08/2018 – 01/2019
- Supported by New Horizon Program at Purdue University.
- Develop the expertise needed to address the grand challenge of permanent human settlements outside Earth.
- My contribution includes creating 3D models to capture features inside lava tubes using over 10 GB visual data.
- 3D models & videos were published in numerous articles worldwide (e.g., usatoday.com, space.com, phys.org, etc.); Available in https://phys.org/news/2019-07-humans-lava-tubes-moon.html
- 1 conference paper published **[C6]**

[R5] EAGER: Active Citizen Engagement to Enable Lifecycle Management of Infrastructure Systems ..... 05/2017 – 08/2018
- Supported by NSF under Grant No. NSF-1645047
- Develop a lifecycle structural management system using crowdsourced images.
- My role is to lead project, develop demos, collect data, and publish.
- 1 journal paper published **[J6]**; 1 journal paper submitted **[J8]**

[R4] Image-Based Collection and Measurements for Construction Pay Items ..... 05/2015 – 08/2017
- Supported by INDOT under Grant No. SPR-4006
- Develop a tool of graphical measurement to improve efficiency and safety at a construction site
- My contribution includes constructing model, developing tool, building a drone.
- 1 journal published **[J4]**; 1 conference paper published **[C1]**; 1 Technical Report published **[C3]**

[R3] VEST: Soft Armor Non-Destructive Evaluation Test Method: Vibration Energy Signature Test ..... 9/2014 – 08/2015
- Supported by U.S. Department of Justice under Grant No. 2014-MU-CX-K004
- Develop a non-destructive test method for soft body armor's ballistic performance.
- My role was to lead team, design systems, build experiment setup, derive model.

[R2] High Rate Compression Performance of Smartphone Buffer Materials ..... 08/2014 – 10/2014

- Supported by Corvid co.
- Assess the dynamic performance of various foam materials.
- My contribution includes conducting experiments, analysis material behaviors.

[R1] **Parametric Analysis of Scramjet Engine Varying Material and Fuel** ..... 08/2012 – 05/2014

- Supported graduate program by University of Mississippi.
- Analytic research of Propulsion and Heat Transfer of an engine optimization problem.
- 3 journal papers published **[J1]**, **[J2]**, **[J3]**; 1 Master Thesis.

Individual Non-Funded Research Projects

[I5] **Future Lifecycle Infrastructure Management System toward Smart City and Resiliency** ..... 01/2019 – Present

- Process Convolution Neural Networks (CNNs) and SIFT image features to enhance extract robust features from image, thus to automatically decipher image orientation and pose.

[I4] **Optimize Maintenance Design of the Large-scale Mechanical System toward Smart Factory** ..... 01/2019 – Present

- Develop a novel monitoring system toward smart factory.

[I3] **Vision-based Visual Inspection System for A Large Number of Aerial Images** ..... 01/2017 – 12/2017

- Develop a building façade visual inspection technique using drones and orthophoto generation.
- 1 journal paper published **[J6]**, 1 proposal submitted and funded **[P5]**

[I2] **Sensor Integrated Autonomous Flight UAV System Development** ..... 05/2016 – Present

- Use various sensors (LIDAR, stereo camera, and IMU) to achieve autonomous flight.
- 2 proposal submitted **[P2]**, **[P3]**

[I1] **Automated Region-of-Interest Localization and Classification for Facility Visual Assessment** ..... 05/2015 – 05/2017

- Develop an image localization technique that can be used in large-scale structures using a large volume of images.
- 1 journal paper published **[J5]**; 1 conference paper published **[C2]**; 3 proposal submitted **[P1]**, **[P4]**

Proposal Development

[P5] **EAGER: Active Citizen Engagement to Enable Lifecycle Management of Infrastructure Systems** 07/2016

- **(Funded** under Grant No. **CMMI-1645047)** Co-authored successful proposal on behalf of Prof. Shirley J. Dyke with funded $100,000 from National Science Foundation (NSF).

[P4] **E-Defense Collaborative Research: Enabling Building Damage Assessment by Engaging Remote Experts** 01/2018

- Co-authored on behalf of Prof. Shirley J. Dyke and requrested $700,000 to National Science Foundation (NSF).

[P3] **S&SA: INT: Autonomous Infrastructure Inspection and Condition-Based Maintenance** 05/2017

- Co-authored proposal on behalf of Prof. David. Cappelleri and requested to National Science Foundation (NSF).

[P2] **S&SA: Reconfigurable Aerial Robots for Intelligent Assessment to Industrial Disasters** 11/2016

- Co-authored proposal on behalf of Prof. Xinyan Deng and requested to National Science Foundation (NSF).

[P1] **Automated Vision-based Welding Inspection Methods on a Large-scale Structures** 10/2015

- An extended-abstract version of proposal submitted; aiming for three different applications of Dam, highway Structures, and Aircraft.
- Co-authored proposal on behalf of Prof. Shirley J. Dyke and requested to Indiana Department of Transportation (INDOT).

Peer-Reviewed Journal Articles

[J10] Ali Lenjani, Shirley J. Dyke, Ilias Bilionis, Chul Min Yeum, Kenzo Kamiya, **Jongseong Choi**, Xiaoyu Liu, & Arindam G. Chowdhury (2019), Towards fully automated post-event data collection and analysis: pre-event and post-event information fusion. *Engineering Structure*. (Accepted)

[J9] **Jongseong Choi**., Chul Min Yeum, Ali Lenjani, & Shirley J. Dyke, A Novel Building Searching & Identification Method for A Large Volume of Reconnaissance Images, in preparation - exp. submission in November 2019

[J8] **Jongseong Choi** & Shirley J. Dyke (2019), CrowdLIM: Crowdsourcing to Enable Lifecycle Infrastructure Management. *Computers in Industry*, submitted

[J7] **Jongseong Choi**, Patrikakis Charalampos, Chul Min Yeum, & Shirley J. Dyke, Robust Graffiti Detection Approach in European Historical Monuments, under review

[J6] **Jongseong Choi.**, Chul Min Yeum, Shirley J. Dyke, & Mohammad J. Jahanshahi (2018), Computer-aided approach for rapid post-event visual evaluation of a building façade. *Sensors*, 18(9), 3017.

[J5] Chul Min Yeum, **Jongseong Choi,** & Shirley J. Dyke. (2018), Automated region-of-interest localization and classification for vision-based visual assessment of civil infrastructure. *Structural Health Monitoring*, 1475921718765419.

[J4] Chul Min Yeum, **Jongseong Choi**, & Shirley J. Dyke (2017), Autonomous image localization for visual inspection of civil infrastructure. *Smart Materials and Structures*, 26(3), 035051.

[J3] Jeffrey A. Roux, **Jongseong Choi**, & Neerad Shakya (2014), Parametric scramjet cycle analysis for nonideal mass flow rate. *Journal of Thermophysics and Heat Transfer*, 28(1), 166-171.

[J2] Jeffrey A. Roux, Neerad Shakya, & **Jongseong Choi** (2013), Scramjet: minimum thrust-specific fuel consumption with material limit. *Journal of Thermophysics and Heat Transfer*, 27(2), 367-368.

[J1] Jeffrey A. Roux, Neerad Shakya, & **Jongseong Choi** (2012), Revised parametric ideal scramjet cycle analysis. *Journal of Thermophysics and Heat Transfer,* 27(1), 178-183.

Refereed Conference Papers & Other Articles

[C7] Shirley J. Dyke, Xiaoyu Liu, **Jongseong Choi**, Chul Min Yeum, Juan Park, Ali Lenjani, Julio A. Ramirez, & Randall Poston (2020), "Learning from Earthquakes Using the Automatic Reconnaissance Image Organizer," Proceedings of 17th World Conference on Earthquake Engineering, Sendai, Japan, Sep 13-18, 2020

[C6] Audai Theinat, Anahita Modiriasari, Antonio Bobet, Jay Melosh, Shirley J. Dyke, Julio A. Ramirez, **Jongseong Choi**, Amin Maghareh, & Daniel Gomez (2019, March), "Geology Explorations of Lava Tubes in the National Beds Lava Monuments," In Lunar and Planetary Science Conference (Vol. 50).

[C5] **Jongseong Choi**, Chul Min Yeum, Shirley J. Dyke, Mohammad R. Jahanshahi, & Gun Wook Park (2018), "Rapid Vision-Based Inspection of Nonstructural Components in Buildings," Proceedings of the 9th European Workshop on Structural Health Monitoring, Manchester, UK, July 10-13, 2018.

[C4] Geoff J. Knowles, Todd Kelley, Euisuk Sung, & **Jongseong Choi** (2017, June), "Board# 100: Research Design, Data Collection, and Assessment Methods for an Integrated STEM Education Model (Work in Progress)," In 2017 ASEE Annual Conference & Exposition.

[C3] Chul Min Yeum, Anup Mohan, Shirley J. Dyke, Mohammad R. Jahanshahi, **Jongseong Choi**, Ziyi Zhao, & Julio A. Ramirez (2017), "Image-Based Collection and Measurements for Construction Pay Items," Purdue University e-publidation.

[C2] Chul Min Yeum, **Jongseong Choi**, & Shirley J. Dyke (2017), "Automated Region-of-Interest Localization and Classification for Visual Assessment on Civil Infrastructure," Proceedings of the 11th International Workshop on Structural Health Monitoring, Stanford, CA, September 12-14, 2017.

[C1] Chul Min Yeum, **Jongseong Choi**, & Shirley J. Dyke (2017), "Image Localization for Computer-enhanced Visual Inspection of Civil Infrastructure," Proceedings of Engineering Mechanics Institute Conference, San Diago, CA, United States, June 4-7, 2017.

Professional Talks & Presentations

[T3] Professional Presentation, Midwest Smart Structure Colloquium (MSSC), Midwest US … 11/2015, 10/2016, 10/2017, and 4/2019

[T2] Professional Presentation, 9th European Workshop on Structural Health Monitoring, Manchester, UK, July …….. 08/2018

[T1] Poster Session, Annual Herrick IAC board meeting, West Lafayette, IN, USA …….. 11/2015, 11/2016, 11/2017, and 11/2018

TEACHING / MENTORING RECORDS

Research Advising (5 undergraduate students)

- Undergraduate Research Advisor ..... 08/2016 – current
  Yisong Yin, Undergrad Independent Research (Senior), 6 credits (Fall 2016 – Spring 2017)
  Sharda Parth, Undergrad Independent Research (Senior), 3 credits (Spring 2017)
  Gun Wook Park, Undergrad Independent Research (Senior), 6 credits (Spring – Fall 2017)
  - 1 conference paper published **[C5]**

  Jonghyun Park, Undergrad Independent Research (Senior), 6 credits (Spring 2018 – current)
  Wookjin Chung, Undergrad Independent Research (Senior), 6 credits (Spring 2018 – current)

Course Teaching

- Teaching Assistant ..... 05/2013 – 05/2014
  - ME325 Dynamics (typ. 70 students)
  - Primary responsibilities included weekly setup of equipment, presentation of pre-lab lectures, and grading.

STEM Curriculum Development for K-12 Students

- TRAILS: Teachers and Researchers Advancing Integrated Lessons in STEM …….. 02/2016 – 01/2020
  - Supported by NSF under Grant No. NSF-1513248
  - Understand and promote practices that increase students' motivations and capacities to pursue careers in STEM.
  - My role includes analyzing video data to observe students' behavior. (08/2016 – 05/2017)
- SLED: Science Learning through Engineering Design …….. 09/2010 – 08/2019
  - Supported by NSF under Grant No. NSF-0962840
  - Collaboration between STEM disciplinary faculty and grades 3-6 teachers to develop engineering-based tasks.

- My role includes analyzing video data to observe students' behavior (09/2015 – 08/2016)

Teaching and Educational Services

- TRAILS K-12 Outreach: Collaborated Eng. Project & Activity w/ McCutcheon High School (Lafayette, IN)
- TRAILS K-12 Outreach: Collaborated Project Evaluation w/ Mishawaka High School (South Bend, IN)
- TRAILS K-12 Outreach: Collaborated Eng. Project Activity w/ Wea Ridge Middle School (Lafayette, IN)
- TRAILS K-12 Outreach: Collaborated Project Evaluation w/ Peru High School (Peru, IN)
- TRAILS K-12 Outreach: Collaborated Eng. Project Activity w/ Battle Ground Middle School (Lafayette, IN)

PROFESSIONAL LEADERSHIP EXPERIENCE

IT Manager (3.3 years) …… 03/2016 – Present
- IISL Laboratory, Purdue University, West Lafayette, IN, USA
- Responsibility: manage website and update.

Workshop director (3 days) …… 04/2019
- 4th Midwest Smart Structure Colloquium from Apr 12014, 2019 at Purdue University West Lafayette, IN, USA.

K-12 Video Data Collector & Analyzer (1.7 years) …… 09/2015 – 05/2017
- TRIALS & SLED research groups (NSF-1513248 & NSF-0962840), Purdue University, West Lafayette, IN, USA
- Responsibility: analyze the video data to observe K-12 student behavior in scientific & communicate with teachers and students to proceed a newly developed curriculum from our engineering education team.

Volunteer Staff Caregiver (1.1 years) …… 09/2009 – 10/2010
- ReVitailse, Southport, Merseyside, UK
- Responsibility: operate and maintain medical devices; train weekly volunteers for the devices.

Chief Soldier Mechanics (2 years) …… 09/2006 – 08/2008
- Republic of Korea Army, Inje-gun, Gangwon-do, South Korea
- Responsibility: pre/post and periodic maintenance of military vehicles.

PROFESSIONAL SERVICE & OTHER QUALIFICATIONS

Awards & Scholarships

- **Honorable Mentions** from 3rd Midwest Smart Structure Colloquium, University of Illinois (UIUC) …… 10/2017
- **Travel Award & Workshop Invitation** from NHERI RAPID Experimental Facility, NSF…… 07/2019
  This award selects 20 attendees who has professional research background for the RAPID 4 days Equipment Training Workshop at the University of Washington, Seattle, as well as support up to $1,500 Travel Fund.
- **Travel Award for Conference** from College of Engineering, Purdue University…… 05/2018
  This award recognizes excellence PhD candidates supporting up to $1,000 for 2019 EWSHM conference at Hilton Hotel, Manchester, UK
  This award recognizes excellence in research presentation.
- **Resident Assistant Scholarship** from University of Mississippi …… 08/2012 – 08/2013
- **Honor Program Scholarship** from University of Mississippi …… 01/2011
  This scholarship is awarded to prominent undergraduate students in the School of Engineering.

Professional Affiliation

- President of Siloam Purdue Presbyterian church, Purdue University …… 01/2018 – 01/2019
- President of Korean Student Association (Olemiss KSA), Univ. of Mississippi …… 05/2014 – 08/2014
- American Society of Engineering Education (ASEE) …… since 08/2017
- American Society of Mechanical Engineering (ASME) …… since 04/2011

Major Courses

- Pattern Recognition/Decision Processing
- Image-based Sensing
- Computer Vision
- Robotics and Machine Vision
- Struct Dynamics Stability
- Adv Math Engr Phys I & II
- Structural Control Systems
- Finite Element Analysis I
- Experimental Stress Analysis
- Numerical Analysis
- Mechanics of Composite Materials
- Elasticity I

Competencies (knowledgeable / **experienced or professional** / **actively utilizing**)

- Programming Language: **Python**, **MATLAB**, C, C++, C#, Java
- Engineering Software: **MATLAB**, **ABAQUS**, **VisualSfM**, **Bentley**, **Pix4D**, **Poetree**, **MeshLAB**, **CATIA**, **AutoCAD**, **SolidWorks**, **Adobe AfterEffect**
- Language: **English**, **Korean**, Japanese
- Other: **LaTeX**, HTML, **Markdown**, **MS Access**, **MS Office**