



# APPLICATION FORM (JOINT RESEARCH) HIGH POTENTIAL INDIVIDUALS GLOBAL TRAINING PROGRAM)

## AGREEMENT

As stated above, I submit this application form to IITP that conducts “High Potential Individuals Global Training Program” supported by Ministry of Science, ICT in South Korea. IITP may disclose the information below to the public for the purpose of providing information and matching a research partnership between your institute and a Korean university.

\* IITP : Institute for Information & communications Technology Planning & Evaluation

Printed Name of  
Chief of Research

Donghyeon Ryu

Date(mm-dd-yyyy)

01-30-2020

Signature of  
Chief of Research

**(Note)** This application is to identify the willingness to participate in this research and to find a research partnership for research institutes in Korea. Therefore, in its sole discretion, it is acceptable to contain only minimal information. (max. 3 pages)

<b>1. Research Title</b>	Infrastructures Autonomous Maintenance by Machine Learning and Multifunctional Materials						
<b>2. Research Area</b>	<b>A.I.</b>	<b>Big Data</b>	<b>Cloud Computing</b>	<b>Block Chain</b>	<b>AR/VR</b>	<b>ICT/SW Convergence</b>	<b>Other ICT /SW</b>
	X	X				X	
<b>3. Chief of research</b>	Title	Assistant Professor		Contact	E-mail : <a href="mailto:donghyeon.ryu@nmt.edu">donghyeon.ryu@nmt.edu</a>		
	Name	Donghyeon Ryu			Tel : +1-575-835-5199		
<b>4. Affiliation</b>	Name	New Mexico Tech		Classification	(X) University ( ) Research Institute ( ) Industry ( ) ETC.		
<b>5. Capacity for students (5 or less)</b>	1		<b>Support for students (all necessary)</b>		(X) Visa support (X) Research Mentoring (X) Research Space (X) Accessibility to Research equipment		
<b>6. Research Objective</b>	The research objective of this proposed Korea-US collaborative study is to suggest innovative framework for autonomous maintenance of infrastructures by employing recent advancement in machine learning and multifunctional materials. As current state-of-the-arts for maintenance of infrastructures are heavily relied on schedule-based visual inspection, there is high demand on human intervention for diagnosis and prognosis of the						



	<p>infrastructures. Even with most advanced structural health monitoring (SHM) approaches, big data from a various types of sensor nodes require heavy data processing for pin-pointing damage in large infrastructures to provide information to be used for suggesting retrofitting and estimating remaining service life. For paradigm changes of infrastructure maintenance from human-intervened SHM to autonomous maintenance approach, machine learning and multifunctional materials are employed.</p>
<b>7. Research Summary</b>	<p>Realization of the innovative concept of the autonomous system for infrastructure maintenance can be accelerated through fusion of advanced computational artificial intelligent and multifunctional materials that can be engineered to attain multiple target functionalities. First, machine learning techniques will be employed for performing autonomous diagnosis and prognosis using big data sourced from a sensor network instrumented in target infrastructures. More specifically, depending on profile of damage (e.g., type, mode, location, and severity), type of machine learning needs to be chosen for optimized performance throughout collaborative research activities. Second, multifunctional materials are used to make synergistic effect along with the machine learning-based system by sourcing multi-modal sensor data with multi-physics information. More importantly, by designing the sensor devices with multifunctional materials, big data can be produced in pre-organized form to cope with different purpose of the autonomous systems, which can be hardly achieved with conventional sensor devices.</p>
<b>8. Need for funding from Korean government</b>	<p>The ambitious research goal can be achieved through close collaboration with Korean university and research activities sponsored by Korean government. The funding will be used for supporting Korean graduate student's study at New Mexico Tech to work with other graduate students under my advisory. Also, PI at the Korean university will be able to perform large scale testings to validate the autonomous systems. Also, it will help researchers visit Korean and US institutions for accomplishing international collaborations. As each institution has its unique capability and research infra, funding from Korean government can help make synergistic effect by seeding the international collaborations.</p>
<b>9. Request for Korean Universities</b>	<p>- The selection of students studying abroad should be conducted after mutual consultation, and please cooperate as much as possible to prepare for VISA.</p>