



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 Dugan Um Date(mm-dd-yyyy) 1/31/2020

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)

1. Research Title	Humanizing CoBots with Hybrid Deep-Q Learning for Manned/Unmanned Teaming						
2. Research Area	A.I.	Big Data	Cloud Computing	Block Chain	AR/VR	ICT/SW Convergence	Other ICT /SW
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3. Chief of research	Title	Associate Professor		Contact	E-mail : dugan.um@tamucc.edu		
	Name	Dugan Um			Tel : +1-512-785-0465		
4. Affiliation	Name	Texas A&M University - CC		Classifi cation	(X) University () Research Institute () Industry () ETC.		
5. Capacity for students	3		Support for students		(X) Visa support (X) Research Mentoring (X) Research Space		



(5 or less)		<i>(all necessary)</i>	(X) Accessibility to Research equipment
<p>6. Research Objective</p>	<p>Robotic manipulation in unknown, dynamic environments has been studied mostly in the domain of probabilistic random action approach. Therefore, due to the curse of dimensionality, the path planning in dynamic, unknown environments is, to some extent, limited only by probabilistic approaches. One of the primary goals in the field of artificial intelligence is to solve complex tasks from high-dimensional, unknown environment problem relying only on sensory inputs. In this research, we challenge manipulation in unknown, dynamic environment such as smart factory, or domestic environments via Deep Q-Learning. While discretized state/action space is easy to handle a Deep Q-Learning, it throws useful information in action domain, which would be essential to solve many dynamic problems. No significant real-world study has been reported in continuous DQL for robotic manipulation. Therefore, we investigate continuous action space based DQL in CoBot motion control.</p>		
<p>7. Research Summary</p>	<p>This research project seeks to generate knowledge and understanding of an innovative hybrid human-robot collaboration (HRC) mechanism through Deep Q-Learning for simultaneous contact and non-contact interactions between human and robots. To this end, we will investigate how a smart Co-Robot (CoBot) equipped with non-contact sensitive skin and torque sensors can achieve zero-collision in human environments, performing its own tasks, and often power-assisting a human for various tasks with continuous Deep Q-Learning platform. The research will include a critical study in continuous control via deep reinforcement learning to achieve transitional phase from non-contact to contact based collaboration and vice versa. We seek scientific answers for mutually contradicting goals to investigate how a CoBot can accomplish its own tasks while coexisting with humans in a dynamic working environment via the continuous Deep Q-Learning.</p>		
<p>8. Need for funding from Korean government</p>	<p>Dr. Dugan Um, PI of this project, requests salary support for three graduate students. Each graduate student at 100% time for 12 months. The role of the graduate students will be responsible for studying the continuous DQL based hybrid CoBot architecture for smart factory during the performance period. The total salary per one graduate student is \$34,725. Total salary requested is \$10,4175 USD.</p>		
<p>9. Request for Korean Universities</p>	<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>		