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	B. Brian Park	Date(mm-dd-yyyy)	01-21-2020
Signature of Chief of Research	*By Jh.yr. Pk*		

☞ *(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	Privacy Assured Proactive Individualized Route Guidance using Federated Learning Approach						
2. Research Area	**A.I.**	**Big Data**	**Cloud Computing**	**Block Chain**	**AR/ VR**	**ICT/SW Convergence**	**Other ICT /SW**
	X	**X**					
3. Chief of research	Title	Associate Professor	Contact	E-mail : bp6v@virginia.edu			
	Name	B. Brian Park		Tel : +1-434-924-6347			
4. Affiliation	Name	University	Classification	(X) University　　(　) Research Institute (　) Industry　　(　) ETC.			
5. Capacity for students (5 or less)	1		**Support for students** *(all necessary)*	(X) Visa support (X) Research Mentoring (X) Research Space (X) Accessibility to Research equipment			
6. Research Objective	The objective of the proposed research is to develop a transformative route guidance system that assures privacy of individual drivers and offers proactive route guidance system.						

7. Research Summary	Our motivations are two-fold. One is existing route guidance systems (e.g., Kakao Navi, SK's T-Map or Google Map) do not assure privacy as they transfer drivers' origin-destination information and route choice behaviors to the server/cloud. The other is existing route guidance is reactive as route guidance is typically updated on the basis of drivers' compliance behaviors. We note that while federated simulation has been widely implemented, federated learning is new to transportation. Our research will utilize federated learning (by enhancing existing federated learning that does not require real-time implementation) to assure privacy of each driver, and yet achieve system level proactive route guidance system customized for each individual driver based on his/her preference using multi-task linear adaptation model. Each driver's route choice behavior will be trained on his/her smart phone, and only trained weights (without sharing origin-destination and route choice behaviors) will be shared with Kakao Navi or T-Map main or cloud server. At the server or cloud level, an aggregated but allowing individual route choice behavior model (i.e., Multi-Task Linear Adaptation Model) will be continuously updated by integrating each driver's route choice behavior (again without sharing personal information). This will allow end users willing to participate in developing route choice behavior model (as they will benefit from the proposed proactive route guidance system) and improve market penetration for route guidance provider (e.g., Kakao Navi, T-Map or Google Map).
8. Need for funding from Korean government	As of now, we plan to use Kakao Navi data (available from Kakao via an agreement – non-funded research) or SK T-Map (if available), and demonstrate the feasibility of federated learning and proactive route guidance system customized for individual driver based on his/her preference, the support from Korean government is needed for a visiting scholar and additional costs related to establishing cloud server and/or high-end computer system for processing large amount of big data. Our approach, if found to be feasible and efficient, will enhance the state-of-art technologies for Korean mobility industry by having them adopting an up-to-date AI technology assuing privacy and proactive route guidance system customized for individual driver. We plan to perform collaborative research with a Korean research partner and supervise a visiting scholar form the Korean institute. Finally, we anticipate that our proof of concept through preliminary results could be marketable to route guidance system vendors via licensing option.
9. Request for Korean Universities	We prefer to work with university partners who have existing relationship with Kakao Navi or SK T-map so that we can use real route choice behavior data, and evaluate the feasibility of the proposed research plan.