專 題 演 講

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題 目： From Zero In-map Learning of Fingerprints to Accurate Boundary Localization

大 綱：

Indoor positioning has been intensively studied. A fundamental issue in such solutions is fingerprints collection. However, due to real-world constraints, collecting full fingerprints at all intended points is sometimes forbidden. To relieve this limitation, we consider the WiFi fingerprint inpainting problem. This problem is different from typical image/video inpainting and poses several challenges. Therefore, learning from a fingerprint map itself, which we call zero-shot or in-map learning, seems to be inevitable. Furthermore, WiFi signal propagations follow physical laws that are different from natural visions. Fortunately, multiple WiFi APs can be regarded as a multi-channel environment, from which rich correlations may be exploited. In this talk, I would first introduce our proposed zero-shot learning models by exploring inter-AP and intra-AP correlations for this problem. With complete fingerprint map, accurate positioning service can be provided to users. However, previous studies may not be applicable to solve the localization problem around the boundary areas. So, I would then discuss an interesting boundary area localization problem. For this problem, we propose a deep learning model which concatenates autoencoders with LSTM networks to perform multi-sensor multi-task fingerprint positioning. The adopted sensors include WiFi, GPS, and magnetometer. A dense block-based autoencoder is employed to extract representative latent codes of fingerprints. Then, a sequence of latent codes are injected into an LSTM network performing three output tasks, responsible for location estimation, most suitable sensor selection, and indoor/outdoor classification, respectively. Extensive real-life experiments are performed and the results demonstrate that our model achieves high positioning accuracy with an average Euclidean distance estimation error of about 0.43 meter.

簡 歷：

Jen-Jee Chen received the B.S. and M.S. degrees in computer science and information engineering from National Chiao Tung University (NCTU), Hsinchu, Taiwan, in 2001 and 2003, respectively, and the Ph.D. degree in computer science from NCTU, Hsinchu, Taiwan, in 2009. He was a Visiting Scholar at the University of Illinois, Urbana-Champaign,
IL, USA, during the 2007–2008 academic year and a Postdoctoral Research Fellow at the Department of Electrical Engineering, NCTU, Taiwan, during 2010–2011. Currently, he is an Associate Professor at the institute of Computational Intelligence, College of Artificial Intelligence (AI), National Yang Ming Chiao Tung University (NYCU), Taiwan, and the Director at the Institute of Intelligent Systems, College of AI, NYCU, Taiwan. His research interests include AI, 5G V2X and IoT, Robotics and Assistive Applications, and mobile computing. Dr. Chen is a member of IEEE and Phi Tau Phi Society.