



University
of Victoria

Graduate Studies

Notice of the Final Oral Examination
for the Degree of Doctor of Philosophy

of

NINA TAHERIMAKHSOUSI

MSc (University of Ferdowsi and Sharif University of Technology, 2008)
BSc (Islamic Azad University, 2006)

“Context Aware Face Recognition”

Department of Computer Science

Monday, December 16, 2019

1:00 P.M.

Clearihue Building

Room B017

Supervisory Committee:

Dr. Hausi Müller, Department of Computer Science, University of Victoria (Supervisor)

Dr. Alex Thomo, Department of Computer Science, UVic (Member)

Dr. Panajotis Agathoklis, Department of Electrical and Computer Engineering, UVic (Outside Member)

External Examiner:

Dr. Ladan Tahvildari, Department of Electrical and Computer Engineering, University of Waterloo

Chair of Oral Examination:

Dr. Bob Kowalewski, Department of Physics and Astronomy, UVic

Abstract

In common face recognition systems the recognition rate is not sufficient for today's applications, and systems only work in conditional databases and fail in unconstrained conditions.

The problem addressed in this dissertation is how to exploit context information to enhance face recognition. Therefore, this dissertation focuses on the investigation of dynamic context management and adaptivity to: (i) improve context awareness and the exploit of the value of contextual information to enhance the recognition rate in face recognition systems, and (ii) improve the dynamic capabilities of adaptivity in face recognition systems by controlling the relevance of contextual information collecting, analyzing and searching context.

Context awareness and adaptivity pose significant challenges for face recognition systems. Regarding context awareness, the first challenge addressed in this dissertation is data collection that can automatically analyze images in order to categorize and summarize contextual information. The second challenge arises from data extraction due to the big size of database of faces. Concerning adaptivity, the third challenge is to improve adaptive learning and classifier method with respect to variations. The fourth challenge, related also to adaptivity, concerns the high rate of videos generated by users from a dense urban area to decentralized cloud infrastructure. The fifth and sixth challenges concern the human's visual system in terms of contextual information in face recognition.

Given these challenges, to improve context awareness and adaptivity in face recognition system we made four contributions. First, we proposed our framework for location-based face recognition. The framework comprises location-centric image databases to recognize faces in images that have been taken at nearby locations frequently visited by individuals. Second, we defined contextual information and architectural designed for context aware face recognition system. Third, we designed contextual information extraction algorithm with an architecture for context aware video-based face recognition, which decentralizes cloud computing on the SAVI network infrastructure. Fourth, we designed an experimental study of face recognition by humans. The experimental study provided insights into the nature of cues that the human visual system relies upon for achieving its impressive performance serving as the building blocks for the developed context aware face recognition system.