Min-Han Tsai

Educations

National Tsing Hua University (NTHU), Taiwan — January 2020 - present
Master program in Computer Science — GPA: 4.15/4.3

National Tsing Hua University (NTHU), Taiwan — Sept. 2015 - June 2019
Master program in Computer Science — GPA: 3.45/4.3

Research Interests

Edge Computing, Internet of Things (IoT), Machine learning, and Multimedia.

Publications

M. Tsai and C. Hsu. *Analytics-Aware Storage of Surveillance Videos: Implementation and Optimization*, in *Proc. of IEEE Internal Conference on Smart Computing (SMARTCOMP'20)*, Bologna, Italy.

L. Chen, **M. Tsai**, M. Tsai, S. Chiou, and C. Hsu *Smart Video Semantic Searching with Actions and Background*, in *Smart Video Semantic Searching with Actions and Background*, Undergraduate Research, October 2018

Professional and Teaching Experiences

Introduction to Multimedia, Dept. of Computer Science, NTHU — Spring 2020
Teaching Assistant

NMS Lab, Dept. of Computer Science, NTHU — Mar. 2019 - Dec. 2019
Research Assistant

National Center for High-performance — June 2019 Dec. 2019
Research Assistant

Data Lab, DB / AI Boot Camp, NTHU — July 2018
Teaching Assistant

MP Lab, Dept. of Computer Science, NTHU — June 2017 - Oct. 2017
Undergraduate students

Honors and Awards

Hackthon in Cloud Programming Course, "Don't touch me" — Spring 2019
First Prize

Research Projects

Information-based Edge Storage Server.

Cameras in smart spaces enable novel and diverse analytic applications, such as object detection and tracking, face recognition, health monitoring, and traffic management. Typically, uploading surveillance video clips to data centers for storage and analytics. Doing so however may lead to high operational cost and suffer from network congestion because each surveillance camera produces a traffic stream at several Mbps. A better way to manage the video clips is to store them on a storage server in an edge network. The edge network interconnects multiple nearby Internet-of-Things (IoT) devices, including surveillance cameras, and connects to the Internet via a gateway through an access network. Without uploading all the video clips to the cloud, the traffic load on the access network is reduced. When users need to analyze the surveillance videos, they instruct nearby analytics servers to request for corresponding video clips from the storage server. These analytics servers could be stationary serving smartphone or laptop users; they could also be mobile ones installed on, e.g., police cars. Keeping the surveillance video clips at the storage server, however, may quickly fill up its disk. Upon the storage space of the edge server is used up, we have to get rid of some video clips to make room for incoming ones. A naive way to do that is to delete the oldest video clips. Doing so, however, may lead to too much information loss, because video clips from different cameras and at different time contain different amounts of information. In fact, video clips that contain some information may better be downsampled instead of being completely deleted. In this project, we design, implement, and optimize a storage server for saving the surveillance video clips. The goal is to retain video clips with the highest information amount and selectively downsample the stored video clips to make room for future ones.

Food intake monitoring in Smart Home.

Food intake monitoring is considered an important part of the research field of the smart home. As more and more people care about their quality of life and health, the habits of food intake directly affect the our nutrition-ingestion, food freshness, the purchasing decisions. For instance, if we clearly understand the consumption of food in our fridge, we prevent food-borne illness easier. In addition, with the various sensors are adopted in IoT scenarios, the data fusion and integration can achieve more comprehensive and precious decision-making or suggestion. There are already many research projects focusing on the food intake logging, however, most of them are using wearable or mobile app manners but pay less attention to user experience. Although these wearable devices are lightweight, comfort and convenience are still challenging issues. As a result, we plan to use the environmental sensors which can be placed in the kitchen, dining table, or food items. The data acquisition from environmental sensors, such as RFID readers, passive infrared sensor, or magnetic sensors, that have less influence on human life. By fusing the data comes from invisible sensors in the smart home, we log, track, predict, and give suggestions to related activities of food intake, e.g., our system delivers warning while knowing the user is overeating. The preliminary goal of this project is to realize when, where, what, and the desire for food intake without interfering with human daily lives in a smart home.

Smart Video Semantic Searching.

Keyword searching implementation has been in many operating systems for years. However, this task is limited to text only. Even if some stream media platforms allow users to search by the words, but they are still based on the title or annotation of a single video. Recording a particular timestamp will be a convenient function when people are binge-watching baseball matches but forget where should they continue. By labeling the video segments, it would be faster and more user friendly to search particular video segments with keywords, which people really care about. We propose a system that is capable of learning the content of videos and provide users certain keywords for searching particular segments. Our system leverage InceptionV3 CNN to extract features and a single layer of LSTM to inference to the foreground. As for the background, we use semantic segmentation to extract the remaining part of images and feed into wide ResNet18 for background prediction. The configuration combines foreground and background information and predicts the result depending on the input.