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A Practical Weather Detection Method Built In the Surveillance System

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Abstract: Extracting information related to weather and visual conditions at a given time and space is indispensable for scene awareness, which strongly impacts our behaviors, from simply walking in a city to riding a bike, driving a car, or autonomous drive assistance. Despite the significance of this subject, it is still not been fully addressed by the machine intelligence relying on deep learning and computer vision to detect the multi-labels of weather and visual conditions with a unified method that can be easily used for practice. What has been achieved to-date is rather sectorial models that address limited number of labels that do not cover the wide spectrum of weather and visual conditions. Nonetheless, weather and visual conditions are often addressed individually. In this paper, we introduce a novel framework to automatically extract this information from street-level images relying on deep learning and computer vision using a unified method without any pre-defined constraints in the processed images. A pipeline of four deep Convolutional Neural Network (CNN) models, so-called the WeatherNet, is trained, relying on residual learning using ResNet50 architecture, to extract various weather and visual conditions such as Dawn/dusk, day and night for time detection, and glare for lighting conditions, and clear, rainy, snowy, and foggy for weather conditions. The WeatherNet shows strong performance in extracting this information from user-defined images or video streams that can be used not limited to: autonomous vehicles and drive-assistance systems, tracking behaviours, safetyrelated research, or even for better understanding cities through images for policy-makers.

I. INTRODUCTION

Cities are complex entities by nature due to the multiple, interconnected components of their systems. Features of the physical environment extracted from images, or so-called urban scenes, have great potential for analysing and modelling cities because they can contain information on a range of factors such as people and transport modes, geometric structure, land use, urban components, illumination, and weather conditions. In recent years, computer vision techniques have shown progress in extracting and quantifying these features. This article is concerned with the recognition of weather and visual conditions, which are two related but separate aspects of urban scenes that can be extracted in order to better understand the dynamics of the appearance of the physical environment. In this study, we refer to visual conditions as the significant changes in the appearance of cities during dawn/dusk, day or night-time including the effect of glare on visibility, whereas weather conditions are the meteorological changes of the environment due to precipitation including clear, rainy, foggy, or snowy weather. They represent crucial factors for many urban studies including transport, behaviour, and safety-related research . For example, walking, cycling, or driving in rainy weather is associated with a higher risk of experiencing an incident than in clear weather. Fog, snow, and glare have also been found to increase risk . Importantly, it is not only the inherent risk that different weather and visual conditions pose to human life that is of interest to researchers. Scene awareness for autonomous navigation in cities is highly influenced by the dynamics of weather and visual conditions and it is imperative for any vision system to cope with them simultaneously.

II. LITERATURE REVIEW

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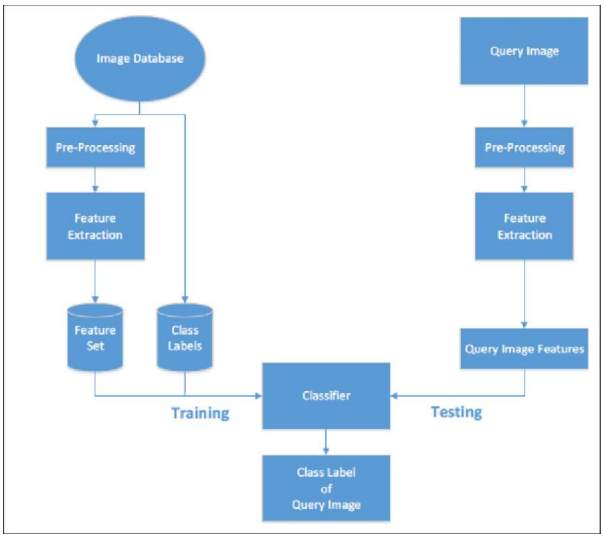
Various weather and visual conditions have been detected relying on a wide spectrum of computer vision algorithms. Here, we categorised them into four broad types: mathematical models, filter-based models, machine learning models using shallow algorithms, and deep models using a convolution structure.

III.IMPLEMENTATION

SYSTEM ARCHITECTURE



MODULES DESCRIPTION

USER

User can upload video/image to system and can get predicted result

SYSTEM

Training Module

In this module paper is a set of different weather scenes and perform Image pre-processing in this process resize image and convert to grayscale for Feature extraction. Feature extractions When the input data to an algorithm is too large to be processed and it is suspected to be redundant (e.g. the same measurement in both feet and meters, or the repetitiveness of images presented as pixels), then it can be transformed into a reduced set of features (also named a feature vector). Determining a subset of the initial features is called feature selection. The selected features are expected to contain the relevant information from the input data, so that the desired task can be performed by using this reduced representation instead of the complete initial data. its doing with VGG Very Deep Convolutional Networks (VGGNet) and creattrining dataset. 5 types of weather classes rau used heat those are cloudy, foggy, rain, shine and sun rise.

IV. RESULT

Fig-4: Output of the video scences

Fig-4.1: Cloudy

Fig-6: RAIN

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Fig-7: FOGGY

V. CONCLUSION

we presented a novel framework, VGGNet, to detect and map weather and visual conditions from single-images relying on deep learning and computer vision. VGGNet is capable of detecting 5 classes: cloudy,foggy,rain,shine and sun rise weather. We aimed to exemplify the application of deep learning and computer vision for scene-awareness and understanding the dynamics of the appearance of urban scenes that could be useful for autonomous applications in cities or elsewhere. After training four deep CNN models on street-level images from different corners of the globe of various urban structure, weather conditions, and visual appearances, the proposed VGGNet showed a strong performance in recognising the combination of different categories of a single image.

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