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HASIL PENILAIAN SEJAWAT SEBIDANG ATAU PEER REVIEW
KARYA ILMIAH : PROSIDING

Judul Karya Ilmiah : Normal and Murmur Heart Sound Classification Using Linear Predictive Coding and k-Nearest Neighbor Methods

Jumlah Penulis : 5 Orang (Aghus Sofwan, Imam Santoso, Himawan Pradipta, **M Arfan**, Ajub Ajulian Zahra M)

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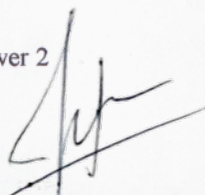
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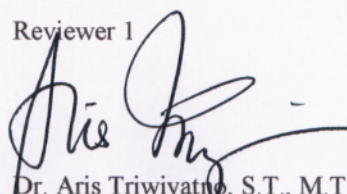
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Semarang,

Reviewer 1



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Makalah telah memenuhi unsur isi paper yang terdiri abstract, introduction , javascript polyline method dan micro-segmentation technique , evaluation procedure, dan conclusion.

2. Ruang lingkup dan kedalaman pembahasan:

Ruang lingkup makalah adalah vehicle distance measurement dengan fokus detail pembahasan pada analisis terhadap micro-segmentation tuning.

3. Kecukupan dan kemutakhiran data/informasi dan metodologi:

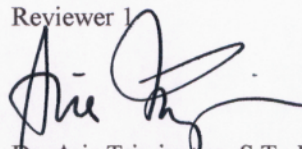
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NIP. 197509081999031002

Unit : Dept. Teknik Elektro FT UNDIP

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c. Kecukupan dan kemutakhiran data/informasi dan metodologi (30%)	7,50		7,30
d. Kelengkapan unsur dan kualitas terbitan/prosiding(30%)	7,50		7,40
Total = (100%)	25,00		24,40
Nilai Pengusul = (40% x 24,40) / 4 = 2,44			

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1. Kesesuaian dan kelengkapan unsur isi jurnal:

Unsur makalah lengkap yang berisi pendahuluan, desain sound classification, feature extraction, pattern classification, serta kesimpulan serta dengan daftar pustaka

2. Ruang lingkup dan kedalaman pembahasan:

Ruang lingkup pembahasan cukup mendalam terkait yang menjadi pokok bahasa, serta hasil dari Normal and Murmur Heart Sound Classification. Pembahasan cukup mendalam dilengkapi dengan penyajian rumus dan proser perhitungannya.

3. Kecukupan dan kemutakhiran data/informasi dan metodologi:

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Semarang,

Reviewer 2

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Normal and Murmur Heart Sound Classification Using Linear Predictive Coding and k -Nearest Neighbor Methods

Sofwan A. ✉ , Santoso I. ✉ , Pradipta H. ✉ , Arfan M. ✉ , Ajub Ajulian Zahr M. ✉

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Abstract

Heart rate sounds have a special pattern that is in accordance with a person's heart condition. An abnormal heart will cause a distinctive sound called a murmur . Murmurs caused by various things that indicate a person's condition. Through a Phonocardiogram (PCG), it can be seen a person's heart

rate signal wave. Normal heartbeat and murmurs have a distinctive pattern, so that through this pattern it can be detected a person's heart defects. This study will make a classification program that will sense normal heart sounds and murmurs. This program uses feature extraction methods using LPC (Linear Predictive Coding) and classification using k -NN (k - Nearest Neighbor) to identify these 2 heart conditions. The data that will be used as a database consists of samples of normal heart rate sounds and murmurs, and also data obtained from the heart rate detection device in the .wav, mono format. The system for detecting heart abnormalities consists of three main parts, namely: recording heart rate sounds, feature extraction using LPC with order 10, and feature lines using k -NN with 3 types of distances and variations of k . From the results of testing with these types of distance, the obtained average accuracy value of Chebyshev, City Block, and Euclidean are 96.67, 91.67, and 93.33 percent, respectively. In addition, the value of k equal 3 is the most optimal value of k with an average level of 96.67 percent. © 2019 IEEE.

Author keywords

heart abnormalities; k -nearest neighbour; linear predictive coding

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Program Schedule

Tuesday, October 29th, 2019

07.30-08.00	Registration		Borobudur 1 Room
08.00-08.15	Opening Ceremony	Opening Speech from the General Chair of ICICoS 2019 (Dr. Retno Kusumaningrum, S.Si, M.Kom)	
08.15-08.25		Opening Speech from the Dean of Faculty of Science and Mathematics, Universitas Diponegoro (Prof. Dr. Widowati M.Si.)	
08.25-08.45		Opening speech from Chair of IEEE Indonesia Section (Prof. Wisnu Jatmiko)	
08.45-08.55		Opening Speech from the Rector Universitas Diponegoro (Prof. Dr. Yos Johan Utama, S.H., M.Hum)	
08.55-09.15		Photo Session and Coffee Break	
09.15-10.10	Plenary	• Keynote Speaker I: Mahardika Pratama, Ph.D	
10.10-11.05		• Keynote Speaker II: Prof. A Min Tjoa	
11.05-12.00		• Keynote Speaker III: Prof. Riyanarto Sarno	
12.10-13.00	Lunch		Restaurant (Cafe Delima)
13.00-15.00	Parallel Session I	Six Parallel Sessions	1: Borobudur 1 2: Borobudur 2 3: Sewu 4: Mendut 5: Kalasan 6: Prambanan
15.00-15.30	Coffee Break		
15.45-17.45	Parallel Session II	Five Parallel Sessions	1: Borobudur 2 Room 2: Sewu Room 3: Mendut Room 4: Prambanan Room 5: Kalasan
17.45-18.30	Free Session		

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Normal and Murmur Heart Sound Classification Using Linear Predictive Coding and k-Nearest Neighbor Methods

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Abstract— Heart rate sounds have a special pattern that is in accordance with a person's heart condition. An abnormal heart will cause a distinctive sound called a murmur. Murmurs caused by various things that indicate a person's condition. Through a Phonocardiogram (PCG), it can be seen a person's heart rate signal wave. Normal heartbeat and murmurs have a distinctive pattern, so that through this pattern it can be detected a person's heart defects. This study will make a classification program that will sense normal heart sounds and murmurs. This program uses feature extraction methods using LPC (Linear Predictive Coding) and classification using k-NN (k-Nearest Neighbor) to identify these 2 heart conditions. The data that will be used as a database consists of samples of normal heart rate sounds and murmurs, and also data obtained from the heart rate detection device in the .wav, mono format. The system for detecting heart abnormalities consists of three main parts, namely: recording heart rate sounds, feature extraction using LPC with order 10, and feature lines using k-NN with 3 types of distances and variations of k. From the results of testing with these types of distance, the obtained average accuracy value of Chebyshev, City Block, and Euclidean are 96.67, 91.67, and 93.33 percent, respectively. In addition, the value of k equal 3 is the most optimal value of k with an average level of 96.67 percent.

Keywords— heart abnormalities, linear predictive coding, k-nearest neighbour.

I. INTRODUCTION

Heart attack still in the first rank that causes of death in many countries of the world. Symptoms of heart abnormalities (murmurs) often come suddenly, therefore early recognition of heart abnormalities can help to avoid a heart attack. Until now doctors are still using heart sound cues to monitor heart performance by using a stethoscope whose produces weak sounds. Therefore, sensitivity of diagnosis and experience to identify the heart sound are needed. In addition, physical limitations also greatly affect the results of interpretation until the diagnosis results are strongly influenced by the physician's subjectivity.

The heart has an important role in supplying oxygen to the whole body and cleaning the body of metabolic products (carbon dioxide). This organ carries out its function by collecting oxygen-deprived blood from the whole body and impelling it into the lungs, where the blood will take up O₂ and remove CO₂. Next, the heart brings together the blood contain O₂ from the lungs to the entire human body tissues.

In order to find out the electrical activity of the heart muscle, it is necessary to record the heart rate from the surface of the body. Recording heart rate sounds can be done electronically using a phonocardiography tool. The recording results of this tool are called phonocardiogram (PCG). Patients who are affected by a heart disease, their PCGs can indicate the disease with a beating sound that is different from the sound of a normal heartbeat. Heart sound has a special pattern that is in accordance with the condition of one's heart health. An abnormal heart will produce additional sounds called murmurs.

This paper has the following structure; first in Section I we introduce the heart sound and its feature extraction, second in Section II, we indicate this topic relation with some same field researches. Then the accompanied methodology is described in Section III. The research results and its discussion are termed in Section IV. Finally, the conclusions based on the research results are provided.

II. RELATED WORKS

There are many researches in heart sound field such as in S1 and S2 detection until discrimination of normal heart sound. In [1] the authors have contribution in heart disease detection based on heart sound using S1 and S2 segmentation algorithm, after their participating in PASCAL Classifying HS Challenge. In order to obtain the clear heart sound, the author of [2] proposed a prototype which consists of transducer to obtain heart acoustic sensitively. Acoustic recognition of the sounds produced by blood flowing through partly obstructed coronary arteries cultivates a potential mechanism for non-contact sensing of this main disease process.

Furthermore, classification of heart sound research has been conducted by many authors, such as in [3-6]. In [3], the authors proposed a feature to sense abnormal heart sound using wavelet decomposition. The wavelet was utilized to remove the noise so that the heart sound can be classified properly. In [4], the authors also utilized wavelet in order to segment the heart sound. The utilized component which is the Empirical Wavelet Transform (EWT) based PCG signal analysis for characteristic heart sound from heart murmur and disturbing surroundings noise. In [5], the authors offered an effective HMM-based (Hidden Markov Model) grouping method to discriminate between the normal and abnormal heart sounds. In [6], the authors present a statistical parameter standard deviation as heart sound feature and then do

Energy Aware Parking Lot Availability Detection Using YOLO on TX2

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Abstract— Finding a parking space is a tedious and time-consuming task in a metropolitan city. Due to this problem, many researchers proposed an automatic parking lot occupancy detection system using a camera with a deep learning method to provide useful information in the smart city system. Since object detection for the parking lot is performed in real-time by utilizing CPU and GPUs while parking detection is working 24 hours a day and 365 days a year, therefore power saving is important to reduce the electricity cost. However, the energy-aware is not considered in most related works. In this paper, we proposed an energy-saving algorithm for parking lot availability detection using YOLO running on the TX2 machine. We experiment using small parking lot prototype and remote control cars. In the experiment, we compare our algorithm with the direct application of original YOLO for parking lot detection, the results show that it reduces power by 97 percent when there is no moving object in the parking lot area and 71 percent when there are moving objects in the parking lot area.

Keywords—deep learning, YOLO, parking lot detection, computer vision

I. INTRODUCTION

Providing parking information in the urban area has been one of the important areas of the smart city. Nowadays, the vision detection method for parking lot availability detection has been commonly used. These vision-based detections not only require the system that is cost performance effective, but also the system that meets the real-time requirement. To meet real-time requirements, most object detection has been parallelized using thread to run full capacity on many cores CPU and using CUDA to run on GPU. Parking lot availability detection usually runs non-stop 24 hours a day and 365 days a year, hence it consumes tremendous power. In this paper, we propose the use and modification of YOLO version 3 to automatically detect parking lot availability which meets the soft real-time requirement as well as to lower the power usage that runs on the Nvidia TX2 machine. We use TX2 because it has CPU and GPUs heterogeneous computing, the camera is embedded and the whole system is an affordable cost-effective performance, and it can be mobile and easy to install in a particular parking lot area.

In general, there is a tradeoff between speed and power usage. To speed up the computation, the system is run in full capacity which uses more CPU cores and GPU cores, because the computation requires more power consumption. Parking

lot applications can be categorized as soft real-time requirements. On the other hand, the hard real-time system must operate within a stringent deadline and any missing deadline will cause catastrophic failure. Autopilot system, pacemaker, and nuclear plan control system are among the example of hard real-time systems. In the parking lot application, a missing deadline within three seconds is tolerable. Hence, there must be a balance between processing speed and power consumption. To realize this problem, we perform simulation for parking lot detection by an artificial parking slot with remote control cars.

We use YOLO (You Only Look Once) [1] object detection program because it is fast and accurate which meets the real-time requirement. YOLO takes an input image and divided it into $n \times n$ grids. It uses a single neural network with fewer convolution layers and fewer filters in those layers to predict each bounding box and each confidence score; it also calculates the class probability map, and finally, together with high confidence scores, it is considered as final object detection. The detail about YOLO can be found in [1].

Our goal in this work is to realize a soft real-time parking lot availability detection with an energy-aware algorithm. This is done by detecting whether the object is moving in the parking lot area during day and night time. When there is no moving object, the parking space remains the same as previously and object detection is not performed or invoked to save power. This motion detection's time complexity must not greater than object detection algorithm, otherwise, nothing is gained.

II. RELATED WORK

A large number of works related to parking space availability detection have been proposed. Most of them [2][3][4][5] using the camera with deep learning methods but without consideration of power-saving. Only a few are considered power-saving such as [6] and [7]. A time and energy-efficient parking system using ZigBee communication protocol has been proposed to run on the ARM microcontroller by Asaduzzaman et al. [6]. Their parking system is not a vision-based method, but the only infra-red sensor is used instead. Marso et al. [7] proposed parking lot detection that considers power saving using Raspberry Pi as a

Acquiring Domain Knowledge for Cardiotocography: A Deep Learning Approach

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Abstract—Infant cardiac distress is the leading cause of neonatal deaths in the world. Cardiotocography (CTG) is a diagnostic tool used for recording fetal heartbeat and uterine contractions during pregnancy to determine cardiac distress. To avoid the need of continuous monitoring by on-site medical personnel, researchers have been working on several machine learning tools to automate the process.

Most of these approaches discover statistical trends in data to predict target variables. However, being reliant on these trends makes them prone to overfitting and other statistical perils. In this paper, we demonstrate the usage of a modified deep neural network to learn about 2 seemingly disjointed tasks in the field of cardiotocography. The proposed model acquires predictive power in one task whilst being trained on a separate yet related task in the same field. Further, it establishes that regularization facilitates the sharing of knowledge across tasks. The resulting model mimics the human learning process by demonstrating the ability to acquire domain knowledge.

Keywords - Neural networks, deep learning, bioinformatics, multitask learning, knowledge engineering

I. INTRODUCTION

Acquiring domain knowledge is the holy grail that most modern machine learning models aspire to attain. However, most extant learning models exploit statistical relationships between the variables in the data with the sole focus being on a single output derived from the input. The scope of such models is narrow in that they are not reusable, are inflexible and are prone to significant variance error. We propose a modified neural network with 2 outputs which learns 2 disjointed tasks in the field of cardiotocography – the fetal condition (normal, suspect or pathological) and one of 10 morphological patterns. Our study shows that training a single neural network with shared layers between tasks produces a robust learning model that is resistant to overfitting. Further, we find that regularizing the neural network i.e. penalizing the weights of the model thereby ensuring sparsity, leads to a greater extent of sharing of parameters. While training the net, a joint loss function is defined which is a weighted average of the individual task losses for the fetal condition and morphological pattern. Most notably we find that even when the fetal condition task is

discounted for, (i.e. in the joint loss function, its weight tended to zero), its test accuracy is appreciable across many testing permutations. It can be inferred that the neural network learns about fetal conditions by sharing information acquired from morphological patterns. Thus, it demonstrates the ability to acquire domain knowledge about cardiotocographic diagnosis in addition to drawing analogies.

II. RELATED WORK

A. Cardiotocographic diagnosis using machine learning

ML is paving the way for efficient diagnosis using medical imaging. Cömert et al. [1] compared ML techniques for fetal heart rate classification. In [2], CTG signals were classified using several machine learning algorithms to improve upon the accuracy of human obstetricians. Bernardes and others. [3]-[5] produced some of the most influential work in automated cardiotocography based analysis of fetal health based on the guidelines prescribed by the International Federation of Obstetrics and Gynecology (FIGO). Magenes et al. [6], [7] employed a neural network based system for classification of fetal conditions. Salemalekis and others [8], [9], [10], [11] used wavelet analysis to predict indicators of fetal health.

B. Multitask learning

The concept of having a single neural network predict more than one outcome was introduced in 1997 by Caruana [12]-[13]. However, this approach was restricted to shallow nets. Ando and Zhang [14]-[15] developed a framework for learning predictive features from multiple tasks. Ben-David and Schuller [16] provide a formal framework for task relatedness on the basis of similarity between the example generating distributions that underlie the tasks. Argyriou et al. [17] presented a method for learning sparse representations shared across multiple tasks. Cavallanti et al. [18] introduced Perceptron-based classification algorithms which improve on their baselines with increasing number of tasks using regularization to bias tasks to exploit relatedness. Crichton, G. et al. [19] used

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Abstract: Most clinical studies are descriptive, measuring different parameters that are associated with certain treatment effects, while causal relations cannot be confirmed. Computational models aid researchers to make predictions of causality and help to focus on the most relevant part of the data. This study used a computational model to find a causal link between iron supplementation effectiveness, RTI, and systemic inflammation parameters, and gut microbiome profiles. We used a causal discovery algorithm on a randomized controlled trial dataset (n=72) of 6 month-old infants from Kenya. We also used correlation and partial correlation to determine the causal effect of any causal link. We found that (1) expression of the Transferrin Receptor (TfR) has a positive causal link with the serum TfR-Ferritin ratio, whereasserumFerritin levels have a negative causal link to TfR expression. (2) C-Reactive Protein (CRP) together with IL-8 and IL-1B have a positive causal relation with IL-6. (3) No causal link between iron supplementation and gut microbiome profile. The first and second result is in

clinical parameters in iron deficiency anemia children with iron-micronutrient supplementation. This could lead to more focused studies to better understand the iron supplementation practice as well as the biological mechanism of RTI, gut microbiome alteration, and iron supplementation.

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☰ Contents

I. Introduction

Roughly, 31.15% of preschool children in Africa are categorized as iron deficiency anemia (IDA). In order to counter that, a program was set for children to have a food supplement of Iron-containing micronutrient powders (MNPs).

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