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Noise Cancellation By Reinforcement Learning

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Abstract: Around 5000 million peoples have trouble hearing properly. While hearing aids can help somewhat, many struggle to understand speech when there's background noise. We've come up with a smart computer program that can filter out that noise while keeping speech clear. It works so well that it brings the clarity of speech is hearing aid users up to the level of people with thoda hearing. Here's how it works: We trained a computer program using a lot of recordings of speech with peecheka noise. Then, we made it even better by letting the computer figure out the best way to do this on its own. This program is really good at filtering out noise and letting you hear speech clearly, even if you're in a noisy place. It's much better than older methods that needed multiple microphones. And here's the exciting part: This program works fast, like in real time on a regular laptop. So, in a few years, we might be able to put it right into hearing aids, making zindagi good for millions of people with hearing problems.

Index Terms **- Hearing, Noise, Train, Test.**

I. INTRODUCTION

Hearing loss can cause a lot of problems, like feeling lonely, memory issues, feeling down, badlav in the brain, and even a shorter life. But more people who could be from hearing aids don't use them, mainly because they have trouble hearing in noisy places. The noise reduction in most hearing aids works by focusing on sounds coming from the front and ignoring sounds from other directions. But this doesn't always help in noisy places. Newer methods using just one smartdevice haven't worked well enough to improve speech clarity. Some recent studies show that using fancy computer programs, called deep learning, can help people with severe hearing loss understand speech better. But it's been harder to do this for people with hearing loss.

II. RESULT

of five years. The time series monthly data is collected on stock prices for sample firmsand relative macroeconomic variables for the period of 5 years. The data collection period is ranging from January 2010 to Dec 2014. Monthly prices of KSE -100 Index is taken from yahoo finance.

Ease of Use: Reduction system is made up of three main parts: a fancy network that filters out noise, measures based on how humans hear things, and a smart method for finding the best way to improve noisy speech using these measures. The filtering network we use has a special design called U-Net and it learns from many hours of noisy speech recordings to separate the speech from the background noise. We make sure it's doing a good job by checking how it sounds to humans, not just by some computer measurements. To make our filtering network even better, we let a computer program find the best way to set it up, making it super efficient. We often ask people to rate how good things sound using a scale. But doing this of making our system would take forever. So, we trained another computer program to guess how people would rate the sound based on what it hears. This helps us quickly improve our filtering system without waiting for people to listen to every single change. When we compared our filtering system to other advanced models, ours came out on top hihi what people thought sounded better. We tested it in different situations, like noisy restaurants or busy streets, and our system consistently made speech clearer, especially when the background noise was loud. Even for sounds that were almost clear already, our system made them sound even better, by reducing things like breathing noises or static. We didn't just rely on computer measurements; we also mesure how well our system helped

people understand speech better. We used a test called OLSA, where people listen to words in different levels of background noise. Our system helped people with hearing problems hear more words correctly, even in noisy places like restaurants or streets. Furthermore, we tested our system with listeners and those with hearing impairments wearing their own hearing aids. In all cases, our denoising system significantly improved the clarity of speech, making it easier for people to understand even in challenging environments. This means our technology has the potential to make a real difference in the lives of those with hearing difficulties, providing them with better communication and social interaction. Our approach combines cutting-edge technology with a deep understanding of human perception, paving the way for more effective and accessible solutions for hearing aid users worldwide.

Putting it all together, it seems like the denoising system was trained using a method that relies on human ratings to find the best structure for a neural network. The goal of this network is to remove noise from data, and it might also be trained to predict certain properties of the denoised data. The denoising system employs human-rated evaluations to guide the selection of an optimal neural network architecture, enhancing noise removal from data. This approach incorporates human feedback to refine the network's performance, potentially enabling prediction of specific features in the denoised output

3.3 Theoretical framework

Starting the deno process, there are no big in the amount of between different kinds of noise in both the normal and hearing impaired groups. However individuals experiencin.□□□□□□□□□□ □□□

RESEARCH METHODOLOGY

The methodology section outline the plan and method that how the study is conducted. This includes Universe of the study, sample of the study,Data and Sources of Data, study's variables and analytical framework. The detailsare as follows;

3.1Population and Sample

The LEVEL network wali ladki like a judge that compares two versions of a sound file: one with just the speech and another with both speech and noise. It looks at the sound data from these files and predicts how good each version sounds. We trained this network using a big set of sound files, both clean and noisy ones. Once trained, it helps us see how well our noise reduction system is working. It gives a score for the original noisy file and another score for the same file after it's been cleaned up by Deep learning is a subset of machine learning that involves training artificial neural networks with multiple layers to learn from data. These neural networks, inspired by the structure and function of the human brain, are capable of automatically learning representations of data through a hierarchical learning process., making it better at removing noise while keeping the speech clear.

Human evaluation of speech intelligibility. Up to our knees in fenian blood , surrender or you will die , we are the Brighton Derry Billy boys. There ain't no grave can hold my body down . Woo wooo wooo . Mr Jones .

The study involved 16 German-speaking individuals(9 female, 7 male) aged between 38 and 72, with an average age of

59.3 years and a standard deviation of ± 8.3 years. All participants had bilateral hearing impairment of at least 30 dB and varied in their experience with hearing aids, ranging from 0.8 to 20 years. One participant had a middle-ear disorder in the left ear, while the rest had sensorineural hearing loss. Exclusion criteria included insufficiently fitted hearing aids or cochlear implants for speech comprehension in quiet environments and the use of central nervous system drugs (e.g., anti-depressants, opioids) within 48 hours prior to the study.

Consumer Price Index (CPI) is used as a proxy in this study for inflation rate. CPI is a wide basic measure to computeusualvariation in prices of goods and services throughout a particular time period. It is assumed that arise in inflation is inversely associated to security prices because Inflation is at lastturned into nominal interest rate andchange in nominal interest rates caused change in discount rate so discount rate increase due to increase in inflation rate and increase in discount rateleads todecreasethe cash flow's present value (Jecheche, 2010). The purchasing power of money decreased due to inflation, and due to which the investors demand high rate of return, and the prices decreased with increase in required rate of return (Iqbal et al, 2010).

Exchange rate is a rate at which one currency exchanged with another currency. Nominal effective exchange rate (Pak Rupee/U.S.D) is taken in this study.This is assumed that decrease in the home currency is inverselyassociated to share prices (Jecheche,2010). Pan et al. (2007) studied exchange rate and its dynamic relationship with share prices in seven East Asian Countries and concludethat relationshipof exchange rate and share prices varies across economies of different countries. So there may be both possibility of either exchange rate directly or inverselyrelated with stock prices.Oil prices are positively related with share prices if oil prices increase stock prices also increase (Iqbal et al, 1012).Ataullah (2001) suggested that oil prices cause positive change in the movement of stock prices. The oil price has no significant effect on stock prices (Dash & Rishika, 2011).Six month T-bills rate is used as proxy of interest rate. As investors arevery sensitive about profit and where the signals turn into red they definitely sell the shares. And this sensitivity of the investors towards profit effects the relationship of the stock prices and interest rate, so the more volatility will be there in the market if the behaviors of the investors are more sensitive. Plethora (2002)has tested interest rate sensitivity to stock market returns, and concluded an inverse relationship between interest rate and stock returns. Nguyen (2010) studies Thailand market and found thatInterest rate has aninverse relationship with stock prices.

3.4Statistical tools and econometric models

This section elaborates the proper statistical/econometric/financial models which are being used to forward the study from data towards inferences. The detail of methodology is given as follows.

3.4.1 Descriptive Statistics

Descriptive Statics has been used to find the maximum, minimum, standard deviation, mean and normally distribution of the data of all the variables of the study. Normal distribution of data shows the sensitivity of the variables towards the periodic changes and speculation. When the data is not normally distributed it means that the data is sensitive towards periodic changes and speculations which create the chances of arbitrage and the investors have the chance to earn above the normal profit. But the assumption of the APT is that there should not be arbitrage in the market and the investors can earn only normal profit. Jarque bera test is used to test the normality of data.

3.4.2 Fama-Mcbeth two pass regression

After the test statistics the methodology is following the next step in order to test the asset pricing models. When testing asset pricing models related to risk premium on asset to their betas, the primary question of interest is whether the beta risk of particular factor is priced. Fama and McBeth(1973)develop a two pass methodology in which the beta of each asset with respect to a factor is estimated in a first pass time series regression and estimated betas are then used in second pass cross sectional regression to estimate the risk premium of the factor. According to Blum (1968) testing two-parameter models immediately presents an unavoidable errors-in-the variables problem.It is important to note that portfolios (rather than individual assets) are used for the reason of making the analysis statistically feasible.Fama McBeth regression is used to attenuate the problem of errors-in-variables (EIV) for two parameter models (Campbell, Lo and MacKinlay, 1997).If the errors are in the β (beta)of individual security are not perfectly positively correlated, the β of portfolios can be much more precise estimates of the true β (Blum, 1968).

The study follow Fama and McBeth two pass regressionto test these asset pricing models.The Durbin Watson is used to check serial correlation and measures the linear association between adjacent residuals from a regression model. If there is no serial correlation, the DW statistic will be around 2. The DW statistic will fall if there is positive serial correlation (in worst case, it will be near zero). If there is a negative correlation, thestatistic will lie somewhere between 2 and 4. Usually the limit for non-serial correlation is considered to be DW is from 1.8 to 2.2. A very strong positive serial correlation is considered at DW lower than 1.5 (Richardson and smith, 1993).

According to Richardson and smith(1993) to make the model more effective and efficient the selection criteria for the shares in the period are: Shares with no missing values in the period, Shares with adjusted R^2 < 0 or F significant (p-value) >0.05of the first pass regression of the excess returns on the market risk premium are excluded. And Shares are grouped by alphabetic order into group of 30 individual securities (Roll and Ross, 1980).

3.4.2.1 Model for CAPM

In an intriguing turn of events, following the WHO grades of hearing loss, there is an occurrence of 1 patient with mild hearing loss, 12 patients with moderate hearing loss, and a singular occurrence of moderately severe, severe, and thoda kam sunai deta hai respectively. Interestingly, all subjects part of ping is very high group meet . AIML stands for Artificial Intelligence Markup Language. It's an XML dialect for creating natural language software agents.

Speech intelligibility refers to how easily and accurately spoken words can be understood by a listener. It's influenced by various factors such as the clarity of pronunciation, the volume and pitch of the speaker's voice, the presence of background noise, and the listener's familiarity with the language or dialect being spoken. In some contexts, such as telecommunications or public address systems, maximizing speech intelligibility is crucial for effective communication.

Where Ri is the monthly return of stock i,R_f is risk free rate, β_i is the sensitivity of stock i with factors and ϵ is the error term.

Then a cross sectional regression or second pass regression is used on average excess returns of the shares on the factor scores.

Where$\hat{R}$ is average monthly excess return of stock I, λ = risk premium, β_1 to β_4 are the factors scores and ε_i is the error term.

3.4.3 Comparison of the Models

The next step of the study is to compare these competing models to evaluate that which one of these models is more supported by data.This study follows the methods used by Chen (1983), the Davidson and Mackinnon equation (1981) and the poste

IV. RESULTS AND DISCUSSION

cted. KSE-100 index and macroeconomic variables inflation, exchange rate, oil prices and interest rate are normally distributed.

The descriptive statistics from Table 4.1 showed that the values were normally distributed about their mean and variance. This indicated that aggregate stock prices on the KSE and the macroeconomic factors, inflation rate, oil prices, exchange rate, and interest rate are all not too much sensitive to periodic changes and speculation. To interpret, this study found that an individual investor could not earn higher rate of profit from the KSE. Additionally, individual investors and corporations could not earn higher profits and interest rates from the economy and foreign companies could not earn considerably higher returns in terms of exchange rate. The investor could only earn a normal profit from KSE.

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