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A Neural Network

Artificial Intelligence

Highlights

Gravitational Search

Transistor Circuit Design

Discovering Thoughts, Inventing Future

Volume 16 Issue 1 Version 1.0

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Artificial Intelligence and Customer Communication

By Hibatullah Alzahrani

Saudi Arabian Cultural Mission

Abstract- There is a rapid increase in the usage of artificial intelligence in the most recent decade. Use of Artificial Intelligence in the customer interaction is gaining traction in the market. It is saving a lot of money because chat bots are taking away the need of physical resources. Best utilization of AI is past the customary contact focus, where an organi- zation's administration impression becomes exponentially. When one considers the aggregate entirety of keen gadgets in an organization today that can convey data about clients and their items to the cloud, an extraordinary wellspring of client administration information is accessible to influence.

Keywords: artificial intelligence, customer interaction, emotional intelligence, chat bots.

GCST-D Classification: B.4.1, F.1.1

Artificial Intelligence and Customer Communication

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I. Introduction

With regards to AI just about anybody you ask will have some opinion about the concept. A few people straightforwardly grasp the progressions in AI innovation while others evade it or are careful about its suggestions. In any case AI as it is depicted in the media is boundlessly not the same as its world. AI is a utilitarian instrument that has numerous significant applications, particularly in a business setting. While considering its utilization for client, its uses turn out to be extremely alluring as a speculation.

At the point when considering AI for client administration applications the primary belief that presumably rings a bell is an ineffectively scripted talk bot that has exceptionally insignificant programming and can just help you with things that can essentially as of now be found on the FAQ page of a site. But with advancements in AI innovation, this is only a venturing stone into higher effectiveness [1]. Before long these poor conversationalist robots will be a relic of days gone by, and be supplanted with AI programs that will work consistently with clients and gain from them and in addition their human associates.

II. Gartner Predictions

As indicated by Gartner research, 89% of organizations will contend principally on client experience. A 2015 survey of more than 2,000 U.S. grown-ups by Harris found that 70% said they would pay more for a brand with a decent client administration notoriety. Significantly a greater amount of them, 86%, said they would likely switch brands after a terrible client administration experience." Because of this the significance of keeping a focused edge over client service development turns out to be self-evident.

The way things are at this moment 89% of clients are disappointed by repeating their issues to numerous agents. Since clients concentrate on client benefit like never before, having the best client administration is a special reward, as well as a need to keep the business alive.

It is assessed that U.S. marks alone lose $41 billion dollars a year due to poor client administration. Executing AI frameworks into your client administration will give you a focused edge and help you take a cut of that lost $41 billion dollars.

III. Analysing AI Usage in Customer Service

a) *Speak customer's tone or language*

Artificial Intelligence will have the capacity to recognize a client's tone, and have the capacity to draw in with them in a way that will make the client feel listened to and critical [3]. This will be exceptionally useful to keeping clients cheerful. She will likewise gain from past data, as well as by watching her human colleagues resolve issues.

b) *Emotional intelligence*

One Significant part of AI application is the Emotional Intelligence [2]. While AI centers a considerable measure of the measure of data it can provide for a despondent client, the engineers of AI application understood that client administration is regularly interwoven with clients who are now disappointed. It has been stated that "Examination demonstrates that a superior client experience is specifically attached to sympathy appeared by the specialist. AI application has an EQ remainder that empowers all the track of each customer cooperation and permits it to adjust the reactions in like manner so it conveys individual support of each client."

c) *Respond bulk emails*

AI has additionally built up the capacity to answer messages in mass for the inquiries which are made frequently (FAQ) which spare their operators and client's important time, and decipher incorrect spellings, shortened forms and different terms that a non AI-fueled web crawler may miss [4]

Author: Saudi Arabian Cultural Mission, e-mail: mesfer66@gmail.com

IV. AI & Customer Service

Best utilization of AI is past the customary contact focus, where an organization's administration impression becomes exponentially. When one considers the aggregate entirety of keen gadgets in an organization today that can convey data about clients and their items to the cloud, an extraordinary wellspring of client administration information is accessible to influence.

At the point when AI can be utilized to summon particular administration activities in light of this information, before the client is even mindful there is an issue, a mammoth jump in client experience is made [5].Consider the machine that dispatches an administration tech; the carrier association re-booking made; or the part that is re-requested without a client thinking about it.

In addition, as we keep on seeing each day with the dispatch of new purchaser items that make homes, autos and wearable PCs 'brilliant', the administration that is being worked inside these items turns into the claim of the item itself [6]. We're moving into an administration time where the main items that separate themselves (and keep clients paying month to month memberships) are the ones that convey important, at the time data to clients that AI empowers.

The real criticism of AI-controlled administration diverts is in the PC's absence of passionate knowledge (or EQ). We've all accomplished the voice acknowledgment framework that comes up short; the email reaction that doesn't answer our inquiry; or the instant message reviewing an item we don't have.

In any case, those are the basic failings of AI. The ones that hurt client administration notoriety the most are the point at which a PC is placed in a position to handle an issue that a human ought to, where rationale and a work process can't as a matter of course be connected.

But then, overexposure of candidly charged clients to specialists is regularly one of the key reasons referred to for high operator turnover, stress and burnout. AI can reduce that torment point and can recognize which circumstances should be raised to an operator.

Both the guarantee and the open door for AI is in the craft of its application. Dissimilar to numerous new innovation applications, clients don't encounter AI. They encounter administration.

Setting your AI course as one that begins with tackling a typical client issue is a perfect approach to collecting future venture and application for AI over the organization, which can likewise reduce those late night messages.

Sympathy is a key feature in the way we impart. It's one reason why we get so baffled at endless telephone menus when we call client administration. We simply need to converse with a man! On the off chance that we could just converse with a real person they would comprehend the issue we're having [7]. They would know how disappointed we are by the words we use, as well as by our articulation. Current employments of AI in client correspondence are exceptionally fundamental, giving basic responses to direct inquiries. In any case, there will come a point where marks that need to utilize AI to complete more mind boggling discussions should make the AI more talkative

At the point when a brand coordinates AI into the fabric of its center information the data it can get to will be much wealthier [8]. In any case, such an improvement then suggests conversation starters about what a brand does with that information, whether it is fitting morally and how advertisers hold trust.

"While there is immense potential for brands to gain by AI to make more customized encounters, they likewise should be mindful so as not to cross the "frightening" line with regards to client protection," says Rachel Barton, overseeing executive of cutting edge client system at Accenture Strategy. "On the off chance that you incorporate the innovation into client information for occasion, it can possibly run free and make its own particular judgements, which could be to the disservice of clients who may feel a level of interruption they didn't as a matter of course join to."

On the off chance that organizations can strike the right harmony between holdings fast to their image values while permitting AI to get to the appropriate measure of information, it can be exceedingly advantageous – it is exceptionally practical and can convey ongoing personalization that may not be conceivable through a human [9]. In any case, Accenture research finds that when clients need to gripe or talk through a mind boggling circumstance they need to converse with a human.

Friendliness is one of the areas contemplating the chances of AI. Lavish inn portfolio Dorchester Collection is utilizing it to recognize what visitors need, not what advertisers think they need [11]. To upgrade its client experience, it is utilizing the AI Metis stage, which permits it to shun the institutionalized neighborliness industry estimation procedures, for example, puzzle customers and consumer loyalty reviews and, rather, tap straightforwardly into advanced client input.

With changing client requirements and business situations, client engagement arrangements need to concentrate on giving quality including administrations and improved Omni channel client experience.

Counterfeit consciousness becomes possibly the most important factor to give human-like, conversational, reliable, applicable, and accommoda- ting data to clients, and is intended to surpass their desires for what a virtual aide can do.

Consider a case from the travel business. At the point when the client calls the reservation focus, the IVR arrangement foresees the most widely recognized solicitations, as "Please let us know in a couple words why you're calling today. You can say, book another reservation, change my reservation, or something else." Using NLU and calculations behind discourse to-content innovation, the arrangement maps the call. Quite a while back, organizations used to have one administration specialist who had a telephone and was productive. At that point they had a PC which could be ten times more productive. Presently a man in client administration could have Artificial Intelligence benefit that would make them much more productive.

Pretty much as a genuine individual in a contact focus can deal with numerous sorts of issues and test a few techniques for taking care of an issue quick, a keen client care arrangement should have the capacity to do likewise. The genuine advantage with utilizing a brilliant client care arrangement is that it scales much superior to a client care operator. It offers savvy answers, shrewd help and analysis, a multi-threading approach, auto mapping of an issue to numerous hubs, and characteristic dialect communication.

By quickly making such unmistakable results as up-selling, expanded faithfulness, and cost reserve funds, AI-driven client care arrangements can emphatically influence all that really matters, make clients glad, and free up the association to more elevated amount targets.

AI is being utilized crosswise over divisions to enhance effectiveness, diminish costs, build incomes and support consumer loyalty by enhancing key territories of client experience [10]. As per Calum Chace, creator of Surviving AI, this is an exceptionally fascinating time for AI. "In the previous couple of years, machines have superior to anything us at perceiving pictures, especially confronts, and perceiving discourse," he says. "Those capacities mean we won't have individuals in call places for long – machines will likewise be broadly reacting to demands at inn front counters and individual enquiries in a wide range of on and disconnected situations."

V. Conclusion

After doing the research on the topic mentioned it is clear that artificial intelligence is shaping the customer interactions to a large extent. In the days coming artificial intelligence is going to remove the need of physical resources for chatting and is emerging as a powerful tool for standard text automation chat.

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A Neural Network Approach to Transistor Circuit Design

By Thomas L. Hemminger

Penn State University

Abstract- Transistor amplifier design is an important and fundamental concept in electronics, typically encountered by students at the junior level in electrical engineering. This paper focuses on two configurations that employ neural networks to design bipolar junction transistor circuits. The purpose of this work is to determine which design best fits the required parameters. Engineers often need to develop transistor circuits using a particular topology, e.g., common emitter, common collector, or common base. These also include a set of parameters including voltage gain, input impedance, and output impedance. For the most part, there are several methodologies that can provide a suitable solution, however the objective of this work is to indicate which external resistors are necessary to yield useful designs by employing neural networks.

Keywords: feed forward neural networks, bipolar junction transistor circuits, MOSFETs

GCST-D Classification: C.2.1

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Keywords: feed forward neural networks, bipolar junction transistor circuits, MOSFETs.

I. Introduction

Many transistor circuits are designed using bipolar junction transistors (BJTs) or MOSFETs. MOSFET designs are usually easier to analyze due to the high gate impedance so this paper focuses on the BJT, and in particular, the common emitter configuration. There will be two types of ac equivalent circuit analyzed in this paper. The first will assume that the emitter bypass capacitor is ideal, i.e. infinite capacitance, and the second will consider a finite capacitor impedance, which significantly increases the complexity of the problem. The coupling capacitors tend to play a lesser role in the ac design parameters so the ideal approximation of these components is reasonably close to the non-ideal case. The output impedance of the source and the input impedance of the load can be factored in after developing the initial model.

The calculations are relatively simple when considering a common emitter amplifier circuit with an ideal bypass capacitor, but a much greater amount of effort is needed for the non-ideal case. The former will be considered first. For a given transistor the designer works through a set of calculations to determine the resistor values, then often has to modify them to achieve the proper gain (Av), input impedance (Rin), output impedance (Ro), and voltage difference between the collector and emitter (Vce). When working with an ideal bypass capacitor, it is not difficult to determine the proper parameters, but for the finite bypass capacitor the problem is significantly more challenging. This work is mainly intended for engineers, but also professors who may need to evaluate specific amplifier designs and grade the circuits supplied by their students. With regard to professors, if a student submits a design, it is the role of the instructor to evaluate the configuration to determine whether it meets the expected parameters. In other words, the resistor values, and/or the bypass capacitor value needs to be defined. If each student, or team, in a lab is expected to create a different design it will be necessary for the instructor to evaluate each solution to determine whether it meets the given criteria so this work should streamline the procedure.

This paper is organized as follows. First, the design procedure for the dc equivalent common emitter circuit is introduced along with some of its defining equations. Next, the expressions needed to solve for the ac equivalent circuits are developed. This is followed by a brief discussion of the neural network architecture. The next section addresses the finite bypass capacitor and the equations required to analyze the modified circuit. Finally, some conclusions will be discussed and some thoughts for further work.

II. The Common Emitter Amplifier

The common emitter amplifier circuit is one of the basic configurations introduced when studying the BJT [Sedra and Smith, 2015], [Jaeger, 1997]. It is a voltage amplifier with a reasonably high input impedance and voltage gain. The output impedance can be a bit high as well, but this can be handled by being certain that the input impedance of the follow-up stage is much higher, as for example, an emitter follower circuit. In a transistor circuit there are the dc bias values and the ac signal, but one must look at each of them separately in order to compute the proper operating points.

An example circuit is shown in Fig. 1 where the 2N3904 NPN transistor is used with $\beta=160$. The ac input is Vi while the output is taken across the load resistor RL on the right.

Author: Professor and Department chair at the Pennsylvania State University, The Behrend College. e-mail: hemm@psu.edu

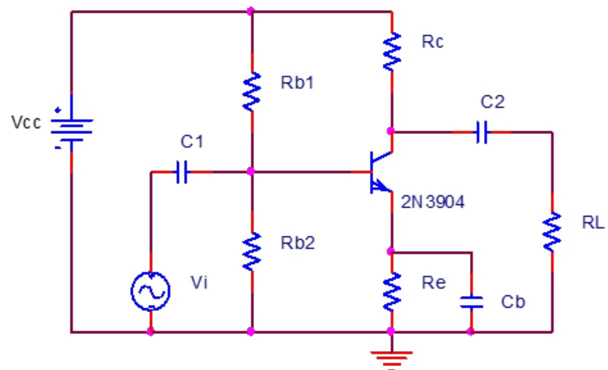

Figure 1: Common emitter amplifier circuit

Initially, the dc circuit is analyzed with all capacitors considered as open circuits in order to find the currents and voltages from the power supply and biasing resistors. The coupling capacitors isolate the dc component and its circuit equivalent is shown in Fig. 2.

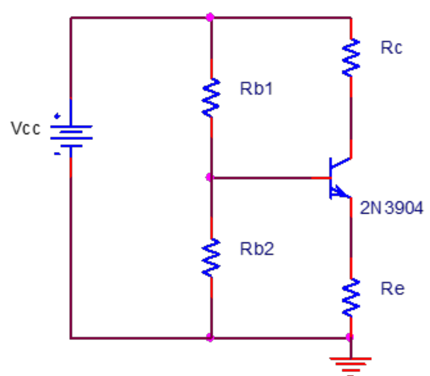

Figure 2: The dc equivalent circuit of a common emitter amplifier with ideal capacitors

To determine the dc biasing values the base resistors and source are replaced with their Thevenin equivalent and a single loop circuit is analyzed. For this circuit the Thevenin expressions are as follows where IBis the dc base current:

$$V_{th} = V_{cc}\left(\frac{R_{B2}}{R_{B1}+R_{B2}}\right) \text{ and } R_B = R_{B1} \parallel R_{B2} \quad (1)$$

So the loop expression becomes:

$$-V_{th} + R_B I_B + 0.7 + (\beta+1) I_B R_E = 0 \quad (2)$$

After the dc bias values have been determined those sources are set to zero and only the ac components are considered. Recall that the dc voltage sources become short circuits to ground when set to zero. The ac equivalent of the transistor circuit is shown in Fig. 3 using the hybrid – π model. This model is usually used when the emitter is at ac ground. The ac values of resistance, voltage gain, etc. are determined from the dc bias currents.

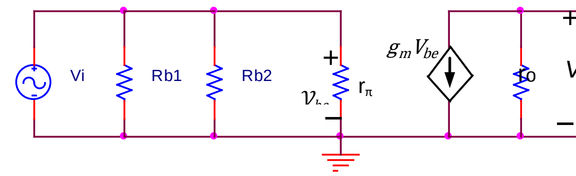

Figure 3: This is the ac equivalent circuit of the common emitter amplifier with an ideal bypass capacitor

The development of most of the ac equivalent expressions can be found in many texts on microelectronics so they are only summarized here. The total collector current ic is approximated where vbeis the ac base to emitter voltage and VTis the thermal voltage which is usually approximated at 25 mV so that.

$$i_C \approx \underbrace{I_C}_{DC}\left[1+\left(\frac{v_{be}}{V_T}\right)\right] = \underbrace{I_C}_{DC} + \underbrace{\left(\frac{I_C}{V_T}\right)v_{be}}_{ac} \quad (3)$$

From now on the ac component is of interest. By superposition the DC sources are shut down, which means that they act like short circuits to ground. By looking at the right hand term from above it can be seen that the ac equivalent is:

$$i_c = \left(\frac{I_C}{V_T}\right)v_{be} \quad (4)$$

This is the reciprocal of resistance and is referred to as trans conductance, with symbol gm: where

$$g_m = I_C / V_T \quad (5)$$

$$\text{therefore: } i_c = g_m v_{be} \quad (6)$$

The ac input resistance of the transistor is defined as input voltage divided by input current so the resistance seen at the base is

$$r_\pi = v_{be}/i_b = v_{be}/(g_m v_{be}/\beta) = \beta/g_m \quad (7)$$

Alternatively

$$r_\pi = \beta/(I_C/V_T) = \beta/(\beta I_B/V_T) = V_T/I_B \quad (8)$$

For the finite bypass capacitor circuit the T-model of the BJT will be used so se resistance seen from the emitter to the base will be needed and is written as

$$r_e = \alpha/g_m \quad (9)$$

where. Since the emitter current is (□ + 1)ib it is easy to figure that the resistance seen at the base is

$$r_\pi = (\beta+1) r_e \quad (10)$$

The voltage gain is

$$A_v = \frac{v_{ce}}{v_{be}} = -g_m R_C \quad (11)$$

The voltage gain is

$$A_v = \frac{v_{ce}}{v_{be}} = -g_m \left(R_C \parallel r_o\right) \quad (12)$$

III. Experimental Procedure

Neural networks are most commonly considered as pattern recognition systems.This author has used them to develop a method of impedance matching using feed- forward neural networks [Hemminger, 2005].They are non-linear systems and are often employed to differentiate between input patterns [Pao, 1989],[Graupe 2013], [Hagan and Demuth].

In order to train the neural networks in this project a set of “for” loops was created in MATLAB for the four biasing resistors. For all of the tests, the resistor values ranged as shown in table 1.

Table 1: Resistor values used to develop output parameters

Resistor	Start Value	Step Value	Stop Value
Rb1	6 kΩ	250Ω	10 kΩ
Rb2	4 kΩ	250Ω	7 kΩ
Rc	1 kΩ	100Ω	3 kΩ
Re	400Ω	100Ω	1.5 kΩ

The values of Rin, Ro, Av, and Vce were calculated for all of the resistor combinations. Once this was completed a neural network was trained using the new input values of Rin, Ro, Av, and Vceto compute the four biasing resistor values. In developing the network, the inputs and outputs were normalized to a magnitude of 1 to ensure convergence. For the ideal bypass capacitor circuit there were 5,349 training patterns, limited to realistic values. For example, the gain, Av, was limited to a magnitude of 210, while Vce was held to the range of 2 volts to 12 volts. The test sets consisted of a larger number of patterns, none of which had been used in training.

The neural network package in MATLAB was utilized to train the networks, employing the Levenberg-Marquardt algorithm, using one hidden layer of 18 sigmoidal (Tanh) neurons each [Demuth and Beale]. Smaller numbers of nodes yielded unacceptable results and more nodes or more than one hidden layer did not provide any improvement in performance. The network was trained for 2000 epochs resulting in a mean-squared error (mse) of 6.4x10-7. Further training did not seem improve performance. A comparison between the neural network results and those by direct calculation is shown in table II. Fig.4 shows the architecture of the neural network. This network employs hyperbolic tangent activation functions to map the transistor parameters to the values of the resistors.

Note that the number of patterns changes with all of the training and testing scenarios.This occurs because as the values of the biasing resistors change, the number of the voltage gains and values of Vce change, and one or the other can fall out of the ranges specified earlier. Only those that fall within those ranges are employed in the tests.When using the resistance values illustrated in table I the output parameters have the ranges shown in table III. It is not required that these ranges be followed precisely but it is likely a good practice to stay within them when considering an input set.

Table 2: Statistical performance of neural network

Data type	Number of patterns	Upper base resistor Rb1 (mse)	Lower base resistor Rb2 (mse)	Collector resistor Rc (mse)	Emitter resistor Re (mse)
Training set	5439	112	58	0.275	0.457
Test Set 1	6306	93	45	0.202	0.288
Test Set 2	10875	93	45	0.202	0.286
Test Set 3	17427	86	42	0.206	0.292
Test Set 4	21534	86	42	0.206	0.294

The training set was included for comparative purposes.

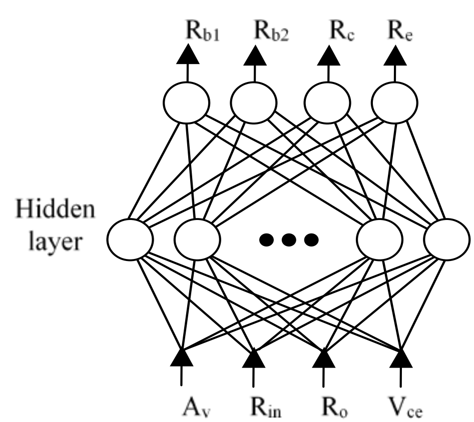

Figure 4: Architecture of the neural network with 18 hidden nodes

Table 3: Input Parameter Ranges

Parameter	Minimum Value	Maximum Value
Rin	566 Ω	1.67 kΩ
Ro	947 Ω	2.18 kΩ
Av	-210 v/v	-92 v/v
Vce	2.41 v	9.11 v

It is important to realize that not all input parameter combinations are feasible. For example, if the

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base bias resistors are kept to a low value the collector and emitter currents can be greater, resulting in a smaller value of Vce. In this case it would not be appropriate to set a small value of dc input resistance and a large value of Vce, since they can be mutually exclusive. However, by judiciously choosing realistic inputs the results can be close to the desired values. Some examples are shown in table IV. The requested parameters are shown with the percent error between the network output and the calculated values. By "tuning" the input parameters the percent errors can be reduced to acceptable values. In this case the voltage gain was the main focus.

Table 4: Statistical performance of neural network

Rin (Ω)	% error	Ro (Ω)	% error	Av	% error	Vbe	% error
900	-4.13	960	-0.65	-172	-5.10	7.0	8.48
880	-4.27	960	-0.66	-172	-2.85	7.0	5.38
880	-6.03	960	-0.76	-172	-0.84	7.0	-0.84

The resistor values from the last trial from table IV were used in a P-Spice simulation. The values were Rb1=30.0 kΩ,Rb2=15.24 kΩ, Rc=995 Ω, and Re=730 Ω. The results are summarized in table V along with the percent errors.

Table 5: Comparison of neural network results against the P-Spice simulation

Parameter	Neural Network	P-Spice	% difference
Rin	827 Ω	804 Ω	0.37
Ro	953 Ω	881 Ω	2.5
Av	-170 v/v	-180 v/v	5.8
Vce	5.671 v	5.56 v	2.0

IV. Using A Finite Bypass Capacitor

If the bypass capacitor does not have zero impedance the problem is much more realistic, but requires a significant amount of additional work to analyze. Here, rather than using the hybrid – π model it is more appropriate to use the T-model since it is easier to include the emitter impedance. This is illustrated in Fig. 5

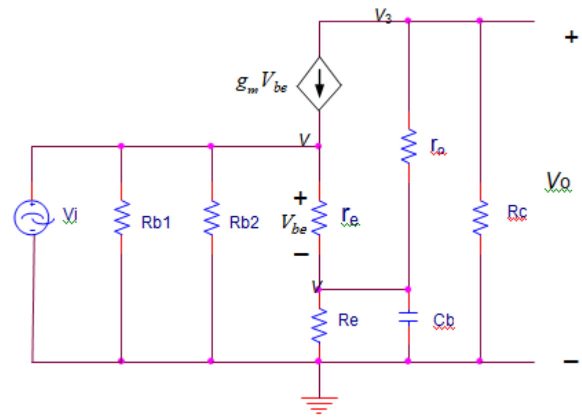

Figure 5: The T-model is used here in order to address the finite bypass capacitance Cb

The circuit was analyzed by employing nodal analysis at the three essential nodes with an input function of I amps at 3 kHz in order to determine the input impedance and other parameters. After simplifying the expressions, three equations in three unknowns were used to determine Rin, and Av. Note that the impedance of the capacitor was only evaluated in magnitude, since the phase would have little effect on the overall result. The three nodal equations are listed here in (13).

$$v_1\left[\frac{1}{R_{b1}}+\frac{1}{R_{b2}}+\frac{1}{r_e}-g_m\right]+v_2\left[g_m-\frac{1}{r_e}\right]=I \quad (13a)$$

$$v_1\left[\frac{-1}{r_e}\right]+v_2\left[\frac{1}{r_e}+\frac{1}{R_E}+\left|\frac{\omega C}{-j}\right|+\frac{1}{r_o}\right]+v_3\left[\frac{1}{r_o}\right]=0 \quad (13b)$$

$$v_1\left[g_m\right]+v_2\left[-g_m-\frac{1}{r_o}\right]+v_3\left[\frac{1}{r_o}+\frac{1}{R_C}\right]=0 \quad (13c)$$

The input impedance was evaluated as $R_{in}=v_1/I\ amps$, and the gain was calculated as $A_v=v_3/v_1$.

Once this was completed a current source was applied to the output to find the output impedance, resulting in the following simultaneous equations.

$$v_1\left[g_m\right]+v_2\left[-\frac{1}{r_o}-g_m\right]+v_3\left[+\frac{1}{R_C}+\frac{1}{r_o}\right]=I \quad (14a)$$

$$v_1\left[\frac{-1}{r_e}\right]+v_2\left[\frac{1}{r_o}+\left|\frac{\omega C}{-j}\right|+\frac{1}{R_E}+\frac{1}{r_e}\right]+v_3\left[-\frac{1}{r_o}\right]=0 \quad (14b)$$

$$v_1\left[-g_m+\frac{1}{r_e}+\frac{1}{R_{b1}}+\frac{1}{R_{b2}}\right]+v_2\left[g_m-\frac{1}{r_e}\right]=0 \qquad (14c)$$

After setting the source to zero the resulting output impedance was calculated as . In order to achieve the necessary parameters it required two 3x3 matrix inversions per iteration and convergence took significantly longer than when considering the ideal bypass capacitor, requiring roughly 3000 epochs. Increasing the number of epochs beyond that number did not improve performance in any measurable way. There were 10 trials for the bypass capacitors from 10μF to 100μF as illustrated in table VI. At first it seemed like the capacitors could be incorporated in the original design as an output parameter of the network along with the resistances but since only the magnitudes of the impedances were considered this presented a problem. Having the capacitor impedance and the emitter resistance combined resulted in an overall impedance that could not be resolved into separate elements. For this reason 10 trials, one for each capacitor value, were conducted to provide proper training. Actually, this is not really a problem because the necessary parameters for each topology can be learned by the network in a matter of minutes and the value of the bypass capacitor is not that critical when only 10 μF increments are being considered. The input frequency of 3 kHz was chosen since this is a good mid-band parameter for audio signals. Requiring the input frequency to be a variable caused problems with convergence, so for the present it was fixed at the aforementioned value. Finite values of bypass capacitance are rarely studied in undergraduate electronics courses, where most curricula assume that the bypass capacitor is ideal with infinite capacitance. This makes the analysis much simpler but not very realistic unless the capacitor used in the physical circuit is fairly large in value. It is interesting, and obvious, that as the capacitance increases, the results from the second design merge with those from the first one. This includes the training errors for each scenario.

Table 6: Statistical performance of neural network after 3000 epochs

Capacitor Value in µF	Number of patterns	Upper base resistor Rb1 (mse)	Lower base resistor Rb2 (mse)	Collector resistor Rc (mse)	Emitter resistor Re (mse)
10	14294	389	218	2.17	1.84
20	13500	437	264	3.44	1.87
39	11982	490	247	2.22	1.80
40	10652	403	219	.037	2.12
50	8884	121	65	0.08	1.36
60	8541	117	59	0.19	1.13
70	8244	56	40	0.14	0.38
80	7987	197	67	0.56	1.25
90	7920	177	72	0.71	0.74
100	7843	148	58	0.11	0.57

Table VII contains the results starting with a 10□F bypass capacitor, and ending with 100□F.It lists the solutions from P-Spice and compares them with the outputs from the neural network. For comparative purposes, the input parameters were kept the same as in the last line in table IV. Here it is seen that at lower capacitances the voltage gain is lower and the input impedance higher, which one would expect. As the capacitance increases the results from the network approach those yielded from the ideal bypass capacitor approximation, which one would also expect. In this table the value of Vce is not listed since it is not dependent on the value of the bypass capacitor and remains constant. It is noteworthy that once a capacitance of 60 – 70□F is reached there is little change in the parameters of interest.

Table 7: The calculated data is from P-Spice. The value of Vce is the same for all of these tests at 5.56 volts

Capacitor Value in µF	Rin (Ω)	% error	Ro (Ω)	% error	Av v/v	% error
10	1163	4.0	952	-3.26	128	-3.76
20	932	3.7	939	-2.13	161	+1.85
39	884	3.88	932	-1.39	170	+1.66
40	867	2.97	931	-1.40	174	+2.11
50	860	3.66	931	-1.40	176	-2.87
60	852	2.67	930	-1.29	177	-3.11
70	846	3.11	928	-1.08	177	-1.85
80	846	2.55	926	+0.11	177	-1.06
90	844	2.11	923	+0.98	177	-1.87
100	842	1.87	922	1.64	177	-1.67

V. Conclusions And Further Work

This has been an interesting and rewarding research project. It is hoped by this author that engineers and faculty members will find these results useful. The fascinating part of this project comes particularly from the results of including the non-ideal bypass capacitance. Non-ideal bypass capacitors are rarely emphasized when teaching about, or working with, transistor circuits, at least at the introductory level. This neural network paradigm should be useful to engineers and faculty members when looking for solutions to various designs. The approach described in this paper can resolve and verify several transistor designs and illustrates the efficacy of neural networks as a development tool for amplifier circuit biasing. An extension of this work will be to expand this technique to other amplifier circuits, e.g., the common collector and common base models employing both the BJT and the MOSFET. An additional objective is to determine a set of input parameters that will yield accurate results without having to adjust them as illustrated in table IV.

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Artificial Intelligence: Uses and Misuses

By Hibatullah Alzahrani
Saudi Arabian Cultural Mission

Abstract- Artificial Intelligence (AI) was mostly regarded as science-fiction in the past but with the recent advancements in technology, it has silently crept into our lives. From social media to computer games to self-driving cars to military gadgets to personal digital assistants, AI is everywhere. This progress is also due to a paradigm shift in AI community where current trend is to make AI stronger in specific domains rather than making a human-like AI which can do anything. Resultantly, AI can now out-perform humans in many areas. But this progress of AI is scary for some people who are predicting the "rise of machines" in half a century or so if AI progress remains unbridled.

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Abstract- Artificial Intelligence (AI) was mostly regarded as science-fiction in the past but with the recent advancements in technology, it has silently crept into our lives. From social media to computer games to self-driving cars to military gadgets to personal digital assistants, AI is everywhere. This progress is also due to a paradigm shift in AI community where current trend is to make AI stronger in specific domains rather than making a human-like AI which can do anything. Resultantly, AI can now out-perform humans in many areas. But this progress of AI is scary for some people who are predicting the "rise of machines" in half a century or so if AI progress remains unbridled.

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I. Introduction

Artificial Intelligence, referred more commonly by its acronym AI, is one of the most fascinating and most mysterious of the modern technologies. Whenever someone mentions AI, an idea pops up in our mind about a super-intelligent computer – one which can understand what people are saying and respond to them and think autonomously and can obey any command issued by its human master. For some people, the picture is more grotesque as the concept of AI bears into their mind the idea of "terminator" like killing robots, hell bound on eliminating the human race and taking over the world. In reality, AI is still at very nascent stage and no way near replicating the intricate behavior of human brain. But though AI can't outperform humans in general way, it can excel the humans in some specific areas. In 1997, AI shocked the world by defeating the then reigning champion of chess Gary Kasparov and more recently, another AI machine, built using Google DeepMind, has defeated the human champion in much more complex game of Go. But these are specifically built machines, designed to do one and only one task. And that's the way Artificial Intelligence has evolved – trying to be the master in few trades rather than the jack of all. From personal digital assistants like Siri and Cortana to self-driving cars to conversational bots, AI is becoming more and more adept at the tasks assigned to it. Behind its rise is the exponential rise in computational power and storage capabilities which in turn have given rise to complex machine learning models like deep neural nets which are really the power-source behind AI functionality and its learning ability.

It is hard to define what Artificial Intelligence really means – in literal terms we can say that Artificial Intelligence means the *machines with the ability to think*.

Author: Saudi Arabian Cultural Mission. *e-mail: mesfer66@gmail.com*

But then it becomes important to define what thinking really means and we can get into all kinds of philosophical debates. Alan Turing, pioneer of the Artificial Intelligence, described AI as *the machines which can learn from experience* [1]. But that is only one part of the story, the other part is about taking some definite action as response to external stimuli. Thus, the modern definition of Artificial Intelligence is given as [2]: "*A rational and flexible agent that senses its environment and takes some action which maximizes its chance of success at some predetermined goal*".

II. A Brief History of AI

The field of AI has seen quite a few ebb and flow during its evolution. The recent rise in its popularity can be partially attributed to increase in computational power of the machines and partially to the realization of its limitations by researchers who now set more realistic and achievable goals. It is difficult to estimate who first came up with the idea of intelligent machines but the concept is widely attributed to famous paper of Alan Turing in 1950, titled "Computing Machinery and Intelligence" [1], in which he raised the question *"Can Machines think?"*. He went on to define thinking of machines as *learning from experience* and also proposed the famous Turing Test (which he originally called as Imitation Game) in which a human investigator is asked to converse with a human and a machine remotely and then tell which one is machine. The test has been criticized for being too narrow as it focuses on only one aspect of AI – namely Natural Language Processing, whereas in reality an AI agent can do many more tasks without doing language processing. The field of AI formally came into being in the 1956 Dartmouth Conference [3], organized by Marvin Minsky, John McCarthy, Claude Shannon and Nathan Rochester. John McCarthy was the one to propose and convince others to accept the name "Artificial Intelligence" for this field. The next two decades were considered the golden years of AI, with huge funding coming from various sources, most notably ARPA (then called DARPA, Department of Defense Advanced Research Projects Agency). The people working in the AI were highly optimistic of its success, especially after some early breakthroughs, and one of the pioneers went as far as to say that within twenty years, machines could do anything that a human can do [4]. Their optimism was based on development of fairly complex AI programs like Daniel Bobrow's STUDENT [5], which could solve simple high-school algebraic problems and Herbert Gelernter's Geometry Theorem Prover [6]. John

McCarthy wrote and then refined the Lisp [7] programming language in late 1950s which even today remains the lingua franca of AI world. But these researchers failed to acknowledge the complexity of remaining problems in AI as well as the limitations of computational power at the time which couldn't handle very large and complex problems. In early 70s, AI came under huge criticism for failing to deliver and funding dried up. At the same time, Perceptrons, which were thought of as analogous to neurons in brain, didn't live up to their potential and the idea to replicate the working of human brain failed miserably. Thus started the first AI winter which continued until the early 80s when the "expert systems" began to be widely used in corporations. Expert systems were custom designed for specific domains and used the knowledge of that domain to answer certain questions and solve complex problems. Funding revived for several projects, most notably the Japan's Fifth Generation Computer Project [7], worth almost $1B in 1981, which set-off a chain of similar projects from USA and UK. Around the same time, Perceptrons were back in popularity due to "back-propagation" [8] algorithm. The AI industry was worth billions when it collapsed again in 1987 with the fall of "Lisp Machines". The desktop machines from Apple and IBM became cheaper than specialized AI hardware and the AI market no longer remained lucrative. The second AI winter continued until the biggest event in AI history came – on 11 May, 1997, Deep Blue [9] became the first computer to beat the then reigning chess-champion Garry Kasparov. This single event restored the people's belief in AI; finally AI was able to outmatch the humans in some field. It also taught the AI people an important lesson that focusing on a single problem domain at a time is way more beneficial than trying to build an all-round AI machine which can do anything. Thus sprang a series of astonishing events which strengthened the AI's macho in the tech arena – a Stanford robot won the DARPA Grand challenge by driving autonomously for 131 miles in 2005 [10]; IBM Watson defeated two of the best Jeopardy players in Jeopardy Quiz Show in 2011 [11]; self-driving cars began to perform at near-human levels; Microsoft Kinect was able to capture the gestures of players and gave them a taste of real-world scenario; Apple's Siri and several other chatbots became common which recognized human speech much more accurately and gave responses accordingly; and finally in March 2016, Google's AlphaGo [12] won 4 out of 5 games of Go to defeat the Go champion Lee Sedol. Much of this success is attributed to two things – firstly computers have become way more powerful which have enabled the statistical models to be built using huge amounts of data and fancy algorithms like Deep Learning. Secondly, there has been a change in AI paradigm such that AI is no longer thought of as a self-acting autonomous machine that can do anything which humans can. Rather AI is now defined as the "intelligent agents" which sense their environment and take some action to maximize their chance of success with respect to some pre-defined goal. Thus an intelligent agent driving the car would perceive the surroundings using computer vision techniques and then decide in which direction to move or when to apply brakes. Similarly, an intelligent agent conversing with humans would decode the human speech, parse it, extract semantics from it and then reply accordingly. This mating of AI with probability and decision theory along with the immense computational power available today has enabled AI to regain its popularity and it is now rightly considered as one of the most important fields in tech world.

III. AI in Our Daily Lives

a) AI in Social Media

There are tons of raw data available at social media platforms and AI is now used extensively to make sense of that data. Using Machine Learning and Data Science techniques and coupling them with AI, social media platforms are now improving the everyday user experience. Facebook uses AI technology to automatically tag the photos, filter news feeds and figure out trending topics. LinkedIn acquired Bright in 2014 – an AI and Machine Learning based start-up – to offer better job-candidate matches for both potential employers and job-seekers. It uses Machine Learning algorithms to do this prediction taking into account the past hiring trends, job location, work experience etc. Similarly Pinterest has recently acquired Kosei, a data software company which specialized in personalized recommendation modeling. The motive is that using such technology would help them in recommending products based on content pinned on network. These are but few of the many examples prevalent in our social media networks and many of us are not even aware that many times it's AI which is choosing our next best friend or our next favorite product.

b) Search Engines

Many search engines have started to incorporate AI in their search algorithms to refine and improve the search results. Google is obviously leading the trend here. Google bought the British AI startup DeepMind in 2014 at the whopping $400 million to kick-start its AI ventures. Since then it has attracted a number of leading AI researchers from both academia and industry who are doing cutting-edge research in various AI domains. Google has recently incorporated RankBrain [13] in its overall search algorithm Hummingbird. RankBrain is an AI based system which helps the main algorithm in processing search results. Just like famous PageRank [14] – a ranking algorithm for ranking search results, RankBrain also helps the main algorithm in processing of results and refining the user search queries. Google uses over 200 "signals" to rank the search results and PageRank is the most important signal but RankBrain is also not far behind and is currently the third most important signal. Other search engines have also started to use AI and Machine Learning to provide more targeted and more refined search results to their users.

c) Strategy Games

Defeating humans in computer games was perhaps the first biggest achievement of the AI. Even though strategy-based computer games have been quite popular for some time now, it is really in the last decade that AI has got nearly invincible. For turn-based games likes Chess and Checkers, and other sports games like Soccer, Baseball and Tennis, if AI could be allowed to play to its full potential, there is literally no chance for humans to win. So much of the effort these days goes into making the gameplay more realistic and letting the humans win eventually if they play good enough. In fact this is one of the biggest difference between the research community and industry in AI games arena – while researchers tend to make AI better and stronger so that it can't be beaten even by the best of human players, industry tends to focus on real-time and real-world experiences and tunes AI in a way which can keep the human opponent engaged and not make the AI seem invincible. Early games made the mistake of making AI too strong, one example of which was *Empire Earth* which had wonderful gameplay but the AI at its strongest was impossible to beat, even by the best of players since it could collect resources at an alarming rate and build forces in no time. More famous games like *Age of Empires* and *Command and Conquer* more or less got the AI part right and players with enough experience were able to outmatch the AI. Recently, as computers have become much more powerful and nearly every PC comes with GPU(either in the form of integrated graphics or external graphics card), strategy games now tend to focus more on graphics part of the game to make the objects and animations look real. Moreover, with the current processing capabilities at hand, it is harder not to let AI grow stronger than before. But the game makers have to strike a fine balance where AI is not so weak that it can be outmatched pretty easily but also not so strong that no one can beat it. Besides, AI now tends to be unpredictable so that a cunning and perceptive human can't detect the patterns on which it operates and make strategy accordingly. So every time you play against AI, even under same scenario, AI tends to mix things up just like humans do. AI role in games is certainly one of the most prevalent one in our lives, especially in the lives of teenagers and perhaps the source of the fear for some AI skeptics who believe that one day AI can easily beat humans in the real world just like it can easily beat humans now in virtual world.

d) Self-Driving Cars

One of the most promising application of AI in near future would be the self-driving or autonomous cars. Using advanced machine learning algorithms, these cars would be able to navigate through highly crowded and busy roads and could run on many different kinds of terrains. There is already a huge progress made in this area with some big names like Google, Tesla and Uber investing big-time in self-driving cars. Some cars already have self-driving features in them in which a human driver can turn the auto-drive mode on but they can be overridden by human intervention, pretty much like cruise control. An actual self-driving car would not require any human intervention and it would navigate using its sensors and radars. As per Google [15], a self-driving car would be continuously answering these four questions:

1. *Where am I?* - The car would use map and sensor information to determine where it is at any given moment.
2. *What's around me?* - The car would detect objects around it using sensors and cameras and classify them according to shape and size. Google's self-driving cars can detect objects from as far as two football fields.
3. *What will happen next?* - The software installed in car then decides what is going to happen next? Which object will move, which will remain static?
4. *What to do?* - Finally the car decides what to do next. Do brakes need to be applied or not? Is it safe to accelerate the car?

Google is the leading researcher in this field with its cars having gone the testing of over 1.5 million miles. It previously used customized models of Lexus but since 2014 it has been testing on its own specially built prototype. Recently Uber has launched its self-driving fleet in Pittsburgh which for the time-being will also be monitored by human drivers. Similarly, Tesla has been providing auto-pilot feature in some of its cars for some time now. Some states like California, Nevada and Texas have already passed legislation regarding self-driving cars while others are contemplating doing so. It is everybody's guess when self-driving cars would take over the human-driven ones but with the recent progress, that day doesn't look too far away.

e) AI in Military

Considering that much of initial funding in AI came from DARPA, it is no surprise that AI is pretty heavily used in military and warfare these days. Unmanned Aerial Vehicles (commonly known as drones) and Unmanned Ground Vehicles (UGV) have been in use of military for over a decade now. Famous among them are the Gladiator Tactical UGV (used by US Marine Corps), ViPer (used by Israeli Forces), Sarge and The Warrior (Unmanned Tanks) and The Talon (used for bomb-disposal). Similarly drones have been used by US for bombing militant hideouts in Afghanistan and Yemen. More recently, domestic law enforcement agencies have also started using AI robots for bomb-

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disposal missions. In fact, very recently, the killing of Dallas shooting suspect through robot is widely believed to be first such incident [16] where a bomb-disposal robot was itself armed with remote-controlled bomb and detonated when it went near the suspect. Use of AI in military is a grey area and the use of drones and other unmanned ground vehicles have been large criticized by human-rights organizations.

f) Speech Recognition & Personal Digital Assistants

Ever since HAL-9000 made its debut in Stanley Kubrick's famous *2001: A Space Odyssey*, people only perceive of AI as a talking machine; such was the cultural impact of that movie. But ironically this is perhaps the trickiest and the least robust of all AI applications. The notion of having an AI talking with you and doing your several tasks is no more a dream now but many challenges still loom. Most significant among them is correctly recognizing the human speech and almost equally challenging is the task of making sense out of this speech. The conversational bots have become quite common but many of them are text-based and domain specific. On smartphone side, Google Now, Siri and Cortana are pretty state of the art and can do almost everything short of having a full-fledged conversation with you. They can make calls, send emails, tell weather, recite important news and many more. Much of this has only been possible recently due to advancements in processors and memory. Using deep learning, extremely sophisticated speech models can be built and custom tuned to the voice of smartphone user. Such dialog systems are extremely useful for people who are less tech savvy as they can just order their phone to do things for them rather than navigating the phone for the desired functionality. As more and more powerful models are being built, use of such systems is becoming more ubiquitous. Focus now is on developing such systems for local languages so that people unfamiliar with English can also have a taste of it.

g) Recommender System

Recommender Systems are now used by all digital marketing vendors and even blogs and social websites. The idea behind them is to observe the patterns of the certain user and then make recommendations to the user based on past behavior. For instance, you shop on Amazon and it will give you a list of recommended items. Similarly, you watch some TV shows on Netflix or Hulu and they can make recommendations to you based on your interests. This trend of targeting users individually and making recommendations to them based on their behavior is a huge plus for marketing people. And behind all of this is sophisticated AI primarily based on unsupervised machine learning algorithms which mine for patterns in the user behavior and draw conclusions accordingly. Websites also have now started to post more directed ads to users based on their browsing behavior. Some believe it to be an invasion of privacy, but this is the price we have to pay for living in the digital world – nothing is a secret anymore and businesses tend to exploit it to their advantage.

h) Robotics

No discussion of AI can be complete without mentioning robots – the physical manifestation of AI. While most other AI products can operate on simple general-purpose computers, robots require special hardware and a wide array of sensors to operate in a seamless manner. For most part of AI history, robots were of little practical use and much of the work was done by hobbyists and AI enthusiasts. In last decade or so, research community picked up the Robotics fever and started organizing competitions and contests like RoboCup [17] which pitted robots against each other in various contests and the winner was awarded sizeable reward. Owing to the recent advancements in processing and memory capabilities, and the availability of very high precision sensors, robots are now used in industrial applications as well. They are used to perform high-precision jobs like welding and riveting, used for material handling and assembling the products, used in ultra-high precision surgeries and also used in potentially dangerous situations like toxic-waste cleaning and bomb disposal. Japan is the leader in designing and making highly advanced humanoid robots, most famous of which is ASIMO (Advanced Step in Innovative Mobility) [18]. It can walk and run on smooth as well as uneven or slippery surfaces, climb stairs and pick and drop objects. It can also recognize human commands and human faces and can avoid obstacles. Similarly NAO [19] is another famous robot which can act as "true family companion" for families. But undoubtedly, the world leader of robots is NASA's Curiosity Rover [20] which has been exploring Mars since 2012 and has sent some amazing pictures of Martian terrain back to Earth. Its primary mission is to determine the Mars habitability and search for any potential life-forms like microbes. The way robotics industry is progressing, it won't be longer than two or three decades when robots would become ubiquitous in every household for doing simple everyday chores like washing and cleaning.

IV. Concerns Regarding AI

While AI has garnered considerable support over the last half-century or so, the recent advances have made some people afraid of its potential strengths and misusage. These concerns can be broadly categorized into 3 main areas:

a) Controversy regarding "Rise of Machines"

This notion that one day AI is going to take over and make humans their slaves or even worse, make humans extinct, is not new. Some of this fear is fueled by sci-fi novels and movies like Terminator but lately some of the big names of modern science have also expressed-concerns over unbridled progress of AI. Most notable among them are Stephen Hawking, Bill Gates and Elon Musk. The controversy regarding Artificial Intelligence or "super-intelligence" has been fueled by Oxford University philosopher Nick Bostrom [21] in his articles and books where he presents several hypothetical scenarios in which AI takes over humans. Stephen Hawking also pitched in with his two cents, hypothesizing that one day AI would become so powerful that it can create a better replica of itself and it would set a chain of better AIs which would eventually no longer need humans and would be dangerous for humans. Similar concerns have been shown by Bill Gates and Elon Musk [22]. But in view of most of the AI community, these concerns are far-fetched and perhaps too distant. AI technology would probably take hundreds of years more to reach at any discernable dangerous level for humans. According to one AI researcher, worrying about AI taking over the world is analogous to worrying about over-population on Mars.

b) Ethical & Moral Concerns

The more serious, and legitimate, concerns are raised from moral and ethical points of view. Is it right to give military AI robots the power to kill the enemies or decide their fate in some other way? Is it right for AI recommender systems to display ads to people based on its perception of people? Is it right to make AI moral agents – i.e. give them the power to decide what is right or wrong in a given scenario? All of these questions deliberate on the fact that how much power can be entrusted to AI! Moreover, most modern AI systems are constantly evolving and learning from their interactions. There is an inherent danger that they would learn to mirror the human values and those values would be biased, based on the type of people AI would interact with. One such example we have already seen in the form of Microsoft Twitter Bot, which learnt profanity and racism pretty quickly due to its interaction with people who were deliberately trying to misguide the bot and were eventually successful [23]. Thus there would always be possibility of AI becoming a representative of ideas and values of small group of people rather than human population as a whole. There is also a question mark on the power of people behind programming AI and their ability to program AI in a negative way can be disastrous. There is also concerns about hacking of AI related products as recently demonstrated in DEF CON 24 [24]. The hackers were able to take control of an autonomous car and were able to accelerate it and apply brakes. Since AI is pretty heavily dependent on sensors, it is also a potential area of concern as some hackers were able to blind the Tesla auto-pilot car and make it collide with objects. All these concerns are pretty legitimate and there is a need to make AI more secure and avoid its transgression in realms of moral and ethical decisions. Professing this point of view, many among AI community have proposed a ban on use of AI in military endeavors.

c) Financial & Social Concerns

There are also financial concerns at stake with AI permeating more and more areas of human life. Self-driving cars, when common, would pretty much make the human drivers obsolete as many of traffic accidents are due to human error. Also it would be more financially feasible for companies to have self-driving trucks rather than a man behind the wheel. Similarly AI when advanced enough to have a natural conversation with humans, would replace the service center receptionists, especially those behind the phones. In the industry too, AI robots are becoming advanced enough to replace human jobs of packaging and assembling but that would take some time. Amazon recently held a competition for the fastest robotic assembler which could categorize and arrange objects correctly and quickly. But many AI researchers have brushed-off these concerns as typical conservative response to anything new. They cite the example of ATM machines which are pretty common these days but were faced with a lot of criticism when launched as they were supposed to make bank staff members out of job. But introduction of ATMs opened newer avenues of interest for the human staff. In a similar way, while AI could replace some of the human jobs, it can open many more opportunities for the humans.

V. Conclusion

There is no doubt that AI has become a major part of our life now, and for better or worse, it is bound to remain an integral part in future. It is already playing an important role in several domains like personal digital assistants, recommender systems, autonomous cars, social media and many more. In coming decades, AI is likely to grow even more and become even stronger. This fact has made some people wary of its success and they are suggesting to put a lid on its progress to keep it under control. Most of their fears are unfounded but some are legitimate and needs to be addressed.

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Recognition of Cursive Arabic Handwritten Text using Embedded Training based on HMMs

By Mouhcine Rabi, Mustapha Amrouch & Zouhir Mahani

Ibn Zohr University

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Keywords: recognition; handwriting; arabic text; hmms; embedded training.

GCST-D Classification: I.3.3, I.4.10

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Mouhcine Rabi [α], Mustapha Amrouch [σ] & Zouhir Mahani [ρ]

Abstract- **In this paper we present a system for offline recognition cursive Arabic handwritten text based on Hidden Markov Models (HMMs). The system is analytical without explicit segmentation used embedded training to perform and enhance the character models. Extraction features preceded by baseline estimation are statistical and geometric to integrate both the peculiarities of the text and the pixel distribution characteristics in the word image. These features are modelled using hidden Markov models and trained by embedded training. The experiments on images of the benchmark IFN/ENIT database show that the proposed system improves recognition.**

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I. Introduction

The recognition of cursive Arabic handwriting text is an active area of pattern recognition research. The variability of words, letter shapes are context sensitive, inter and intra word spaces, the cursive nature of Arabic handwriting, the skew and slant of characters and words makes the development of offline recognition handwritten system a challenging task.

Researches have tried various approaches for text recognition employing various techniques for pre-processing, features extraction and classification [1]. The subject of this article concerns the recognition of cursive Arabic handwriting [2] [3].

Several systems are available based on two approaches; a global approach that considers the word as non-divisible base entity avoiding the segmentation process and its problems.

This approach is reliable and applicable for vocabularies of limited size. Against, the analytical approach is based on the decomposition of the word sequence into characters or graphemes proceeding by a segmentation phase. The latter can be explicitly based on a priori division of the image into sub-units (letters or grapheme) or implicitly based on a recognition engine to validate and rank the segmentation hypothesis.

The approach used in our system is analytical based on implicit segmentation; segmentation and recognition are carried out jointly.

Author α: Laboratory IRF-SIC, faculty of sciences, Ibn Zohr University Agadir, Morocco. e-mail: mouhcineh@gmail.com

Author σ: Laboratory IRF-SIC, faculty of sciences Ibn Zohr University, Agadir, Morocco. e-mail: m.amrouch@uiz.ac.ma

Author ρ: Hight school of technology. Ibn Zohr University, Agadir, Morocco. e-mail: zouhir.mahani@uiz.ac.ma

The first step of a handwriting recognition system after preprocessing is the extraction features. The objective of this phase is the selection of primitives relevant for the next steps of classification and recognition.The performance of a recognition hand written system largely depends on the quality and the relevance of the extracted features. In our system after the baselines estimation, the extracted features are statistics acting on the densities of pixels and structural extracted from the representation of the character shapes.

Hidden Markov models (HMMs) are used for classification [4] [5][6]. There are many reasons for success of HMMs in text recognition including avoidance of the need to explicitly segmentation. In addition, HMMs have sound mathematical and theorical foundations.

Each word is described by a model built by concatenating the models of the component character. The system performs training and recognition of words and characters.

Character models are trained through embedded training from images of words and their transcription.

"Fig. 1" presents the synopsis of the proposed system.

The remainder of this paper is organized as follow. Section 2 presents a detailed description of the features extraction preceded by baselines estimation. Section 3 is focused on classification step and the embedded training method. The performance of the recognition system has been experimented on the benchmark database IFN/ENIT and the obtained experimental results are shown and analyzed in section 4. The paper finally concludes with some conclusions and perspectives.

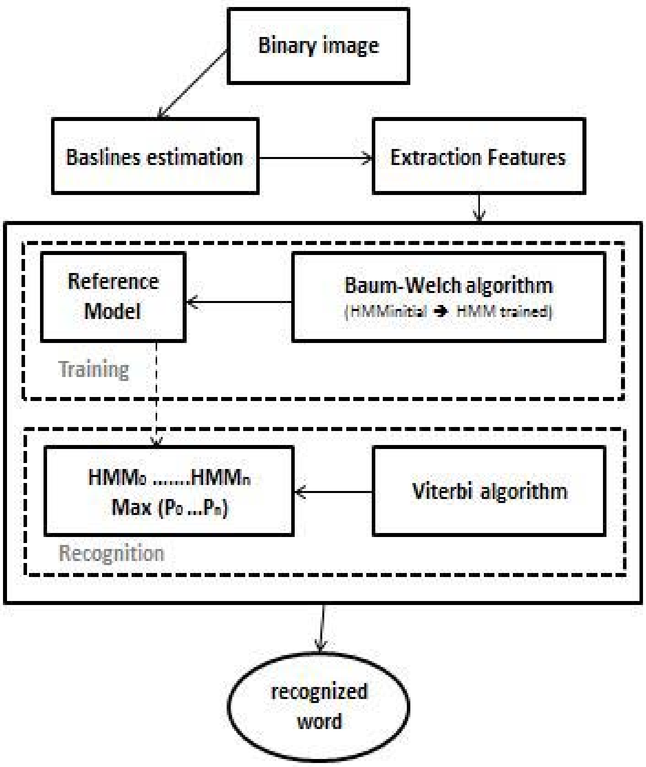

Figure 1: Synopsis of proposed system

II. Extraction Features

a) *Baseline Estimation*

The goal is to find, for a given word, the positions of the two following parallel lines "Fig. 2":

- Lower baseline (LB),
- Upper baseline (UB).

These baselines divide the image into lower, upper and middle zone.

Figure 2: Lower and upper baselines estimation

Several techniques exist for estimating these two lines, horizontal projection histogram, the Hough transform, the minima of the bottom contours [7], the neighborhood approach and components, PCA (Principal Component Analysis) [8] [9].

The approach used is based on the horizontal projection curve that is computed with respect to the horizontal pixel density, knowing that the skew and slant correction of words are made in preprocessing step to harmonize the course of the sliding windows in the extraction features.

LB corresponds to the maximum of the projection profile curve, then, the algorithm scans the image from top to bottom to find the upper baseline, which corresponds to the first line with a projection value higher or equal to the average row density. Thus, the handwritten variability of word in both zones, upper and lower are considered.

b) *Extraction features*

The features extraction method used in our system is inspired by work of El-Hajj [10] with some modifications, the used technique has shown excellent results in several researches [11][12]. The features extraction stage consists of extracting a sequence of characteristics vector by dividing the word image into vertical frames. The sliding windows are shifted in the direction of writing (right to left). The width of each window is a parameter to set, the height of a window varies according to the dimension of the word image.

In each window we extract a set of 28 features represent the distribution features based on foreground pixels densities and concavity features. Each window is divided into a fixed number n of cells. Some of these features are extracted from specific areas of the image delimited by the word baselines.

In our experimentation the parameters are set to n = 20 cells and the width = 8 pixels. This leads to a total of N_f= 28 to calculate in each frame.

Let :

n(i) : the number of foreground pixels in cell i

r(j) : the number of foreground pixels in the j_{th} row of a frame.

b(i) : the density level of cell i : b(i)=0 if n(i)=0 else b(i)=1.

The extracted features are the following:

f1: density of foreground (black) pixels.

$$f1 = \frac{1}{H \times w} \sum_{i=1}^{n_c} n(i)$$

f2: number of transitions black/white between two consecutive cells.

$$f2 = \sum_{i=2}^{n_c} |b(i) - b(i-1)|$$

f3: difference's position of gravity centers of foreground pixels in two consecutive frame (current and previous)

$$f3 = g(t) - g(t-1)$$

f4: normalized vertical position of the center of gravity of the foreground pixels in the whole frame with respect to the lower baseline.

$$f4 = \frac{g - L}{H}$$

f5, f6: represent the density of foreground pixels over and under the lower baselines.

$$f5 = \frac{\sum_{j=L+1}^{H} r(j)}{H.w} \quad ; \qquad f6 = \frac{\sum_{j=1}^{L-1} r(j)}{H.w}$$

f7: number of transitions black/white between two consecutive cells of different density levels above the lower baseline.

$$f7 = \sum_{i=k}^{n_c} |b(i) - b(i-1)|$$

f8: zone to which the gravity center of blck pixels belongs (lower zone f8=3, middle zone f8=2, upper zone f8=1)

f9,..., f14: the concavity features are defined as:

$$f9 = \frac{C_{left-up}}{H} \quad ;$$

$C_{left-up}$: the number of background pixels that have neighbor black pixels in the two directions (left and up) The same applies to f9, …, f14 in six directions left-up, up-right, right-down, down-left, vertical and horizontal. f15, …, f20 : the baseline dependent features related to the core zone are defined as :

$$f15 = \frac{CM_{left-up}}{d} \; ;$$

$CM_{left-up}$: the number of background pixels in the configuration left-up

The same applies to f16, …, f120 in six directions left-up, up-right, right-down, down-left, vertical and horizontal.

f21,…, f28 : represent the density of foreground pixels in each vertical column in a frame.

In each frame 28 features vector are extracted, these features are statistical and geometric to integrate both the peculiarities of the text and the pixel distribution characteristics in the word image, which capture the type of strokes (curved, oriented, vertical, and horizontal).

III. Modeling

a) Hidden Markov Models

A Hidden Markov Model (HMM) is a doubly stochastic process with an under-lined stochastic process (Markov chain) that is not observable (it is hidden), but can only be observed through another set of stochastic processes that produce the sequence of observed symbols [13].

In order to define an HMM completely , following elements are needed, $\lambda = (N, M, A, B, \Pi)$:

- N: The number of states of the model,
- M: The number of observation symbols in the alphabet. If the observations are continuous then M is infinite,
- A : A set of state transition probabilities,
- B: A probability distribution in each of the states,
- Π: The initial state distribution.

The use of HMM aims to resolve three problems:

- The Evaluation

  Given an HMM λ and a sequence of observations $O=o_1,o_2,\ldots,o_T$, what is the probability that the observations are generated by the model, $P\{O|\lambda\}$

- The Decoding

  Given a model λ and a sequence of observations $O=o_1,o_2,\ldots,o_T$, what is the most likely state sequence in the model that produced the observations?

- The Training

  Given a model λ and a sequence of observations $O=o_1,o_2,\ldots,o_T$, how should we adjust the model parameters $\{\Pi, A, B\}$ in order to maximize$P\{O|\lambda\}$

b) Character and word models

The used approach is analytical and based on character modeling by HMM. Each character model has a number of parameters; topology, number of hidden states, state transition probabilities and observation probabilities.

There is no specific theory to set these parameters, so the solution is empirical. Many considerations can be taken into account in setting these parameters and in particular the technique used in the generation of sequences of observations. In our system we used a model, right-left topology with four states for each character and three transitions for each state "Fig. 3".

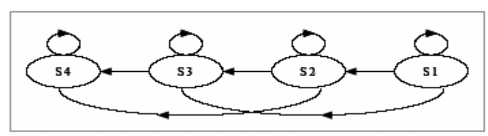

Figure 3: Character HMM topology

Word model is built by concatenating the appropriate character models "fig. 4".

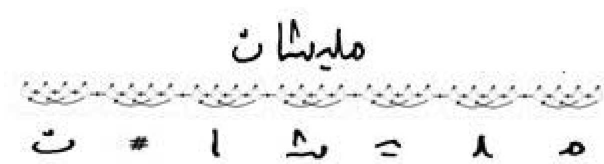

Figure 4: HMM model for Arabic word : مليشات

c) Embedded-training

The system performs training and recognition of words and characters. Training the character models are made from images of words and their transcription. The approach is analytical without segmentation and the character models are trained using embedded-training [14] [10].

The embedded training is to automatically identify relevant information letters without specifying them explicitly, by exploiting the redundancy of information between words, matched to changes in context and letters position "fig. 5".

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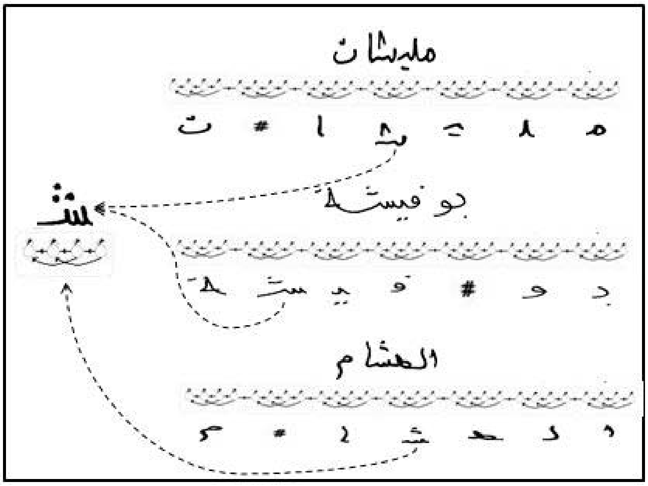

Figure 5: Embedded training of character “chin”

IV. Experimentations and Results

In order to investigate the potential of using embedded-training for offline cursive handwriting recognition, the benchmark database IFN/ENIT is used [15], that contains a total of 26459 handwritten words of 946 Tunisian town/villages names written by different writers.

We used the toolbox HTK (Hidden Markov Model Toolkit [16]) to model the characters and words. The table below shows the experimental results of our system compared to other recognition systems using the same benchmarking database IFN/ENIT, divided into four sets , a, b, c for training and d for testing :

Table 1: Recognition results of various systems

System	Models	Recognition rate %
A.Maqqor [6]	Multiple Classifiers	76.54
Kessentini [17]	Multi Stream HMM	79.80
Alkhateeb [18]	HMM and dynamic Bayesian network	86.73
Parvez [19]	FATF with set medians	79.58
Proposed System	Embedded training based HMM	**87.93**

Table shows the results of recognition rates for various offline systems recognition of cursive Arabic handwritten text using various models and the same database to compare rates and infer the effectiveness of the proposed method.

Alkhateeb and al [18] are presented a comparative study of approaches for recognizing handwritten Arabic words using Hidden Markov Models (HMM) and Dynamic Bayesian Network (DBN) classifiers, and The recognition rate achieved was 86,73%. [17] [19] [6] are presented systems using respectively a multi-stream Hidden Markov Models, Fuzzy Attributed Turning Function (FATF) with set-medians and multiple classifiers; the recognition rate for the results of the systems mentioned does not exceed 80%. Whereas the proposed system outperforms the results and achieve 87.93%.

Finally, the performance of handwritten Arabic recognition system is significantly improved using embedded training based on HMMs.It remains to boost the rate using annexes improvements (Post-Processing: language models)

V. Conclusion and Perspectives

In this paper, we present a recognition system of Arabic cursive handwriting using embedded training based on hidden Markov models. The extracted features are based on the densities of foreground pixels, concavity and derivative features using sliding window, some of these features depends on baselines estimation. The modelling proposed has improved recognition, and shown encouraging results to be perfect later.

Many points are yet to be achieved, firstly modeling a character allows deformations related to its context (next and previous character). To account possible deformations, contextual modeling of characters is opted. The word is no longer seen as a succession of independent characters, but as a sequence of characters in context. Word models are the concatenation of context-dependent characters models: the trigraphe, this modelling will allow building more accurate and more efficient models. Taking into account the characters environment allows more precise and more effective models to be built. However, this implies a multiplication of HMM parameters to be learned, it would be the focus of our next work. Then language models will be incorporated to refine and improve the results and lead to a more efficient system.

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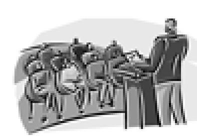

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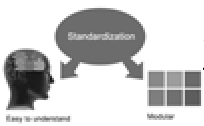

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The IFOARS institution is entitled to form a Board comprised of one Chairperson and three to five board members preferably from different streams. The Board will be recognized as "Institutional Board of Open Association of Research Society"-(IBOARS).

The Institute will be entitled to following benefits:

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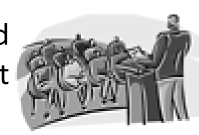
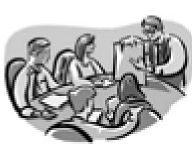
The author fees of such paper may be waived off up to 40%.



The Global Journals Incorporation (USA) at its discretion can also refer double blind peer reviewed paper at their end to the board for the verification and to get recommendation for final stage of acceptance of publication.

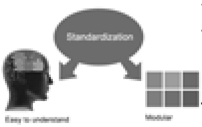


The IBOARS can organize symposium/seminar/conference in their country on behalf of Global Journals Incorporation (USA)-OARS (USA). The terms and conditions can be discussed separately.

The Board can also play vital role by exploring and giving valuable suggestions regarding the Standards of "Open Association of Research Society, U.S.A (OARS)" so that proper amendment can take place for the benefit of entire research community. We shall provide details of particular standard only on receipt of request from the Board.

The board members can also join us as Individual Fellow with 40% discount on total fees applicable to Individual Fellow. They will be entitled to avail all the benefits as declared. Please visit Individual Fellow-sub menu of GlobalJournals.org to have more relevant details.

We shall provide you intimation regarding launching of e-version of journal of your stream time to time. This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.



After nomination of your institution as "Institutional Fellow" and constantly functioning successfully for one year, we can consider giving recognition to your institute to function as Regional/Zonal office on our behalf.
The board can also take up the additional allied activities for betterment after our consultation.

The following entitlements are applicable to individual Fellows:

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- • This individual has learned the basic methods of applying those concepts and techniques to common challenging situations. This individual has further demonstrated an in–depth understanding of the application of suitable techniques to a particular area of research practice.

Note :

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- In future, if the board feels the necessity to change any board member, the same can be done with the consent of the chairperson along with anyone board member without our approval.
- In case, the chairperson needs to be replaced then consent of 2/3rd board members are required and they are also required to jointly pass the resolution copy of which should be sent to us. In such case, it will be compulsory to obtain our approval before replacement.
- In case of "Difference of Opinion [if any]" among the Board members, our decision will be final and binding to everyone. "

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The Area or field of specialization may or may not be of any category as mentioned in 'Scope of Journal' menu of the GlobalJournals.org website. There are 37 Research Journal categorized with Six parental Journals GJCST, GJMR, GJRE, GJMBR, GJSFR, GJHSS. For Authors should prefer the mentioned categories. There are three widely used systems UDC, DDC and LCC. The details are available as 'Knowledge Abstract' at Home page. The major advantage of this coding is that, the research work will be exposed to and shared with all over the world as we are being abstracted and indexed worldwide.

The paper should be in proper format. The format can be downloaded from first page of 'Author Guideline' Menu. The Author is expected to follow the general rules as mentioned in this menu. The paper should be written in MS-Word Format (*.DOC,*.DOCX).

The Author can submit the paper either online or offline. The authors should prefer online submission.Online Submission: There are three ways to submit your paper:

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(II) Choose corresponding Journal.

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- Font type of all text should be Swis 721 Lt BT.
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- Abstract Font size of 9 Bold, “Abstract” word in Italic Bold.
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- Two Column with Equal Column with of 3.38 and Gaping of .2
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1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript’s Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

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The recommended size of original research paper is less than seven thousand words, review papers fewer than seven thousands words also.Preparation of research paper or how to write research paper, are major hurdle, while writing manuscript. The research articles and research letters should be fewer than three thousand words, the structure original research paper; sometime review paper should be as follows:

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(c) Up to ten keywords, that precisely identifies the paper's subject, purpose, and focus.

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(e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition; sources of information must be given and numerical methods must be specified by reference, unless non-standard.

(f) Results should be presented concisely, by well-designed tables and/or figures; the same data may not be used in both; suitable statistical data should be given. All data must be obtained with attention to numerical detail in the planning stage. As reproduced design has been recognized to be important to experiments for a considerable time, the Editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned un-refereed;

(g) Discussion should cover the implications and consequences, not just recapitulating the results; conclusions should be summarizing.

(h) Brief Acknowledgements.

(i) References in the proper form.

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It is vital, that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

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Language: The language of publication is UK English. Authors, for whom English is a second language, must have their manuscript efficiently edited by an English-speaking person before submission to make sure that, the English is of high excellence. It is preferable, that manuscripts should be professionally edited.

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- One should avoid outdated words.

Keywords are the key that opens a door to research work sources. Keyword searching is an art in which researcher's skills are bound to improve with experience and time.

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Acknowledgements: Please make these as concise as possible.

References

References follow the Harvard scheme of referencing. References in the text should cite the authors' names followed by the time of their publication, unless there are three or more authors when simply the first author's name is quoted followed by et al. unpublished work has to only be cited where necessary, and only in the text. Copies of references in press in other journals have to be supplied with submitted typescripts. It is necessary that all citations and references be carefully checked before submission, as mistakes or omissions will cause delays.

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1. Choosing the topic: In most cases, the topic is searched by the interest of author but it can be also suggested by the guides. You can have several topics and then you can judge that in which topic or subject you are finding yourself most comfortable. This can be done by asking several questions to yourself, like Will I be able to carry our search in this area? Will I find all necessary recourses to accomplish the search? Will I be able to find all information in this field area? If the answer of these types of questions will be "Yes" then you can choose that topic. In most of the cases, you may have to conduct the surveys and have to visit several places because this field is related to Computer Science and Information Technology. Also, you may have to do a lot of work to find all rise and falls regarding the various data of that subject. Sometimes, detailed information plays a vital role, instead of short information.

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19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

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22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

Segment Draft and Final Research Paper: You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.
- Do not give permission to anyone else to "PROOFREAD" your manuscript.
- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

Criterion for Grading a Research Paper (Compilation) by Global Journals Inc. (US)

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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