Making The Human Emotions Computable. Wald´s Equation and Z-Test A Good Example To Compute The Human Feeling Toward The Machines. A Case Study with Facebook

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Author Heider Jeffer

***Abstract*— In this research we will present a vision and a revolutionary idea, our objective function is making Human emotions computable. This research open a new idea to digitize the human feeling to be computable and to be proven as true in the same time.**

What we will do here is computing the interaction between the human and machine [Heider Jeffer - Rosella Gennari]. Researchers have recognized human machine interaction will open a new dimension in machine learning(Gerhard Fischer)(E. Levin). In this proposal we will show that user´s interaction with machine is computable. We can compute {user´s satisfaction , user´s success and user´s failure} with machine (i.e dose the use success on his/her task at facebook) (Heider Jeffer, Rossella Gennari)

"Figure1. This image give a general idea about the system that we designed for this research. The Three red circles represent the inputs, the yellow color represent the processes , and the green represent the outputs and the feedback of the system.
From Heider Jeffer ©2017

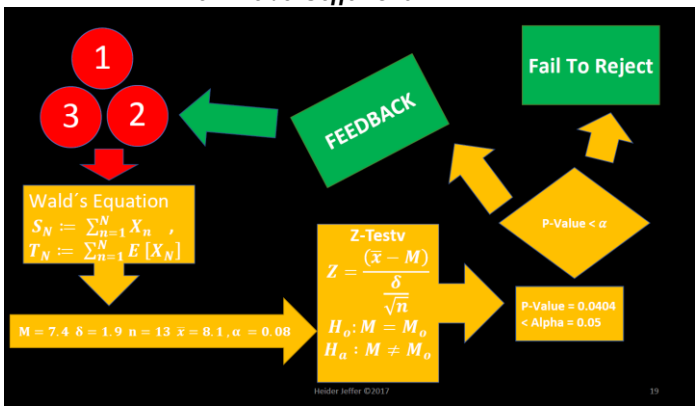

Figure 1 IPO model by Heider Jeffer

In this paper we will do that, by designing an IPO model (inputs, processes and outputs), this model has three inputs , two processes and two outputs. We received the inputs from Prof. Rossella Gennari and Heider Jeffer, these inputs are digitals human emotion toward the machine, we do that by assigning a value to represent the user interaction (i.e value describe user´s success , value described user´s failure and value described the user´s satisfaction) then will be send to the processes. The system has two processes; Wald process and Z-Test process, Wald will receive the inputs to compute M , δ, and $\bar{x}$ they represent the users` mean, users´ standard division and users expected value then Z-Test process will test Wald´s results to show that; if we have a high percentage of confidence we fail to reject Wald´s equation or not. Finally the system´s output will be or fail to reject or reject, otherwise the information will be sent to the feedback to be improved after that it will be send again to the inputs {see figure 1}. (Heider Jeffer, Leonardo Ricci- Department of Physics- University of Torento), (Heider and Rossella). In this research the inputs and the feedback are not in our concern, our part is the Wald and Z-Tests processes.

As results of this research. We will show that Wald and Z-Tests is a good example for computing human feeling toward the machine. Yes. We discover a new way to digitalis human emotion toward the machine. This research succeed digitize Human feeling into a formula . And above all, Yes we prove it is a true. And. Finally even if it is not then there is a feedback to improve the data and redo it again until it work.

Keywords—IPO Model, Wald´s equation, Z-Test, Human Machine interaction

I. INTRODUCTION

THE aim of this paper is to design an IPO model able to compute the interaction between human and the machine.
The IPO model has three inputs, two processes and two outputs, in which:

Inputs are [user´s satisfaction, user´s success and user´s failure] they are given by Prof Rossella, these inputs represent three level of a digital human interaction toward machine.

Processes are Wald´s equation and Z-Test [Wald Method], Wald´s will process the inputs to compute M , δ, and $\bar{x}$, Z-Test will prove (M , δ, and $\bar{x}$) whether if they are truly represent the users interaction in facebook our not.

Outputs of our system regarding to the Z-Test on Wald´s results, twill be: we reject or we fail to reject that users interaction toward Facebook is computable.

And if the results is rejected then it will be send to the feedback

Feedback will receive the rejected results to be improved and modified, updated,,,etc. and send them back to the inputs. In this research, we have no authorities on the feedback, therefore we did not mention it in this paper.

In case if the results are disappointed then these information will be send to the feedback to improve the data and will be send again to the inputs. So It is a dynamic system that keep testing and trying over the time until we satisfied our objective function (Make the emotion computable)

"Figure 2.
For this research. This image show the flowchart:
Inputs, processes and outputs.
By Heider Jeffer © 2017

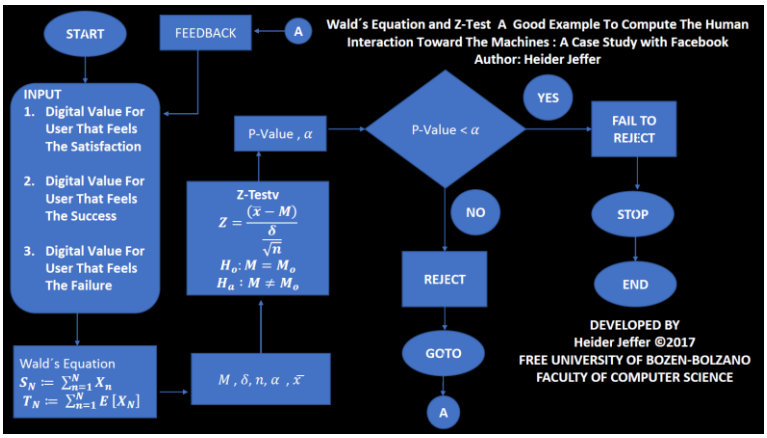

Figure 2 Flowchart by Heider Jeffer ©2017

This research will explain and describe the inputs ,processes and outputs, we take more care on the processes and outputs, since we don't have a full control on the inputs and the data management.

The (E. Levin) research showed us how to choose the right statistic distribution, and its standard errors. From Scott MacKenzie article we learn a new idea to define the input. Our work with Professor Leonardo Ricci, we got the knowledge to prove if the output are true or not.

Finally. From our laboratorial work with Professor Rosella Gennari in human machine interaction, we gain more knowledge about human functionality toward the machine, And she gave us the inputs for 13 users interaction in facebook. We will introduce these inputs into Wald equation. Wald ´s eq. is:

$$S_N := \sum_{n=1}^{N} X_n$$
$$T_N := \sum_{n=1}^{N} E\,[X_N]$$

From Wald´s we have, users´ M , δ, n,

α and $\bar{x}$ the interaction of 13 users in facebook. These are Wald´s output. Next step, we have to test Wald´s outputs by the Z-Test, to show that whether users´ M , δ, n, α and $\bar{x}$ are really represent the human interaction of 13 users toward facebook or not (Heider Jeffer, Leonardo Ricci), we do that by Z-Test:

$$Z = \frac{(\bar{x} - M)}{\frac{\delta}{\sqrt{n}}}$$

In the end of this research we will show that we are with 99% confidence able to compute the users interaction toward facebook (Heider Jeffer, Leonardo Ricci).

II. METHODOLOGY - STEP BY STEP

The model has three inputs, two processes and two outputs

A. System Inputs – Satisfaction Success Failure

The inputs are feelings. In order to make these feeling computable, we digitalis these feeling into values, these digital values are given by Prof. Rosella Gennari. She is professor of Human Machin Interaction at the Faculty of Computer Science of the Free University of Bozen-Bolzano (Rosella Gennari).

Figure. The Three States of inputs, By Heider Jeffer and Rossela
HCI Lab 8 by Heider Jeffer ©2017

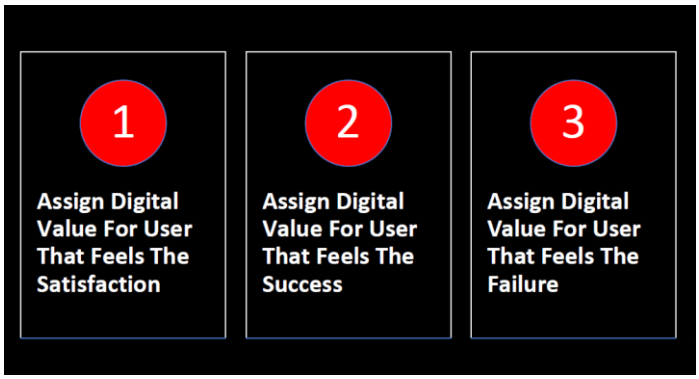

Figure 3 Heider Jeffer and Rossela , HCI Lab 8 by Heider Jeffer ©2017

The system inputs are:

1. Assign Digital Value For User That Feels The Satisfaction
2. Assign Digital Value For User That Feels The Success
3. Assign Digital Value For User That Feels The Failure

Next step, the system inputs will send to the processors.

B. System Processes: Wald´s and Z-Test

The two processes are Wald´s equation and Z-Test. Wald receive the inputs, process them, then import the results to the Z-test.

Figure {This image shows: Yellow color the Wald and Z-Test Process , The red colors are the inputs entering in Wald From left to right
By Heider Jeffer ©2017}

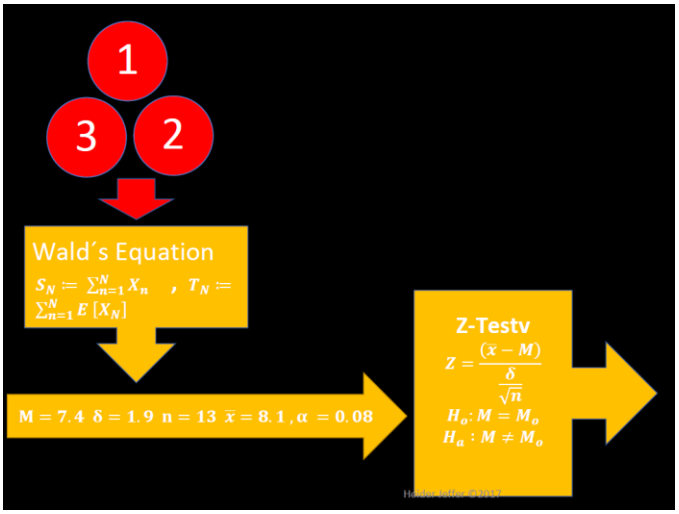

Figure 4 {This image shows: Yellow color the Wald and Z-Test Process , The red colors are the inputs entering in Wald From left to right
By Heider Jeffer ©2017}

1) **Process - Wald´s Equation**

Figure. {This image Shows Wald´s (colored in yellow) receive the inputs.
The inputs three reds circles red}

From Heider Jeffer ©2017

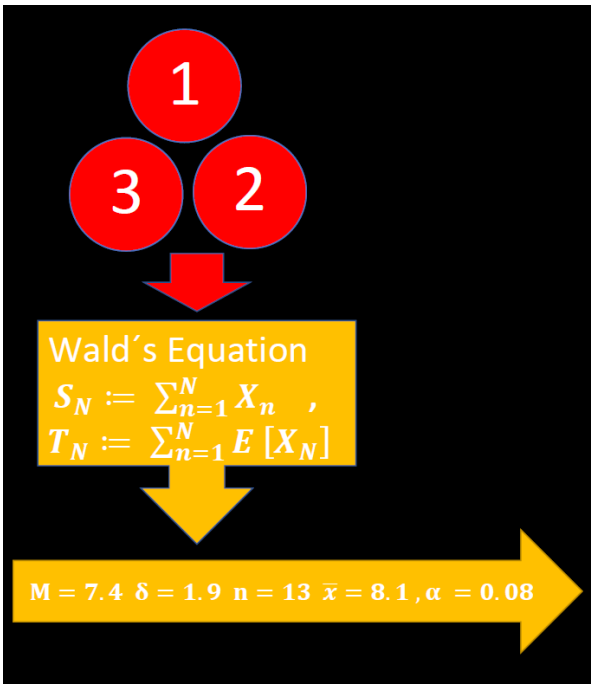

Figure 5 {This image Shows Wald´s (colored in yellow) receive the inputs. From Heider Jeffer ©2017

In this process Wald´s equation will receive the inputs (human digital human feeling) to be process in Wald´s equation:
$S_N := \sum_{n=1}^{N} X_n$, $T_N := \sum_{n=1}^{N} E[X_N]$ From Wald´s eq we will have the following:
M: the mean of users feel (Satisfaction, Success, Failure) in facebook
δ : standard division of users feel (Satisfaction, Success, Failure) in facebook
n : total number users
α : 0.05 is the alpha parameters of users feel (Satisfaction, Success, Failure)
$\bar{x}$: the expected value of users feel (Satisfaction, Success, Failure) in facebook

Next step Wald will send its results (M , δ, n, α and $\bar{x}$) to Z-Test process.

2) **Process - Z-Test**

This process will to test Wald´s results that the results { M , δ, n, α and $\bar{x}$ } to prove whether if they are realistic or not , by using the following formula:

$$Z = \frac{(\bar{x} - M)}{\frac{\delta}{\sqrt{n}}}$$

$H_o: M = M_o$
$H_a : M \neq M_o$

"Figure 10. Shows that the Z-Test recived (M , δ, n, α and $\bar{x}$) from walds and process them to find out P-Value and α and send them to the out put. By Heider Jeffer ©2017.

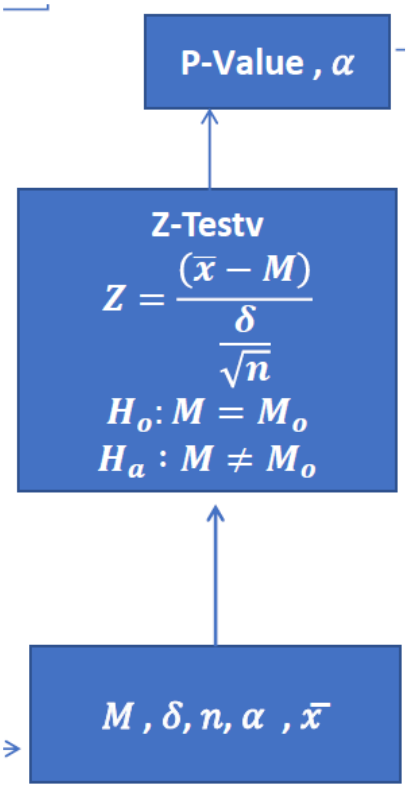

Figure 6 Shows that the Z-Test recived (M , δ, n, α and $\bar{x}$) from walds and process them to find out P-Value and α and send them to the out put. By Heider Jeffer ©2017.

"In Z , we compute the P-Value to compare it with α. To prove whether Wald´s results are represent the users interaction in Facebook our not.

C. System Outputs

Regarding the Z-Test on Wald´s results the outputs will be or [Fail To Reject] or [Reject]. If P-Value smaller than α then we fail to reject our theory. If P-Value greater than α than we will reject our research assumption, so we will send the information to the feedback.

Figure12 The system will check whether P-Value is smaler than α or not, by Heider Jeffer ©2017

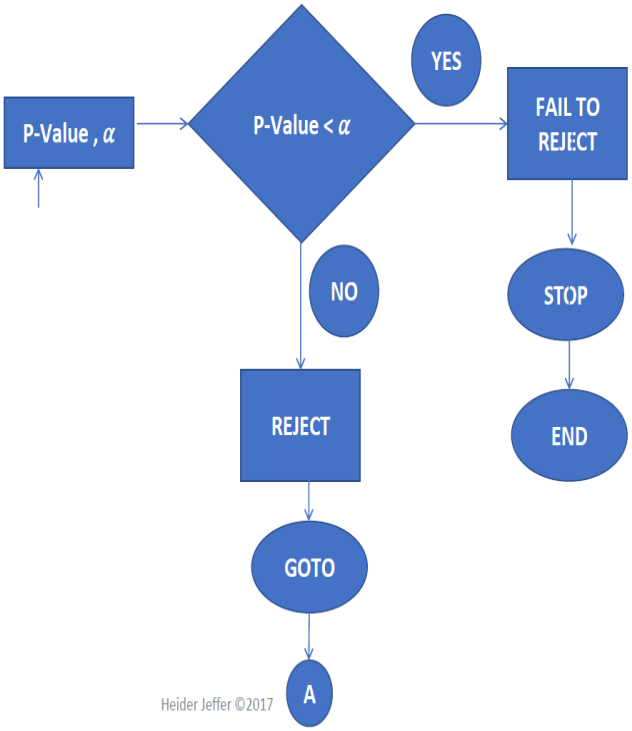

Figure 7 The system will check whether P-Value is smaller than α our not, by Heider Jeffer ©2017

If P-Value smaller then α then we prove our experiment results is true. Otherwise the rejected results will send to the feedback.

D. Feedback

Figure Show the Feedback received the rejected results from the outputs to be improved ,then will be send to the outputs. From Heider Jeffer ©2017

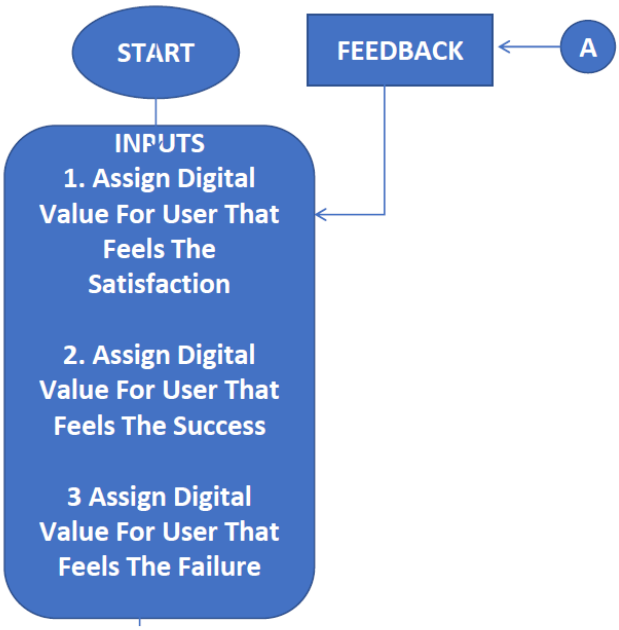

Figure 8 Show the Feedback received the rejected results from the outputs to be improved ,then will be send to the outputs. From Heider Jeffer ©2017.

The feedback will receive all the information from the output to improve the theory and send them to the input. Hence that, We have no authority in the feedback or data management.

III. CONTRIBUTION

From Z-Test process we failed to reject Wald´s results. We succeed to use Wald´s equation as system process to describe the relation between the human and the machine. We succeed to use Z-test in the system process to test Wald´s results. We succeed to design a system able to interduce some human activity into equations. This research will help the designer to understand UX (user´s

experience) and digital computer industries. Above all this research is a new dimension in computing machinery and artificial intelligence. Even if we start with facebook as a study case, but this research have more than one application.

IV. EVALUATION – RESULTS

Inputs

We have one task with 13 participants for each participant there is failure and success, assigned 1 to success and zero to the failure, we used Excel to compute the average of success . We used Wald eq. to find Confidence intervals for binary success.

Figure 15 Jeffer Lab 7 , Lab6 , The Inputs by Rosella Gennari and Heider Jeffer Lab 7 , Lab6 ©2017

Participant	Task
P1	1
P2	0
P3	1
P4	1
P5	0
P6	1
P7	0
P8	1
P9	0
P10	1
P11	1
P12	1
P13	1

Figure 9 Figure 3User´s Input by Rosella Gennari and Heider Jeffer ©2017

Processes Wald

Wald´s equation is,

$E[S_n] = E[N]E[X_1]$

From Wald´s equation we have 0.6923 Maximum Likelihood with 0.05 Alpha. M = 7.4 $\delta = 1.9$ n = 13 $\bar{x} = 8.1$ and $\alpha = 0.08$ (Heider Jeffer).

Figure 16: Wald Generator Lab 7 , Lab 8, by Heider Jeffer Rosella Gennari. Wald´s Process : M , δ, n, α and $\bar{x}$. Heider Jeffer © 2017

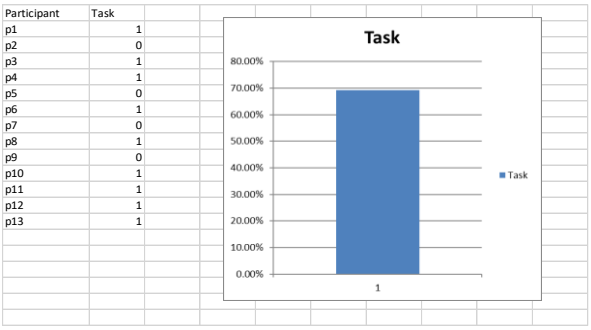

Figure 10 Wald´s Process : M , δ, n, α and $\bar{x}$ by Heider Jeffer

Process: Z-Test

from Wald, we have the following,

$M = 7.4$ $\delta = 1.9$ $n = 13$ $\bar{x} = 8.1$ and $\alpha = 0.08$

Z-Test is,

$Z = \frac{(\bar{x} - M)}{\frac{\delta}{\sqrt{n}}}$

therefore,

$H_o: M = 7.4$ and $H_a: M \neq 7.4$ and $Z = 7.4$

For two tailed test we have:

P-Value= 0.0404 and P-Value is $\leq \alpha$ (0.05)

Figure. Z-Test Process: Hypothesis Test Graph Generator by Heider Jeffer ©2017

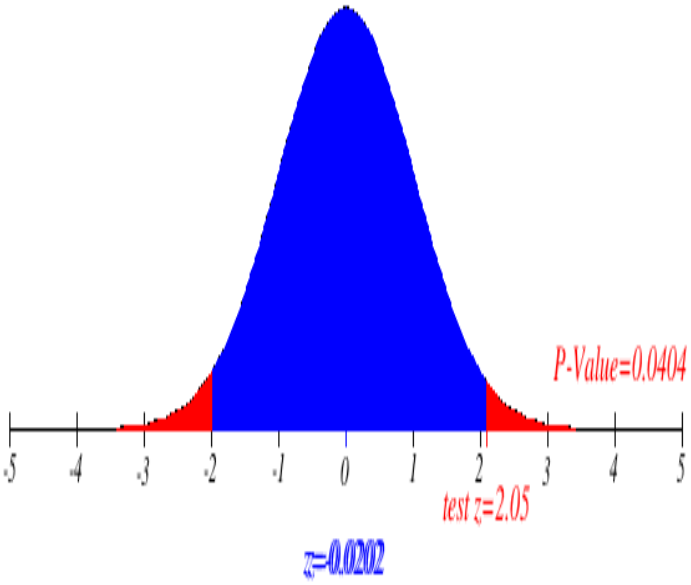

Figure 11 Z-Test Process: Hypothesis Test Graph Generator by Heider Jeffer

Outputs

At the 1% significant level the data do provide significant evidence to conclude that the mean of our [Wald´s results for all 13 users in facebook] is differ from 7.4. We are 99% confidence that the

mean of [Wald´s results for all 13 users in facebook] is greater than 7.4. We fail to reject (Heider Jeffer).

V. Related Work

1. For her great collaboration on this research. I want to express my deepest gratitude to Professor Rosella Gennari. I worked with her. She is a professor of human machine interaction at the Faculty of Computer Science of the Free University of Bozen-Bolzano. Professor Rosella Gennari has been the ideal project supervisor. Her sage advice, insightful criticisms, and patient

2. encouragement aided the writing of this research in innumerable ways, she really helped us out with her professional insights into the scene and with finding the right estimator that fit to the statistics distribution of our participants. Finally she was the one that inspired us to do this research.

3. Big thanks goes to Professor Leonardo Ricci. He is aggregate Professor at Department of Physics, Interdepartmental Center Mind / Brain – CIMEC, for his help in the Wald`s eq. Z-Test.

4. From the beginning we were headed in the direction of HCI (human computer interaction), but reading "A stochastic model of human-machine interaction for learning dialog strategies" by (E. Levin) gave us a better understanding on what kind of impact this research could have in the audio, visualization, and eye scanning.

5. I. Scott MacKenzie article "Fitts' law as a research and design tool in human-computer interaction" helped with its detailed information about how to make a statistic test to investigate the interaction between the user and the machine.

"This research start with one case study (Facebook). We had positive findings with it, but we want to generalize its outcome for every artificial intelligence in every corner of the world.

We are well aware that this research is only a starting point with a one case study but it is help us to have an idea how the future will look like."

VI. Final Considerations- WELCOME TO THE FUTURE

Although this research was designed with a very small scope, including only Facebook participants, but now we can say this has a positive impact on software designers, physicists and mathematicians. We succeed to compute the human behavior toward the machine which is every thing the software designers need to create a software that able to improve the UX.

Above all computing deglazing the human activities help the AI to improve the machine learning. We can say that. Yes it is possible to design a model to improve the relation of the human machine interaction to be a next step toward the machine learning.

References

[1] User Modeling in Human–Computer Interaction **(Gerhard Fischer)** https://goo.gl/m34hBX

[2] A stochastic model of human-machine interaction for learning dialog strategies **(E. Levin)** https://goo.gl/5RGaVy

[3] Seminars In Human Machine Interaction **(Heider Jeffer, ROSELLA GENNARI)** Faculty of Computer Science https://goo.gl/W8dtJz

[4] Department of Physics Interdepartmental Center Mind / Brain – CIMEC **(Heider Jeffer, Leonardo Ricci**) https://goo.gl/BPkLFp

[5] Measuring the User Experience: Collecting, Analyzing, and Presenting (William Albert, Thomas Tullis) https://goo.gl/a3v7ys

[6] How measuring student performances allows for measuring blended extreme apprenticeship for learning Bash programming **(Vincenzo Del Fatto , Gabriella Dodero , Rosella Gennari)** https://goo.gl/JcCh7J

[7] Wald Method https://measuringu.com/Wald /

[8] Information Processing and Human-Machine Interaction. An Approach to Cognitive Engineering(J. Rasmussen) https://goo.gl/QZn1iJ

[9] From human–machine interaction to human–machine cooperation (Jean-Michel Hoc) https://goo.gl/DYYmqp

[10] Fitts' law as a research and design tool in human-computer interaction (I. Scott MacKenzie) https://goo.gl/iB6wc8