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An Introduction to Artificial Psychology

Application Fuzzy Set Theory and Deep Machine Learning in Psychological Research using R

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This book is dedicated to thinkers whose worthy thoughts never saw the light of day

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Preface

Don’t You Know the Statistics? Don’t be Afraid and Enter

In science we try to build up a picture of the world. With the advancement of science, certainty has been isolated day by day and dark clouds have cast doubt on its beauty and radiance, and the certainty of Holy Grails turned upside down. Scientists have worked hard to push certainty out of the heart of mathematics. This effort was not very successful, and the advancement of science did not only increase human knowledge of phenomena but also expanded our knowledge of the limitations of scientific knowledge.

It shook the body of certain scientific principles, and the use of most of the tools of world representation have been shown to be problematic.

Until the twentieth century, science dealt with the certainty of Aristotelian logic. Now there was a world in which something could be both A and Not-A. Thus the death knell rang for the dominant 2000-year-old Aristotelian thought and instead of a comprehensive description of the world by drawing fixed and unique maps whose lines were in harmony with the day-to-day world, science made a set of maps, maps that were different but which gave a flexible understanding of the world.

Science is emerging in the postmodern world where scientific reading is not a fixed machine, rather it is creative and dynamic and readers create meaning in their minds based on thoughtful or lived experiences. Therefore, an author is no longer the final reference and refuge of the work or the only true creator. The reader does not suffer in passive silence in the ruthless wave of information, rather he is the one who gives life to the text. The data is silent and vague, and the mind of the reader ignites and speaks to them. In this new scientific worldview, we are not neutral observers of phenomena, which is neither possible nor desirable, but have become participants in the world.

Bohr, one of the great thinkers of quantum physics, believes that measurement questions the world and that question changes the answers. So what we are seeing are not phenomena, but, as Heinberg puts it, the genius of physics. What we see is not reality, but reality that is intertwined with the method of studying it. So we can say that what we see is the product of the science of measurement. In other words, the process of recognizing a phenomenon causes it to occur, but to what extent? We do not know. With this view, certainty is slowly receding from the world of science, and uncertainty is rising above thought. Psychological scientists, who are skilled in crossing the boundaries of science and brain activity, are not spared from this dramatic change. They found inadequate behavior and adopted a qualitative methodology for trapping elusive, dynamic, and meaningful phenomena. As we get closer to reality, precision decreases and vice versa.

Although a group with flexibility and scientific breadth combined these two methodologies, this hybrid was not inherited certainty at all, and this method gave rise to inherent uncertainty of the phenomena, and the struggle between precision and reality continued.

David Appelbaum has written a beautiful book called *The Stop*, in which he made a subtle statement which we express here. In this book, he compares the speed of seeing and examining things as experienced by a blind person by touch. Although the blind person cannot see, he says that this not-seeing also has its advantages, because the blind person sees things that a seeing person does not because he moves cautiously and slowly and, as a result, he finds his way through obstacles with a different touch and method and gains a new understanding. Perception is a trace of a hidden meaning; a perception often deepens, albeit slowly. So it can be said that although fast methods of understanding have their advantages, standing and looking calmly and evolving perception is also important. More attention should be paid to the development of a new methodology and extension of the current one. Therefore, it is hoped that mind researchers, psychologists, and all those with a research mindset will use multifaceted methods.

Behavioral scientists therefore have a reliable basis for relying and looking at psychological phenomena to be able to grasp the pearl of truth, but there is doubt about the nature of truth. The transition from classical (nineteenth century) certainty to the uncertainty of the present century was necessary as understanding evolved. This transition was not straightforward but enabled us to get nearer to the truth.

Developing theories in quantitative and qualitative research is the main purpose of this book.

We know that researchers' inference involves probability and uncertainty, so we talk about decay of the Holy Grail of perceived truths. It should be said that probability is an uncertainty about the existence or non-existence of phenomena, while what is examined in this book is a representation of another type of uncertainty, that is, the degree of certainty about existence or non-existence of phenomena rather than naively assuming a phenomenon's non-existence.

Most of us, however, have the same uncertainty in terms of the likelihood of the results obtained by doing research in psychology. We are aware of research findings but do not always believe that its results present a true understanding of psychological problems. However, the goal is not to reduce their value in any way. Because uncertainty is everywhere!!

Inference was created to model human thought, in order to obtain more dynamic and consistent findings with reality by using approximate and fuzzy reasoning.

The science of psychology is full of linguistic variables that require an approximate, indefinite, and obscure method of their own kind so that we do not fall into imitation models in studying the psychological phenomena of these multi-faceted concepts. These multi-faceted concepts may be interpreted and examined in different ways which is fine. What is annoying, however, is the dominance of a particular method or a particular way of thinking and its application to the inference of data in research.

In this book, we have considered the methodology of approximate inference in psychological research from a theoretical and practical perspective. Quantitative variable-oriented methodology and qualitative case-oriented methods are both used to explain the set-oriented methodology which we call fuzzy psychology. As stated in the opening sentence of the book, it does not matter if you do not know much about mathematics or statistics, because statistical and mathematical intuitions are key here and they will be learned through practice. What is important is to understand the method and its application to new, dynamic, and elusive phenomena.

Finally, your comments on this book are very welcome, so please do not hesitate to share them with us.

In the end, remember Montagne's short but deep saying "What do we know?" The human world is indeed full of uncertainty, whose beauty we have not been able to define and explain.

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Parviz Azadfallah has a Ph.D. in Health Psychology and became qualified in several international academic courses in Neuropsychology and Psychodynamic Psychotherapies. He started his scientific activity at the Psychology Department of Tarbiat Modares University (TMU) in 1999. He conducted many research projects and supervised 45 PhD theses and more than 50 Master dissertations from 1999 to

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Peter Watson holds three degrees in Mathematical Statistics including a Ph.D. (Manchester). He has been providing statistical support in various ways to the research at CBSU, the Cognition and Brain Sciences Unit in Cambridge (and its predecessor, the Applied Psychology Unit) since 1994 (and prior to that fulfilling a similar role at the MRC Age and Cognitive Performance Research Centre in Manchester). He is the co-author of over 100 papers and lectures at the University of Cambridge. He is a statistical referee for several journals including *BMJ Open* and the *Journal of Affective Disorders*. He has also been a major contributor of articles to the on-line CBSU statswiki web pages which receive upwards of 100,000 visits annually. He has also been secretary, since 1996, of the Cambridge Statistics Discussion Group and chair and meetings organiser for the SPSS users group (ASSESS) since 2001 and has also been a member of the Clinical Trials Advisory Panel for Alzheimer's Research UK.

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