Formal Representation of Causal Analysis, from THE Source

For most researchers in the ever growing fields of probabilistic graphical models, belief networks, causal influence and probabilistic inference, ACM Turing award winner Dr. Pearl and his seminary papers on causality are well-known and acknowledged. Representation and determination of Causality, the relationship between an event (the cause) and a second event (the effect), where the second event is understood as a consequence of the first, is a challenging problem. Over the years, Dr. Pearl has written significantly on both Art and Science of Cause and Effect. In this book on "Causality: Models, Reasoning and Inference", the inventor of Bayesian belief networks discusses and elaborates on his earlier workings including but not limited to Reasoning with Cause and Effect, Causal inference in statistics, Simpson's paradox, Causal Diagrams for Empirical Research, Robustness of Causal Claims, Causes and explanations, and Probabilities of causation Bounds and identification.

In these eleven chapters followed by an epilogue, Dr. Pearl's manuscript postulates representational and computational foundation for the processing of information under uncertainty. It commences with introduction of simpler concepts in Bayesian inference, causality and corresponding proves. However, as text progresses into causal vs. statistical concepts along with theory of inferred causation, the theorems get arduous, somewhat counter-intuitive and the text becomes demanding to keep up. Chapter 3 is an interesting read where causality is discussed in context of philosophy and history. As Dr. Liu states, Judea Pearl's thesis regarding statistics that it deals with quantitative constructs like mean, variance, correlation, regression, dependence, conditional

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independence, association, likelihood, collapsibility, risk ratio, odd ratio, marginalization, conditionalization, etc. Meanwhile the causal analysis deals with the topics of randomization, influence, effect, confounding, disturbance, correlation, intervention, explanation and attribution. One of the challenges while following Dr. Pearl's work is that it abstracts causation discussing it in mathematical and philosophical manner without providing concrete mathematical and computational model for applied research. I believe the book provides great foundation for formal representation of causal analysis and its components, such as do(x) to represent intervention. Automated Reasoning Group at UCLA has made some strides in this area however the applied research aspects of this formalism still needs to be `tightly bound' by reason of scarcity of empirical evidence for the algorithms in practice.
About the Reviewer

Adnan Masood works as a web architect and technical lead for Green Dot Corporation where he develops SOA based middle-tier architectures, distributed systems, and web-applications using Microsoft technologies. He is a Microsoft Certified Trainer holding several technical certifications, including MCPD (Enterprise Developer), MCSD .NET, and SCJP-II. Adnan is attributed and published in print media and on the Web; he is technical editor for "Microsoft Windows Server AppFabric Cookbook" and also taught Windows Communication Foundation (WCF) courses at the University of California at San Diego.

Adnan regularly presents at local code camps and user groups. He is actively involved in the .NET community as cofounder and president of the of San Gabriel Valley .NET Developers group. Adnan holds a Master’s degree in Computer Science; he is currently a doctoral student working towards PhD in Machine Learning; specifically interestingness measures in outliers using Bayesian Belief Networks. He also holds systems architecture certification from MIT and SOA Smarts certification from Carnegie Mellon University.