Litera tuurrubriek

# door H. Koppelaar

# Reviews (uit het SIGSOC-bulletin)

Computer Models in the Social Sciences by Robert B. Coats and Andrew Parkin Winthrop, 1977, 184 pages, paper, \$9.95.

I fear that many readers will skip this review after a brief glance at the book's title. One can hardly blame them; much of the literature on modelling and simulation is highly theoretical, and beset with an incredible amount of mathematics and jargon, making it unsuitable for use by the majority of social scientists.

Happily, this book is different. The authors neatly dispel the myth that rigorous mathematical knowledge is a prerequisite to understanding and constructing computer models. From the Preface: "To understand this book you need only simple algebra, a little statistics and an alert mind. Quite a large part of the book can be understood without the first two of these." A practical, rather than a theoretical, approach is taken in this easy-to-read, entertaining, and thought-provoking introduction to computer modelling.

Another quote from the Preface sets the tone for what follows: "Using a computer becomes worthwhile only when analyzing a system of some complexity which cannot easily be analyzed in more conventional ways. Practical techniques of analyzing complex systems is the unifying theme of the various parts of this book." The first part of the book discusses the principles used in designing, constructing, and experimenting with computer models. The second half consists of in-depth studies of diverse models. including a queuing model, an associative model of memory, a model of hed usage at a hospital, and an economic model. In each case the reader follows through the thought processes that go into the design and construction of the model. The excellent discussion questions are suitable for use either by the individual reader, or in a classroom situation.

An extensive hibliography cites 300 recent documents which describe computer models, artanged under the headings: behavioral sciences, demography, economics, education, ergonomics, manavement, planning, politics, public administration, suciology, transport, world models. Unfortunately, this excellent reference source is buried in the middle of the book, where it can easily escape the attention of someone merely skimming through the book.

Another nice feature of the book is that it confronts the special human problems encountered when trying to build a model in the ancial sciences. The authors are aware that quantification often proves impossible, and that the human element affects systems in unpredictable ways. They never lose sight of the fact that the goal is the creation of practical, workable models that will benefit people, rather than an abstract theory of modelling which is of little practical use.

In short, if you'ré sfter a solid foundation in the Why and How of computer models, which will give you the knowledge to construct your own workable models, then this book is for you.

Robert Marcus, Lincoln, NE

Use of Fsuchological Experimentation as an Aid to Development of a Query Language by Phyllis Rismer IEEE Trans. Software Eng. SE-3, 3, May, 1977, pp. 218-229.

This paper describes a series of psychological experiments used to test a new database query language. The intent is to make psychological testing of a language part of the design and development process. By testing a language: while it is still under development, features that require changing can be identified and the changes made.

The experiments, which used college students as subjects, investigated: 1) overall "learns) bility" of the language, 2) "learnability" of individual features of the language, and 3) the types and frequencies of errors made. Recommended changes to the particular language and the basis for those recommendations are described.

In addition, errors made by experimental subjects during the testing are then analyzed from the point of view of possible causes. Based on this analysis a numliminary model of query writing and two possible indices of query complexity are suggested.

From the Abstract

HUMAK, K.M.S., Statistische Methoden der Modellbildung, Band I: Statistische Inferenz für liaeare Parameter, Berlin: Akademie-Verlag, 1977. 516 p., prijs DM-BA.- (Mathematische Lehrbücher und Monographien; 43).

This impressive work contains an overwhelming amount of information concerning an area which night be outlined by mentioning the chapter headings: (1) Satistische Probleme bei der Bildung von Modellen für Ursache-Wirkungs-Schühungen, (2) Schätzung Linearer Parameter, (3) Schätzung linearer Paraster bei Susatzinformation, (4) Zulässigkeit und Verbesserungen der GLSE, (5) Frühung linearer Hypothesen, (6) Bereichsschätzungen für lineare Paraster und Scoressionsfunktionen, (7) Bayessche und strukturelle Inferenz, (8) Methoden der Versuchsplanung.

The main goal is to give a rigorous, mathematical, as general as possible, treatment of the linear model and the corresponding techniques. The authors are aware of the gap between their impressive collection of results and the skills required in order to make adequate applications: Selbstverständlich wird ram diese Methoden in Anwendungen nur verbunden mit einer guten Heuristiek, worter Berücksichtigung des Fachwissens und mit "statistischen Fingerspitzenwordit, einester Können.

Many potential readers will not be able to close this gap. They should not start studying the HUMAK book by reading in a straightforward manner, because the material covered is too abundant: 500 pages of very condensed writing will appall nearly everybody. The reviewer found some comfort in the fact that K.M.S. HUMAK is not the name of one single super-statistician; it stands for Kollektiv Mathematische Statistik, Humboldt Universität zu Berlin erd Akademie der Wissenschaften der D.D.R., a group of obviously very skill-

rul statisticians under the guidance of HELGA and OLAF BUNKE. The book may be very useful as a reference text, though again many readers will be frightened by the extreme generality of the notations and formulations. Nevertheless the reviewer likes to mention that some students in Groningen already enjoyed it very much to use parts of the HUMAK book, especially Section 5.3.4 to be discussed later, for the purpose of writing a master's thesis. Apart from reviewing many recent developments, the book contains many original contributions, usually generalizations. Some original contributions deserve special attention because they are based on interesting new ideas. A few will be mentioned.

Section 2.7 bears the fancy title Approgression which refers to a combination of approximation and regression problems. The subject is closely related to that of selecting variables in multiple linear regression. The motivation is interesting and adequately expressed (obviously by 0. BUNKE) as follows: So fubrem schlechte a priori Kenntnisse über f (the true unknown regression function) zu einer grossen Anzahl unbekannter Parameter. Schltzt man die unbekanntem Parameter und wählt als Schätzung für f die entsprechende Funktion mit geschätzter Parameterm, so können die Schätzfehler sehr gross eein. In deramtigen Fällen setzt man bei praktischen Anwendungen der Regressionsaulyse häufig ein Modell mit einer geringen Anzahl von Parameterm an, d.h., man arbeitet mit einem "inadäquaten" Modell und nümmt einen "systematischen" Fehler in Kauf. Bei der Wahl des inadäquaten Modells muss zwischen Schätzfehler und systematischem Fehler abgewogen werden.

Section 5.3.4. contains the following interesting idea (due to PINCUS) to deal with testing problems with a restricted alternative. The usual polyhedral convex come alternatives present difficulties when applying the likelihood ratio principle. PINCUS proposes to replace the polyhedral come by the corresponding circular (circumscribed) come and he derives the null distribution of the corresponding likelihood ratio statistic.

W. Schaafsma.

(uit de Mededelingen van het Wiskundig Genootschap)

VOROB'EV, N.N., C a m e t h e o r y : Lectures for economists and systems scientists. Berlin etc.: Springer Verlag, 1977. 178 p., prijs DM 38.20 (Applications of mathematics; 7).

Dit boek is een Engelse vertaling van een boek, dat in 1974 in het Russisch verscheen, en waaraan de vertaler (S. KOTZ) nog enige opgaven heeft toegevoegd. Bet is gebaseerd op een semester-cursus speltheorie voor studenten met basiskennis in lineaire algebra en analyse. In het voorwoord vermeldt de auteur, dat hij gepoogd heeft de wiskundige aanpak bij de speltheoretische argumentatie aan te houden.

Het boek is ingedeeld in vier hoofdstukken, gevolgd door oefeningen, een geselecteerde bibliografie en een index. Het eerste hoofdstuk behandelt matrixspelen, waarin twee personen tegen elkaar spelen, ieder met een eindig aantal strategieën, en waarbij de winst van de een het evengrote verlies van de ander betekent. Gemengde strategieën worden ingevoerd, de minimaxstelling voor gemengde strategieën wordt bewezen, waaruit de waarde van een matrixspel en optimale strategieen worden gedefinieerd. Aan de hand van simpele voorbeelden worden de begrippen verduidelijkt. Speciale gevallen, zoals diagonale en symmetrische spelen worden genoemd en de relatie tussen de oplossing van een matrixspel en lineaire programmering wordt toegelicht. In het tweede hoofdstuk worden oneindige antagonistische spelen behandeld: in tegenstelling tot matrix-spelen heeft iedere speler nu een oneindig aantal strategieën tot zijn beschikking. Een minimax eigenschap wordt hiervoor bewezen. Voor convexe spelen (bij iedere vaste strategie van de eerste speler is de uitbetaling aan de tweede speler een convexe funktie van zijn strategie) worden speciale eigenschappen afgeleid. Het hoofdstuk eindigt met voorbeelden: marktcompetitie en toewijzing van produktcapaciteiten.

Het derde hoofdstuk behandelt niet-coöperatieve spelen: er kunnen meer dan twee spelers zijn, die geen coalities mogen vormen, en iedere speler heeft een eindig aantal strategieën. Weer worden gemengde strategieën gedefinieerd, evenals evenwichtssituaties. De stelling van NASH over het bestaan van evenwichtssituaties wordt bewezen. Bi-matrix spelen komen in het kort aan bod, en worden toegelicht met voorbeelden. Het laatste hoofdstuk behandelt cooperatieve spelen, waarin de spelers wel coalities mogen vormen. Karakteristieke funkties, imputaties, de kern van een spel, VON NEUMAN-MORGENSTERN oplossingen en SHAPLEY vectoren komen aan de orde.

De vertaler heeft de oefeningen behorende bij de paragrafen van het boek op verzoek van de auteur tesamen opgenomen aan het einde van het boek. De bibliografie bevat 9 elementaire boeken, 6 zwaardere werken, 5 geavanceerde uitgaven en 3 overzichtsartikelen.

Het boek is prettig leesbaar, goed verzorgd (op enkele drukfouten na) en goed ingedeeld. Het tweede hoofdstuk bevat mathematisch wat zwaardere kost dan de eerdergenoemde basiskennis. De voorbeelden zijn simpel gehouden, maar zijn wel illustratief en soms ook indicatief met betrekking tot mogelijke toepassingsgebieden. De auteur is er naar mijn mening goed in geslaagd de basisgedachten van de speltheorie neer te leggen, waarbij ook de mathematische behandeling goed tot uitdrukking komt. Aanbevolen als inleiding tot de speltheorie voor mensen met mathematische achtergronden.

A.T. Langeveld.

(uit de Mededelingen van het Wiskundig-Genootschap )

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PUBLICATION DATE: the communist party (CPN), the Christian Democratic party (CDA), the liberal party (VVD), the radical party (PPR) and a more orthodox protestant party (SGP). The PvdA, CDA and VVD are the three largest political parties. The other parties were chosen to incorporate both the left-right split between the parties and the religious - non religious split. In earlier research quite often three dimensions have been distinguished: left-right, religious-non religious and large-small parties. All dimensions are well represented in our choice of the six parties: the six parties cover the whole continuum from left to right (in order: CPN,PPR, PvdA, CDA, VVD and SGP); three parties have religious backgrounds (CDA, PPR, SGP),three do not(CPN, PvdA, VVD); and three parties are large (PvdA, CDA, VVD) and three small (CPN, PPR, SGP).

For each pair of parties presented, subjects could give the following responses to the question of preference:

o first party is preferred over second party o second party is preferred over first party o no difference in preference o don't know; no response

# 5. The results

To determine a coefficient of homogeneity for our six political parties we have worked with those 309 respondents who gave a completely transitive response. The matrix with difficulties of preference of right party to left party can be found in table 4.

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Table 4:	Diffi	cultie	s of prefei	ence	of right	party	above	left
	party	(frac	tions of re	spon	dents pro	eterrin	g colu	111
	party	above	row party)	for	309 resp	ondent	s with	a
	compl	etely	transitive	rank	order.			
	CPN	PPR	PvdA	CDA	VVD	SGP		
CPN	-	.91	.95	.89	.78	.62		
PPR		-	.78	.68	.55	.30		
PvdA			-	.53	.39	.21		
CDA				-	.31	.07		
VVD					-	.30		
SGP						-		

We shall discuss the values for the coefficient of homogeneity first for triples of political parties, then for four tuples, five tuples and for all six parties. Of all twenty triples out of the six political parties, sixteen had a negative coefficient of homogeneity H<sub>ABC</sub>. The only four triples with a positive H<sub>ABC</sub> were:

CPN-PPR-VVD	Η	=	.08
CPN-PPR-SGP	Н	=	.14
PPR-CDA-VVD	Н	=	.10
PvdA-CDA-VVD	Н	-	.21

The best scales are found with either the three largest or the three smallest parties. Also, replacing PvdA by PPR (the largest party by the largest remaining party), or replacing SGP by VVD (the smallest by the smallest remaining party) gives a positive  $H_{ABC}$ . Therefore, only triples of parties that are homogeneous with respect to size can be reasonably represented along J-scales that may be interpreted as left-right scales.

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