

***Application of Conditional
Probability in Constructing
Fuzzy Functional Dependency***

Rolly Intan



PETRA PRESS Publishing

Application of Conditional Probability in Constructing Fuzzy Functional Dependency (FFD)

By: Rolly Intan

Copyright ©2015 by Institute for Research and Community Service
Petra Christian University, Surabaya, INDONESIA

All rights reserved. No part of this publication or the information contained herein may be reproduced, stored in a retrieval system, or transmitted in any form or by no means, electronic, mechanical, by photocopying, recording or otherwise, without written permission from the publisher.

Although all care is taken to ensure the integrity and quality of this publication and the information herein, no responsibility is assumed by the publishers nor the author for any damage to property or persons as a result of operation or use of this publication and/or the information contained herein.

Published by:
Institute for Research and Community Service
Petra Press
Petra Christian University
Jl. Siwalankerto 121-131, Surabaya 60236
INDONESIA
<http://lppm.petra.ac.id>

ISBN 979-602-71225-1-9

Preface

This book is an extended version of my master thesis providing a research in constructing Fuzzy Functional Dependency based on the concept of conditional probability relation. Functional dependency is still considered as the most popular tool in performing a design of classical (crisp) relational database. When the concept of classical (crisp) relational database is generalized to fuzzy relational database in order to provide higher level of information (perception based information) using fuzzy labels such as *Old*, *Young*, *High Salary*, *Warm*, etc, it is also necessary to generalize (crisp) functional dependency to fuzzy functional dependency. Moreover, a concept of partial fuzzy functional dependency is proposed as a new concept that plays important role in data querying.

I realized what written in this book only shared a small part of research topics in fuzzy information system. However, I hope this book will be a valuable reference, especially for undergraduate as well as graduate students who are interested to study and do a research in the area of fuzzy information

system. In the last chapter, I suggest several related topics to be a further topic of research.

I would like to express my gratitude to my advisor and co-advisor, Prof. Dr. Hiroshi Suzuki and Prof. Dr. Masao Mukaidono, for their support and guidance throughout the research during my master study at International Christian University, Tokyo, Japan since 1998 to 2000. I would also like to extend my gratitude to my family. Without their encouragement and sacrifice, I would not complete my master study on time successfully.

Surabaya, April 2015

Rolly Intan

Contents

PREFACE	iii
CONTENTS	v
Chapter 1. INTRODUCTION	1
Chapter 2. BASIC DEFINITIONS AND NOTATIONS	5
2.1 Conditional Probability	5
2.2 The Classical Relational Database	6
2.2.1 Select Operator	7
2.2.2 Project Operator	8
2.2.3 Join Operator	9
2.3 Functional Dependency (FD)	10
2.4 Fuzzy Sets	11
2.4.1 Basic Definitions and Operations of Fuzzy sets	11
2.4.2 Imprecise Data and Fuzzy Sets	13
2.5 Fuzzy Sets and Probability	14
2.6 Fuzzy Relational Database	17

Chapter 3. FUZZY SETS AND CONDITIONAL PROBABILITY	21
3.1 Conditional Probability Two Fuzzy Sets Based on Possibility Theory	21
3.1.1 Possibility Distribution and Basic Assignment	22
3.1.2 Conditional Probability Two Fuzzy Sets by Applying Basic Assignment	23
3.2 Conditional Probability Based on Minimum, Independent and Maximum Probability	25
3.3 An Extended Fuzzy Relational Database	33
Chapter 4. FUZZY FUNCTIONAL DEPENDENCY	35
4.1 Definition of Fuzzy Functional Dependency	36
4.2 Inference Rules for FFD	39
4.3 Partial Fuzzy Functional Dependency	41
Chapter 5. APPLICATION OF FFD IN APPROXIMATE DATA REDUCTION AND QUERY DATA	44
5.1 Approximate Data Reduction and Projection	44
5.2 Approximate Natural Join and Queries	51
5.2.1 Query data	52
5.2.2 Approximate Natural Join	56
Chapter 6. SUMMARY	59
REFERENCES	63