**TABLE OF CONTENTS PAGE**

Certification i

Abstract ii

Table of content iii

**CHAPTER ONE**

**INTRODUCTION**

* 1. Background of the Study 1
  2. Objective of the Study 3
  3. Statement of the Problem 4
  4. Aim of the Study 4
  5. Significance of the Study 5
  6. Scope and Limitation of The Study 5
  7. Definition of Terms 6

**CHAPTER TWO**

**LITERATURE REVIEW**

2.1 Theoretical Background 7

2.2 Review of Relevant Literatures 9

2.2.1 Image Process 9

2.2.2 Clustering 10

2.2.3 Semi Supervised Clustering 10

2.2.4 Bi-Clustering (Co-Clustering) 10

2.2.5 Underlying Trends in Stock Market 11

2.2.5 Discriminant Features Extraction in Financial Distress Data 11

2.3 Artificial Bee Colony (ABC) 12

2.4 Non Negative Matrix Factorization (NMF) 15

2.5 NMF and ABC for Text Summarization 17

2.5.1 Similarity Measure 20

2.5.2 Clustering algorithm 21

**CHAPTER THREE**

**METHODOLOGY**

3.1 Research Approach 25

3.1.1 Materials 26

* + 1. Methods 27
  1. Procedural Model of NMF 27

3.2.1 Document Collection 27

3.2.2 Document processing and Term Extraction 27

3.2.3 Term document matrix construction 29

3.2.4 Term weighting generation 30

3.2.5 Dimension reduction using NMF 31

3.2.6 The Mechanism for Application Design 31

* 1. Hybrid Text Summarization Using ABC And NMF Activities 32

**REFERENCES**

Daniel D. Lee & H. Sebastian Seung (1999). "Learning the parts of objects by non-negative matrix factorization". *Nature*. 401 (6755): 788–791.

Dorigo M., Stutzle T., Ant Colony Optimization, MIT Press, Cambridge, MA, 2004.

Geem Z., Kim J., Loganathan G., A new heuristic optimization algorithm: harmony search, Simulation 76 (2001) 60–68.

Inderjit S. Dhillon; Suvrit Sra (2005). *Generalized Nonnegative Matrix Approximations with Bregman Divergences.*

Karaboga D., Basturk B., A comparative study of artificial bee colony algorithm, Applied Mathematics and Computation 214 (2009) 108–132.

P. Paatero; U. Tapper (1994). "Positive matrix factorization: A non-negative factor model with optimal utilization of error estimates of data values". *Environmetrics*. 5 (2): 111–126

Pia Anttila; Pentti Paatero; Unto Tapper; Olli Järvinen (1995). "Source identification of bulk wet deposition in Finland by positive matrix factorization". *Atmospheric Environment*. 29 (14): 1705–1718.

Rainer Gemulla; Erik Nijkamp; Peter J Haas; Yannis Sismanis (2011). *Large-scale matrix factorization with distributed stochastic gradient descent* (PDF). pp. 69–77.

Simon D., Biogeography-based optimization, IEEE Transactions on Evolutionary Computation 12 (2008) 702–713.

Tandon, Rashish; Suvrit Sra (2010). "Sparse nonnegative matrix approximation: new formulations and algorithms"

Wang, Wenwu (2010). "Instantaneous Versus Convolutive Non-Negative Matrix Factorization: Models, Algorithms and Applications to Audio Pattern Separation". In Wang, Wenwu. *Machine Audition: Principles,* *Algorithms and Systems*. IGI Global. pp. 353–370.

William H. Lawton; Edward A. Sylvestre (1971). "Self modeling curve resolution". *Technometrics*. 13 (3): 617+. JSTOR 1267173 (https://www.jstor.org/stable/1267173). doi:10.2307/1267173 (<https://doi.org/10.230> 7%2F1267173).

Yang Bao; et al. (2014). *Topic NMF: Simultaneously Exploiting Ratings and Reviews for Recommendation*.