**LEARNING DYADIC DATA AND PREDICTING UNACCOMPLISHED CO-OCCURRENT VALUES BY MIXTURE MODEL**

Nguyen L1\* and Lanuza MH2

1Loc Nguyen’s Academic Network, Vietnam

2Philippine Normal University, Manila, Philippines

\*ng\_phloc@yahoo.com

***ABSTRACT***

Dyadic data which is also called co-occurrence data (COD) contains co-occurrences of objects where these objects are indexed and grouped into two finite sets. It is necessary to model dyadic data by applied mathematical tools because dyadic data analysis is interesting and important to many applications relating to indexed two-dimensional data such as image processing and recommendation collaborative filtering. Fortunately, finite mixture model is a solid statistical model to learn and make inference on dyadic data because mixture model is built smoothly and reliably by expectation maximization (EM) algorithm which is suitable to inherent spareness of dyadic data. This research summarizes mixture models for dyadic data, in which there are three well-known models such as symmetric mixture model (SMM), asymmetric mixture model (AMM), and product-space mixture model (PMM) which are described by beautiful mathematical proofs and explanations derived from EM algorithm. Objects in traditional dyadic data are indexed as categories and so their potential real values are concerned because of potential applications and extensions of dyadic data analysis. For instance, when each co-occurrence in dyadic data is associated with a real value, there are many unaccomplished values because a lot of co-occurrences are inexistent. In the research, these unaccomplished values are estimated as mean (expectation) of random variable given partial probabilistic distributions inside dyadic mixture model. This estimation result is solid due to support of EM algorithm.

Keywords: dyadic data, co-occurrence data, expectation maximization (EM) algorithm, mixture model.

**Biography**

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| Loc Nguyen  Founder of Loc Nguyen’s Academic Network, Vietnam  Loc Nguyen is an independent scholar from 2017. He holds PhD degree from 2009 and Postdoctoral degree from 2013 (certified by INSTICC) in computer science. He was granted as Mathematician by London Mathematical Society for Postdoctoral research in Mathematics from 2016. He was awarded as Professor by SciencePG from 2016. | A close-up of a child smiling  Description automatically generated with medium confidence |

**Contact Information:**

1/4B Ton Duc Thang street, My Binh ward, Long Xuyen city, An Giang province 881092, Vietnam.

Tel: +84-975250362

Email: ng\_phloc@yahoo.com, ngphloc@gmail.com

Twitter: @ng\_phloc

LinkedIn: https://www.linkedin.com/in/loc-nguyen-b9330510

ORCID: http://orcid.org/0000-0001-5192-8106

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Name for the Certificate: Loc Nguyen

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