

COMMON FIXED POINT THEOREM IN PARTIALLY ORDERED INTUITIONISTIC *L*-FUZZY VECTOR METRIC SPACES

Şehla EMİNOĞLU^{1,*}

¹Department of Mathematics, Ankara Yıldırım Beyazıt University, Ankara, Türkiye

ABSTRACT

Real-world applications of natural sciences frequently involve ambiguous or ill-defined solutions, giving rise to inherent fuzziness. To deal with this, Zadeh in [8] suggested a rule to handle fuzziness in design. Goguen in [4] later added to Zadeh's work by looking at more general ordered structures beyond just the unit interval. Identifying the supremum and infimum of a fuzzy set typically necessitates that the underlying partially ordered set (poset) constitutes at least a complete lattice adhering to the distributive property. Aliprantis discussed the concept of ordered vector spaces in his excellent book Positive Operators [1]. He further contributed to the concept of Riesz spaces, along with several associated structures and properties. The concept of vector metric spaces, where distances are measured in Riesz spaces, was initially presented in [2]. In [3], the parameter s was considered as a vector within the framework of L-fuzzy sets introduced by Goguen [4], alongside the fuzzy metric space formulated by Kramosil and Michálek [5]. To support this framework, the order structure was incorporated into the concept of left-hand continuity. Consequently, left and right order continuity notions were introduced to develop L-fuzzy vector metric spaces and their non-Archimedean variants. On the other hand, in [6] Banach contraction theorem in M-complete non-Archimedean fuzzy metric spaces was proved and the class of fuzzy contractive mappings was enlarged. In [7] the common fixed point theorem in \mathcal{L} -fuzzy metric spaces for arbitrary t-norms was proved. This work make a contribution to the theoretical development of fuzzy vector metric spaces and intuitionistic L-fuzzy metric spaces constructed over order structures extending beyond the classical unit interval. It formalized the notions of left and right order convergence and continuity in an intuitionistic non-Archimedean \mathcal{L} -fuzzy vector metric space. In addition, it illustrates the proposed definitions and establishes several well-known results. Furthermore, it proves the common fixed point theorem in partially ordered intuitionistic *L*-fuzzy vector metric spaces for commuting mappings. Finally, it addressed the necessity for further research in this area.

Keywords Intuitionistic \mathcal{L} -fuzzy vector metric \cdot The common fixed point theorem \cdot Commuting mappings \cdot Riesz spaces

References

- [1] Aliprantis C.D., and Burkinshaw O, Positive Operators, Springer, Dordrecht, 2006.
- [2] Çevik C., and Altun I., Vector Metric Spaces and Some Properties, Topological Methods in Nonlinear Analysis, 34(2): 375-382, 2009.
- [3] Eminoğlu Ş., On Non-Archimedean *L*-Fuzzy Vector Metric Spaces, Journal of New Theory, 46-56, 2023.

^{*}Corresponding Author's E-mail: sehla.eminoglu@aybu.edu.tr

- [4] Goguen J., *L-Fuzzy Sets*, Journal of Mathematical Analysis and Applications, 18(1): 145-174, 1967.
- [5] Kramosil I., and Michálek J., Fuzzy Metrics and Statistical Metric Spaces, Kybernetica, 11(5): 336-344, 1975.
- [6] Mihet D., Fuzzy Φ-contractive mappings in non-Archimedean fuzzy metric spaces, Fuzzy Sets and Systems, 159, 739-744, 2008.
- [7] Saadati R., Razani A., and Adibi H., A Common Fixed Point Theorem in *L-Fuzzy Metric Spaces*, Chaos, Solitons & Fractals, 33(2): 358-363, 2007.
- [8] Zadeh L.A., Fuzzy Sets, Information and Control, 8(3): 338-353, 1965.