

14th Conference of the European
Society for Fuzzy Logic and Technology

Book of Abstracts
EUSFLAT 2025

Riga, Latvia,
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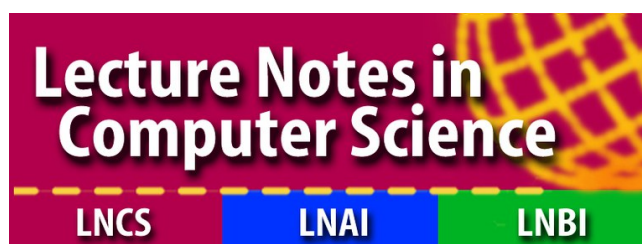


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SS2: Representing and Managing Uncertainty: different scenarios, different tools. Organizers

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SS3: Mathematical Fuzzy Logic. Organizers

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SS4: Soft Methods in Statistical Inference and Data Analysis. Organizers

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SS5: Fuzzy Implication Functions. Organizers

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SS6: Information Fusion Techniques Based on Aggregation Functions, Preaggregation Functions and their Generalizations. Organizers

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SS7: Fuzzy Metric Spaces and their Generalizations: theory and applications. Organizers

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SS8: New Contexts in Aggregation Theory. Organizers

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SS9: Modeling Complex Dynamics: adapting analytical tools for diverse scenarios. Organizers

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Uniqueness and Reconstruction of Strict T-Norms Known Only Above a Level Curve and Different Curves

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Special Section: EUSFLAT2025 Main Track

Track: Abstracts

Abstract. Investigating how to extend t-norms defined on a subset of the unit square (referred to as pre-t-norms) to the entire domain is a fundamental and long-standing challenge in the research of these operators [1]. Usually, the problem is studied under continuity and Archimedean assumptions, because the existence of additive/multiplicative generators reduces the problem to the study of systems of functional equations which depend on the known region. Although there exists plenty of results dealing with different regions, only in a few cases the explicit construction of the completion is provided and/or the unicity is ensured.

Recent characterizations of (S,N)-implications encouraged the study and resolution of the completion problem for new subregions [2]. Interestingly, those results are rooted in a novel result that ensures the construction and uniqueness of the additive generator of a continuous and cancellative pre-t-norm known above a level curve. Although this result was used with the main purpose of solving the particular problem in [2], it has been pointed out that it may be useful to understand further which regions of the unit square contain enough information to reconstruct a t-norm.

In our work, we are interested in applying this result to study which additional information should we add to the region above a level curve to ensure a unique completion of a continuous and cancellative pre-t-norm. In particular, we consider the diagonal, a vertical/horizontal section and, more generally, an arbitrary curve. For all the considered cases, we confirm the existence and uniqueness of the completion and we provide its construction in terms of the additive generator.

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Keywords: T-norm; Pre-t-norm; Continuous completion.

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On a Generalization of the F-Chains Based Construction of Fuzzy Implication Functions

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Special Section: Fuzzy Implication Functions

Track: Abstracts

Abstract. Fuzzy implication functions are one of the fundamental operators in fuzzy logic, serving as generalizations of the classical conditional to other domains, such as the unit interval. Their definition imposes only monotonicity and boundary conditions, allowing for a broad spectrum of operators with diverse behaviours. This flexibility has led to the introduction of numerous families of fuzzy implication functions, each with distinct properties and applications. However, the increasing variety of such families underscores the need for deeper theoretical understanding [1], particularly regarding their structural relationships and classification.

In this work, we focus on construction methods which use different techniques for generating new fuzzy implication functions from existing ones. Specifically, we generalize the F-chains based construction, initially introduced to extend a construction method of aggregation functions to the case of fuzzy implication functions [2]. Our generalization is based on two main ideas. First, the use of a collection of fuzzy implication functions instead of a single and not necessarily an identical one for each variable, and second, the use of two different increasing functions satisfying some boundaries conditions instead of a unique F-chain. We analyse in depth the preservation of additional properties under this generalized construction, establishing the necessary conditions.

Moreover, we reveal that the F-chains based construction serves as a unifying framework for several existing methods. In particular, we prove that diverse construction techniques such as contrapositivation, aggregation or vertical/horizontal threshold methods can be reformulated in terms of our generalized approach. Thus, we highlight structural similarities between seemingly distinct strategies. Consequently, the generalized F-chains based method provides a cohesive perspective on the landscape of fuzzy implication construction methods apart from being a standalone tool.

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Keywords: Aggregation function; Fuzzy implication function; Construction method; F-chain.

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