

International  
Online Conference



**Algebraic  
and Geometric  
Methods of Analysis**

dedicate to the memory  
of Yuriy Trokhymchuk  
(17.03.1928-18.12.2019)

May 25-28, 2021  
Odesa, Ukraine

## LIST OF TOPICS

- Topological methods in analysis
- Geometric problems of complex and mathematical analysis
- Algebraic methods in geometry
- Differential geometry in the whole
- Geometry and topology of differentiable manifolds
- General and algebraic topology
- Geometric and topological methods in natural sciences

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# Fuzzy ultrametrization of spaces of non-additive measures on fuzzy ultrametric spaces

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Recall that a triangular norm is a binary operation  $*$  on the unit segment which is continuous, associative, commutative, monotone, for which 1 is the unit. The following are examples of triangular norms:  $\min$ ,  $\cdot$  (multiplication),  $a * b = \max\{a + b - 1, 0\}$  (Łukasiewicz t-norm).

Given a triangular norm  $*$ , we define a fuzzy metric on a set  $X$  as a function  $M : X \times X \times (0, \infty) \rightarrow (0, 1]$  satisfying for all  $x, y, z \in X$  and  $s, t \in (0, \infty)$ :

- (1)  $M(x, y, t) > 0$ ;
- (2)  $M(x, y, t) = 1$  if and only if  $x = y$ ;
- (3)  $M(x, y, t) = M(y, x, t)$ ;
- (4)  $M(x, y, t) * M(y, z, s) \leq M(x, z, t + s)$ ;
- (5) the function  $M(x, y, \cdot) : (0, \infty) \rightarrow [0, 1]$  is continuous

(see, e.g., [2]).

A fuzzy metric is said to be a fuzzy ultrametric (a fuzzy non-Archimedean metric) if  $*$  =  $\min$  and the following holds: (4')  $M(x, y, t) * M(y, z, s) \leq M(x, z, \max\{t, s\})$ . This is known to be equivalent to the following: (4'')  $M(x, y, t) * M(y, z, t) \leq M(x, z, t)$ .

By  $I(X)$  we denote the set of all idempotent measures on a compact Hausdorff space  $X$  (see [5]). This set is endowed with the weak\* topology. In this way we obtain a functor in the category of compact Hausdorff spaces and continuous maps.

A standard construction allows us to consider the set of idempotent measures of compact support for any Tychonov space  $X$ ; we keep the notation  $I(X)$  for this set.

Let  $(X, M)$  be a fuzzy ultrametric space. A fuzzy ultrametric  $\bar{M}$  on the set  $I(X)$  is defined in [3]. The construction  $(I(X), \bar{M})$  determines a functor in the category of fuzzy ultrametric spaces and non-expanding maps.

We continue the investigations of the mentioned paper as follows. The idempotent measure monad on the category of fuzzy ultrametric spaces is an idempotent counterpart of the probability measure monad on the same category which is introduced and investigated in [4]. Also, one can prove analogous results for the functor and monad of another class of non-additive measures, namely the max-min measures (see, e.g., [1]).

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