

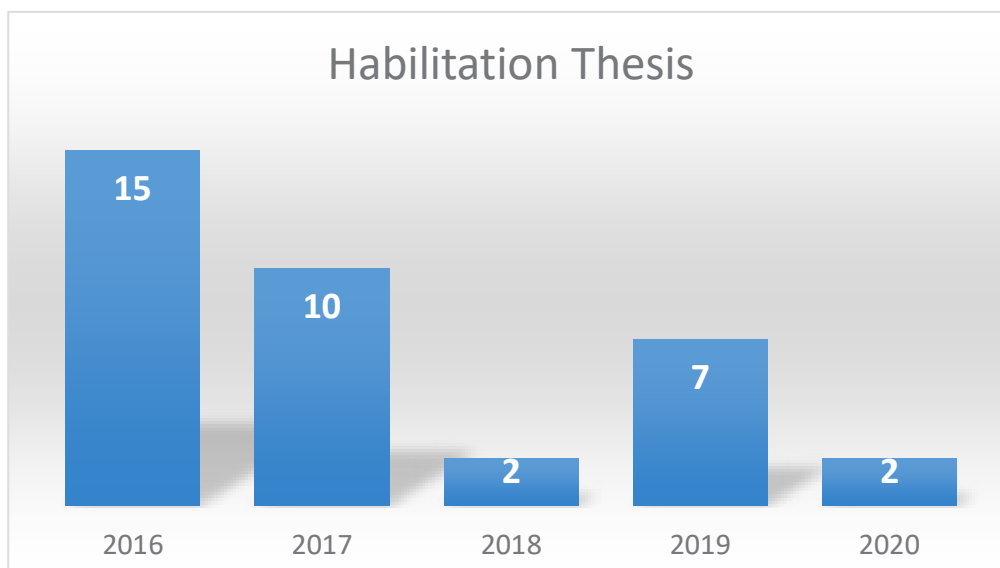
# HABILITATION THESIS

## EVOLUTION OF HABILITATION THESIS IN UPT 2016 - 2020

Habilitation (from Latin *habilis* "fit, proper, skillful") is the highest academic qualification a scholar can achieve by his or her own pursuit.

In this chapter we present the habilitation thesis supported by teachers from Politehnica University Timisoara, both at UPT and, also, at other universities.

The habilitation thesis are presented in chronological order, according to institution where they were sustained.



## IMAGE ENHANCING TECHNIQUES BASED ON FUSION

Author: Codruta ANCUTI

### Abstract

The present habilitation thesis summarizes the research contributions of the candidate obtained between 2011 (when the candidate obtained the PhD) to this date.

The most significant research activity and the obtained results are presented structured in several parts that represent original contributions in the field of image processing and computational photography: image dehazing (day-time single image dehazing, night-time single image dehazing, dehazing evaluation dataset), underwater images enhancement, image decolorisation and single scale fusion technique for effectively merging images.

**I. Image dehazing** deals with the problem of enhancing the visibility in terms of color and details for images degraded by haze. In outdoor environments, haze phenomena appears when the light reflected from object surfaces is scattered due to the impurities of the aerosol, or due to the presence of fog and haze. The yielding hazy images are characterized by poor contrast, lower saturation and additional noise.

**II. Enhancing Underwater Images.** We describe an effective technique that is able to enhance underwater images. Our strategy derives the inputs and the weight measures only from the degraded version of the image. In order to overcome the limitations of the underwater medium we define two inputs that represent color corrected and contrast enhanced versions of the original underwater image/frame, but also four weight maps that aim to increase the visibility of the distant objects degraded due to the medium scattering and absorption. The enhanced images and videos are characterized by reduced noise level, better exposedness of the dark regions, improved global contrast while the finest details and edges are enhanced significantly. In addition, the utility of our enhancing technique is proved for several challenging applications (image matching, segmentation, etc.).

**III. Image decolorization (color-to-grayscale)** deals with the problem of converting a color image (with three- $RGB$ -channels) into



a single channel image version. Often, the standard decolorization conversion is simply employed as the luminance channel of different color spaces. However, this simple global mapping disregards important chromatic information and therefore, in many cases, the output does not preserve the original appearance. Our grayscale transformation, designed in  $RGB$  color space and takes as individual inputs the three color channels ( $R$ ,  $G$ ,  $B$ ). Our technique is guided by two weight maps that transfer in the final result the most significant information of each derived input ( $RGB$  color channels). In order to minimize artifacts introduced by the weight maps, our approach is designed in a multi-scale fashion.

The full thesis at:

[http://www.upt.ro/Informatii\\_teze-de-abilitare-sustinite\\_285\\_ro.html](http://www.upt.ro/Informatii_teze-de-abilitare-sustinite_285_ro.html)

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## WATER IN SUPRAMOLECULAR NANOSYSTEMS AND MATERIALS FOR FOODS, PHARMACEUTICALS AND COSMETICS

**Author: Daniel-Ioan HĂDĂRUGĂ**

### Abstract

The *Habilitation Thesis* is based on the author's research in food and pharmaceutical fields. Research results were published as original articles in highly esteemed journals from these fields, as well as book chapters in encyclopedias and monographs from internationally recognized publishers in the last five years (e.g., many articles in *Food Chemistry*, ISI 6.3/Q1 or book chapter in *Encyclopedia of Analytical Science*, Elsevier, 2019). Moreover, the research results were presented at high level international conferences in the field such as *International Conference on Water in Food (EFW)* – Reims, Helsinki, Leuven, Belgium and Prague, or *European Conference on Cyclodextrins (EuroCD)* –Asti, Antalya and Lille.

The thesis starts with the presentation of the main author's research results regarding the scientifically, professional and academic aspects in the field of "*Engineering of vegetable and animal resources*": an introduction related to biological and supramolecular systems, implications of water molecules in the obtaining, analysis and bioavailability of some biologically active compounds. The thesis continues with the synthesis and characterization of supramolecular nanosystems having applications in food, pharmaceutical and cosmetic fields, based on the scientific results obtained for molecular nanoencapsulation in natural and semi-synthetically modified cyclodextrins of unique biologically active compounds or mixtures with hydrophobic properties, as well as more hydrophilic natural antioxidants. In the next section is detailed the Karl Fischer titration method (KFT), which have important applications for selective determination of water in supramolecular nanosystems based on cyclodextrins and materials that can be used in food product development. The thermogravimetry-differential thermogravimetry (TG-DTG) and differential scanning calorimetry (DSC) thermal methods that are applicable to the obtained supramolecular nanosystems in order to evaluate the water/moisture content, the stability, releasing properties of volatile and degradation compounds have been emphasized. The correlation and multivariate statistical analyses of the above obtained data were presented in the final part. Both linear and multilinear regression, as well as classifying and grouping methods by multivariate statistical analysis – principal



component analysis (PCA) have been used. Relevant mathematical models on the water content, composition and KFT kinetic parameters for food ingredients and supramolecular nanosystems having food, pharmaceutical and cosmetic applications, as well as between the KFT and TG-DSC parameters were obtained.

The second section of the thesis is dedicated to the evolution and development plan for professional, scientifically and academic career. It was emphasized the development of the career in the field of engineering of vegetable and animal resources, the publications, international impact and visibility through the *Hirsch index - 12*, acting as *Guest Editor for Food Chemistry*, *Vice-president of Association EuroFoodWater* (Reims, France), activating in scientific and organizing committees of international conferences in the field (*EFW* and *EuroCD*), or as expert for international and national grants.

The full thesis at:

<https://www.usab-tm.ro/ro/scoli-doctorale-66/abilitare-11118>

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