Transilvania University of Brașov
INTERDISCIPLINARY DOCTORAL SCHOOL

ADMISSION TO DOCTORAL STUDIES   Session September 2025

Field of doctoral studies: Electronics engineering, telecommunications and information technologies
Doctoral supervisor: Prof. dr. eng. Mihai IVANOVICI

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: *Multidimensional image and signal analysis and processing*
Contents / Main aspects to be considered Mathematical morphology, complexity, entropy, fractal models and multi-scale analysis; color, multi- and hyper-spectral texture characterization; fractal image analysis and synthesis; feature extraction; color, multi- and hyper-spectral image segmentation; Knowledge extraction from multidimensional data; Artificial Intelligence models; Applications of color texture and satellite image analysis (including Sentinel-1, Sentinel-2, PRISMA), data fusion in the context of the AI4AGRI European project: https://ai4agri.unitbv.ro
Recommended bibliography: 1. M. Ivanovici, "Color and Multispectral Texture Image Analysis – Models, Features and Applications", Editura Universității Transilvania din Brașov, ISBN 978-606-19-0587-4, 2015.
Prerequisites / Remarks: BSc and/or MSc degree in the field of Electronics engineering, telecommunications and information technologies or strongly related.
☑ **Scientific Doctorate (full-time only)** ☐ **Professional Doctorate – in the fields of Music and Science of sport and physical education (full-time or part-time)**
☑ **without tuition fee (state budget funded)** ☑ **with tuition fee or with funding from other sources than the state budget**

TOPIC 2: *Real-time smart electronic systems for data/signal acquisition and processing for high-energy physics experiments*
Contents / Main aspects to be considered Real-time data acquisition and processing systems for the particle detectors of the ATLAS Experiment at LHC, CERN, Geneva or CBM Experiment at FAIR, GSI, Darmstadt, Germania; Packet processors, parallel/concurent computing architectures and specific architectures for real-time large data volume processing; trigger processor, track reconstruction, data visualization in the context of the national project entitles „The ATLAS Experiment at LHC".

Recommended bibliography:

1. M. Ivanovici, "Computer Network Emulation for Quality of Experience Assessment", Editura Universității Transilvania din Brașov, ISBN 978-606-19-0586-7, 2015
2. http://cern.ch
3. https://www.cbm.gsi.de/

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TOPIC 3: *Real-time electronic systems for color, multispectral or hyperspectral image acquisition, processing and analysis, implemented in FPGA/ASIC*

Contents / Main aspects to be considered

Algorithms and architectures for the acquisition, processing and analysis of color, multispectral or hyperspectral images; microprocessors and system architecture; hardware description languages (Verilog, VHDL); artificial/computational intelligence models implemented in hardware; applications: e.g. object detection / recognition, texture / image classification.

Recommended bibliography:

1. M. Ivanovici et al, "VIPERA 1.0 – A Versatile Imaging Platform for Education, Research and Applications", International Symposium on Electronics and Telecommunications, 2018.

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TOPIC 4: *Big Data Analytics*

Contents / Main aspects to be considered

Real-time big data visualization, analysis and processing algorithms and architectures; including Artificial Intelligence, prediction; time series; data mining; knowledge extraction; Big Data applications in the context of the AI4AGRI European project: https://ai4agri.unitbv.ro

Recommended bibliography:

1. C. Florea, L. Florea, „Inteligență Artificială", Editura Universității Transilvania din Brașov, 2023

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TOPIC 5: *Image Analysis for Content Understanding and Risk Evaluation*

Contents / Main aspects to be considered

Algorithms and models of artificial intelligence for the analysis of images (color, multispectral, including satellite) in order to understand the content, for the detection of illegal activities in the Black Sea or for special missions, both for risk assessment and making predictions. In the context of the SOLUTIONS projects „*IMINT for the Black Sea, borders, mines*" și „*Fusion and Manafement Platform for Multi-Source Data Collections Exploitable by Artificial Intelligence Models for Estimation and Predictive Analysis of Risk Situations (AI4RISK)*"

Recommended bibliography:

1. C. Florea, L. Florea, „Inteligență Artificială", Editura Universității Transilvania din Brașov, 2023

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Doctoral supervisor,	Coordinator of the field of doctoral studies,
Prof. Dr. eng. Mihai IVANOVICI	Prof. Dr. eng. Mihai IVANOVICI
Signature	Signature