Transilvania University of Brașov
INTERDISCIPLINARY DOCTORAL SCHOOL

ADMISSION TO DOCTORAL STUDIES **Session September 2025**

Field of doctoral studies: Electronic engineering, telecommunications and information technologies
Doctoral supervisor: Prof. Dr. Titus Constantin BĂLAN

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: Optimized hardware/software architectures for packet processing
Contents / Main aspects to be considered - *Methods for implementing packet processing at the level of hybrid embedded systems including processor, SW elements and HW acceleration* - *FPGA-based systems for real-time packet analysis* - *Implementing and optimizing package processing for cybersecurity applications* - *Secure communication at the level of RISC-V architectures*
Recommended bibliography: - **John L. Hennessy and David A. Patterson. 2017. Computer Architecture, Sixth Edition: A Quantitative Approach (6th. ed.). Morgan Kaufmann Publishers Inc., San Francisco, CA, USA.** - **Mohit Arora, The Art of Hardware Architecture: Design Methods and Techniques for Digital Circuits, 2012** - **Philip Andrew Simpson, FPGA Design Best Practices for Team-based Reuse, 2015** - **Computer Organization and Design RISC-V Edition: The Hardware Software Interface (1st. ed.). Morgan Kaufmann Publishers Inc., San Francisco, CA, USA.** **https://futurenetworks.upb.ro/sdpicaddos/**
Prerequisites / Remarks: - *Bachelor's and/or Master's degree in the field of Electronic Engineering, Telecommunications and Information Technologies or in a very close field*
X Scientific Doctorate (full-time only) **☐ Professional Doctorate (full-time or part-time)**
X without tuition fee (state budget funded) **X with tuition fee or with funding from other sources than the state budget**

TOPIC 2: AI solutions for cybersecurity and methods to secure AI-based deployments

Contents / Main aspects to be considered

- *Improving digital fact investigations and incident response using AI*
- *Streamlining penetration testing*
- *Methods to optimize malware analysis with intelligent processes*

Recommended bibliography:

- **M. Sikorski and A. Honig, Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software. San Francisco, CA: No Starch Press, 2012.**
- **B. Nikkel, Practical Linux Forensics: A Guide for Digital Investigators. San Francisco, CA: No Starch Press, 2021.**
- **S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 4th ed. Upper Saddle River, NJ: Pearson, 2020.**
- **G. Weidman, Penetration Testing: A Hands-On Introduction to Hacking. San Francisco, CA: No Starch Press, 2014.**

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- *Bachelor's and/or Master's degree in the field of Electronic Engineering, Telecommunications and Information Technologies or in a very close field*
- *Cybersecurity Knowledge*

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TOPIC 3: Modelling and evaluating two-way interaction in VR and XR applications

Contents / Main aspects to be considered –

- *System architectures for real-time interaction between users and content generators in VR/XR environments, with a focus on latency and synchronization.*
- *Bidirectional feedback mechanisms (audio, visual, gestural) and their impact on user and performer experience.*
- *Quality of Experience (QoE) assessment and analysis of objective and subjective metrics for interaction in low-latency networks*

Recommended bibliography:

- *A. Janin, C. Choi, M. Rath, R. Tang, and T. Pederson, "Real-Virtual Objects: Exploring Bidirectional Embodied Tangible Interaction with a Virtual Human in World-Fixed Virtual Reality," in 2024 IEEE Conference on Virtual Reality and 3D User Interfaces (VR), Orlando, FL, USA, 2024.*
- *A. A. Ababneh, M. M. Alkhateeb, and Y. Jararweh, "Virtual Reality and User Experience: Current Trends and Future Challenges," Sensors, vol. 25, no. 6, 2025. [Online]. Available:* https://www.researchgate.net/publication/390153559
- *M. Saba, P. Lin, S. Lee, and J. Park, "Understanding User Behaviors of XR Environments*

using LLM," arXiv preprint arXiv:2501.13778, Jan. 2025. [Online]. Available: https://arxiv.org/abs/2501.13778

- *B. Petit, R. Paiva, F. D. V. Ramos, and M. Cordeiro, "Collaboration in Virtual Reality: Survey and Perspectives," arXiv preprint arXiv:2411.16124, Nov. 2024. [Online]. Available: https://arxiv.org/abs/2411.16124*

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Doctoral supervisor,

Prof. Dr. Titus Constantin BĂLAN

Signature

Coordinator of the field of doctoral studies,

Prof. Dr. Mihai IVANOVICI

Signature