Transilvania University of Brașov
INTERDISCIPLINARY DOCTORAL SCHOOL

## ADMISSION TO DOCTORAL STUDIES Session September 2026

**Field of doctoral studies: Mechatronics and Robotics**
**Doctoral supervisor: Prof. Dr. Sorin Grigorescu**

## TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

**TOPIC 1:** ***Graph Neural Networks for Perception, Localization and Mapping***

**Contents / Main aspects to be considered:**

- **Graph Neural Networks**
- **Robot perception**
- **Simultaneous Localization and Mapping**

**Recommended bibliography:**


[1] Sorin Grigorescu, Cosmin Ginerică, Machine Learning, Transilvania University, 2017.

[2] Sorin Grigorescu, Computer Vision Systems, Transilvania University, 2018.

[3] Richard Hartley, Andrew Zisserman, *Multiple View Geometry in Computer Vision*, Cambridge University Press, 2004.

[4] Zachary Teed, Deng Jia, "DROID-SLAM: Deep Visual SLAM for Monocular, Stereo, and RGB-D Cameras", Advances in neural information processing systems NeurIPS, 2021.

[5] Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.

[6] Peter Corke, Robotics, Vision and Control, Springer, 2017.

[7] Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer, 2009.


**Prerequisites / Remarks:**

- **Introduction to Robotics**
- **Deep Learning**
- **Computer Vision**

☑ **Scientific Doctorate**
☑ **Professional Doctorate**

☑ **without tuition fee (state budget funded)**
☑ **with tuition fee or with funding from other sources than the state budget**

**TOPIC 2:** ***Real-time perception, mapping and localization SLAM systems***

**Contents / Main aspects to be considered:**

- **Robot perception**
- **Simultaneous Localization and Mapping**
- **Embedded Systems**

**Recommended bibliography:**


[1] Sorin Grigorescu, Cosmin Ginerică, Machine Learning, Transilvania University, 2017.

[2] Sorin Grigorescu, Computer Vision Systems, Transilvania University, 2018.

[3] Richard Hartley, Andrew Zisserman, *Multiple View Geometry in Computer Vision*, Cambridge University Press, 2004.

[4] Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.

[5] Peter Corke, Robotics, Vision and Control, Springer, 2017.


**Prerequisites / Remarks:**

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- **Deep Learning**
- **Computer Vision**

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**TOPIC 3:** ***Artificial intelligence methods for legged robots***

**Contents / Main aspects to be considered:**

- **Legged robots control**
- **Data-driven control**

**Recommended bibliography:**


[1] Sorin Grigorescu, Cosmin Ginerică, Machine Learning, Transilvania University, 2017.

[2] Marc Raibert, Legged Robots that Balance, MIT Press, 1986.

[3] Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.

[4] Peter Corke, Robotics, Vision and Control, Springer, 2017.

[5] Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer, 2009.


**Prerequisites / Remarks:**

- **Introduction to Robotics**
- **Deep Learning**
- **Control Theory**

☑ **Scientific Doctorate**

☑ **Professional Doctorate**

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**TOPIC 4:** ***Artificial intelligence methods for collaborative robotic task planning***

**Contents / Main aspects to be considered:**

- **Collaborative robot control based on AI**
- **Swarms**
- **Task planning**

**Recommended bibliography:**


[1] Sorin Grigorescu, Cosmin Ginerică, Machine Learning, Transilvania University, 2017.

[2] Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.

[3] Peter Corke, Robotics, Vision and Control, Springer, 2017.

[4] Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer, 2009.


**Prerequisites / Remarks:**

- **Introduction to Robotics**
- **Deep Learning**

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☑ **Professional Doctorate**

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**TOPIC 5: Real-time Operating Systems for Robotics**

**Contents / Main aspects to be considered:**

- **Real-time robotic control**
- **Robotic operating systems**

**Recommended bibliography:**


[1] Sorin Grigorescu, Cosmin Ginerică, Machine Learning, Transilvania University, 2017.

[2] Sorin Grigorescu, Computer Vision Systems, Transilvania University, 2018.

[3] Richard Hartley, Andrew Zisserman, *Multiple View Geometry in Computer Vision*, Cambridge University Press, 2004.

[4] Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.

[5] Peter Corke, *Robotics, Vision and Control*, Springer, 2017.

[6] Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, *Robotics: Modelling, Planning and Control*, Springer, 2009.

**Prerequisites / Remarks:**

- **Introduction to Robotics**
- **Operating Systems**

☑ **Scientific Doctorate**

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**TOPIC 6:** ***Artificial intelligence methods for self-driving cars***

**Contents / Main aspects to be considered:**

- **Perception for autonomous driving**
- **AI-based vehicle control**

**Recommended bibliography:**


[1] Sorin Grigorescu, Cosmin Ginerică, Machine Learning, Transilvania University, 2017.

[2] Sorin Grigorescu, Computer Vision Systems, Transilvania University, 2018.

[3] Richard Hartley, Andrew Zisserman, *Multiple View Geometry in Computer Vision*, Cambridge University Press, 2004.

[4] Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.

[5] Peter Corke, Robotics, Vision and Control, Springer, 2017.

[6] Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer, 2009.


**Prerequisites / Remarks:**

- **Introduction to Robotics**
- **Deep Learning**
- **Computer Vision**

☑ **Scientific Doctorate**

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**TOPIC 7:** ***Unsupervised learning for perception and control in robotics***

**Contents / Main aspects to be considered:**

- **Unsupervised learning**
- **Robot perception**
- **Robot control**

**Recommended bibliography:**


[1] Sorin Grigorescu, Cosmin Ginerică, Machine Learning, Transilvania University, 2017.

[2] Sorin Grigorescu, Sisteme de Vedere Artificială, Editura Universității Transilvania, 2018.

[3] Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.

[4] Peter Corke, Robotics, Vision and Control, Springer, 2017.

[5] Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer, 2009.


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- **Computer Vision**

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**TOPIC 8:** ***Artificial intelligence methods for reasoning in robotic systems***

**Contents / Main aspects to be considered:**

- **Large Language Models in Robotics**
- **Environment modelling**

**Recommended bibliography:**


[1] Sorin Grigorescu, Cosmin Ginerică, Machine Learning, Transilvania University, 2017.

[2] Sorin Grigorescu, Sisteme de Vedere Artificială, Editura Universității Transilvania, 2018.

[3] Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.

[4] Peter Corke, Robotics, Vision and Control, Springer, 2017.

[5] Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer, 2009.


**Prerequisites / Remarks:**

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**TOPIC 9:** *Livelong learning of action primitives in legged robots*

**Contents / Main aspects to be considered:**

- **Continual Learning in robotics**
- **Legged robot control**

**Recommended bibliography:**


[1] Sorin Grigorescu, Cosmin Ginerică, Machine Learning, Transilvania University, 2017.

[2] Sorin Grigorescu, Sisteme de Vedere Artificială, Editura Universității Transilvania, 2018.

[3] Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.

[4] Peter Corke, Robotics, Vision and Control, Springer, 2017.

[5] Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer, 2009.


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- **Deep Learning**
- **Computer Vision**

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Doctoral supervisor,

**Prof. Dr. Sorin Grigorescu**

Coordinator of the field of doctoral studies,

**Prof. Dr. Sorin Grigorescu**