

Universitatea *Transilvania* din Braşov  
Facultatea de Inginerie Electrică și Știința Calculatoarelor  
Departamentul de Automatică și Tehnologia Informației

## TEMATICĂ

pentru concursul de admitere la doctorat în domeniul  
*Ingineria Sistemelor* – Septembrie 2019

### TEMELE PROPUSE:

- Optimizarea parametrilor și modelarea personalizată a sistemelor biologice
- Modelarea sistemelor dinamice folosind rețele neurale adânci
- Rețele neurale adânci pentru procesarea eficientă a volumelor mari de date fără etichetare explicită

### BIBLIOGRAFIE:

- [1] Markus W. Covert, *Fundamentals of Systems Biology: From Synthetic Circuits to Whole-cell Models*, CRC Press, 2014.
- [2] Brian P. Ingalls, *Mathematical Modeling in Systems Biology: An Introduction*, MIT Press, 2013.
- [3] Fabian Fröhlich et al., Efficient Parameter Estimation Enables the Prediction of Drug Response Using a Mechanistic Pan-Cancer Pathway Model, *Cell Systems*, Vol. 7(6), pp. 567-579, 2018.
- [4] Ian Goodfellow et al., *Deep Learning*, Adaptive Computation and Machine Learning series, MIT Press, 2016.
- [5] Ricky T. Q. Chen et al., Neural Ordinary Differential Equations, NIPS, 2018.
- [6] Longlong Jing et al., Self-supervised Visual Feature Learning with Deep Neural Networks: A Survey, <https://arxiv.org/abs/1902.06162>, 2019.
- [7] Francois Chollet, *Deep Learning with Python*, Manning, 2017.

Brasov, 17.07.2019

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## TOPICS

for the doctoral program admission competition in the field of  
*Systems Engineering* – September 2019

### PROPOSED TOPICS:

- Parameter optimization and personalized systems biology modeling
- Modeling dynamic systems using deep neural networks
- Deep neural networks for efficient exploitation of large datasets without performing explicit labeling

### REFERENCES:

- [1] Markus W. Covert, *Fundamentals of Systems Biology: From Synthetic Circuits to Whole-cell Models*, CRC Press, 2014.
- [2] Brian P. Ingalls, *Mathematical Modeling in Systems Biology: An Introduction*, MIT Press, 2013.
- [3] Fabian Fröhlich et al., Efficient Parameter Estimation Enables the Prediction of Drug Response Using a Mechanistic Pan-Cancer Pathway Model, *Cell Systems*, Vol. 7(6), pp. 567-579, 2018.
- [4] Ian Goodfellow et al., *Deep Learning, Adaptive Computation and Machine Learning series*, MIT Press, 2016.
- [5] Ricky T. Q. Chen et al., *Neural Ordinary Differential Equations*, <https://arxiv.org/abs/1806.07366>, 2018.
- [6] Longlong Jing et al., *Self-supervised Visual Feature Learning with Deep Neural Networks: A Survey*, <https://arxiv.org/abs/1902.06162>, 2019.
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