

# UNIVERSITY OF SOUTH FLORIDA

## Defense of a Doctoral Dissertation

Adaptive Multi-scale Place Cell Representations and Replay for Spatial Navigation  
and Learning in Autonomous Robots

by

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For the Ph.D. degree in Computer Science and Engineering

Place cells are one of the most widely studied neurons in the brain hippocampus thought to play a vital role in spatial cognition. Studies show that place cell activity is highly correlated with the animal's location in an environment, forming "pl (v)49 (r)3.6.9 (g)4.9 (i)

ENB 313 and Online (Microsoft Teams)

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THE PUBLIC IS INVITED

### Publications

- 1) **Scleidorovich, P.**, Weitzenfeld, A., Fellous, JM., and Dominey, P. Integration of velocity-dependent spatio-temporal structure of place cell activation during navigation in a reservoir model of prefrontal cortex. *Biol Cybern* (accepted).
- 2) **Scleidorovich, P.**, Llofriu, M., Fellous, JM. et al. A computational model for spatial cognition combining dorsal and ventral hippocampal place field maps: multiscale navigation. *Biol Cybern* 114, 187–207 (2020). <https://doi.org/10.1007/s00422-019-00812-x>
- 3) **Scleidorovich, P.**, Llofriu, M., Fellous, JM., and Weitzenfeld, A., "A Computational Model for Latent Learning based on Hippocampal Replay," *2020 International Joint Conference on Neural Networks (IJCNN)*, 2020, pp. 1-8, doi: 10.1109/IJCNN48605.2020.9206824.
- 4) Cazin, N., **Scleidorovich, P.**, Weitzenfeld, A. et al. Real-time sensory–motor integration of hippocampal place cell replay and prefrontal sequence learning in simulated and physical rat robots for novel path optimization. *Biol Cybern* 114, 249–268 (2020). <https://doi.org/10.1007/s00422-020-00820-2>
- 5) Llofriu, M., **Scleidorovich, P.**, Tejera, G. et al., "A Computational Model for a Multi-Goal Spatial Navigation Task inspired by Rodent Studies," *2019 International Joint Conference on Neural Networks (IJCNN)*, 2019, pp. 1-8, doi: 10.1109/IJCNN.2019.8851852.
- 6) Cazin, N., Llofriu, M., **Scleidorovich, P.**, et al. (2019) Reservoir computing model of prefrontal cortex creates novel combinations of previous navigation sequences from hippocampal place-cell replay with spatial reward propagation. *PLOS Computational Biology* 15(7): e1006624.

*Ruth H. Bahr, Ph.D.*

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