Dr. Antonio Rodríguez-Sánchez

Associate Professor

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Antonio José Rodríguez Sánchez is currently an Assistant Professor in the Intelligent and Interactive Systems group of the department of Computer Science at the Universität Innsbruck (Austria) leaded by Prof. Justus Piater.

He was born in Santiago de Compostela (A Coruña), a beautiful city in the north-west of Spain. He completed his Ph.D. at the Center for Vision Research (York University, Toronto, Canada) on modeling attention and intermediate areas of the visual cortex under the supervision of Prof. John K. Tsotsos (Canada Research Chair) in 2010. He obtained the degree of M.Sc. in Computer Science at the Universidade da Coruña (Spain) in 1998. He received his B.Sc. in Computer Science at Universidad de Córdoba (Spain) with Honors and did his Bachelor Thesis at the Université de La Rochelle (France). He has also finished 3 years of B.Sc. in Biology in the Universidad Autónoma de Madrid (Spain).

His current research interests include different areas of artificial intelligence: Explainable AI, computational neuroscience, (deep) neural networks, computer vision, machine learning and robotics.

He is also interested from an “amateur” point of view in other non computer related scientific fields such as physiscs, mathematics, biology, history, sports (skiing, swimming, hiking, fencing) and photography.

Areas of Interest

- Explainable AI
- Biological plausibility and inspiration
- Computer Vision

- Machine and Deep Learning

Positions

- Assistant Professor at the Department of Computer Science, Intelligent and Interactive Systems, University of Innsbruck (since 2015).
- Senior Researcher at the Department of Computer Science, Intelligent and Interactive Systems, University of Innsbruck (2011-2015).
- Junior Researcher and Teaching Assistant at the Department of Computer Science and Engineering, Attention Lab, York University, Toronto, Canada (2002-2010).
- Instructor at University of Ontario Institute of Technology, Oshawa, Canada (2006-2009).
- Junior Researcher at Biotechnology Center, Centro de Investigaciones Científicas (CSIC), Madrid, Spain (2000-2002).
- Computer Engineer at Lucent Technologies, Tres Cantos (Madrid), Spain (1998-2000)

Education

- 10/2010: PhD in Computer Science, York University (Canada).
- 06/1998: Engineering Degree in Computer Science, University of A Coruña (Spain).
- 06/1996: Bachelor Degree in Computer Science, University of Córdoba (Spain).
- 3 years Bachelor in Biology (1998-2001), Autonomous University of Madrid (Spain).

Talks and Workshops

- A current list of talks and workshops can be found here.

Publications

1. David Peer, Sebastian Stabinger, Stefan Engl, Antonio Rodríguez-Sánchez, Greedy-layer pruning: Speeding up transformer models for natural language processing. Patterm Recognition Letters 157, p.¬†76, 2022.

[Link] [PDF] [Abstract] [BibTeX]

2. Cristof Rojas, Erwan Renaudo, Antonio Rodríguez-Sánchez, Deep Learning for Fast Segmentation of Ewaste Devices Inner Parts in a Recycling Scenario. International Conference on Pattern Recognition and Artificial Intelligence, 2022. ¬©¬†Springer-Verlag [Link] [BibTeX]

3. Sebastian Stabinger, David Peer, Justus Piater, Antonio Rodr√≠guez-S√°nchez, Evaluating the progress of deep learning for visual relational concepts. Journal of Vision 21 (11), p.¬†8, 2021.

[Link] [PDF] [Abstract] [BibTeX]

4. Josef Gugglberger, David Peer, Antonio Rodríguez-Sánchez, Training Deep Capsule Networks with Residual Connections. International Conference on Artificial Neural Networks and Machine Learning, 2021. ¬©¬†Springer-Verlag [Link] [arXiv] [PDF] [BibTeX]

5. Sebastian Stabinger, David Peer, Antonio Rodríguez-Sánchez, Arguments for the unsuitability of convolutional neural networks for non-local tasks. Neural Networks 142, pp.¬†171,Äì179, 2021.

[Link] [arXiv] [PDF] [Abstract] [BibTeX]

6. Josef Gugglberger, David Peer, Antonio Rodríguez-Sánchez, Training Deep Capsule Networks with Residual Connections. arXiv:2104.07393, 2021.

[Link] [PDF] [Abstract] [BibTeX]

7. David Peer, Sebastian Stabinger, Antonio Rodríguez-Sánchez, Auto-tuning of Deep Neural Networks by Conflicting Layer Removal. arXiv:2103.04331, 2021.

[Link] [PDF] [Abstract] [BibTeX]

8. Matteo Saveriano, Erwan Renaudo, Antonio Rodríguez-Sánchez, Justus Piater (editors), Human-Friendly Robotics 2020: 13th International Workshop, 2021.

[Link] [PDF] [BibTeX]

9. David Peer, Sebastian Stabinger, Antonio Rodríguez-Sánchez, conflicting_bundle.py - A python module to identify problematic layers in deep neural networks. Software Impacts 7, 2021.

[Link] [PDF] [Abstract] [BibTeX]

10. David Peer, Sebastian Stabinger, Antonio Rodríguez-Sánchez, Conflicting Bundles: Adapting Architectures Towards the Improved Training of Deep Neural Networks . IEEE/CVF Winter Conference on Applications of Computer Vision, pp.¬†256,Äì256, 2021.

[Link] [arXiv] [PDF] [Abstract] [BibTeX]

11. David Peer, Sebastian Stabinger, Antonio Rodríguez-Sánchez, Limitation of capsule networks.

Pattern Recognition Letters 144, pp.¬†68,Äì74, 2021. ¬†¬©¬†Elsevier [Link] [arXiv] [PDF] [Abstract] [BibTeX]

12. Sebastian Stabinger, David Peer, Antonio Rodríguez-Sánchez, Training of Feedforward Networks Fails on a Simple Parity-Task . NeurIPS 2020 Workshop: The pre-registration experiment, 2020. [Link] [BibTeX]

13. Fares J. Abu-Dakka, Matteo Saveriano, Variable impedance control and learning - A review . Frontiers in Robotics and AI, 2020, to appear. [Link] [arXiv] [PDF] [BibTeX]

14. Alzbeta Tureckova, Tomas Turecek, Zuzana Komikova Oplatkova, Antonio Rodríguez-Sánchez, Improving CT Image Tumor Segmentation Through Deep Supervision and Attentional Gates.

Frontiers in Robotics and AI 7, 2020.

[Link] [PDF] [Abstract] [BibTeX]

15. Damiano Melotti, Kevin Heimbach, Antonio Rodríguez-Sánchez, Nicola StrisciuglioNicola, George Azzopardi, A robust contour detection operator with combined push-pull inhibition and surround suppression. Information Sciences, 2020.

[Link] [PDF] [Abstract] [BibTeX]

16. Sebastian Stabinger, Justus Piater, Antonio Rodríguez-Sánchez, Evaluating the Progress of Deep Learning for Visual Relational Concepts. arXiv:2001.10857, 2020.

[Link] [PDF] [Abstract] [BibTeX]

17. Antonio Rodríguez-Sánchez, Tobias Dick, Capsule Networks for Attention Under Occlusion. Artificial Neural Networks and Machine Learning – ICANN 2019, pp. 523–534, 2019. Springer LNCS 11731.  [Link] [PDF] [Abstract] [BibTeX]

18. Gregor Ehrensperger, Sebastian Stabinger, Antonio Rodríguez-Sánchez, Evaluating CNNs on the Gestalt Principle of Closure. Artificial Neural Networks and Machine Learning – ICANN 2019, pp. 296–301, 2019. Springer LNCS 11727.  [Link] [PDF] [Abstract] [BibTeX]

19. Alzbeta Tureckova, Antonio Rodríguez-Sánchez, ISLES Challenge: U-Shaped Convolution Neural Network with Dilated Convolution for 3D Stroke Lesion Segmentation. International MICCAI Brainlesion Workshop, pp. 319–327, 2019.  [Link] [PDF] [Abstract] [BibTeX]

20. David Peer, Sebastian Stabinger, Antonio Rodríguez-Sánchez, Limitations of routing-by-agreement based capsule networks. arXiv:1905.08744, 2019.

[Link] [PDF] [Abstract] [BibTeX]

21. David Peer, Sebastian Stabinger, Antonio Rodríguez-Sánchez, Increasing the adversarial robustness and explainability of capsule networks with gamma-capsules. arXiv:1812.09707, 2019.

[Link] [PDF] [Abstract] [BibTeX]

22. Safoura Rezapour Lakani, Antonio Rodríguez-Sánchez, Justus Piater, Towards affordance detection for robot manipulation using affordance for parts and parts for affordance.

Autonomous Robots, 2018, early access. ¬©¬†Springer-Verlag [Link] [PDF] [Abstract] [BibTeX]

23. Safoura Rezapour Lakani, Antonio Rodríguez-Sánchez, Justus Piater, Exercising Affordances of Objects: A Part-Based Approach. IEEE Robotics and Automation Letters 3 (4), pp.¬†3465,Äì3472,

2018. ¬©¬†IEEE [Link] [PDF] [Abstract] [BibTeX]

24. Antonio Rodríguez-Sánchez, Daly Chea, George Azzopardi, Sebastian Stabinger, A deep learning approach for detecting and correcting highlights in endoscopic images. International Conference on Image Processing Theory, Tools and Applications., 2017, to appear.

[Link] [PDF] [Abstract] [BibTeX]

25. Safoura Rezapour Lakani, Antonio Rodríguez-Sánchez, Justus Piater, Can Affordances Guide Object Decomposition Into Semantically Meaningful Parts?. IEEE Winter Conference on Applications of Computer Vision, 2017. ¬©¬†IEEE [Link] [PDF] [Abstract] [BibTeX]

26. Antonio Rodríguez-Sánchez, Sabine Oberleiter, Hanchen Xiong, Justus Piater, Learning V4 curvature cell populations from sparse endstopped cells. Artificial Neural Networks and Machine Learning ‚Äì ICANN 2016, pp.¬†463‚Äì471, 2016. Springer LNCS 9887. ¬©¬†Springer-Verlag [Link] [PDF] [Abstract] [BibTeX]

27. Sebastian Stabinger, Antonio Rodríguez-Sánchez, Justus Piater, 25 years of CNNs: Can we compare to human abstraction capabilities?. Artificial Neural Networks and Machine Learning ‚Äì ICANN 2016, pp.¬†380‚Äì387, 2016. Springer LNCS 9887. ¬©¬†Springer-Verlag [Link] [arXiv] [PDF] [Abstract] [BibTeX]

28. Sabrina Fontanella, Antonio Rodríguez-Sánchez, Justus Piater, Sandor Szedmak, Kronecker decomposition for image classification. Experimental IR Meets Multilinguality, Multimodality, and Interaction ‚Äì Proceedings of the 7th International Conference of the CLEF Association, pp.¬†137‚Äì149, 2016. Springer LNCS 9822. ¬©¬†Springer-Verlag [Link] [PDF] [Abstract] [BibTeX]

29. Thomas Hoyoux, Antonio Rodríguez-Sánchez, Justus Piater, Can Computer Vision Problems

Benefit from Structured Hierarchical Classification?. Machine Vision and Applications 27,

pp.¬†1299,Äì1312, 2016.

[Link] [PDF] [Abstract] [BibTeX]

30. Sebastian Stabinger, Antonio Rodríguez-Sánchez, Justus Piater, Monocular Obstacle Avoidance for Blind People using Probabilistic Focus of Expansion Estimation. IEEE Winter Conference on Applications of Computer Vision, 2016. ¬©¬†IEEE [Link] [PDF] [Abstract] [BibTeX]

31. Sebastian Stabinger, Antonio Rodríguez-Sánchez, Justus Piater, Learning Abstract Classes using Deep Learning. The First International Workshop on Computational Models of the Visual Cortex, 2015. [Link] [arXiv] [PDF] [Abstract] [BibTeX]

32. Antonio Rodríguez-Sánchez, Mazyar Fallah, Ales Leonardis, Hierarchical object representations in the visual cortex and computer vision . Frontiers in Computational Neuroscience 9 (142), 2015.

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33. Antonio Rodríguez-Sánchez, Sandor Szedmak, Justus Piater, SCurV: A 3D Descriptor for Object Classification. IEEE/RSJ International Conference on Intelligent Robots and Systems, pp.¬†1320‚Äì1327, 2015. ¬©¬†IEEE [Link] [PDF] [Abstract] [BibTeX]

34. Hanchen Xiong, Antonio Rodríguez-Sánchez, Sandor Szedmak, Justus Piater, Diversity priors for learning early visual features. Frontiers in Computational Neuroscience 9 (104), 2015.

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35. Antonio Rodríguez-Sánchez, Sabrina Fontanella, Justus Piater, Sandor Szedmak, IIS at ImageCLEF 2015: Multi-label classification task. Conference and Labs of the Evaluation Forum, 2015.

[Link] [PDF] [Abstract] [BibTeX]

36. Thomas Hoyoux, Antonio Rodríguez-Sánchez, Justus Piater, Sandor Szedmak, Can Computer Vision Problems Benefit from Structured Hierarchical Classification?. Computer Analysis of Images and Patterns, pp.¬†403,Äì414, 2015. Springer LNCS 9257. ¬©¬†Springer-Verlag [Link] [PDF] [Abstract] [BibTeX]

37. Safoura Rezapour Lakani, Mirela Popa, Antonio Rodríguez-Sánchez, Justus Piater, CPS: 3D Compositional Part Segmentation through Grasping. 12th Conference on Computer and Robot Vision, pp.¬†117,Äì124, 2015. Best Robotic Vision Paper Award. ¬©¬†IEEE [Link] [PDF] [Abstract] [BibTeX]

38. Antonio Rodríguez-Sánchez, Heiko Neumann, Justus Piater, Beyond Simple and Complex Neurons: Towards Intermediate-level Representations of Shapes and Objects.. K√ºnstliche Intelligenz 29, pp.¬†19,Äì29, 2015. ¬©¬†Springer-Verlag [Link] [PDF] [Abstract] [BibTeX]

39. Antonio Rodríguez-Sánchez, Justus Piater, Models of the Visual Cortex for Object Representation: Learning and Wired Approaches. In: Lucio Grandinetti, Thomas Lippert, Nicolai Petkov (editors), Brain-Inspired Computing, pp.¬†51,Äì62, 2014 (BrainComp 2013). Springer LNCS 8603. ¬©¬†Springer-Verlag [Link] [PDF] [Abstract] [BibTeX]

40. Safoura Rezapour-Lakani, Mirela Popa, Antonio J. Rodríguez-Sánchez, Justus Piater, Scale-Invariant, Unsupervised Part Decomposition of 3D Objects. Parts and Attributes, 2014

(Workshop at ECCV). Extended Abstract. [Link] [PDF] [BibTeX]

41. George Azzopardi, Antonio Rodríguez-Sánchez, Justus Piater, Nicolai Petkov, A computational model of push-pull inhibition of simple cells with application to contour detection. Perception ECVP Abstract Supplement, p.¬†163, 2014 (European Conference on Visual Perception). Extended Abstract. [Link] [Abstract] [BibTeX]

42. Hanchen Xiong, Sandor Szedmak, Antonio Rodríguez-Sánchez, Justus Piater, Towards Sparsity and Selectivity: Bayesian Learning of Restricted Boltzmann Machine for Early Visual Features. 24th International Conference on Artificial Neural Networks, pp.¬†419,Äì426, 2014. Springer LNCS. ¬©¬†Springer-Verlag [Link] [PDF] [Abstract] [BibTeX]

43. George Azzopardi, Antonio Rodr√≠guez-S√°nchez, Justus Piater, Nicolai Petkov, A push-pull CORF model of a simple cell with antiphase inhibition improves SNR and contour detection. PLoS ONE 9 (7), 2014.

[Link] [PDF] [Abstract] [BibTeX]

44. Antonio Rodríguez-Sánchez, Gregory Dudek, John Tsotsos, Detecting, Representing and Attending to Visual Shape. In: Sven Dickinson, Zygmunt Pizlo (editors), Shape Perception in Human and Computer Vision: An Interdisciplinary Perspective, pp.¬†429,Äì442, 2013. Springer

Advances in Computer Vision and Pattern Recognition. ¬©¬†Springer-Verlag [home] [Link] [PDF] [Abstract] [BibTeX]

45. Norbert Krüger, Peter Janssen, Sinan Kalkan, Markus Lappe, Ales Leonardis, Justus Piater, Antonio Rodríguez-Sánchez, Laurenz Wiskott, Deep Hierarchies in the Primate Visual Cortex: What Can We Learn For Computer Vision?. IEEE Transactions on Pattern Analysis and Machine

Intelligence 35 (8), pp.¬†1847,Äì1871, 2013. ¬©¬†IEEE [Link] [PDF] [Abstract] [BibTeX]

46. Antonio Rodríguez-Sánchez, John Tsotsos, The roles of endstopped and curvature tuned computations in a hierarchical representation of 2D shape. PLoS ONE 7 (8), 2012.

[Link] [PDF] [Abstract] [BibTeX]

47. Antonio Rodríguez-Sánchez, John Tsotsos, The roles of endstopped and curvature tuned computations in a hierarchical representation of 2D shape. In: M. Pomplun, J. Suzuki (editors), Developing and Applying Biologically-inspired Vision Systems: Interdisciplinary concepts,

pp.¬†184,Äì207, 2012. [Link] [PDF] [Abstract] [BibTeX]

48. Antonio Rodríguez-Sánchez, John K. Tsotsos. The importance of intermediate representations for the modeling of 2D shape detection: Endstopping and curvature tuned computations. Proc. IEEE Computer Vision and Pattern Recognition, 4321-4326. [Link]

49. Antonio Rodríguez-Sánchez. Intermediate Visual Representations for Attentive Recognition Systems. PhD Thesis, York University Technical report CSE-2010-06. September 2010

50. Antonio Rodríguez-Sánchez, John K. Tsotsos, Stefan Treue, Julio Martinez-Trujillo. Comparing neuronal and behavioral thresholds for spiral motion discrimination, Neuroreport 20(18): 1613-1618, December 2009.

51. John K. Tsotsos, Antonio Rodríguez-Sánchez, Albert Rothenstein, Eugene Simine. Different Binding Strategies for the Different Stages of Visual Recognition, Brain Research. 2008 [PDF]

52. Albert Rothenstein, Antonio Rodríguez-Sánchez, Eugene Simine, John K. Tsotsos. Visual Feature Binding within the Selective Tuning Attention Framework, Int. J. Pattern Recognition and Artificial Intelligence - Special Issue on Brain, Vision and Artificial Intelligence, 22(5), 2008 p. 861-881

53. Antonio Rodríguez-Sánchez, Eugene Simine, John K. Tsotsos. Attention and Visual Search, International Journal of Neural Systems, Vol. 17, No. 4, August 2007

54. John Tsotsos, Antonio Rodríguez-Sánchez, Albert Rothenstein, Eugene Simine. Different Binding Strategies for the Different Stages of Visual Recognition. Brain, Vision and Artificial Intelligence 2007, Naples, Italy.

55. Eugene Simine, Antonio Rodríguez-Sánchez, John K. Tsotsos. Visual Search vith Selective Tuning. Vision Sciences Society 2007, Sarasota (USA)

56. John K. Tsotsos, Antonio Rodríguez-Sánchez, Albert Rothenstein, Eugene Simine. The Different

Stages of Visual Recognition Requieres Different Binding Strategies. Center for Vision Research 2007, Toronto (Canada)

57. Antonio Rodríguez-Sánchez, Eugene Simine, John K. Tsotsos. Feature Conjunctions in Serial Visual Search. International Conference on Artificial Neural Networks, 10-14 September 2006, Athens (Greece)

58. Antonio Rodríguez-Sánchez, Eugene Simine, John K. Tsotsos. Feature Conjunctions in Serial Visual Search. International Conference on Artificial Neural Networks, 10-14 September 2006, Athens (Greece)

59. Antonio Rodríguez-Sánchez, John K. Tsotsos. A System for Biologically Plausible Object Recognition. IS 2005, 16th Annual Canadian Conference on Intelligent Systems, Quebec (Canada)

60. Antonio Rodríguez-Sánchez, John K. Tsotsos, Julio Martinez-Trujillo. Velocity gradient information influences optical flow processing in human observers. Vision Sciences Society 2004, Sarasota (USA).

61. Antonio Rodríguez-Sánchez, John Tsotsos, Julio Martinez-Trujillo (2004). Velocity gradient information influences optical flow processing in human observers [Abstract]. Journal of Vision, 4(8)

62. Antonio Rodríguez-Sánchez, John K. Tsotsos. Attention, Visual Search and Object Recognition. Technical Report. York University

63. Antonio Rodríguez-Sánchez, Douglas O. Cheyne, John K. Tsotsos, Julio Martinez-Trujillo. Speed gradient information influences optical flow processing in human observers. Society for Neuroscience 2003, Saint Louis (USA).

64. Antonio Rodríguez-Sánchez, John K. Tsotsos, Martínez-Trujillo. Speed gradients improve human ability to discriminate among optical flow stimuli. Center for Vision Research 2003, Toronto (Canada).

65. Alberto D. Pascual-Montano, Angela Sesto, Antonio Rodríguez-Sánchez, Manuel Navarro, Juan L. Jorcano, Jose M. Carazo. Density Estimator Self-Organizing Map for Gene Expression Analysis. ISMB 2002.

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- **Springer** and **Versita/Springer:** The final publication is available at link.springer.com.

Supervised Theses

- Safoura Rezapour-Lakani. PhD.
- Sebastian Stabinger. PhD, In progress.
- David Peer. PhD, In progress.
- Suzana Ilic. PhD, In progress.
- Jakob Mittelberger and Chris Engelhardt. MSc. In progress.
- Rick Spiegel. MSc. In progress.
- Josef Gugglberger. MSc. In progress.
- Christoph Klosch. MSc. In progress.
- Maicol Polvere. MSc (University of Genoa). In progress.
- Salvatore Giancani. MSc (University of Genoa). 24/07/2020.
- Sabine Oberleiter. MSc. An architecture to learn curvature-tuned neural populations. 25/04/2018.
- Daly Chea. MSc. Finding Reflections using Convolutional Neural Networks. 14/06/2017.
- Check other Bachelor and Master thesis finished or in progress.

Present and coming Teaching

- Winter term 2020/21. Visual Computing.

- Winter term 2020/21. Deep Learning.
- Winter term 2020/21. Vertiefungsseminar.
- Summer term 2021. Computer Vision.
- Summer term 2021. Advanced Computer Vision.
- Summer term 2021. Algorithms and Data Structures.
- Summer term 2021. Masterseminar.

Past Teaching

- Introduction to Computer Vision (2011/12-2019/20). University of Innsbruck.
- Advanced Computer Vision (2011/12-2019/20). University of Innsbruck.
- Deep Learning (2017/18-2019/20). University of Innsbruck.
- Probabilistic models and methods (2015/16-2019/20).
- Machine Learning (2010/11 and 2019/20). University of Innsbruck.
- PS Data Structures and Algorithms (2017/18 and 2019/20). University of Innsbruck.
- PS Computer Graphics (2016/17). University of Innsbruck.
- Masterseminar on Machine learning and Computer Vision (2011/12, 2012/13, 2013/14, 2014/15). University of Innsbruck.
- PS Introduction to Intelligent Systems (2011/12). University of Innsbruck.
- Applied Internet and Multimedia (2006/07. 2007/28, 2008/09). University of Ontario Institute of Technology (Canada).
- Computer Architecture (2008/09). University of Ontario Institute of Technology (Canada).
- Computer Use in Science (2002/03, 2003/04, 2004/05, 2007/08). York University (Canada).
- Fortran and Scientific Computing (2003/04). York University (Canada).
- Introduction to Computer Use (2002/03, 2007/08). York University (Canada).
- Introduction to Computer Science II (2004/05). York University (Canada).
- Programming I (2000/01, 2001/02). University Carlos III de Madrid (Spain).
- Computer Science basics (2000/01, 2001/02). University Carlos III de Madrid (Spain).

Projects

- 3rd Hand (2014-2017)
- PaCMan (EU FP7-ICT-STREP, 2014-2016)
- IntellAct (EU FP7-ICT-STREP, 2011–2014)

Code

- Paper: Antonio Rodríguez-Sánchez, Daly Chea, George Azzopardi, Sebastian Stabinger, A deep learning approach for detecting and correcting highlights in endoscopic images. Code. License.
- Paper: Thomas Hoyoux, Antonio Rodríguez-Sánchez, Justus Piater, Can Computer Vision Problems Benefit from Structured Hierarchical Classification?. Machine Vision and Applications 27, pp. 1299–1312, 2016. Code. License.
- Paper: Hanchen Xiong, Antonio Rodríguez-Sánchez, Sandor Szedmak, Justus Piater, Diversity priors for learning early visual features. Frontiers in Computational Neuroscience 9 (104), 2015.

Code. License.

- Paper: Antonio J. Rodríguez-Sánchez, John K. Tsotsos, The roles of endstopped and curvature tuned computations in a hierarchical representation of 2D shape. PLoS ONE 7 (8), pp. 1–13, 2012. Code. License