

# Curriculum Vitae

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German Citizen

**Research Interests** Evolutionary Robotics, Neuroevolution, AI in Games, Human Computation

## ACADEMIC TRAINING

**Postdoctoral Fellowship, Cornell University**, Sep. 2012 - Sep. 2013

Advisor: Hod Lipson

**Postdoctoral Researcher, University of Central Florida**, Summer 2012

Advisor: Kenneth O. Stanley

**Ph.D. Computer Science, University of Central Florida**, Aug. 2008 - May 2012

Dissertation: Towards Evolving More Brain-Like Artificial Neural Networks

Advisor: Kenneth O. Stanley

**Diploma Computer Science, Philipps-University of Marburg**, 2007

Thesis: The Evolution of Cooperation in a Team of autonomous Agents with Plastic Neural Networks

Advisor: Manfred Sommer

## CURRENT POSITIONS

**Associate Professor, IT University of Copenhagen**. Aug. 2015 - present

**Co-founder, Modl.ai** , 2017 - present

**Machine Learning Consultant, Uber AI Labs** 2017 - present

**Co-director of the [Robotics, Evolution and Art Lab \(REAL\)](#)** comprising 4 faculty, 4 PhD students, and 2 postdocs.

## PREVIOUS POSITIONS

**Research Scientist, [Geometric Intelligence](#), a deep learning startup (acquired by Uber)** 2016.

**Assistant Professor, IT University of Copenhagen**. Sep. 2013 - Aug. 2015

**Co-founder and CEO, [FinchBeak LLC](#)**, a company that created casual social games enabled by next generation AI technology, Florida. 2012 - 2015

**Software Developer**. xaitment, a company that developed artificial intelligence for commercial computer games and simulations. Saarbrücken, Germany, Sep. 2007 - July 2008

## GRANTS AND FELLOWSHIPS

**PI** for IT University of Copenhagen, Defense Advanced Research Projects Agency (DARPA) project *Super Turing Evolving Lifelong Learning ARchitecture* (STELLAR). ITU budget: \$300K, 2018 - 2020.

**Co-PI Horizon 2020 - Future & Emerging Technologies (FET) Proactive [Flora-Robotica](#)**. Total budget: €3,6M, ITU budget: €551K, April 2015 - April 2019.

**Co-author** of a successful Innovations Fonden - Industrial PhD proposal "Improving Marketing Mix Decisions Through Interactive Bayesian Optimization", 2018. Award consists of one funded Ph.D. for three years. Budget: €140K

**German Academic Exchange Service (DAAD) Postdoctoral Fellowship**, 2012-2013.

Awarded: €32,232

## RECOGNITION AND AWARDS

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**Distinguished Young Investigator award** 2018, International Society for Artificial Life. *For an individual early in their career that has already made important contributions to the field of Artificial Life.*

**Best Paper Award** *Proceedings of Audio Mostly* (AM 2018), for Scirea, Eklund, Togelius, and Risi: Evolving in-game mood-expressive music with MetaCompose.

**Winner of the Short Video Competition** *IEEE Conference on Computation Intelligence and Games* (CIG) 2018, for Volz, Schrum, Liu, Lucas, Smith, Risi: Evolving Mario Levels in the Latent Space of a Deep Convolutional Generative Adversarial Network.

**Best Paper Award** *Conference on Genetic and Evolutionary Computation* (GECCO 2018), for Volz, Schrum, Liu, Lucas, Smith, Risi: Evolving Mario Levels in the Latent Space of a Deep Convolutional Generative Adversarial Network.

**Best Student Paper Award** *Conference on Artificial Life* (ALIFE 2018), for Veenstra, Salas, Bongard, Støy and Risi: Intrinsic Mortality Governs Evolvability.

**Nominated for Best Paper Award** *9th Computer Science and Electronic Engineering* (CEEC'17), for Scirea, Togelius, Eklund, Risi (2017): Primal-Improv: Towards Co-Evolutionary Musical Improvisation.

**Best Paper Award** (out of 57 papers submitted) *IEEE Conference on Computational Intelligence and Games* (CIG 2017), for Poulsen, Thorhauge, Funch and Risi. DLNE: A Hybridization of Deep Learning and Neuroevolution for Visual Control.

**Virtual Creature Contest Winner** (out of 8), GECCO-217, for Veenstra, Faina, Stoy, and Risi. Evolving Simulated Modular Robots.

**Best Paper Award** *Evolutionary Computation in Robotics (EvoROBOT 2017)*, for Lüders, B., Schläger, M., Korach, A., and Risi, S. Continual and One-Shot Learning through Neural Networks with Dynamic External Memory.

**Best Paper Award** *NIPS 2016 Workshop on Continual Learning and Deep Networks (CLDL 2016)* (out of 22), for Benno Lüders, Mikkel Schläger, and Sebastian Risi. Continual Learning through Evolvable Neural Turing Machines.

**Best Paper Award** *Evolutionary and Biologically Inspired Music, Sound, Art and Design (EvoMusArt 2016)* (out of 25), for Marco Scirea, Julian Togelius, Peter Eklund, Sebastian Risi, MetaCompose: A Compositional Evolutionary Music Composer.

**Virtual Creatures Contest Finalists** *Genetic and Evolutionary Computation Conference* (GECCO-2015, Madrid, Spain), for Lisborg, A. and Risi, S., Evolving Flying EVCs With Novelty Search.

**Best Paper Award Finalist** One of 5 (out of 198) *Proceedings of the 5th International Conference on Intelligent Robotics and Applications* (ICIRA- 2012, Montral, Canada), for D'Ambrosio, D.B., Goodell, S., Lehman, J., Risi, S. and Stanley, K.O., Multirobot Behavior Synchronization through Direct Neural Network Communication.

**Best Student Paper Award** (out of 299 papers submitted with student first authors) *International Joint Conference on Neural Networks* (IJCNN-2012, Brisbane, Australia), for Risi, S. and Stanley, K., A Unified Approach to Evolving Plasticity and Neural Geometry.

**Nominated for Best Paper Award** in Generative and Developmental Systems (2 of 20 nominated) *Genetic and Evolutionary Computation Conference* (GECCO-2011, Dublin, Ireland), for Risi, S. and Stanley, K., Enhancing ES-HyperNEAT to Evolve More Complex Regular Neural Networks.

**Best Paper Award** in Artificial Life, Evolutionary Robotics, Adaptive Behavior, Evolvable Hardware (out of 42) *Genetic and Evolutionary Computation Conference* (GECCO-2009, Montreal, Canada), for Risi, S., Vanderbleek, S., Hughes, C., Stanley, K., How Novelty Search Escapes the Deceptive Trap of Learning to Learn.

**Best Paper Award** in Generative and Developmental Systems (out of 20) *Genetic and Evolutionary Computation Conference* (GECCO-2010, Portland, OR), for Risi, S., Lehman, J., Stanley, K., Evolving the Placement and Density of Neurons in the HyperNEAT Substrate.

To Students I advise: Tony Emile Yves Beltramelli, **Nominated for the best Master's thesis in Computer Science 2015** by the Danish Society for Computer Science. Niels Justesen, **Winner of an EliteForsk travel grant**, 2018.

## PUBLICATIONS

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All my publications can be downloaded from: [sebastianrisi.com/publications](http://sebastianrisi.com/publications)

Google Scholar page: <https://scholar.google.com/citations?user=Tf8winBIYUsC>

Note: Student co-authors are marked with an asterisk (\*)

### *Edited Publications*

1. Steve Dahlskog, Sebastian Deterding, José Font, Mitu Khandaker, Carl Magnus Olsson, Sebastian Risi, Christoph Salge (2018). *Proceedings of the 13th International Conference on the Foundations of Digital Games*. ACM New York, NY, USA.
2. Hod Lipson, Hiroki Sayama, John Rieffel, Sebastian Risi, and René Doursat, eds. (2014). *Artificial Life 14: Proceedings of the Fourteenth International Conference on the Synthesis and Simulation of Living Systems*, MIT Press.

### *Journal Articles*

1. Niels Justesen\*, Philip Bontrager\*, Julian Togelius, Sebastian Risi: Deep Learning for Video Game Playing. Submitted.
2. Jacob Schrum, Sebastian Risi, Joel Lehman: Using Indirect Encoding of Multiple Brains to Produce Multimodal Behavior. Submitted. arXiv preprint: <http://arxiv.org/abs/1604.07806>
3. Andrea Soltoggio, Kenneth O. Stanley, Sebastian Risi: Born to Learn: the Inspiration, Progress, and Future of Evolved Plastic Artificial Neural Networks. In: *Neural Networks* journal.
4. Frank Veenstra, Chloe Metayer, Sebastian Risi, Kasper Stoy: Towards Energy Autonomy in Heterogeneous Modular Plant-Inspired Robots through Artificial Evolution. In: *Frontiers in Robotics and AI, section Bionics and Biomimetics*, 2017.
5. Stefano Nichele, Mathias Berild Ose\*, Sebastian Risi, Gunnar Tufte (2017): CA-NEAT: Evolved Compositional Pattern Producing Networks for Cellular Automata Morphogenesis and Replication. Accepted to appear: *IEEE Transactions on Cognitive and Developmental Systems*.
6. Niels Justesen\*, Tobias Mahlmann, Sebastian Risi and Julian Togelius: Playing Multi-Action Adversarial Games: Online Evolution vs. Tree Search. Accepted to appear in: *IEEE Transactions on Computational Intelligence and AI in Games* (TCIAIG).
7. Marco Scirea\*, Julian Togelius, Peter Eklund, Sebastian Risi (2017): Affective Evolutionary Music Composition with MetaCompose. In: *Genetic Programming and Evolvable Machines* (GENP).
8. Daniel Cellucci\*, Robert MacCurdy, Hod Lipson, Sebastian Risi (2017): 1D Printing of Recyclable Robots. In: *IEEE Robotics and Automation Letters* (RA-L). The contents of this paper were also selected by IROS'17 Program Committee for presentation at the Conference.  
Video: <https://youtu.be/ElW002IiuXA>

9. Andrés Faína, Lars Toft Jacobsen\*, [Sebastian Risi](#) (2017): Automating the Incremental Evolution of Controllers for Physical Robots. In: *Artificial Life Journal Special Issue on the Evolution of Physical Systems*.
10. Tim Taylor, Josh Auerbach, Josh Bongard, Jeff Clune, Simon Hickinbotham, Mizuki Oka, [Sebastian Risi](#), Kenneth O. Stanley, Jason Yosinski (2016): WebAL Comes of Age: A review of the first 21 years of Artificial Life on the Web. To appear in: *Artificial Life* journal.
11. Daniel Jallof\*, Julian Togelius, [Sebastian Risi](#): EvoCommander: A Novel Game Mechanic Based on the Indirect Control Of Evolving Neural Network (2016). To appear in: *IEEE Transactions on Computational Intelligence and AI in Games* (TCIAIG).
12. [Sebastian Risi](#) and Julian Togelius: Neuroevolution in Games: State of the Art and Open Challenges (2015). To appear in: *IEEE Transactions on Computational Intelligence and AI in Games* (TCIAIG).
13. [Sebastian Risi](#), Joel Lehman, David B. D'Ambrosio, Ryan Hall and Kenneth Stanley (2015). Petalz: Search-based Procedural Content Generation for the Casual Gamer. In: *IEEE Transactions on Computational Intelligence and AI in Games* (TCIAIG).
14. Joel Lehman, Jeff Clune and [Sebastian Risi](#) (2014): An Anarchy of Methods: Current Trends in How Intelligence is Abstracted in AI. In: *IEEE Intelligent Systems*, 29(6): 56–62.
15. Joel Lehman, [Sebastian Risi](#), David D'Ambrosio and Kenneth Stanley (2013): Encouraging Reactivity to Create Robust Machines. In: *Adaptive Behavior*.
16. [Sebastian Risi](#) and Kenneth O. Stanley (2012): An Enhanced Hypercube-Based Encoding for Evolving the Placement, Density, and Connectivity of Neurons. In: *Artificial Life*, 18: 1-33, Cambridge, MA: MIT Press.
17. [Sebastian Risi](#), Charles E. Hughes, and Kenneth O. Stanley (2010): Evolving Plastic Neural Networks with Novelty Search. In: *Adaptive Behavior*, 18(6): 470-49, London: SAGE.

#### Articles in Books

1. Invited article. Dan Ashlock, [Sebastian Risi](#), Julian Togelius: Representations for search-based methods. To appear in: *Procedural Content Generation in Games: A Textbook and an Overview of Current Research*. Springer. 2015. To appear.

#### Refereed Conference, Symposium, and Workshop Papers

1. Marco Scirea, Peter Eklund, Julian Togelius, and [Sebastian Risi](#): Evolving in-game mood-expressive music with MetaCompose In: *Proceedings of Audio Mostly* (AM 2018). **Winner of the best paper award.**
2. Jichen Zhu, Antonios Liapis, [Sebastian Risi](#), Rafael Bidarra and Michael Youngblood: Explainable AI for Designers: A Human-Centered Perspective on Mixed-Initiative Co-Creation To appear: *Proceedings of the IEEE Conference on Computational Intelligence and Games* (CIG 2018).
3. Frank Veenstra\*, Pablo González de Prado Salas, Josh Bongard, Kasper Støy and [Sebastian Risi](#): Intrinsic Mortality Governs Evolvability. In: *Proceedings of the 2018 Conference on Artificial Life*. **Winner of the best student paper award.**
4. Niels Justesen\* and [Sebastian Risi](#) (2018): Automated Curriculum Learning by Rewarding Temporally Rare Events. To appear: *Proceedings of the IEEE Conference on Computational Intelligence and Games* (CIG 2018).
5. Mostafa Wahby\*, Mary Katherine Heinrich\*, Daniel Nicolas Hofstadler\*, Payam Zahadat, [Sebastian Risi](#), Phil Ayres, Thomas Schmickl, Heiko Hamann (2018): A Robot to Shape your Natural Plant: The Machine Learning Approach to Model and Control Bio-Hybrid Systems. To appear in: *Proceedings of the Conference on Genetic and Evolutionary Computation* (GECCO 2018). New York, NY: ACM (8 pages).

6. Frank Veenstra\*, Jonas Jørgensen, [Sebastian Risi](#) (2018): Evolution of Fin Undulation on a Physical Knifefish-inspired Soft Robot To appear in: *Proceedings of the Conference on Genetic and Evolutionary Computation* (GECCO 2018). New York, NY: ACM (8 pages).
7. Vanessa Volz\*, Jacob Schrum, Jialin Liu, Simon M. Lucas, Adam M. Smith, [Sebastian Risi](#) (2018): Evolving Mario Levels in the Latent Space of a Deep Convolutional Generative Adversarial Network To appear in: *Proceedings of the Conference on Genetic and Evolutionary Computation* (GECCO 2018). New York, NY: ACM (8 pages). **Winner of a best paper award.**
8. Jakob Merrild\*, Mikkel Angaju Rasmussen and [Sebastian Risi](#) (2018): HyperNTM: Evolving Scalable Neural Turing Machines through HyperNEAT. To appear in: *Proceedings of the 21th European Conference on the Applications of Evolutionary Computation* (EvoApplications 2018)
9. Philip Bontrager\*, Wending Lin\*, Julian Togelius and [Sebastian Risi](#) (2018): Deep Interactive Evolution. To appear in: *Proceedings of Evolutionary and Biologically Inspired Music, Sound, Art and Design* (EvoMusArt 2018).
10. Stefano Nichele, [Sebastian Risi](#), Gunnar Tufte and Laura Beloff (2017): Towards a Plant Bio-Machine. To appear in: *Proceedings of the IEEE Symposium Series on Computational Intelligence* (SSCI 2017)
11. Niels Justesen\*, and [Sebastian Risi](#) (2017): Learning Macromanagement in StarCraft from Replays using Deep Learning. To appear in: *Proceedings of the IEEE Conference on Computational Intelligence and Games* (CIG 2017).
12. Marco Scirea\*, Julian Togelius, Peter Eklund, [Sebastian Risi](#) (2017): Primal-Improv: Towards Co-Evolutionary Musical Improvisation'). Accepted to appear in: *Proceedings of the 2017 9th Computer Science and Electronic Engineering* (CEECE'17)
13. Andreas Precht Poulsen\*, Mark Thorhauge\*, Mikkel Hvilshøj Funch\* and [Sebastian Risi](#) (2017): DLNE: A Hybridization of Deep Learning and Neuroevolution for Visual Control. To appear in: *Proceedings of the IEEE Conference on Computational Intelligence and Games* (CIG 2017). **Winner of the best paper award.**
14. Niels Justesen\*, and [Sebastian Risi](#) (2017): Continual Online Evolution for In-Game Build Order Adaptation in StarCraft. To appear in: *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO-2017)*. New York, NY: ACM.
15. Marco Scirea\*, Julian Togelius, Peter Eklund, [Sebastian Risi](#) (2017): Can you feel it? Evaluation of affective expression in music generated by MetaCompose. To appear in: *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO-2017)*. New York, NY: ACM
16. Frank Veenstra\*, Andres Faina, [Sebastian Risi](#), Kasper Stoy (2017): Evolution and Morphogenesis of Simulated Modular Robots: A Comparison Between a Direct and Generative Encoding. To appear in: *Proceedings of the 20th European Conference on the Applications of Evolutionary Computation* (EvoApplications 2017)
17. Pablo González de Prado Salas, [Sebastian Risi](#): Interactive Evolution of Complex Behaviours through Skill Encapsulation. To appear in: *Proceedings of the 20th European Conference on the Applications of Evolutionary Computation* (EvoApplications 2017)
18. Benno Lüders\*, Mikkel Schläger\*, Aleksandra Korach\*, and [Sebastian Risi](#) (2017): Continual and One-Shot Learning through Neural Networks with Dynamic External Memory. In: *Proceedings of the 20th European Conference on the Applications of Evolutionary Computation* (EvoApplications 2017). **Winner of a best paper award.**
19. Patrikk Sørensen\*, Jeppeh Olsen\*, and [Sebastian Risi](#) (2016): Interactive Super Mario Bros Evolution. In: *Proceedings of the IEEE Conference on Computational Intelligence and Games* (CIG-2016). Piscataway, NJ:IEEE.

20. Cristinel Patrascu\* and Sebastian Risi (2016): Artefacts: Minecraft meets Collaborative Interactive Evolution. In: *Proceedings of the IEEE Conference on Computational Intelligence and Games (CIG-2016)*. Piscataway, NJ:IEEE.
21. Joel Lehman, Sebastian Risi, and Jeff Clune (2016): Creative Generation of 3D Objects with Deep Learning and Innovation Engines. In: *The Seventh International Conference on Computational Creativity (ICCC 2016)*.
22. Frank Veenstra\*, Andres Faina, Kasper Stoy and Sebastian Risi (2016): Generating Artificial Phytomorphologies for Function and Aesthetics through Evolving L-Systems. In: *Proceedings of The Fifteenth International Conference on the Simulation and Synthesis of Living Systems (ALife XV)*, 2016.
23. Mathias Löwe\* and Sebastian Risi: Accelerating the Evolution of Cognitive Behaviors Through Human-Computer Collaboration. In: *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO-2016)*. New York, NY: ACM (8 pages).
24. Rasmus Boll Greve\*, Emil Juul Jacobsen\*, and Sebastian Risi: Evolving Neural Turing Machines for Reward-based Learning. In: *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO-2016)*. New York, NY: ACM (8 pages).
25. Sebastian Bak\*, Nina Rask\*, Sebastian Risi: Towards Adaptive Evolutionary Architecture. In: *Proceedings of Evolutionary and Biologically Inspired Music, Sound, Art and Design (EvoMusArt)*, 2016.
26. Marco Scirea\*, Julian Togelius, Peter Eklund, Sebastian Risi: MetaCompose: A Compositional Evolutionary Music Composer. In: *Proceedings of Evolutionary and Biologically Inspired Music, Sound, Art and Design (EvoMusArt 2016)*. **Winner of a best paper award.**
27. Heiko Hamann, Mostafa Wahby, Thomas Schmickl, Payam Zahadat, Daniel Hofstadler, Kasper Stoy, Sebastian Risi, Andres Faina, Frank Veenstra, Serge Kernbach, Igor Kuksin, Olga Kernbach, Phil Ayres and Przemyslaw Wojtaszek: Flora Robotica - Mixed Societies of Symbiotic Robot-Plant Bio-Hybrids. In: *Proceedings of the 2015 IEEE Symposium on Artificial Life (IEEE ALIFE 2015)*.
28. Frederik Frydenberg\*, Kasper Andersen\*, Sebastian Risi and Julian Togelius: Investigating MCTS Modifications in General Video Game Playing. In: *Proceedings of the 2015 IEEE Conference on Computational Intelligence and Games*.
29. Dan Lessin and Sebastian Risi: Soft-Body Muscles for Evolved Virtual Creatures: The Next Step on a Bio-Mimetic Path to Meaningful Morphological Complexity. In: *Proceedings of the 13th European Conference on Artificial Life (ECAL 2015)*.
30. Jacob Fischer\*, Nikolaj Falsted\*, Mathias Vielwerth\*, Julian Togelius, Sebastian Risi: Monte Carlo Tree Search for Simulated Car Racing. In: *Proceedings of the Foundations of Digital Games Conference (FDG 2015)*.
31. Björn Jónsson\*, Amy Hoover, and Sebastian Risi: Interactively Evolving Compositional Sound Synthesis Networks In: *Genetic and Evolutionary Computation Conference (GECCO-2015)*.
32. Dan Lessin and Sebastian Risi: Manual Muscle Control in Evolved Virtual Creatures: A Novel Form of Gameplay Made Possible by Evolutionary Computation. In: *Genetic and Evolutionary Computation Conference (GECCO-2015)*.
33. Peter Thorup Ølsted\*, Benjamin Ma\*, and Sebastian Risi: Interactive Evolution of Levels for a Competitive Multiplayer FPS. In: *Proceedings of IEEE Congress on Evolutionary Computation (IEEE CEC 2015)*.
34. Jan Piskur\*, Peter Greve\*, Julian Togelius, and Sebastian Risi: BrainCrafter: An Investigation Into Human Neural Network Engineering. In: *Proceedings of the IEEE Congress on Evolutionary Computation (IEEE CEC 2015)*.

35. Jinhong Zhang\*, Rasmus Taarnby\*, Antonios Liapis and Sebastian Risi (2015): DrawCompileEvolve: Sparking Interactive Evolutionary Art with Human Creations. To appear in: *Proceedings of the Eighth European Event on Evolutionary and Biologically Inspired Music, Sound, Art and Design* (EvoMUSART 2015). New York, NY: Springer.
36. Niels Justesen\*, Bálint Tillman\*, Julian Togelius, Sebastian Risi (2014): Script- and Cluster-based UCT for StarCraft. In: *Proceedings of the IEEE Conference on Computational Intelligence and Games* (CIG-2014). Piscataway, NJ:IEEE.
37. Sebastian Risi and Kenneth Stanley (2014): Guided Self-Organization in Indirectly Encoded and Evolving Topographic Maps. In: *Proceedings of the Genetic and Evolutionary Computation Conference* (GECCO-2014). New York, NY: ACM.
38. Gregory Morse, Sebastian Risi, and Kenneth Stanley (2013): Single-Unit Pattern Generators for Quadruped Locomotion. In: *Proceedings of the Genetic and Evolutionary Computation Conference* (GECCO-2013).
39. Sebastian Risi, Daniel Cellucci and Hod Lipson (2013). Ribosomal Robots: Evolved Designs Inspired by Protein Folding. In: *Proceedings of the Genetic and Evolutionary Computation Conference* (GECCO-2013).
40. Sebastian Risi and Kenneth Stanley (2013): Confronting the Challenge of Learning a Flexible Neural Controller for a Diversity of Morphologies. In: *Proceedings of the Genetic and Evolutionary Computation Conference* (GECCO-2013). Note: Videos of this best evolved controller are available at <http://youtu.be/JzLamilbUMk>.
41. Sebastian Risi, Joel Lehman, David D'Ambrosio, Ryan Hall and Kenneth Stanley (2012): Introducing a Marketplace for Evolved Content in the Petalz Social Video Game. In: *Proceedings of the Eighth Annual AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment* (AIIDE 2012).
42. David D'Ambrosio, Skyler Goodell, Joel Lehman, Sebastian Risi and Kenneth Stanley (2012): Multirobot Behavior Synchronization through Direct Neural Network Communication. In: *Proceedings International Conference on Intelligent Robotics and Applications* (ICIRA 2012). Note: This paper is accompanied with a set of video demos at <http://eplex.cs.ucf.edu/demos/hive-brain-patrol>. **One of 5 (out of 198) Best Paper Award Finalists.**
43. Joel Lehman, Sebastian Risi, David D'Ambrosio and Kenneth Stanley (2012): Rewarding Reactivity to Evolve Robust Controllers without Multiple Trials or Noise. In: *Proceedings of the Thirteenth International Conference on Artificial Life* (ALIFE XIII). Cambridge, MA: MIT Press.
44. Sebastian Risi and Kenneth O. Stanley (2012): A Unified Approach to Evolving Plasticity and Neural Geometry. In: *Proceedings of the International Joint Conference on Neural Networks* (IJCNN-2012). New York, NY: IEEE.  
**Winner of the Best Student Paper Award (out of 299 papers submitted with student first authors)**
45. David B. D'Ambrosio, Joel Lehman, Sebastian Risi, and Kenneth O. Stanley (2011). Task Switching in Multiagent Learning through Indirect Encoding. In: *Proceedings of the International Conference on Intelligent Robots and Systems* (IROS 2011, San Fransisco, CA). Piscataway, NJ: IEEE. Note: This article is accompanied by a demonstration video at <http://eplex.cs.ucf.edu/patrolling.html>
46. Sebastian Risi and Kenneth O. Stanley (2011). Enhancing ES-HyperNEAT to Evolve More Complex Regular Neural Networks. In: *Proceedings of the Genetic and Evolutionary Computation Conference* (GECCO-2011, Dublin, Ireland). New York, NY: The Association for Computing Machinery.  
**Nominated for Best Paper Award in Generative and Developmental Systems (2 of 20 nominated in track)**

47. Sebastian Risi and Kenneth O. Stanley (2010): Indirectly Encoding Neural Plasticity as a Pattern of Local Rules. In: *Proceedings of the 11th International Conference on Simulation of Adaptive Behavior* (SAB 2010). 533-543, New York, NY: Springer.
48. Sebastian Risi, Joel Lehman, and Kenneth O. Stanley (2010): Evolving the Placement and Density of Neurons in the HyperNEAT Substrate. In: *Proceedings of the Genetic and Evolutionary Computation Conference* (GECCO-2010). 563-57, New York, NY:ACM.  
**Winner of the Best Paper Award in Generative and Developmental System (out of 20 submissions in track)**
49. David B. D'Ambrosio, Joel Lehman, Sebastian Risi, and Kenneth O. Stanley (2010): Evolving Policy Geometry for Scalable Multiagent Learning. In: *Proceedings of the Ninth International Conference on Autonomous Agents and Multiagent Systems* (AAMAS-2010), 731-73. Note: This paper is accompanied with a set of videos at <http://eplex.cs.ucf.edu/mahnaamas2010.html>
50. Sebastian Risi, Sandy Vanderbleek, Charles E. Hughes and Kenneth O. Stanley (2009): How Novelty Search Escapes the Deceptive Trap of Learning to Learn. In: *Proceedings of the Genetic and Evolutionary Computation Conference* (GECCO-2009). 153-16, New York, NY: ACM.  
**Winner of a Best Paper Award in Artificial Life, Evolutionary Robotics, Adaptive Behavior, Evolvable Hardware (out of 42 submissions in track)**
51. Pascal Lehwerk, Sebastian Risi and Alfred Ultsch: Visualization and clustering of tagged music data. In: *Proceedings of the 31st Annual Conference of the German Classification Society* (GfKI-2007), Freiburg, Germany.

#### Workshop and Minimally-Reviewed Publications

1. Niels Justesen\*, Sebastian Risi, Julian Togelius Blood Bowl: The Next Board Game Challenge for AI. To appear in: *FDG workshop on Tabletop Games*, 2018 (2 pages).
2. Heiko Hamann, Mohammad Divband Soorati\*, Mary Katherine Heinrich\*, Daniel Nicolas Hofstadler, Igor Kuksin, Frank Veenstra\*, Mostafa Wahby\*, Stig Anton Nielsen, Sebastian Risi, Tomasz Skrzypczak, Payam Zahadat, Przemyslaw Wojtaszek, Kasper Stoy, Thomas Schmickl, Serge Kernbach and Phil Ayres: flora robotica - An Architectural System Combining Living Natural Plants and Distributed Robots. To appear in: *Living Architectures Workshop 2017, at the European Conference on Artificial Life (ECAL) 2017*.
3. Stefano Nichele, Mathias Berild Ose\*, Sebastian Risi, Gunnar Tuftte: CA-NEAT: An Evolved Cellular Automata Morphogenetic System Based On Compositional Pattern-Producing Network Developmental Mappings. To appear in: *Morphogenetic Engineering Workshop, at the European Conference on Artificial Life (ECAL) 2017*.
4. Benno Lüders\*, Mikkel Schläger\*, and Sebastian Risi: Continual Learning through Evolvable Neural Turing Machines. In: *Proceedings of the NIPS 2016 Workshop on Continual Learning and Deep Networks (CLDL 2016)*. **Winner of the Best Paper Award.**
5. Rasmus Boll Greve\*, Emil Juul Jacobsen\*, and Sebastian Risi: Evolving Neural Turing Machines. In: *Proceedings of the NIPS 2015 Workshop on Reasoning, Attention, Memory (RAM 2015)*
6. Sebastian Risi, Jinhong Zhang\*, Rasmus Taarnby\*, Peter Greve\*, Jan Piskur\*, Antonios Liapis, and Julian Togelius (2014): The Case for a Mixed-Initiative Collaborative Neuroevolution Approach. In: *Proceedings of the Workshop on Artificial Life and the Web* (WebAL-1) at the 14th International Conference on the Synthesis & Simulation of Living Systems (ALIFE-14).
7. Sebastian Risi, Joel Lehman, David B. D'Ambrosio and Kenneth Stanley (2014): Automatically Organizing Procedurally Generated Content for Collecting Games. In: *Proceedings of the Workshop on Procedural Content Generation in Games (PCG) at the 9th International Conference on the Foundations of Digital Games* (FDG-2014). New York, NY: ACM



8. [Sebastian Risi](#) (2013): A Compiler for CPPNs: Transforming Phenotypic Descriptions Into Genotypic Representations. In: *Proceedings of the 2013 AAAI Fall Symposium on How Should Intelligence be Abstracted in AI Research*.
9. Joel Lehman, [Sebastian Risi](#) and Kenneth Stanley (2012): The Benefits of Divergent Search for Evolved Representations. In: *Proceedings of the Workshop of the Thirteen International Conference on Artificial Life (ALIFE XIII)*. Cambridge, MA: MIT Press.
10. [Sebastian Risi](#), Fabian Mörchen, Alfred Ultsch and Pascal Lehwark: Visual mining in music collections with Emergent SOM. In: *Proceedings of the 6th International Workshop on Self-Organizing Maps (WSOM-2007)*, Bielefeld, Germany.

#### Non-Refereed Publications

1. Joel Lehman, and [Sebastian Risi](#): Creative machines: The next frontier for artificial intelligence. Videnskab.dk. [Danish](#) / [English](#) version. 2016.
2. Dan Lessin, Don Fussell, Risto Miikkulainen, [Sebastian Risi](#): Increasing Behavioral Complexity for Evolved Virtual Creatures with the ESP Method In: ArXiv e-prints. E-print no.arXiv:1510.07957. Submitted Oct 2015
3. Burns G, Gil Y, Liu Y, Villanueva-Rosales N, [Risi S](#), Lehman J, Clune J, Lebiere C, Rosenbloom P S, van Harmelen F, Hendler J A, Hitzler P, Janowic K, Swarup S. Reports on the 2013 AAAI Fall Symposium Series. AI Magazine. 2014. 35 (2), 69-74. (invited article)
4. Kenneth O. Stanley, Jeff Clune, David B. D'Ambrosio, Colin D. Green, Joel Lehman, Gregory Morse, Justin K. Pugh, [Sebastian Risi](#), and Paul Szerlip (2013): CPPNs Effectively Encode Fracture: A Response to Critical Factors in the Performance of HyperNEAT. University of Central Florida Dept. of EECS Technical Report CS-TR-13-05.

#### INVITED TALKS AND PRESENTATIONS

- "Meta-learning in Games", **Invited Keynote**, Games and Games Intelligence (IGGI) 2018 Conference, London, Oct. 2018.
- "Creating Adaptive Machine through Evolutionary-based Meta Learning", **Invited Keynote**, Autonomy Day 2018, Oslo, Norway, May 2018.
- "Procedural Content Generation through Neural Network-based Approaches" **Invited Talk**, King Digital Entertainment, Stockholm, March 15th, 2018.
- "Why Video Games could be the Key towards Artificial Intelligence" **Invited Talk** hosted by Selskabet for Naturlærers Udbredelse, Copenhagen, October 2017 (over 200 participants)
- "Evolving Lifelong Learning Machines" **Invited Talk**. Google DeepMind, London, October 2017.
- Dagstuhl Seminar. **Invited Participant** at Dagstuhl Seminar on Artificial and Computational Intelligence in Games: AI-Driven Game Design, Dagstuhl, Germany, November 2017.
- "Design Through Evolution" **Invited Talk**, InnoChain workshop seminar lectures at the Institute for Advanced Architecture of Catalonia (IAAC), Barcelona 2017.
- "Towards More Adaptive and Creative Artificial Intelligence in Games" **Invited Talk**, Golem.de Tech-Summit - Quo Vadis 2017, Berlin, April 2017.
- "Combining Deep Learning and Artificial Evolution" **Invited talk**, Current Trends in Artificial Intelligence, 1st DTU Compute Workshop, Copenhagen, Nov. 22nd 2016. Over 100 attendees.
- "Human Computation for Embodied Agents" **Invited talk**, Danish Embodied Artificial Intelligence Workshop, Odense, Nov. 10th 2016.

- “Evolutionary Robotics and Embodied Cognition” **Invited talk** at the Danish e-Infrastructure Corporation (DeIC) conference about our DeIC eScience pilot project, Oct 4th, 2016.
- “Towards More Adaptive and Creative Artificial Intelligence” **Invited talk University of Essex**, AI Seminar, April 14th, 2016.
- “Bio-inspired, Automated Design of Machine Bodies and Artificial Brains” **Invited talk**. European Robotics Week in Prague, Nov 28th, 2015.
- “Generative and Developmental Systems” **Invited Talk**, Workshops about art and science: Artistic investigations into Robots and Plants, Nov 11th, 2015. National Autonomous University of Mexico. (through Skype)
- “Will self-replicating evolving robots take over the planet?” **Invited talk for OpenITU**, October 24th, 2014 (OpenITU opens the ITU to the public, with topics in ICT publicly debated)
- “Bio-inspired, Automated Design of Machine Bodies and Adaptive Brains” **Invited Keynote, PPSN 2014 Workshop on Nature-inspired Techniques for Robotics.**, September 12th, 2014
- “Evolving Complex Patterns Through a High-Level Abstraction of Natural Development”. **Invited talk for Copenhagen School of Design and Technology (KEA)**, Copenhagen, Denmark, March 13th, 2014.
- “Abstracting the Essential Properties of Natural Evolution into Evolutionary Computation”. **Invited talk for European Bioinformatics Institute**, Cambridge, England, July 7th, 2011.
- “Adaptive Tactical Team-AI for Next Generation Bots”. **Invited talk for Microsoft Gamefest**, Seattle, Washington, 2008. A demonstration of the Counter Strike teams that I created during my time at xaitment is available here: <http://www.youtube.com/watch?v=-yW1lKEQRvg>
- “Tactical Team-AI for Next Generation Bots”. **Invited talk for Quo Vadis Developer Conference**, Berlin, Germany, 2008.

## PATENTS

- Sebastian Risi, Julian Togelius, Noor Shaker. *A method for (re-)training a machine learning component*. Patent application filed, Sep. 12th 2017.
- David D’Ambrosio, Sebastian Risi, Joel Lehman, Amy Hoover and Kenneth O. Stanley. *Generating Flower Images and Shapes with Compositional Pattern Producing Networks*. University of Central Florida. US Patent 20,130,083,016

## TEACHING EXPERIENCE

### *Graduate Courses*

- Teacher *Modern AI for Games***. ITU, Copenhagen, Fall 2013, 2014, 2015, 2016, 2017.
- Teacher *Data Mining*** ITU, Copenhagen, Spring 2014, 2015, 2016, 2017, 2018.
- Teacher *Artificial Life and Evolutionary Robotics*** ITU, Copenhagen, Spring 2014, 2015, 2016.

### *Teaching Training*

- ITU’s Assistant Professors Programme**. IT University of Copenhagen. Completed May 2016.
- Preparing Tomorrow’s Faculty Program**. University of Central Florida, Summer 2012  
Received training in course design, delivery of instruction, teaching strategies, collaborative learning and classroom management.

### *Other Educational Contributions*

- Guest lectures for *Evolutionary Computation***. Cornell University, 2012.

## STUDENTS SUPERVISED

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### Ph.D. Students:

- ◇ Mathias Kristian Kyndlo Löwe (industrial PhD), 2018 - present
- ◇ Mads Johansen Lassen (co-supervised with Martin Pichlmaier), 2018 - present
- ◇ Niels Justesen, 2016 - present
- ◇ Frank Veenstra (Flora-Robotica project; co-supervised with Kasper Stoy). Dissertation title: *The Watchmaker's guide to Artificial Life: On the Role of Death, Modularity and Physicality in Evolutionary Robotics*. Graduated May 2018.
- ◇ Marco Scirea. Dissertation title: *Affective Music Generation and its effect on player experience*. Graduated Oct. 2017. *Now: Assistant Professor position at the University of Southern Denmark.*

### Postdocs:

- ◇ Djordje Grbic, 2018 - present
- ◇ Pablo González de Prado Salas, 2015 - 2018
- ◇ Stefano Nichele, Visiting Postdoc, August 2016 - December 2016
- ◇ Dan Lessin, 2014 - 2016

### Head of PhD Defense Committee:

- ◇ Christoffer Holmgård, 2015

Supervised over 50 Masters and over 30 Bachelor students

## PROFESSIONAL ACTIVITIES AND OUTREACH

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- ◇ Task Force Member, IEEE Technical Committee on Cognitive and Developmental System, 2015-present.
- ◇ Advisory Board, Apex Game Tools, 2015 - present
- ◇ Participated in the Fundamentals of Collective Adaptive Systems FoCa App Sprint 2014 ([www.focas.eu](http://www.focas.eu)), with the goal to produce widely accessible training/teaching material about collective adaptive systems.
- ◇ Editorial Board *Frontiers in Evolutionary Robotics*
- ◇ 2015 Nominated for election to the Board of Directors of the International Society for Artificial Life (ISAL)
- ◇ Judge for the Virtual Creatures Competition at GECCO 2014.

### Service to the University

- ◇ Vice-Head of Program, ITU's Master in Games (comprised of approx. 110 students), Aug. 2016 - present
- ◇ Evaluator for faculty positions: IT University of Copenhagen, Aalborg University
- ◇ ITU Subject Area Team Games, 2014 - present

### Conference Organization

- ◇ Program Co-Chair, Foundations of Digital Games, August 2018, Malmö
- ◇ Track Co-Chair of the Complex Systems Track at GECCO-2018.

- ◇ Co-Organizer, GECCO Virtual Creature Competition, 2017–2018.
- ◇ Co-Organizer, Symposium on Crossing into Physical Realms with Collaborative & Interactive Machine Learning, Co-hosted by the Centre for IT and Architecture (CITA) and the Robotics, Evolution and Art Lab (REAL), Feb 12th, 2016.
- ◇ Co-Chair, Workshop on Procedural Content Generation in Games (PCG-2015) at FDG 2015.
- ◇ Local-chair Evostar 2015, Copenhagen, Denmark, 8-10 April 2015 (the Leading European Event on Bio-Inspired Computation)
- ◇ Track Co-Chair of the Generative and Developmental Systems Track at the Genetic and Evolutionary Computation Conference (GECCO-2015).
- ◇ Organizing Committee, International Conference on the Simulation & Synthesis of Living Systems (Alife-2014), July 23-26, 2014, NYC.
- ◇ Track Co-Chair of the Generative and Developmental Systems Track at the Genetic and Evolutionary Computation Conference (GECCO-2014).
- ◇ Co-Chair, AAAI Symposium on How Should Intelligence be Abstracted in AI Research, November 15-17, 2013, Washington DC. Attendees: 38 participants and five keynotes of major leader of their respective fields (Andrew Ng, Stanford; Georg Striedter, UC Irvine; Randall O'reilly, University of Colorado Boulder; Risto Miikkulainen, UT Austin; Gary Marcus, NYU; Pierre-Yves Oudeyer, Inria France).

### Reviewer and Program Committees

Reviewer:

- *Funding agencies*: **ERC** (external reviewer for a Starting and Consolidator Grant), The Icelandic Research Fund, Engineering and Physical Sciences Research Council (EPSRC; UK), South Africa's National Research Foundation (NRF), National Council of Science and Technology of Chile
- *Journals*: **Nature Communications**, PLOS ONE, Journal of Artificial Intelligence Research (JAIR), Neural Networks, Evolutionary Computation Journal, Frontiers in Neurorobotics, Transactions on Computational Intelligence and AI in Games, IEEE Transactions on Evolutionary Computation
- *Conferences and Workshops*: **AAAI**, **NIPS**, International Conference on the Synthesis and Simulation of Living Systems (ALIFE), CHI Play, Foundations of Digital Games (FDG), Conference on Computational Intelligence and Games (CIG), AI and Interactive Digital Entertainment Conference (AIIDE), Genetic and Evolutionary Computation Conference (**GECCO**), Robotics and Autonomous Systems, Genetic Programming and Evolvable Machines, Workshop on Development and Learning in Artificial Neural Networks (DevLeaNN)

### Membership

IEEE (Institute of Electrical and Electronic Engineers)

ACM (Association for Computing Machinery)

AAAI (American Association for Artificial Intelligence)

CIS (Computational Intelligence Society)

### SOFTWARE AND GAMES RELEASED

**Artefacts** combines a sandbox-like environment akin to Minecraft with the ability to interactively evolve unique three-dimensional building blocks. Artefacts does not only allow players to collaborate by building larger structures from evolved objects but also to continue evolution of others' artefacts. Supervised creation by Cristinel Patrascu (Master Student). Released January 2016.

**FPSEvolver** is a competitive multiplayer FPS game in which a group of players can generate, play and improve levels to fit their particular preferences by voting on a selection of evolving levels. Supervised creation by Peter Thorup Ølsted and Benjamin Ma (Master Students). Released January 2015. Available at: [http://peterolsted.com/thesis\\_game/FPS\\_Evolver.zip](http://peterolsted.com/thesis_game/FPS_Evolver.zip)

**EvoCommander** is a game that allows players to interactively evolve neural networks and then switch between them during battle. Supervised creation by Daniel Jallov (Master Student). Release Fall 2014. Available at: <http://jallov.com/thesis>

**UnityNEAT** a port of SharpNEAT from pure C# 4.0 to Unity 4.x (using Mono 2.6), integrated to work with Unity scenes for evaluation. Supervised creation by Daniel Jallov (Master Student). Released fall 2014. Available at: <https://github.com/lordjesus/UnityNEAT>

**DrawCompileEvolve** website for drawing image that can then be further evolved interactively. Supervised creation of program by Rasmus Taarnby and Jinhong Zhan (Master Students). Released fall 2014. Available at: <http://rasmustaarnby.dk/drawcompileevolve>

**BrainCrafter** is an online program that allows users to manually build artificial neural networks to control a robot. BrainCrafter was designed to study how good humans are at building complex networks for control problems and if collaborating with other users can facilitate this process. Supervised creation of program by Peter Greve and Jan Piskur (Master Students). Released Fall 2014. Available at: [braincrafter.dk](http://braincrafter.dk)

**Petalz** is a social Facebook game that demonstrates novel AI technology invented at the University of Central Florida. Petalz allows the player to breed an unlimited variety of different flowers. As the project leader I originated the idea for the game and supervised its creation. Petalz is the first game that combines unique user generated content with social gaming on Facebook and is the first product of our company FinchBeak LLC. Publicly available at: <http://apps.facebook.com/petalzgame>

**ES-HyperNEAT C#** is a public implementation of the evolvable-substrate HyperNEAT (ES-HyperNEAT) algorithm in C#. It is build upon the HyperSharpNEAT-Compatible Multiagent Simulator and Experimental Platform. ES-HyperNEAT is an extension of the original HyperNEAT method for evolving large-scale artificial neural networks. While in the original HyperNEAT the human user had to decide the placement and number of hidden neurons, ES-HyperNEAT can determine the proper density and position of hidden neurons entirely on its own while still preserving the advances introduced by the original HyperNEAT. Released Spring 2012. Available at: <http://eplex.cs.ucf.edu/software.html>

**HyperSharpNEAT-Compatible Multiagent Simulator and Experimental Platform** is an extensible single- and multiagent experimental platform. It contains an updated implementation of HyperSharpNEAT that is a modification of the SharpNEAT package by Colin Green. The package includes an implementation of the room-clearing experiments described in our AAMAS 2010 paper. Released Fall 2010, Eplex Research Group, UCF. Available at: <http://eplex.cs.ucf.edu/software.html>

**Databionic ESOM Tools** is a suite of programs to perform data mining tasks like clustering, visualization, and classification with Emergent Self-Organizing Maps (ESOM). Databionics Research Group, University of Marburg, Germany. Available at: <http://databionic-esom.sourceforge.net/>

## SELECTED PRESS COVERAGE

**Science** [Bored with your video game? Artificial intelligence could create new levels on the fly](#)

**Fast Company** [The machines have taught themselves to make Mario levels](#)

**CNET** [Super Mario, Doom will become harder to master thanks to AI](#)

**BBC** [AI creates new levels for Doom and Super Mario games](#)

**Der Standard** [KI soll Gaming schwieriger und besser machen](#). May, 2018.

**The Register** [Doom and Super Mario could be a lot tougher now AI is building levels](#). May, 2018.

**Videnskab** [Computerspil kan gøre kunstig intelligens mere menneskelig](#). April, 2018.

**New Scientist** [DeepMind dojo will train AI to beat human StarCraft players](#). August, 2017.

**New Scientist** [Transformer robots can be printed on demand in just 13 minutes](#). 2017.

**Gizmodo** [This Printer Doodles Stick Figure Robots to Explore Areas We Can't](#), 2017.

**International Business Times** [1D printing: These shape changing robots can easily go through hard-to-reach spots](#), 2017.

**DR (Danish Broadcasting Corporation)** [Ny robotprinter printer robotter](#). 2017.

**Interview DeIC** [HPC meets AI to create a new breed of thinking machines](#). 2017.

**Podcast Interview for The Danish Society of Engineers (IDA)**. 2017.

Coverage of [Geometric Intelligence](#) being acquired by Uber in the **New York Times**, **Wired**, **Fortune**, **Bloomberg**, **MIT Tech Review**, **BBC**, **Wall Street Journal**, **Tech Crunch**, among others. 2016.

**Interview by Information.dk**. [Computere som kreative fødselshjælpere](#). 2016.

**Interview Computerworld.dk**. [Mennesker i IT](#), 2016.

**Interviewed about Google's AI: Computerworld.dk**.

**Popular Science**. 2016. [This sculpture was designed and 3d printed by an AI artist](#).

**IEEE Spectrum**. 2016. [EU Project Developing Symbiotic Robot-Plant Biohybrids](#).

Press coverage of our Deep Spying Research in: **Wired UK**, **El Pais**, **Forbes**, **Danish national TV**, **GEEK**, **Vice**, **Gizmodo**, **XDA Developers**, among others.

The Innovator Newsletter, University of Central Florida (12/01/12): Article about our company FinchBeak and our commercial video game Petalz.

**aigamedev.com** - AI for Game Development Website (7/15/12): Video interview about Petalz. Title: PETALZ: Where Artificial Evolution Meets User-Generated Content.

## LANGUAGE KNOWLEDGE

German native • English fluent • Spanish fluent • Danish basic (Module 3)

## REFERENCES

Kenneth O. Stanley, Professor, School of Electrical Engineering and Computer Science, University of Central Florida. Orlando, FL 32816-2362. kstanley@cs.ucf.edu. +1 (407) 473-0072.

Hod Lipson, Professor, Mechanical Engineering, Columbia University, NY. hod.lipson@columbia.edu. +1 (607) 592-4383

Julian Togelius, Associate Professor, Polytechnic School of Engineering, New York University, julian.togelius@nyu.edu. +46 705 192088