Rudolf Lioutikov

Curriculum Vitæ

Research Interest

Machine-Learning: Imitation Learning, Reinforcement Learning, Optimal Decision Making, Policy Search, Explainable AI, Causality Theory, Skill Acquisition, Movement Segmentation, Structure Learning, Grammar Induction, Skill Composition and Sequencing, Life-Long Learning, Active Learning

Robotics: Anthropomorphic Robots, Human-Machine Interaction, Semi-Autonomy, Motor Skills, Movement Primitive Representation, Grasping, Manipulation, Adaptive Control, Human-In-The-Loop, Multi-Agent Systems, Robot Assisted Rehabilitation, Intelligent Prosthetics

Current Position

01.2019 – **Assistant Professor of Practice**, *Texas Institute for Discovery Education in Science*, College of Natural Sciences, **University of Texas at Austin**.
Austin, Texas, USA

Education

10.2013 – 10.2018 **Ph.D. Student**, *Intelligent Autonomous Systems*, Technical University Darmstadt, Darmstadt, Germany.

08.2015 – 09.2015 **Summer School**, *Machine Learning Summer School*, Kyoto, Japan.

10.2011 – 09.2013 **M.Sc. in Computer Science**, *Technical University Darmstadt*, Darmstadt, Germany.
Focus on Robotics and Machine Learning. Minor in Bionics.

07.2010 – 09.2011 **Exchange**, *National University of the Province Buenos Aires*, Tandil, Argentina.

10.2006 – 07.2010 **B.Sc. in Computer Science**, *Technical University Darmstadt*, Darmstadt, Germany.

Honors and Awards

2019 Georges Giralt Award Finalist, European Robotics Forum grants this award for best European robotics Ph.D. Thesis

GDC 3.430 – 2317 Speedway – Austin 78712, TX, USA
lioutikov@utexas.edu

Research Experience

01.2019 – **Assistant Professor of Practice**, *Texas Institute for Discovery Education in Science*, College of Natural Sciences, **University of Texas at Austin**.
Austin, Texas, USA

10.2013 – 10.2018 **Graduate Research Assistant**, *Intelligent Autonomous Systems - Technical University Darmstadt*, Developing new methods to introduce robotics into small and medium sized enterprises.
3rd Hand Project - Seventh Framework Programme (FP7-ICT-2013-10)

09.2012 – 09.2013 **Undergraduate Research Assistant**, *Intelligent Autonomous Systems - Technical University Darmstadt*, Evaluation of robot learning methods on a throwing scenario.

Teaching Experience

01.2019 – **Assistant Professor**, *Robot Learning*, University of Texas at Austin.

10.2015 – 04.2016 **Teaching Assistant**, *Robot Learning*, Technical University Darmstadt.

04.2015 – 10.2015 **Teaching Assistant**, *Intelligent Multi-Agent Systems*, Technical University Darmstadt.

10.2014 – 04.2015 **Teaching Assistant**, *Technical Foundations of Computer Science*, Technical University Darmstadt.

04.2013 – 09.2013 **Lecture Assistant**, *Software Engineering Design and Construction*, Technical University Darmstadt.

Student Supervision

07.2019 – 08.2019 **FRI Fellowship**, *Self-Supervised Semantic Grounding of Movement Primitive Sequences*, University of Texas at Austin, Bhave, S.; Kodali, P.; O'Neil, C.; Trowbridge, I.

07.2019 – 08.2019 **FRI Fellowship**, *Self-Supervised Segmentation of Movement Primitive Sequences*, University of Texas at Austin, Bhave, R.; Hao, K.; Thomson, I.

04.2017 – 10.2017 **Student Research Project**, *Learning Grammars for Sequencing Movement Primitives*, Technical University Darmstadt, Berninger, K.; Szelag, S.

10.2016 – 04.2017 **Student Research Project**, *Probabilistic Trajectory Segmentation by Means of Hierarchical Dirichlet Process Switching Linear Dynamical Systems*, Technical University Darmstadt, Sieb, M.; Schultheis, M.; Szelag, S.

01.2016 – 07.2016 **Master's Thesis**, *Context-driven Movement Primitive Adaptation*, Technical University Darmstadt, Wilbers, D.

10.2015 – 04.2016 **Master's Thesis**, *Combining Human Demonstrations and Motion Planning for Movement Primitive Optimization*, Technical University Darmstadt, Koert, D.

04.2014 – 04.2015 **Student Research Project**, *Inverse Kinematics for Optimal Human-robot Collaboration*, Technical University Darmstadt, Koert, D.

04.2014 – 04.2015 **Student Research Project**, *Sequencing of Movement Primitives for Task- and Motion Planning* , Technical University Darmstadt, Sigg M,; Faller, F.

10.2013 – 04.2014 **Student Research Project**, *Competitive Robot Pong*, Technical University Darmstadt, Koert, D.; Vandommele, T.

Industrial Experience

07.2006 – 07.2010 **Student Trainee**, *Bisnode Informatics Germany GmbH*, Darmstadt, Germany.
Web development
User statistics and behavioral analysis for webapplications

Interdisciplinary Skills

programming

C, C++, Java, Matlab, Python, Perl, ROS, SL

languages

german native language
english advanced
spanish advanced
russian basic
french rudimentary

Reviewing

2019 Advances in Neural Information Processing Systems (NeurIPS)
Conference on Robot Learning (CoRL)
2018 The IEEE/RSJ International Conference on Intelligent Robots and Systems
The IEEE Robotics and Automation Letters
2017 The IEEE International Conference on Robotics and Automation
The IEEE Robotics and Automation Letters
The IEEE/RSJ International Conference on Intelligent Robots and Systems
2016 The IEEE International Conference on Robotics and Automation
The International Journal of Robotics Research
The IEEE/RSJ International Conference on Intelligent Robots and Systems
The 25th International Joint Conference on Artificial Intelligence
2015 Automatica
Autonomously Learning Robots Workshop at Advances in Neural Information Processing Systems (NIPS)
The IEEE/RSJ International Conference on Intelligent Robots and Systems
2014 The IEEE/RSJ International Conference on Intelligent Robots and Systems

Publications

Ph.D. Thesis

2018 **Lioutikov, R.**, *Parsing Motion and Composing Behavior for Semi-Autonomous Manipulation*,
Intelligent Autonomous Systems - Technical University Darmstadt,
Thesis Advisor: Prof. Dr. Jan Peters, Ph.D.
External Referee: Prof. Ken Goldberg (UC Berkeley)
Committee: Prof. Andreas Koch (TU Darmstadt),
Prof. Oskar von Stryk (TU Darmstadt),
Prof. Kristian Kersting (TU Darmstadt)

Journal Articles

2019 **Lioutikov, R.**; Maeda, G.; Veiga, F.F.; Kersting, K.; Peters, J, *Learning Attribute Grammars for Movement Primitive Sequencing*, International Journal of Robotics Research (IJRR).

Lioutikov, R.; Peters, J, *Reinforcement Learning for Formal Grammars*, IEEE Robotics and Automation Letters (submitted).

2017 **Lioutikov, R.**; Neumann, G.; Maeda, G.; Peters, J, *Learning Movement Primitive Libraries through Probabilistic Segmentation*, International Journal of Robotics Research (IJRR).

Maeda, G.; Neumann, G.; Ewerton, M; **Lioutikov, R.**; Kroemer, O; Peters, J, *Probabilistic Movement Primitives for Coordination of Multiple Human-Robot Collaborative Tasks*, Autonomous Robots (AURO).

Maeda, G.; Ewerton, M.; Neumann, G.; **Lioutikov, R.**; Peters, J, *Phase Estimation for Fast Action Recognition and Trajectory Generation in Human-Robot Collaboration*, International Journal of Robotics Research (IJRR).

Osa, T.; Ghalamzan, E. A. M.; Stolkin, R.; **Lioutikov, R.**; Peters, J.; Neumann, G, *Guiding Trajectory Optimization by Demonstrated Distributions*, IEEE Robotics and Automation Letters (RA-L).

Paraschos, A.; **Lioutikov, R.**; Peters, J.; Neumann, G, *Probabilistic Prioritization of Movement Primitives*, Proceedings of the International Conference on Intelligent Robot Systems, and IEEE Robotics and Automation Letters (RA-L).

2014 **Lioutikov, R.**; Paraschos, A.; Peters, J.; Neumann, G, *Generalizing Movements with Information Theoretic Stochastic Optimal Control*, Journal of Aerospace Information Systems (JAIS).

Articles in Conference Proceedings

2018 **Lioutikov, R.**; Maeda, G.; Veiga, F.F.; Kersting, K.; Peters, J, *Inducing Probabilistic Context-Free Grammars for the Sequencing of Robot Movement Primitives*, Proceedings of the IEEE International Conference on Robotics and Automation (ICRA).

2017 Wilbers, D.; **Lioutikov, R.**; Peters, J, *Context-Driven Movement Primitive Adaptation*, Proceedings of the IEEE International Conference on Robotics and Automation (ICRA).

2016 Maeda, G.; Maloo, A.; Ewerton, M.; **Lioutikov, R.**; Peters, J, *Anticipative Interaction Primitives for Human-Robot Collaboration*, AAAI Fall Symposium Series. Shared Autonomy in Research and Practice.

Koert, D.; Maeda, G.J.; **Lioutikov, R.**; Neumann, G.; Peters, J, *Demonstration Based Trajectory Optimization for Generalizable Robot Motions*, Proceedings of the International Conference on Humanoid Robots (HUMANOIDS).

2015 **Lioutikov, R.**; Neumann, G.; Maeda, G.; Peters, J, *Probabilistic Segmentation Applied to an Assembly Task*, Proceedings of the International Conference on Humanoid Robots (HUMANOIDS).

Ewerton, M; Maeda, G; **Lioutikov, R.**; Amor, H.B.; Peters J.; Neumann, G, *Learning Multiple Collaborative Tasks with a Mixture of Interaction Primitives*, IEEE International Conference on Robotics and Automation (ICRA).
Best Conference Paper Award Finalist, Best Student Paper Award Finalist, Best Service Robotics Paper Award Finalist

Maeda, G.; Neumann, G.; Ewerton, M.; **Lioutikov, R.**; Peters, J, *A Probabilistic Framework for Semi-Autonomous Robots Based on Interaction Primitives with Phase Estimation*, Proceedings of the International Symposium of Robotics Research (ISRR).

Model-Based Relative Entropy Stochastic Search, *Advances in Neural Information Processing Systems (NIPS)*, , Abdolmaleki, A.; **Lioutikov, R.**; Peters, J; Lau, N.; Reis, L.; Neumann, G.

2014 **Lioutikov, R.**; Paraschos, A.; Peters, J.; Neumann, G, *Sample-Based Information-Theoretic Stochastic Optimal Control*, Proceedings of the IEEE International Conference on Robotics and Automation (ICRA).

Lioutikov, R.; Kroemer, O.; Peters, J.; Maeda, G, *Learning Manipulation by Sequencing Motor Primitives with a Two-Armed Robot*, Proceedings of the 13th International Conference on Intelligent Autonomous Systems (IAS).

Maeda, G.J.; Ewerton, M.; **Lioutikov, R.**; Amor, H.B.; Peters, J.; Neumann, G, *Learning Interaction for Collaborative Tasks with Probabilistic Movement Primitives*, Proceedings of the International Conference on Humanoid Robots (HUMANOIDS).

Workshop papers

2018 **Lioutikov, R.**; Faller, F.; Sigg, M.; Perters, J.; Maeda, G, *A Graph-Search Based Approach for Movement Primitive Sequencing*, Abstract-Only Session.
IEEE International Conference on Robotics and Automation (ICRA)

Lioutikov, R.; Maeda, G.; Veiga, F.F.; Kersting, K.; Peters, J, *Learning Intuitive Grammars for Movement Primitive Sequences*, Robot Teammates Operating in Dynamic, Unstructured Environments.
IEEE International Conference on Robotics and Automation (ICRA)

Lioutikov, R.; Perters, J, *Movement Primitive Sequencing via Attribute Grammars*, Third Machine Learning in Planning and Control of Robot Motion Workshop.
IEEE International Conference on Robotics and Automation (ICRA)

2016 Maeda, G.; Maloo, A.; Ewerton, M.; **Lioutikov, R.**; Peters, J, *Proactive Human-Robot Collaboration with Interaction Primitives*, International Workshop on Human-Friendly Robotics (HFR).

2015 Lopes, M.; Peters, J.; Piater, J.; Toussaint, M.; Baisero, A.; Busch, B.; Erkent, O.; Kroemer, O.; **Lioutikov, R.**; Maeda, G.; Mollard, Y.; Munzer, T.; Shukla, D, *Semi-Autonomous 3rd-Hand Robot*, Workshop on Cognitive Robotics in Future Manufacturing Scenarios.
European Robotics Forum

Rueckert, E.; **Lioutikov, R.**; Calandra, R.; Schmidt, M.; Beckerle, P.; Peters, J, *Low-cost Sensor Glove with Force Feedback for Learning from Demonstrations using Probabilistic Trajectory Representations*, Workshop on Tactile and force sensing for autonomous compliant intelligent robots..
IEEE International Conference on Robotics and Automation (ICRA)

2014 **Lioutikov, R.**; Kroemer, O.; Peters, J.; Maeda, G, *Towards a Third Hand*, 1st International Workshop on Intelligent Robot Assistants.
International Conference on Intelligent Autonomous Systems (IAS)

Ewerton, M.; Neumann, G.; **Lioutikov, R.**; Amor, H.B.; Peters, J.; Maeda, G, *Modeling Spatio-Temporal Variability in Human-Robot Interaction with Probabilistic Movement Primitives*, Workshop on Machine Learning for Social Robotics.
IEEE International Conference on Robotics and Automation (ICRA)

Master's Thesis

2013 **Lioutikov, R.**, *Learning time-dependent feedback policies with model-based policy search*, Intelligent Autonomous Systems - Technical University Darmstadt, Thesis Advisors: Dr. tech. Gerhard Neumann, Prof. Dr. Jan Peters, Ph.D.