

# Karla Štěpánová

Curriculum Vitae (updated: 13.11.2023)

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Nationality: Czech



## Education

- 2011–2017 **PhD. in Artificial Intelligence and Biocybernetics**, *Czech Technical University in Prague*, Faculty of Electrical Engineering, Dept. of Cybernetics, Czech Republic.  
Thesis: "Hierarchical probabilistic model of language acquisition"  
[https://dspace.cvut.cz/bitstream/handle/10467/66703/Disertace\\_Stepanova\\_Karla\\_2016.pdf](https://dspace.cvut.cz/bitstream/handle/10467/66703/Disertace_Stepanova_Karla_2016.pdf)
- 2008–2010 **M.Sc. in Condensed matter Physics**, *Charles University in Prague*, Fac. of Mathematics and Physics, CR.  
Thesis: "Study of conditions of crystallization and thermodyn. prop. of selected intermetallic compounds of lanthanides"
- 2005–2008 **B.Sc. in General Physics**, *Charles University in Prague*, Faculty of Mathematics and Physics, Czech Republic.  
Thesis: "Study of conditions of crystallizations of selected intermetallic compounds of lanthanides"

## Work and professional experience

- 2016 – now **Researcher**, *Robotics and Machine Perception Group, The Czech Institute of Informatics, Robotics and Cybernetics (CIIRC), CTU in Prague*, Czech Republic.  
GAČR grant No. 21-31000S "Multimodal representations of robotic actions and tasks applied in learning by demonstration" (Miracle), 2021-2024, (<http://imitrob.ciirc.cvut.cz/projects/miracle/>)
- 01-05/2016 **Visiting Researcher**, *CNRS, Plymouth University*, UK.  
Prof. Angelo Cangelosi
- 2015 - 2016 **Research fellow**, *CTU in Prague, Faculty of Electrical Engineering*, CR.
- 2013-2016 **Maternity leave.**
- 07/2014 **Visiting researcher**, *NCSR DEMOKRITOS*, Athens, Greece, Prof. Nicolaos Mavridis.
- 2010-2013 **Maternity leave.**

## Research stays, Internships and Summer schools

- TU Delft **06/2023**, 1 week research stay - Learning tasks from demonstrations, Dr. Jens Kober, TU Delft, Netherlands.
- UK **01-05/2016**, 5 month research stay - Implementation of the hierarchical model of language acquisition into the iCub robot, Prof. Angelo Cangelosi, CNRS, Plymouth University, UK.
- Greece **07/2014**, 14 days research stay - Ripley project, Prof. Nicolaos Mavridis, NCSR DEMOKRITOS, Athens.
- Sweden **13.-20.12.2016**, 3rd Orebro Winter School on "Artificial Intelligence and Robotics".
- Greece **07/2014**, Summer school IRSS 2014, Specialization: symbol grounding project.

## Teaching activities

- 2013-now **Cognitive systems**, winter semester 2013-2023, seminars and lectures (half semester).
- 2015-2020 **Optimization**, winter semester 2015 - 2020 seminars (full semester).
- 2012-now **Neuroinformatics**, summer semester 2012 - 2023 (1 seminar, 1 lecture).

### Selected Supervised individual projects, master and bachelor thesis

- 2021 **Petr Vanc**, Probabilistic gesture control of a robotic arm, (diploma thesis (co-supervisor)).
- 2020 **Pavel Stoudek**, Extracting Material Properties of Objects from Haptic Exploration Using Multiple Robotic Grippers, (diploma thesis (co-supervisor)).
- 2020 **Jan Jirman**, Scene reconstruction from multiple RGB-D cameras and detection of the best additional camera viewpoint, (bachelor thesis).
- 2020 **Michal Mares**, Exploratory Action Selection to Learn Object Properties from Haptic Exploration Using a Robot Hand, (bachelor thesis (co-supervisor, supervisor Matej Hoffmann, dean award)).
- 2019 **Marek Jaluvek**, Programming compliant KUKA robots by linguistic instructions, (bachelor thesis).

- 2019 **Tan Wei Xi**, *Creating motor primitives for controlling KUKA robotic arm*, (master thesis)).
- 2018 **František Puciov**, *Automatic Self-Calibration from Self-Observation and Self-Touch on a Dual-Arm Industrial Manipulator*, (master thesis (dean award)).
- 2017 **Predrag Božovič**, *Creating a set of basic robotic arm movements using ROS*, (individual project).
- 2015 **Josef Dvořák**, *Differences in behavioral data between gifted and average adolescents*, (bachelor thesis).
- 2015 **Petr Bukovský**, *Differences in EEG data between gifted and average adolescents*, (bachelor thesis).
- 2013 **Petr Volf**, *EEG signal analysis of mentally gifted children*, (MSc thesis).

## Publications

### Selected Publications in journals

- RAL + IROS SEDLAR J., ŠTEPANOVA K., ..., BABUSKA, R. (2023). Imitrob: Imitation Learning Dataset for Training and Evaluating 6D Object Pose Estimators. *IEEE Robotics and Automation Letters*, 8(5), 2788-2795.
- RAL + IROS SKOVIERA, R, BEHRENS J.K., STEPANOVA, K. (2022). SurfMan: Generating Smooth End-Effector Trajectories on 3D Object Surfaces for Human-Demonstrated Pattern Sequence." *IEEE Robotics and Automation Letters* 7.4: 9183-9190.
- RCIM STEPANOVA, K., ROZLIVEK, J., PUCIOQ, F., KRSEK, P., PAJDLA, T., HOFFMANN, M. (2022). Automatic self-contained calibration of an industrial dual-arm robot with cameras using self-contact, planar constraints, and self-observation. *Robotics and Computer-Integrated Manufacturing* 73, 102250. [**10 citations**]
- RAL + ICRA BEHRENS J., ŠTEPANOVA K., LANGE R., SKOVIERA R. (2019). Specifying Dual-Arm Robot Planning Problems through Natural Language and Demonstration. *IEEE Transactions on Cognitive and Developmental Systems.*, early access, doi: 10.1109/LRA.2019.2898714. [**6 citations**]
- RAL + ICRA STEPANOVA K., PAJDLA T., HOFFMANN M. (2019). Robot Self-Calibration Using Multiple Kinematic Chains – A Simulation Study on the iCub Humanoid Robot. *IEEE Robotics and Automation Letters.*, vol. 4, no. 2, pp.1900 - 1907. [**16 citations**]
- TCDS ŠTĚPÁNOVÁ K., KLEIN F.B., VAVREČKA M., CANGELOSI A. (2018). Mapping language to vision in a real-world robotic scenario. *IEEE Transactions on Cognitive and Developmental Systems.*, vol. 10, no. 3, pp.784-794. [**6 citations**]
- PAAA ŠTĚPÁNOVÁ K., VAVREČKA M. (2018). Estimating number of components in Gaussian mixture model using combination of greedy and merging algorithm. *Pattern Analysis and Applications*, pp. 1-12. [**4 citations**]
- RAS HOFFMANN M., ŠTĚPÁNOVÁ K., REINSTEIN M.[equal contribution] (2014). The effect of motor action and different sensory modalities on terrain classification in a quadruped robot running with multiple gaits. *Robotics and Autonomous Systems*, vol.62, no. 12, pp.1790-1798. [**28 citations**]

### Selected Publications in international peer-reviewed conferences and extended abstracts in journals

- IROS VANC P., ..., STEPANOVA K. (2023). Communicating human intent to a robotic companion by multi-type gesture sentences. In: IROS.
- ICRA VANC P., ..., STEPANOVA K. (2023). Context-aware robot control using gesture episodes. In: ICRA.
- ICRA BEHRENS, J.K., NAZARCZUK M., STEPANOVA, K., HOFFMANN, M., DEMIRIS, Y., MIKOLAJCZYK, K. (2021). Embodied Reasoning for Discovering Object Properties via Manipulation. In: ICRA.
- Humanoids ROZLIVEK J., RUSTLER, L., STEPANOVA, K., HOFFMANN, M. (2020). Multisensorial robot calibration framework and toolbox. In: *IEEE-RAS 20th International Conference on Humanoid Robots (Humanoids)*.
- ICRA BEHRENS, J.K., STEPANOVA, K., BABUSKA, R. (2020). Simultaneous task allocation and motion scheduling for complex tasks executed by multiple robots. In: ICRA.
- IROS SKOVIERA R., STEPANOVA K., TESAR M., ŠEJNOVA G., SEDLAR J., VAVRECKA M., BABUSKA R., ŠIVIC J. (2018). Teaching robots to imitate a human with no on-teacher sensors. What are the key challenges?. In: IROS workshop. Madrid, Spain.
- KUZ STEPANOVA K., HOFFMANN M., STRAKA Z., KLEIN F.B., CANGELOSI A., VAVREČKA M. (2017). Where is my forearm? Clustering of body parts from simultaneous tactile and linguistic input using sequential mapping. In: *Cognition and artificial life (KUZ XVII.)*. Trenčianske Teplice, Slovakia.
- ICONIP KLEIN F.B., ŠTĚPÁNOVÁ K., CANGELOSI A. (2016). Implementation of a modular Growing When Required neural gas architecture for recognition of falls. In: *International Conference on Neural Information Processing (ICONIP 2016)*, Kyotó, Japan.

## Funding received so far

- Principal investigator **GAČR**, "*Multimodal representations of robotic actions and tasks applied in learning by demonstration*" (*Miracle*) (grant supported by Grant agency of ČR), 07/2021-06/2024.
- TAČR**, "*Imitation learning supported by language for industrial robotics*" (grant supported by Technological agency of ČR), 10/2017-09/2019.
- MoRoUS**, *Project to propagate and support study at FEL CTU in Prague "Corresponding seminar MoRoUS for high schools"* (<http://morous.felk.cvut.cz>), 2015, 2016 and 2017.
- FRVŠ grant No. G3/2023**, ,, "*Application for administrating psychological experiments using EEG measurement*", <http://bio.felk.cvut.cz/psychee>, 2012.
- Team member **TAČR**, "*Collaborative robotics workplace of the future*" (*CROW*) (grant supported by Technological agency of ČR), 01/2019-12/2021.
- GAČR grant**, "*Robot self-calibration and safe physical human-robot interaction inspired by body representations in primate brains*", No.17-15697Y, 01/2017-present.
- EU FP7 grant**, "*TRADr : Long-Term Human-Robot Teaming for Robot-Assisted Disaster Response*", No. 60963, 08/2016 - present.
- SGS grant**, "*Support of interactive approaches to biomedical data acquisition and processing*", No. SGS16/231/OHK3/3T/13, sponsored by the CTU in Prague, 01/2016-09/2016.
- FRVŠ grant**, "*Innovation of Neuroinformatics course*", 2013.
- SGS grant**, "*New approaches to collection, evaluation and utilization of biological data II*", No. SGS13/203/OHK3/3T/13, sponsored by the CTU in Prague, 2013-2015.
- SGS grant**, "*New approaches to collection, evaluation and utilization of biological data*", No. SGS10/279/OHK3/3T/13, sponsored by the CTU in Prague, 2011-2012.