Katja Ovchinnikova

Curriculum Vitae

I am a computer scientist specializing in machine learning and artificial intelligence. During my career, I worked in a range of application fields, including natural language processing, robotics, molecular biology, precision medicine, and marine and environmental sciences. I'm also part of Homeward Bound, a leadership network for women in STEMM focusing on climate change.

Contact

email katja@ovchinnikova.me
webpage `www.ovchinnikova.me`
blog `katja-hb.home.blog`
twitter `twitter.com/Katja_HB4`
youtube `https://www.youtube.com/channel/UCxUv_Kpq6hjEjdzAW3GZV3w`

Education

2018–2019 **Homeward Bound alumna**, *Homeward Bound Program, global leadership training for women in STEMM focusing on climate change.*

2007–2011 **PhD**, *Institute of Cognitive Science, University of Osnabrück, Germany*, summa cum laude honor, OLB first prize.

Professional positions

2020–2023 **Researcher**, *Department for BioMedical Research of the University of Bern*, Bern, Switzerland.

2014–2020 **Researcher**, *European Molecular Biology Laboratory*, Heidelberg, Germany.

2014–2016 **Researcher**, *High Performance Humanoid Technologies Lab, Institute for Anthropomatics, Karlsruhe Institute of Technology*, Germany.

2014–2016 **Guest researcher**, *Institute of Computational Linguistics, Heidelberg University*, Germany.

2012–2014 **Computer scientist**, *Information Sciences Institute, USC*, Los Angeles, USA.

2010–2011 **Visiting student researcher**, *Information Sciences Institute, USC*, Los Angeles, USA.

2001–2006 **Researcher (HiWi/WiMi)**, University of Tübingen, Germany.

Projects

current

2020–Present **AI-driven precision medicine**, `https://www.urogenus-research.org`.
Precision medicine for cancer treatment. I work on applying deep learning and other computer science algorithms to genomic, proteomic and molecular data.

2016–Present **METASPACE**, `https://metaspace2020.eu`.
Computational metabolite annotation of imaging mass spectrometry data. I work on applying natural language processing and computer vision algorithms to metabolite data.

2015–Present **Coral Health**, `https://hilo.hawaii.edu/coralhealth`.
Analysis of coral disease based on the lesion distribution and segmentation of images of coral colonies. In collaboration with UH Hilo Hawaii.

2019–Present **Scallop detection**.
Detection of scallops in sea bottom imagery. In collaboration with University of St. Andrews.

past

2017–2018 **Photo Identification of Manta Ray Images**, `http://www.hamerinhawaii.org`.
Development of an algorithm and a desktop application for automatic identification of manta ray images. In collaboration with Mark Deakos from Hawaii Association for Marine Education & Research.

2014–2016 **XPERIENCE: Robots Bootstrapped through Learning from Experience**, `www.xperience.org`.
The goal of the project is to extend state of the art enactive systems by using structural bootstrapping to generate new knowledge. Xperience implements, adapts, and extends a complete robot system for automating introspective, predictive, and interactive understanding of actions and dynamic situations. I worked on a dialog system, planning, and domain-specific knowledge extraction from corpora.

2014–2017 **Mediator: Computational Analysis of Mass Media**, `http://mediaanalysistools.github.io`.
Pilot study project on computational analysis of mass media. Our long-term goals are to develop tools for 1) tracking distribution of media content, i.e. looking for information sources, citations, and modifications, 2) finding contradicting and supporting evidence for news statements, 3) detecting media bias, 4) detecting manufactured spread of opinions.

2013–2014 **Photo Identification of Whale Images**, `https://github.com/eovchinn/socialwhales`.
Pilot project on developing of a web service for uploading and annotating photographs of whales, matching new images against the accumulated whale catalogue, acquiring statistics about whale migration paths and population distributions.

2013–2014 **Heider-Simmel Interactive Theater**, *USC/ISI, USA*, `https://hsit.ict.usc.edu`.
Interpretation and narrativization of simple two-dimensional videos in terms of goals, plans, beliefs, and emotions. I worked on application of probabilistic abduction to scene recognition.

2012–2014 **Metaphor Interpretation for Cultural Schemas**, *USC/ISI, USA*, `https://github.com/eovchinn/Metaphor-ADP`.
Detection of linguistic metaphors in English, Spanish, Russian, and Farsi texts, and mapping them to conceptual metaphors. I supervised a team responsible for development of an abduction-based metaphor interpretation pipeline and corpus-based knowledge extraction.

2010–2011 **Machine Reading**, *USC/ISI, USA*.
Knowledge acquisition by machine reading. I worked on turning lexical-semantic databases like WordNet and FrameNet into machine-readable FOL axioms applicable for reasoning.

2005–2006 **Adaptive Ontologies on extreme Markup Structures**, *University of Tübingen, Germany*, `http://coli.lili.uni-bielefeld.de/Texttechnologie/Forschergruppe/Ontologies/index.html`.
Automatic extraction of ontological knowledge from text and updating existing knowledge bases. I developed algorithms for non-monotonic ontology updates including automatic resolution of ontological inconsistencies.

2003-2005 **Distributional Idiosyncrasies**, *SFB 441 at the University of Tübingen, Germany*, `http://www.english-linguistics.de/sfb441/a5/`.
Study of how syntactic, semantic, and selectional properties constraint lexical elements in their contexts of use. I worked on developing a similarity measure for comparing grammatical structures and on implementing a web service for psycholinguistic experiments.

2001–2002 **Grammar Formalisms and Parsing**, *Department of Linguistics, University of Tübingen, Germany*, `http://www.sfs.uni-tuebingen.de/~fr/current/textbook.html`.
Development of an online course for teaching grammar formalisms and parsing. I developed the Morph Moulder graphical tool for visualizing formal grammars.

Publications

Books
Ovchinnikova, E. (2012): *Integration of World Knowledge for Natural Language Understanding*, Atlantis Press, Springer.

Journal Articles
L. Rappez, M. Stadler, S. Triana, R. Muthoni Gathungu, K. Ovchinnikova, P. Phapale, M. Heikenwalder and T. Alexandrov (2021). SpaceM reveals metabolic states of single cells. In: Nature Methods, 18, 799-805, *https://doi.org/10.1038/s41592-021-01198-0*.

K. Ovchinnikova, M. A. James, T. Mendo, M. Dawkins, J. Crall and K. Boswarva (2021). Exploring the potential to use low cost imaging and an open source convoluted neural network detector to support stock assessment of the king scallop (*Pecten maximus*). In: Ecological Informatics, *https://doi.org/10.1016/j.ecoinf.2021.101233*.

Ovchinnikova, K., V. Kovalev, L. Stuart and T. Alexandrov (2020): OffsampleAI: artificial intelligence approach to recognize off-sample mass spectrometry images. In: *BMC Bioinformatics*, 21, 1-11, *https://doi.org/10.1186/s12859-020-3425-x*.

Ovchinnikova, K., A. Rakhlin, L. Stuart, S. Nikolenko and T. Alexandrov (2020): ColocML: Machine learning quantifies co-localization between mass spectrometry images. In *Bioinformatics*, *https://doi.org/10.1093/bioinformatics/btaa085*.

Wächter, M., E. Ovchinnikova, V. Wittenbeck, P. Kaiser, S. Szedmak, W. Mustafa, D. Kraft, N. Krüger, J. Piater and T. Asfour (2018): Integrating Multi-Purpose Natural Language Understanding, Robot's Memory, and Symbolic Planning for Task Execution. In *Humanoid Robots, Robotics and Autonomous Systems*, 99(): 148-165.

Aksoy, E., E. Ovchinnikova, A. Orhan, Y. Yang and T. Asfour (2017): Unsupervised Linking of Visual Features to Textual Descriptions in Long Manipulation Activities. In *IEEE Robotics and Automation Letters*, 2(3):1397-1404.

Burns, J., T. Alexandrov, E. Ovchinnikova, R. D. Gates and M. Takabayashi (2016): Investigating the spatial distribution of Growth Anomalies affecting Montipora capitata corals in a 3-dimensional framework. In: *Journal of Invertebrate Pathology*, 140:51-57.

Burns, J., T. Alexandrov, E. Ovchinnikova, R. D. Gates and M. Takabayashi (2016): Data for spatial analysis of growth anomaly lesions on Montipora capitata coral colonies using 3D reconstruction techniques. In: *Data Brief*, 9:460-462.

Palmer, A., E. Ovchinnikova, M. Thune, R. Lavigne, B. Guevel, A. Dyatlov, O. Vitek, C. Pineau, M. Boren and T. Alexandrov (2015): Using collective expert judgements to evaluate quality measures of mass spectrometry images. In: *Bioinformatics (special issue ISMB/ECCB'15)*, 31(12):375-384.

Zock, M., Wandmacher, T., Ovchinnikova, E. (2010): Are vector-based approaches a feasible solution to the "tip-of-the-tongue" problem? *eLexicography in the 21st century: New challenges, New applications*, 7:355–365.

Ovchinnikova, E., Kühnberger, K.-U. (2007): Automatic Ontology Extension: Resolving Inconsistencies. *GLDV-Journal for Computational Linguistics and Language Technology*, 22(2):19–33.

Ovchinnikova, E., Wandmacher, T., and Kühnberger, K.-U. (2007): Solving Terminological Inconsistency Problems in Ontology Design. *International Journal of Interoperability in Business Information Systems (IBIS)*, 2(1):65–80.

Ovchinnikova, E. and Richter, F. (2007): Morph Moulder: Graphical Software for Teaching and Visualizing Logic for HPSG and Description Logics. *Logic Journal of IGPL*, 15(4):333–345.

Preprints

Alexandrov, T., K. Ovchnnikova, A. Palmer, V. Kovalev, A. Tarasov, L. Stuart, R. Nigmetzianov, D. Fay and Key METASPACE Contributors (2019): METASPACE: A community-populated knowledge base of spatial metabolomes in health and disease. BioRxiv 539478 [Preprint]. Feb., 2019. Available from: *https://doi.org/10.1101/539478*.

Book Chapters

Inoue, N., Ovchinnikova, E., Inui, K., Hobbs, J. R. (2014): Weighted Abduction for Discourse Processing Based on Integer Linear Programming. In: *Plan, Activity, and Intent Recognition*, Eds. Sukthankar, G., Goldman, R. P., Geib, S., Pynadath, D. V., Hung, H. B., 33–55.

Ovchinnikova, E., Montazeri, N., Alexandrov, T., Hobbs, J. R., McCord, M. C., Mulkar-Mehta, R. (2014): Abductive Reasoning with a Large Knowledge Base for Discourse Processing. In: *Computing Meaning*, Eds. Hunt, H., Bos, J., Pulman, S., vol. 47, 107–127.

Wandmacher, T., Ovchinnikova, E., Mönnich, U., Michaelis, J.. Kühnberger, K.-U. (2011): Adaptation of Ontological Knowledge from Structured Textual Data. In: *Modeling, Learning, and Processing of Text Technological Data Structures*, Eds. Mehler, A., Kühnberger, K.-U., Lobin, H., Lüngen, H., Storrer, A. and Witt, A., 129–153.

Refereed Proceedings

Ovchinnikova, E., M. Wächter, V. Wittenbeck, and T. Asfour (2015): Multi-Purpose Natural Language Understanding Linked to Sensorimotor Experience in Humanoid Robots. In: *Proc. of Humaniods*, 365–372.

Ovchinnikova, E., Israel, R., Wertheim, S., Zaytsev, V., Montazeri, N., and Hobbs, J. (2014): Abductive Inference for Interpretation of Metaphors. In: *Proc. of ACL Workshop on Metaphor in NLP*. Baltimore, 33–41.

Ovchinnikova, E., A. Gordon, J. R. Hobbs (2013): Abduction for Discourse Interpretation: A Probabilistic Framework. In: *Proc. of IWCS*, 42–50.

Inoue, N., E. Ovchinnikova, K. Inui, and J. R. Hobbs (2012): Coreference Resolution with ILP-based Weighted Abduction. In: *Proc. COLING*, 1291–1308.

Peñas, A. and Ovchinnikova, E. (2012): Unsupervised Acquisition of Axioms to Paraphrase Noun Compounds and Genitives. In: *Proc. of CICLing*, vol. 7181, 388–401.

Ovchinnikova, E., Montazeri, N., Alexandrov, T., Hobbs, J., McCord, M. C., and Mulkar-Mehta, R. (2011): Abductive Reasoning with a Large Knowledge Base for Discourse Processing. In: *Proc. of IWCS*, 225–234.

Ovchinnikova, E., Borgo, S., Oltramari, A., Vieu, L., and Alexandrov, A. (2010): Data-Driven and Ontological Analysis of FrameNet for Natural Language Reasoning. In: *Proc. of LREC*, 3157–3164.

Ovchinnikova, E., Alexandrov, T., and Wandmacher, T. (2009): Automatic acquisition of the argument-predicate relations from a frame-annotated corpus. In: *Proc. of EMNLP*, 1388–1397.

Wandmacher, T., Ovchinnikova, E., and Alexandrov, T. (2008): Does Latent Semantic Analysis reflect Human Associations? In: *Proc. of the Lexical Semantics workshop at ESSLLI 2008*.

Wandmacher, T., Ovchinnikova, E., Krumnack, U.m, and Dittmann, H. (2007): Extraction, evaluation and integration of lexical-semantic relations for the automated construction of a lexical ontology. In: *Proc. of the Australasian Ontology Workshop*, vol. 85, 61–69.

Krumnack, U., Ovchinnikova, E., and Wandmacher, T. (2007). LexO: Constructing a lexical ontology from heterogenous resources. In: *Proc. of the Lexicon/Ontology Interface Workshop (OntoLex)*.

Kühnberger, K.-U., Wandmacher T., Schwering, A., Ovchinnikova, E., Krumnack, U., Gust, H. and Geibel, P. (2007): I-Cog: A Computational Framework for Integrated Cognition of Higher Cognitive Abilities. In: *Proc. of MICAI*, LNAI 4827, vol. 4827, 203–214.

Kühnberger, K.-U., Wandmacher, T., Ovchinnikova, E., Krumnack, U., Gust, H. and Geibel, P. (2007): Modeling Human-Level Intelligence by Integrated Cognition in a Hybrid Architecture. In: *Foundations of Artificial Intelligence (FAInt), Workshop at KI 2007, CEUR-WS*, vol. 277, 1–15.

Mönnich, U., Michaelis, J., Ovchinnikova, E., Wandmacher, T. and Kühnberger, K.-U. (2007): Information Extraction from Annotation Graphs Serving for the Adaptation of Ontologies - Position Paper. In: *Proc. of the Workshop on Learning from Non-Vectorial Data in conjunction with KI 2007*.

Ovchinnikova, E. and Kühnberger, K.-U. (2007): Automatic Ontology Extension: Resolving Inconsistencies - Extended Abstract . In; *Proc. of the Workshop "Ontologies and Text Technology: Approaches to Extract Semantic Knowledge from Syntactic Information"*, PICS, vol. 2007-1, 93–98.

Azarova, I., Ivanov, V., Ovchinnikova, E., and Sinopalnikova, A. (2006): RussNet as a Semantic Component of the Text Analyser for Russian. In: *Proc. of the Third International WordNet Conference (GWC)*, 19–27.

Azarova, I., Ivanov V., and Ovchinnikova, E. (2006): Inheritance of the Valency Frames in RussNet Thesaurus for the Automatic Text Analysis. In: *Proc. of the international conference "Dialog"*, 18–25.

Ovchinnikova, E. and Richter, F. (2006): Morph Moulder: Graphical Software for Teaching and Visualizing RSRL and Description Logics. In *Proc. of SICTTL*, 143–147.

Azarova, I. and Ovchinnikova, E. (2006): Semantic Interpretation of the Noun Phrases in Russian Corpora. In: *Proc. of the International Conference on Corpus Linguistics*.

Ovchinnikova, E. and Kühnberger, K.-U. (2006): Adaptive ALE-TBox for Extending Terminological Knowledge. In: *Proc. of Australian Joint Conference on Artificial Intelligence*, vol. 4304, 1111–1115.

Ovchinnikova, E. and Kühnberger, K.-U. (2006): Aspects of Automatic Ontology Extension: Adapting and Regeneralizing Dynamic Updates. In: *Proc. of the Australasian Ontology Workshop (AOW), Conferences in Research and Practice in Information Technology*, vol. 72, 52–60.

Azarova, I., Ivanov, V., and Ovchinnikova, E. (2005): Semantic Structure of the Proposition in the Procedure Extracting Facts from Russian Texts. In: *Proc. of the international conference "Dialog"*, 6–11.

Richter, F., Ovchinnikova, E., Trawinski, B., and Meurers, D. (2002): Interactive Graphical Software for Teaching the Formal Foundations of Head-Driven Phrase Structure Grammar. In: *Proc. of Formal Grammar 2002*, 137–148.

Other

Ovchinnikova, E., Zaytsev, V., Wertheim, S., Israel, R. (2014): Generating Conceptual Metaphors from Proposition Stores. *arXiv preprint arXiv:1409.7619*.

Gordon, A., Hobbs, J., Ovchinnikova, K., Roemmele, M., and Morency, L. (2013): Abduction of mental states with a formal theory of commonsense psychology. Abstract. In: *Workshop on Mental model ascription by language-enabled intelligent agents*, July 31, 2013, Berlin, Germany.

Teaching

2019-2021 Workshop on climate change and action, University of Heidelberg & European Molecular Biology Laboratory & Local Conference of Youth, workshop materials: `https://github.com/eovchinn/ClimateWorkshop`

2018-2020 Workshops on implicit bias and ally skills, University of Heidelberg & European Molecular Biology Laboratory

2009 Concepts and Words: Theoretical and Empirical Perspectives Interdisciplinary seminar, University of Osnabrück

2008 Lexicons and Ontologies Independent Study Course, University of Osnabrück

2001 Grammar Formalisms and Parsing Lectures and Seminar, University of Tübingen

Selected invited talks

June 2019 Homeward Bound – a global initiative to tackle climate change and support diversity in leadership and academia, University of Bern

May 2017, 2018 Computational methods for ecology and marine science, Quantitative Underwater Ecological Surveying Techniques (QUEST), Big Island, Hawai'i

Jul. 2014 Natural Language Understanding with World Knowledge and Inference (tutorial), 14th International Conference on Principles of Knowledge Representation and Reasoning, Vienna, Austria

Jan. 2014 Inference-Based Natural Language Understanding, Allen Institute for AI, Seattle, USA

Nov. 2013 Heider-Simmel Interactive Theater, Laboratory for Applied Ontology, Trento, Italy

Feb. 2012 ILP-based Weighted Abduction for Natural Language Understanding, Universidad Nacional de Educacion a Distancia, Madrid, Spain

May 2011 World Knowledge for Natural Language Understanding using Abductive Reasoning, Seminar für Sprachwissenschaft, Tübingen, Germany

Mar. 2011 World Knowledge for Natural Language Understanding using Abductive Reasoning, Informatiekunde RijksuniversiteitGroningen, Groningen, Netherlands

Awards

2018 Selected along with 99 other scientists from around the world to be part of the Homeward Bound 4 program (`https://homewardboundprojects.com.au`)

2012 The PhD thesis won the OLB first prize (`https://www.olb.de/dieolb/16532.php`) (5.000 Euro award)

2007 The PhD project was supported by a 3-year scholarship from the German Academic Exchange Service (DAAD)

Activism

2020– Part of the AntarcicaNOW team (`https://www.antarcticanow.org`)

2019 Main organizer of the first Heidelberg Climathon (`https://climathon.climate-kic.org/en/heidelberg`)

2019– Climate change activist and educator: part of Homeward Bound program, Scientists4Future, Green EMBL

2018– Diversity & equality activist and educator

Selected press

2019 Energy News Network about our Homeward Bound voyage (`https://issuu.com/embl/docs/embletc_summer_2020-single/28`)

2019 Interview for "Women in Science" book (`https://go.technologynetworks.com/women-in-science`)

2019 Interview for EMBL magazine (`https://issuu.com/embl/docs/embl_magazine_summer_2019`)

Programming skills

Python, Java, Perl, Prolog, JavaScript, R

Languages

English (Fluent), German (Fluent), Russian (Fluent), Italian (Conversational), French (Basic)

References

Marianna Kruithof-de Julio, *Department of Urology & Department for BioMedical Research*, Murtenstrasse 35, 3008 Bern, Switzerland, Phone: +41-31-632 0931, Email: marianna.kruithofdejulio@dbmr.unibe.ch.

Theodore Alexandrov, *European Molecular Biology Laboratory*, Meyerhofstr. 1, 69117 Heidelberg, Germany, Phone: +49 6221 3878690, Email: theodore.alexandrov@embl.de.

John Burns, *Hawaii Institute of Marine Biology*, 46-007 Lilipuna Rd Kaneohe, HI 96744, USA, Phone: +1 808-854-4057, Fax: +1 808-236-7443, Email: johnhr@hawaii.edu.