Katja (Ekaterina) Ovchinnikova

Curriculum Vitae

Research interests

- human and automated reasoning
- computational molecular biology
- computational analysis in ecology and marine science
- computational image analysis
- computational natural language understanding
- language and vision
- computational analysis of mass media

Contact

email	katja@ovchinnikova.me
webpage	`www.ovchinnikova.me`
blog	`katja-hb.home.blog`
Twitter	`twitter.com/Katja_HB4`

Education

2018–2019	**Homeward Bound Program**, *leadership training for women in STEMM focusing on climate issues*.
2007–2011	**PhD**, *Institute of Cognitive Science, University of Osnabrück, Germany*, summa cum laude honor, OLB first prize.
2001–2002	**Exchange student**, *Department of Computational Linguistics, University of Tübingen, Germany*.
1998–2003	**M.Sc.**, *Department of Mathematical, Applied and Computational Linguistic, Saint Petersburg State University, Russia*, diploma with distinction.

Professional positions

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

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

Nov. 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

2016–Present **METASPACE**, `https://metaspace2020.eu`.
This project is on computational metabolite annotation of imaging mass spectrometry data. In this project, I work on applying natural language processing and computer vision algorithm to metabolite data.

2017–Present **Photo Identification of Manta Ray Images**, `http://www.hamerinhawaii.org`.
This project is on developing 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.

2015–Present **Coral Health**, `https://hilo.hawaii.edu/coralhealth`.
This project is on analyzing coral disease based on statistical analysis of the lesion distribution as well as on photo identification of the coral colonies. In collaboration with UH Hilo Hawaii.

past

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. In this project, 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`.
This is a 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`.
This project is on developing 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. The main algorithm for automatic matching of whale images can be found at `https://github.com/eovchinn/WhalePhotoID_MATLAB`.

2013–2014 **Heider-Simmel Interactive Theater**, *USC/ISI, USA*, `https://hsit.ict.usc.edu`.

This project is on interpretation and narrativization of simple two-dimensional videos in terms of goals, plans, beliefs, and emotions. In this project, 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`.

This project is on detecting linguistic metaphors in English, Spanish, Russian, and Farsi texts, and mapping them to conceptual metaphors. I supervised a group (6 people) responsible for development of an abduction-based metaphor interpretation pipeline and corpus-based knowledge extraction.

2010–2011 **Machine Reading**, *USC/ISI, USA*.

This project is on acquiring knowledge 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`.

This project is on 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/`.

This project is on studying 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`.

This project is on developing 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 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   Ovchinnikova, K., V. Kovalev, L. Stuart and T. Alexandrov (2019): Recognizing off-sample mass spectrometry images with machine and deep learning. Submitted to *Bioinformatics*, BioRxiv 518977 [Preprint]. Jan., 2019. Available from: *https://doi.org/10.1101/518977*.

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.

Theses

PhD thesis.

Title	*Integration of Word Knowledge for Natural Language Understanding*
Year	2011
Advisor	Prof. Dr. Kai-Uwe Künberger
Institution	Institute of Cognitive Science, University of Osnabrück

Diploma thesis.

Title	*Interactive graphical visualization of the mathematical foundations of the formal grammars*
Year	2003
Advisor	Dr. Irina V. Azarova
Institution	Department of Mathematical, Applied and Computational Linguistics, St.Petersburg State University

Teaching

2018-2019	Interactive workshops on implicit bias and ally skills, University of Heidelberg & European Molecular Biology Laboratory, Facilitator
2009	Concepts and Words: Theoretical and Empirical Perspectives Interdisciplinary seminar, University of Osnabrück, Teacher
2008	Lexicons and Ontologies Independent Study Course, University of Osnabrück, Teacher
2001	Grammar Formalisms and Parsing Lectures and Seminar, University of Tübingen, Teaching Assistant

Selected Invited Talks

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

Academic service (committees, reviewer)

AAAI, ACL, AGI, CICLing, COLING, Co-SLI, EMNLP, IEEE RA-L, IROS, IWCS, LREC, MICAI, NLPAR, OTT, STARTSEM, RAS, Concept Types and Frames, NSF grant proposal review.

Awards

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)

References

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

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