

Michael Wessel

Senior Computer Scientist

Dr. rer. nat. (\approx PhD) / Dipl. Inform. (\approx MSc)

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<https://scholar.google.com/citations?user=hAweuA0AAAAJ>

<https://github.com/lambdamikel?tab=repositories>

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RESEARCH INTERESTS

Artificial Intelligence (AI). Primary interests and areas of expertise include logic-based knowledge representation, Semantic Web, question answering, and AI programming. Other interests include information systems, databases, natural language processing, machine learning, and applications of Deep Learning.

EDUCATION

04/2008 Doctoral degree (Dr. rer. nat.) with highest distinction (Summa Cum Laude).
Hamburg University of Technology (TUHH), Germany.
Thesis: Flexible, Configurable Software Architectures for Ontology-Based Information Systems.

04/1998 Diploma in Computer Science with distinction.
University of Hamburg, Germany.
Thesis: A Visual Spatial Concept Definition Language.

TECHNICAL SKILLS

Common Lisp (Lispworks, Allegro CL, SBCL), Scheme, Lisp GUIs (Lispworks CAPI, CLIM), Lisp Libraries (Quicklisp, ASDF, `defsystem`, `cl-http`, AllegroGraph, ...), Python, Basic Python Machine Learning Libraries (Numpy, Tensorflow, PyTorch, Matplotlib), Basic NLP Python Libraries (NLTK, spaCY, Wordnet), Prolog, C/C++, Java, Java GUIs (JavaFX, SWT), Linux (Bash), Databases (PostgreSQL, MySQL / MariaDB, XQuery, AllegroGraph, SPARQL Endpoints), Latex, Semantic Web Stack (Description Logics, Ontologies, RDFs, OWL, OWLlink, SPARQL, Protégé, Python RDFlib), Logic Programming (Datalog, Flora-2, Prolog, XSB), Basic Web Technologies (HTML, XML, Javascript, Apache, REST APIs, Webservices, Ajax, JSON, OpenLayers), Microcontrollers (AVR, STM32), Arduino, WinAVR, Verilog, CUPL, KiCAD, Basic EDA Technology, Basic FPGA Knowledge, Z80 Assembler, BASIC, Pascal, Modula-II, Linux, Mac, Windows, Raspberry Pi, Basic Electronics

CERTIFICATES

06/2021 Natural Language Processing Specialization
Coursera Credential ID 5WET5A3CCPLE

02/2020 TensorFlow in Practice Specialization
Coursera Credential ID 7ZCFNHKC7GJB

10/2018 Deep Learning Specialization
Coursera Credential ID P8XJW33AWR56

EMPLOYMENT HISTORY

4/2022 – **Senior Computer Scientist**

today *SRI International, Artificial Intelligence Center, Menlo Park, CA 94025*

Project involvements:

COBRA: Developed a Python test & evaluation harness for SRI's federated mission plan repair system, COBRA. Conducted experiments to evaluate scalability, steerability, and other QoS metrics of the distributed system.

PathwayTools: Added two new search facilities to SRI's PathwayTools database. Reduced the compilation-time of the Lisp code by a factor of 6.

Gazetracker: Developed the Arduino-based breadboard for a new generation of SRI's BRIGHT Gazetracker. This involved the development of digital triggering mechanisms for two cameras and associated IR LEDs for illumination, and the development of a physical user interface consisting of switches, a potentiometer, and a status display. An Arduino Due and a Nano BLE 33 were used.

11/2017 – **Advanced Computer Scientist II**

4/2022 *SRI International, Artificial Intelligence Center, Menlo Park, CA 94025*

Project involvements:

COBRA: Python test harness for self-evaluation for COBRA. Designed and conducted experiments to evaluate scalability, steerability, and other QoS metrics of the system. Moreover, I developed the REST-server to COBRA's Prolog-based subsystem in Prolog, and the map & routing REST-server in Python.

Procedural Knowledge Capture from Video: This project aimed at capturing knowledge from hand-annotated and narrated "how to" tutorial videos. I developed a queryable semantic repository, utilizing OWL ontologies and SPARQL, and developed an ontology-based event fusion & interpretation architecture on top of this repository.

MEDIC: A prototype Virtual Personal Assistant (VPA) for Army Combat Medics. A Domain Specific Language (DSL) for dialogue workflow & process modeling on top of our ontology-based dialogue manager, the OntoVPA framework, was developed and applied to model standard medical procedures from a Field Medic Guidebook.

CHATPAL: A virtual companion system for the elderly. CHATPAL engages the senior in several scripted, templated yet flexible and adaptive conversations during which it learns important knowledge nuggets, e.g., names of friends and relatives, hobbies, and other personal preferences. CHATPAL utilizes these nuggets in later conversations, resulting in a deeply personalized VPA experience.

DNN Facade Classifier: The Pytorch Vision library was applied to train different Convolutional Neural Networks (CNNs) to classify building facade images into different architectural styles. The different CNNs were evaluated for accuracy using k-fold cross validation and accuracy, and the best performing network turned into a REST service.

10/2010 – **Computer Scientist**

10/2017 *SRI International, Artificial Intelligence Center, Menlo Park, CA 94025*

Project involvements:

Ontology-Based Dialogue Management: OntoVPA is an ontology-based dialogue manager, utilizing OWL ontologies both for domain and discourse knowledge representation, and ontology-based SPARQL rules to realize the discourse dynamics at runtime. Ontology authoring and compilation was done in the Racer reasoner. The SPARQL-based dialogue manager was built on top of Apache Jena in Java. OntoVPA-based systems were implemented for three different commercial customers.

Sunflower: Maintenance, refactoring and extension of the basic ontology management software layer. Development of a graphical ontology editor as an Eclipse / SWT Java plugin.

AURA / HALO: A project funded by the late Paul Allen that aimed at realizing a knowledge-based electronic biology textbook with question answering capabilities. I was responsible for the maintenance and extension of the Lisp-based knowledge representation system. Developed algorithms for knowledge base maintenance and question answering. Implemented knowledge base translations to standard formats such as OWL2, TPTP, and first-order logic.

09/2004 – **Teaching & Research Assistant**

10/2010 *Hamburg University of Technology (TUHH), Institute for Software Systems (STS), Germany*

- Researcher in several projects funded by the European Commission.
- Teaching on the graduate level; designed and graded written exams.
- Supervision and co-supervision of bachelor and master students.

09/2004 – **Co-Founder, Consultant & Developer**

12/2013 *Racer Systems GmbH & Co. KG, Hamburg, Germany*

At Racer Systems we developed the well-known RacerPro OWL and description logic reasoner. RacerPro was used by hundreds of academic and commercial customers.

- Developed an influential query and rule language, nRQL.
- Contributed significantly to the W3C member submission *OWLink*.
- Developed the open-source ontology management framework OntoLisp.
- Preparation of documentation (Reference Manual and User Guide).

06/1998 – **Teaching & Research Assistant**

08/2004 *University of Hamburg, Informatics Department, Cognitive Systems Group, Germany*

- Researcher for various projects funded by the German Research Council (DFG).
- Teaching on the undergraduate level.
- Co-supervision of bachelor and master students.

PROFESSIONAL SERVICES

- Program committee member / reviewer: AAAI 2016 – AAAI 2022; KR 2016; Deep Knowledge Representation Challenge Workshop 2011; Ontologies, Reasoning and Modularity 2008 (WORM-08)
- Reviewer for a couple of workshops and conferences, including Description Logics, KR, ESWC, ISWC, AAAI, ECAI, Lisp conferences, etc.

I have reviewed for the following international journals:

- Semantic Web Journal
- Knowledge and Information Systems (I have received a Springer reviewer certificate)
- Computer Science and Information Systems
- Journal of Computer Science and Technology (I have a certificate)
- International Journal on Artificial Intelligence Tools

SELECTED PUBLICATIONS

- “An Ontology-Based Dialogue Management Framework for Virtual Personal Assistants in Common Lisp”, Michael Wessel, *In: Proceedings of the 15th European Lisp Symposium, Online, Porto, Portugal, March 21 – 22, 2022, <https://www.european-lisp-symposium.org/2022>*
- “A Tangram Puzzle Solver in Common Lisp”, Michael Wessel, *In: Proceedings of the 14th European Lisp Symposium, Online, Everywhere, May 3 – 4, 2021, <https://european-lisp-symposium.org/static/proceedings/2021.pdf>*
- “An Ontology-Based Dialogue Management System for Virtual Personal Assistants”, Michael Wessel, Girish Acharya, James Carpenter, and Min Yin, *In: Eskenazi M., Devillers L., Mariani J. (eds) Advanced Social Interaction with Agents. Lecture Notes in Electrical Engineering, vol 510. Springer, Cham. https://doi.org/10.1007/978-3-319-92108-2_23*
- “Abductive Conjunctive Query Answering w.r.t. Ontologies”, Ralf Möller, Özgür Özçep, Volker Haarslev, Anahita Nafissi, and Michael Wessel, *KI - Künstliche Intelligenz, June 2016, Volume 30, Issue 2, pp 177-182*
- “Automatic Strengthening of Graph-Structured Knowledge Bases”, Vinay Chaudhri, Nikhil Dinesh, Stijn Heymans, and Michael Wessel, *3rd International Workshop on Graph Structures for Knowledge Representation and Reasoning, 2013*
- “KB Bio 101: A Challenge for OWL Reasoners”, Michael Wessel, Vinay Chaudhri, and Stijn Heymans, *The OWL Reasoner Evaluation Workshop, 2013*
- “Object-Oriented Knowledge Bases in Logic Programming”, Vinay K. Chaudhri, Stijn Heymans, Michael Wessel, and Son Cao Tran, *Technical Communication of International Conference in Logic Programming, 2013*
- “KB Bio 101: A Repository of Graph-Structured Knowledge”, Vinay K. Chaudhri, Michael Wessel and Stijn Heymans, *Exploiting Large Knowledge Repositories, 2012*
- “The RacerPro Knowledge Representation and Reasoning System”, Volker Haarslev, Kay Hidde, Ralf Möller, and Michael Wessel, *Semantic Web, 03 / 2012*
- “Flexible Software Architectures for Ontology-Based Information Systems”, Michael Wessel and Ralf Möller, *Journal of Applied Logic – Special Issue on Empirically Successful Systems, 01 / 2009*
- “OWLlink”, Thorsten Liebig, Marko Luther, Olaf Noppens, and Michael Wessel, *Semantic Web, 01 / 2011*
- “What Happened to Bob? Semantic Data Mining of Context Histories”, Michael Wessel, Marko Luther, and Ralf Möller, *International Workshop on Description Logics, 2009.*
- “Software Abstractions for Description Logic Systems”, Michael Wessel and Ralf Möller, *European Lisp Workshop, 2008*
- “Flexible und konfigurierbare Software-Architekturen für datenintensive ontologiebasierte Informationssysteme”, Michael Wessel, *PhD Thesis (in German), ISBN 978-3-8325-2162-2, Logos-Verlag, Berlin*
- “Towards a Media Interpretation Framework for the Semantic Web”, Sofia-Espinosa Peraldi, Atila Kaya, Sylvia Melzer, Ralf Möller, and Michael Wessel, *IEEE/WIC/ACM International Conference on Web Intelligence, 2007*
- “Design Principles and Realization Techniques for User Friendly, Interactive, and Scalable Ontology Browsing and Inspection Tools”, Michael Wessel and Ralf Möller, *International Workshop on OWL: Experiences and Directions, 2007*
- “On the Scalability of Description Logic Instance Retrieval”, Ralf Möller, Volker Haarslev, and Michael Wessel, *29. German Annual Conference on Artificial Intelligence, 2006*
- “A High Performance Semantic Web Query Answering Engine”, Michael Wessel and Ralf Möller, *International Workshop on Description Logics, 2005*
- “Querying the Semantic Web with Racer + nRQL”, Volker Haarslev, Ralf Möller, and Michael Wessel, *KI-2004 International Workshop on Applications of Description Logics, 2004*
- “Some Practical Issues in Building a Hybrid Deductive Geographic Information System with a DL Component”, Michael Wessel, *International Workshop on Knowledge Representation meets Databases, 2003*
- “Obstacles on the Way to Spatial Reasoning with Description Logics – Some Undecidability Results”, Michael Wessel, *International Workshop on Description Logics, 2001*
- “Terminological Default Reasoning About Spatial Information: A First Step” Ralf Möller and M. Wessel, *International Conference on Spatial Information Theory COSIT, 1999.*
- “Towards Computer Vision with Description Logics: Some Recent Progress” Ralf Möller, Bernd Neumann, and Michael Wessel, *Integration of Speech and Image Understanding, 1999*
- “VISCO: Bringing Visual Spatial Querying to Reality” Michael Wessel and Volker Haarslev, *IEEE Symposium on Visual Languages, 1998.*
- “GenEd - An Editor with Generic Semantics for Formal Reasoning about Visual Notations”, Volker Haarslev and Michael Wessel, *IEEE Symposium on Visual Languages, 1996*