Michael Wessel, PhD

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Dr. Wessel has over 20 years of experience as an Artificial Intelligence researcher and has worked for extended time periods both in academia as well as in industry. Prior to joining SRI, has was co-founder of an influential startup that played a key role in maturing Semantic Web technology, offering the world's first scalable Web Ontology Language reasoner. At SRI, Dr. Wessel contributed to over 10 commercial and non-commercial projects, ranging from topics in Knowledge Representation & Reasoning, Automated Planning, over Machine Learning & Data Analysis, prompt-engineering for Large Language Models, to Agentic, Multi-Agent, and Embedded Systems.

Skills and Expertise:

- Artificial Intelligence Programming
- Logic-Based Knowledge Representation & Reasoning
- Activity Recognition & Tracking
- Planning
- Dialogue Systems
- Semantic Web Technologies – OWL, RDFs, SPARQL
- Machine Learning & Deep Learning
- Large Language Models
- Embedded Systems
- Critical & Analytical Thinking
- Logical Thinking
- Technical Paper Writing

Technical Skills:

- Python, C, Java, JavaScript, Common Lisp, Prolog
- Machine Learning & Deep Learning Frameworks (PyTorch, Pandas, scikit learn, matplotlib)
- Github, Docker, Linux
- Databases
- Basic Web Development

Accomplishments:

- Reduced compilation time of the PathwayTools System by a factor of 6.
- Invented a new interpretable fine-grained text content characterization model based on high-dimensional semantic concept vectors.
- Lead developer of SRI's ontology-based dialogue management system. The 2017 OntoVPA publications have received a high number of citations by now, and contributed to 3 granted patents.
- Named a "Top 25% PC member" of the AAAI-2021 Program Committee.
- Winner of the Hackaday "Reinvented Retro" Contest 2021: https://hackaday.com/2021/07/17/reinvented-retro-contest-winners-announced/
- Lead contributor to the W3C Member Submission "OWLlink": https://www.w3.org/Submission/owllink-structural-specification/
- Created the Semantic Web query language nRQL, which was used by hundreds of users of the RacerPro OWL / Description Logic reasoner.

Years of Experience: 25+

Representative Projects

COLLEAGUE | *SRI International* | *Senior Computer Scientist.* Developed a multi-agent Hierarchical Task Network (HTN) planner for SRI's collaborative robotic framework, extending GTPyhop with partially ordered plans, pre/post-condition reasoning, and agent-aware task decomposition.

KMASS | *SRI International* | *Senior Computer Scientist.* Led research on applying LLMs to Oil & Gas workflows (sentiment, classification, topic modeling, synthetic text). Created **Concept Vectors**, an interpretable semantic topic model using multi-label concept classifiers and taxonomic activation dynamics to overcome sparsity in domain semantics. Used LLMs to mine concept associations from large industry corpora.

COBRA | *SRI International* | *Senior Computer Scientist.* Built a Python-based test and evaluation harness for SRI's federated mission-plan repair system. Designed and executed experiments assessing scalability, steerability, and QoS metrics across distributed agents.

PathwayTools | *SRI International* | *Senior Computer Scientist.* Implemented two new search facilities for the Pathway Tools database and optimized the Lisp codebase, reducing compilation time by **6×**.

Procedural Knowledge Capture from Video | *SRI International* | *Advanced Computer Scientist II.* Designed an ontology-driven multimedia integration architecture to extract procedural knowledge from "how-to" videos using OWL and SPARQL. Work contributed to a granted US patent.

MEDIC | *SRI International* | *Advanced Computer Scientist II.* Developed a Virtual Personal Assistant for Army Combat Medics within the OntoVPA framework. Created a Domain-Specific Language enabling rapid authoring of medical workflows from the Army Field Medic Guidebook

CHATPAL | *SRI International* | *Advanced Computer Scientist II.* Built a personalized virtual companion for elderly users using OntoVPA. Implemented conversational learning of user-specific facts (family, hobbies, preferences) to drive long-term personalization. Resulted in a granted US patent.

DNN Facade Classifier | *SRI International* | *Advanced Computer Scientist II.* Trained and evaluated multiple CNN architectures in PyTorch to classify building facades by architectural style using k-fold validation. Deployed the top model as a REST service for a major Japanese construction partner.

Ontology-Based Dialogue Management | *SRI International* | *Computer Scientist.* Developed OntoVPA, a next-generation ontology-based dialogue manager using OWL/RDF for discourse representation and SPARQL rules for runtime dynamics. Built on Apache Jena and Racer; deployed for three commercial customers.

Sunflower | *SRI International* | *Computer Scientist.* Refactored and optimized the ontology management layer of the SUNFLOWER reasoner for Flora-2, improving performance by several orders of magnitude. Built an Eclipse/SWT-based graphical ontology editor.

AURA / HALO | *SRI International* | *Computer Scientist.* Developed algorithms for knowledge-base maintenance, question answering, and translation into OWL2, TPTP, SILK, ASP, and first-order logic. Contributed to Paul Allen–funded efforts to build an intelligent, college-level biology tutor.

Experience

Organization	Role	Years
SRI International	Senior Computer Scientist	2022–Present
SRI International	Advanced Computer Scientist II	2017–2022
SRI International	Computer Scientist	2010–2017
Racer Systems GmbH & Co. KG	Co-Founder, Consultant & Developer	2004–2013
Hamburg University of Technology	Teaching & Research Assistant	2004–2010
University of Hamburg	Teaching & Research Assistant	1998–2004

Education

Degree/Certification	Institution	Years
PhD, Computer Science	Hamburg University of Technology (TUHH)	2008
MS, Computer Science	University of Hamburg	1998
Certificate, Natural Language Processing Specialization	Coursera	2021
Certificate, TensorFlow in Practice Specialization	Coursera	2020
Certificate, Deep Learning Specialization	Coursera	2018

GitHub Project, Publications & Patents

- Homepage: https://www.michael-wessel.info/
- GitHub projects: https://github.com/lambdamikel
- Google Scholar: https://scholar.google.com/citations?user=hAweuA0AAAAJ&hl=en
- Semantic Scholar. https://www.semanticscholar.org/author/Michael-Wessel/145546968
- “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 Özcep, 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 f¨ur 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.