

Investigating cybercrime

Oerlemans, J.J.

Citation

Oerlemans, J. J. (2017, January 10). *Investigating cybercrime*. *Meijers-reeks*. Meijers Research Institute and Graduate School of the Leiden Law School of Leiden University, Leiden. Retrieved from https://hdl.handle.net/1887/44879

Version: Not Applicable (or Unknown)

License: License agreement concerning inclusion of doctoral thesis in the

Institutional Repository of the University of Leiden

Downloaded from: https://hdl.handle.net/1887/44879

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle $\underline{\text{https://openaccess.leidenuniv.nl/handle/1887/44879}}$ holds various files of this Leiden University dissertation

Author: Oerlemans, Jan-Jaap **Title:** Investigating cybercrime **Issue Date:** 2017-01-10

Acknowledgements

Writing a PhD thesis is a journey we do not take alone. Therefore, I would like to thank the people who assisted me in completing this project.

My former colleagues at Fox-IT helped me to learn more about cyber-security and the practice of digital investigations. Gratitude is owed in particular to Ronald Prins, who has supported me throughout all of my research and has always been available for discussion. I would also like to extend special thanks to my colleagues at eLaw, Center for Law and Digital Technologies at Leiden University. Our many brainstorming sessions – and the informal discussions we had during our Friday afternoon drinks – really helped me to develop my ideas about IT law. I found writing a PhD thesis to be a humbling experience, and I learned to listen to all of the comments and suggestions made concerning my manuscript. This feedback eventually brought my research to a higher level. Since it is not customary in Leiden to thank your PhD supervisors in the acknowledgements, I will refrain from doing so. However, suffice it to say I have become acutely aware of the indispensable role that supervisors play in developing the academic writing skills of a young legal scholar.

I am also grateful to Orin Kerr, Daniel Solove, and Susan Brenner. All three were willling to spend time with me discussing the U.S. regulations for digital investigative methods with me during my tenure as a visiting scholar at George Washington University in Washington D.C.¹ My visits to the Dutch national high tech crime unit, the U.S. Secret Service headquarters, and the FBI headquarters also helped me to better understand the practice of cybercrime investigations.

This research would not have been possible without assistance from Lodewijk van Zwieten. The many interviews and the opportunity to conduct dossier research at the office of the Public Prosecution Service in Rotterdam significantly contributed to my research. I would also like to thank all other interview respondents for both taking the time to speak with me and sharing their knowledge and insights.

While working on this PhD thesis, I co-authored several publications with Bert-Jaap Koops, Bart Custers, Charlotte Conings, Ronald Pool, and Rolf van Wegberg. I thank you all for your cooperation and hope we can continue to research together in the future. I would also like to thank my colleagues at the Research and Document Centre (WODC) and the Dutch Defence Academy for their good company and cooperation in research.

¹ My tenure here was sponsored by the Leiden University Fund and eLaw.

420 Acknowledgements

Finally, I would like to thank my parents and wife for supporting me in my research. My parents have provided me with love and support throughout my entire life. Eva, your love, support, and – perhaps above all – your patience have been very important to me. While I was never able to give you a realistic indication of when I would finish my dissertation, you graciously accepted the inevitable delays and low points I experienced along the way. During my PhD journey, we have gotten married and started our own family. I dedicate this work to our daughter, Violet.

Curriculum Vitae

Jan-Jaap Oerlemans (1985) studied law (IT law and criminal law) at Leiden University and the University of Amsterdam. From 2010 to 2015, he worked for Fox-IT as a researcher and legal consultant. In 2014, he started working for the Research and Documentation Centre of the Dutch Ministry of Security and Justice and in 2015 for the Dutch Defence Academy. In his professional work he focuses on cybercrime, privacy, digital investigations, and cybersecurity. Jan-Jaap conducted his PhD research at eLaw, Center for Law and Digital Technologies, and the E.M. Meijers Institute of Legal Studies of Leiden University. Via his supervisor, Jaap van den Herik, he was also affiliated with SIKS, the Dutch Research School for Information and Knowledge Systems.

See https://www.universiteitleiden.nl/en/staffmembers/jan-jaap-oerlemans for more information and a full list of publications.

SIKS dissertation series (2009-2016)

- 1. Rasa Jurgelenaite (RUN) Symmetric Causal Independence Models
- 2. Willem Robert van Hage (VU) Evaluating Ontology-Alignment Techniques
- 3. Hans Stol (UvT) A Framework for Evidence-based Policy Making Using IT
- Josephine Nabukenya (RUN) Improving the Quality of Organisational Policy Making using Collaboration Engineering
- Sietse Overbeek (RUN) Bridging Supply and Demand for Knowledge Intensive Tasks Based on Knowledge, Cognition, and Quality
- 6. Muhammad Subianto (UU) Understanding Classification
- 7. Ronald Poppe (UT) Discriminative Vision-Based Recovery and Recognition of Human Motion
- 8. Volker Nannen (VU) Evolutionary Agent-Based Policy Analysis in Dynamic Environments
- 9. Benjamin Kanagwa (RUN) Design, Discovery and Construction of Service-oriented Systems
- 10. Jan Wielemaker (UvA) Logic programming for knowledge-intensive interactive applications
- 11. Alexander Boer (UvA) Legal Theory, Sources of Law & the Semantic Web
- 12. Peter Massuthe (TU/e), Humboldt-Universitaet zu Berlin) Operating Guidelines for Services
- 13. Steven de Jong (UM) Fairness in Multi-Agent Systems
- 14. Maksym Korotkiy (VU) From ontology-enabled services to service-enabled ontologies (making ontologies work in e-science with ONTO-SOA)
- 15. Rinke Hoekstra (UvA) Ontology Representation Design Patterns and Ontologies that Make Sense
- 16. Fritz Reul (UvT) New Architectures in Computer Chess
- 17. Laurens van der Maaten (UvT) Feature Extraction from Visual Data
- 18. Fabian Groffen (CWI) Armada, An Evolving Database System
- 19. Valentin Robu (CWI) Modeling Preferences, Strategic Reasoning and Collaboration in Agent-Mediated Electronic Markets
- 20. Bob van der Vecht (UU) Adjustable Autonomy: Controling Influences on Decision Making
- 21. Stijn Vanderlooy (UM) Ranking and Reliable Classification
- 22. Pavel Serdyukov (UT) Search For Expertise: Going beyond direct evidence
- 23. Peter Hofgesang (VU) Modelling Web Usage in a Changing Environment
- 24. Annerieke Heuvelink (VU) Cognitive Models for Training Simulations
- 25. Alex van Ballegooij (CWI) "RAM: Array Database Management through Relational Mapping"
- 26. Fernando Koch (UU) An Agent-Based Model for the Development of Intelligent Mobile Services
- 27. Christian Glahn (OU) Contextual Support of social Engagement and Reflection on the Web
- 28. Sander Evers (UT) Sensor Data Management with Probabilistic Models
- 29. Stanislav Pokraev (UT) Model-Driven Semantic Integration of Service-Oriented Applications
- 30. Marcin Zukowski (CWI) Balancing vectorized query execution with bandwidth-optimized storage
- 31. Sofiya Katrenko (UvA) A Closer Look at Learning Relations from Text
- 32. Rik Farenhorst (VU) and Remco de Boer (VU) Architectural Knowledge Management: Supporting Architects and Auditors
- 33. Khiet Truong (UT) How Does Real Affect Affect Affect Recognition In Speech?
- 34. Inge van de Weerd (UU) Advancing in Software Product Management: An Incremental Method Engineering Approach
- 35. Wouter Koelewijn (UL) Privacy en Politiegegevens; Over geautomatiseerde normatieve informatieuitwisseling
- 36. Marco Kalz (OUN) Placement Support for Learners in Learning Networks
- 37. Hendrik Drachsler (OUN) Navigation Support for Learners in Informal Learning Networks
- 38. Riina Vuorikari (OU) Tags and self-organisation: a metadata ecology for learning resources in a multilingual context

- 39. Christian Stahl (TU/e), Humboldt-Universitaet zu Berlin) Service Substitution A Behavioral Approach Based on Petri Nets
- 40. Stephan Raaijmakers (UvT) Multinomial Language Learning: Investigations into the Geometry of Language
- 41. Igor Berezhnyy (UvT) Digital Analysis of Paintings
- 42. Toine Bogers (UvT) Recommender Systems for Social Bookmarking
- 43. Virginia Nunes Leal Franqueira (UT) Finding Multi-step Attacks in Computer Networks using Heuristic Search and Mobile Ambients
- 44. Roberto Santana Tapia (UT) Assessing Business-IT Alignment in Networked Organizations
- 45. Jilles Vreeken (UU) Making Pattern Mining Useful
- 46. Loredana Afanasiev (UvA) Querying XML: Benchmarks and Recursion

- 1. Matthijs van Leeuwen (UU) Patterns that Matter
- 2. Ingo Wassink (UT) Work flows in Life Science
- Joost Geurts (CWI) A Document Engineering Model and Processing Framework for Multimedia documents
- 4. Olga Kulyk (UT) Do You Know What I Know? Situational Awareness of Co-located Teams in Multidisplay Environments
- 5. Claudia Hauff (UT) Predicting the Effectiveness of Queries and Retrieval Systems
- 6. Sander Bakkes (UvT) Rapid Adaptation of Video Game AI
- 7. Wim Fikkert (UT) Gesture interaction at a Distance
- 8. Krzysztof Siewicz (UL) Towards an Improved Regulatory Framework of Free Software. Protecting user freedoms in a world of software communities and eGovernments
- 9. Hugo Kielman (UL) A Politiele gegevensverwerking en Privacy, Naar een effectieve waarborging
- 10. Rebecca Ong (UL) Mobile Communication and Protection of Children
- 11. Adriaan Ter Mors (TUD) The world according to MARP: Multi-Agent Route Planning
- 12. Susan van den Braak (UU) Sensemaking software for crime analysis
- 13. Gianluigi Folino (RUN) High Performance Data Mining using Bio-inspired techniques
- 14. Sander van Splunter (VU) Automated Web Service Reconfiguration
- 15. Lianne Bodenstaff (UT) Managing Dependency Relations in Inter-Organizational Models
- 16. Sicco Verwer (TUD) Efficient Identification of Timed Automata, theory and practice
- 17. Spyros Kotoulas (VU) Scalable Discovery of Networked Resources: Algorithms, Infrastructure, Applications
- 18. Charlotte Gerritsen (VU) Caught in the Act: Investigating Crime by Agent-Based Simulation
- 19. Henriette Cramer (UvA) People's Responses to Autonomous and Adaptive Systems
- 20. Ivo Swartjes (UT) Whose Story Is It Anyway? How Improv Informs Agency and Authorship of Emergent Narrative
- 21. Harold van Heerde (UT) Privacy-aware data management by means of data degradation
- 22. Michiel Hildebrand (CWI) End-user Support for Access to \\ Heterogeneous Linked Data
- $23. \ \ Bas\, Steune brink\, (UU)\, \textit{The Logical Structure of Emotions}$
- 24. Dmytro Tykhonov (TUD) Designing Generic and Efficient Negotiation Strategies
- 25. Zulfiqar Ali Memon (VU) Modelling Human-Awareness for Ambient Agents: A Human Mindreading Perspective
- 26. Ying Zhang (CWI) XRPC: Efficient Distributed Query Processing on Heterogeneous XQuery Engines
- 27. Marten Voulon (UL) Automatisch contracteren
- 28. Arne Koopman (UU) Characteristic Relational Patterns
- 29. Stratos Idreos(CWI) Database Cracking: Towards Auto-tuning Database Kernels
- 30. Marieke van Erp (UvT) Accessing Natural History Discoveries in data cleaning, structuring, and
- 31. Victor de Boer (UvA) Ontology Enrichment from Heterogeneous Sources on the Web
- 32. Marcel Hiel (UvT) An Adaptive Service Oriented Architecture: Automatically solving Interoperability Problems
- 33. Robin Aly (UT) Modeling Representation Uncertainty in Concept-Based Multimedia Retrieval
- 34. Teduh Dirgahayu (UT) Interaction Design in Service Compositions
- 35. Dolf Trieschnigg (UT) Proof of Concept: Concept-based Biomedical Information Retrieval

- 36. Jose Janssen (OU) Paving the Way for Lifelong Learning; Facilitating competence development through a learning path specification
- 37. Niels Lohmann (TU/e) Correctness of services and their composition
- 38. Dirk Fahland (TU/e) From Scenarios to components
- 39. Ghazanfar Farooq Siddiqui (VU) Integrative modeling of emotions in virtual agents
- 40. Mark van Assem (VU) Converting and Integrating Vocabularies for the Semantic Web
- 41. Guillaume Chaslot (UM) Monte-Carlo Tree Search
- 42. Sybren de Kinderen (VU) Needs-driven service bundling in a multi-supplier setting the computational e3-service approach
- 43. Peter van Kranenburg (UU) A Computational Approach to Content-Based Retrieval of Folk Song Melodies
- 44. Pieter Bellekens (TU/e) An Approach towards Context-sensitive and User-adapted Access to Heterogeneous Data Sources, Illustrated in the Television Domain
- 45. Vasilios Andrikopoulos (UvT) A theory and model for the evolution of software services
- 46. Vincent Pijpers (VU) e3alignment: Exploring Inter-Organizational Business-ICT Alignment
- 47. Chen Li (UT) Mining Process Model Variants: Challenges, Techniques, Examples
- 48. Withdrawn
- 49. Jahn-Takeshi Saito (UM) Solving difficult game positions
- 50. Bouke Huurnink (UvA) Search in Audiovisual Broadcast Archives
- 51. Alia Khairia Amin (CWI) Understanding and supporting information seeking tasks in multiple sources
- 52. Peter-Paul van Maanen (VU) Adaptive Support for Human-Computer Teams: Exploring the Use of Cognitive Models of Trust and Attention
- 53. Edgar Meij (UvA) Combining Concepts and Language Models for Information Access

- 1. Botond Cseke (RUN) Variational Algorithms for Bayesian Inference in Latent Gaussian Models
- 2. Nick Tinnemeier (UU) Organizing Agent Organizations. Syntax and Operational Semantics of an Organization-Oriented Programming Language
- Jan Martijn van der Werf (TU/e) Compositional Design and Verification of Component-Based Information Systems
- 4. Hado van Hasselt (UU) Insights in Reinforcement Learning; Formal analysis and empirical evaluation of temporal-difference learning algorithms
- 5. Base van der Raadt (VU) Enterprise Architecture Coming of Age Increasing the Performance of an Emerging Discipline.
- 6. Yiwen Wang (TU/e) Semantically-Enhanced Recommendations in Cultural Heritage
- 7. Yujia Cao (UT) Multimodal Information Presentation for High Load Human Computer Interaction
- 8. Nieske Vergunst (UU) BDI-based Generation of Robust Task-Oriented Dialogues
- 9. Tim de Jong (OU) Contextualised Mobile Media for Learning
- 10. Bart Bogaert (UvT) Cloud Content Contention
- 11. Dhaval Vyas (UT) Designing for Awareness: An Experience-focused HCI Perspective
- 12. Carmen Bratosin (TU/e) *Grid Architecture for Distributed Process Mining*
- 13. Xiaoyu Mao (UvT) Airport under Control. Multiagent Scheduling for Airport Ground Handling
- 14. Milan Lovric (EUR) Behavioral Finance and Agent-Based Artificial Markets
- 15. Marijn Koolen (UvA) The Meaning of Structure: the Value of Link Evidence for Information Retrieval
- 16. Maarten Schadd (UM) Selective Search in Games of Different Complexity
- 17. Jiyin He (UvA) Exploring Topic Structure: Coherence, Diversity and Relatedness
- 18. Mark Ponsen (UM) Strategic Decision-Making in complex games
- 19. Ellen Rusman (OU) The Mind's Eye on Personal Profiles
- 20. Qing Gu (VU) Guiding service-oriented software engineering A view-based approach
- 21. Linda Terlouw (TUD) Modularization and Specification of Service-Oriented Systems
- 22. Junte Zhang (UvA) System Evaluation of Archival Description and Access
- 23. Wouter Weerkamp (UvA) Finding People and their Utterances in Social Media
- 24. Herwin van Welbergen (UT) Behavior Generation for Interpersonal Coordination with Virtual Humans On Specifying, Scheduling and Realizing Multimodal Virtual Human Behavior
- 25. Syed Waqar ul Qounain Jaffry (VU) Analysis and Validation of Models for Trust Dynamics

- 26. Matthijs Aart Pontier (VU) Virtual Agents for Human Communication Emotion Regulation and Involvement-Distance Trade-Offs in Embodied Conversational Agents and Robots
- 27. Aniel Bhulai (VU) Dynamic website optimization through autonomous management of design patterns
- 28. Rianne Kaptein (UvA) Effective Focused Retrieval by Exploiting Query Context and Document Structure
- 29. Faisal Kamiran (TU/e) Discrimination-aware Classification
- 30. Egon van den Broek (UT) Affective Signal Processing (ASP): Unraveling the mystery of emotions
- 31. Ludo Waltman (EUR) Computational and Game-Theoretic Approaches for Modeling Bounded Rationality
- 32. Nees-Jan van Eck (EUR) Methodological Advances in Bibliometric Mapping of Science
- 33. Tom van der Weide (UU) Arguing to Motivate Decisions
- 34. Paolo Turrini (UU) Strategic Reasoning in Interdependence: Logical and Game-theoretical Investigations
- 35. Maaike Harbers (UU) Explaining Agent Behavior in Virtual Training
- 36. Erik van der Spek (UU) Experiments in serious game design: a cognitive approach
- 37. Adriana Burlutiu (RUN) Machine Learning for Pairwise Data, Applications for Preference Learning and Supervised Network Inference
- 38. Nyree Lemmens (UM) Bee-inspired Distributed Optimization
- 39. Joost Westra (UU) Organizing Adaptation using Agents in Serious Games
- 40. Viktor Clerc (VU) Architectural Knowledge Management in Global Software Development
- 41. Luan Ibraimi (UT) Cryptographically Enforced Distributed Data Access Control
- 42. Michal Sindlar (UU) Explaining Behavior through Mental State Attribution
- 43. Henk van der Schuur (UU) Process Improvement through Software Operation Knowledge
- 44. Boris Reuderink (UT) Robust Brain-Computer Interfaces
- 45. Herman Stehouwer (UvT) Statistical Language Models for Alternative Sequence Selection
- 46. Beibei Hu (TUD) Towards Contextualized Information Delivery: A Rule-based Architecture for the Domain of Mobile Police Work
- 47. Azizi Bin Ab Aziz(VU) Exploring Computational Models for Intelligent Support of Persons with
- 48. Mark Ter Maat (UT) Response Selection and Turn-taking for a Sensitive Artificial Listening Agent
- 49. Andreea Niculescu (UT) Conversational interfaces for task-oriented spoken dialogues: design aspects influencing interaction quality

- 1. Terry Kakeeto (UvT) Relationship Marketing for SMEs in Uganda
- 2. Muhammad Umair (VU) Adaptivity, emotion, and Rationality in Human and Ambient Agent Models
- 3. Adam Vanya (VU) Supporting Architecture Evolution by Mining Software Repositories
- 4. Jurriaan Souer (UU) Development of Content Management System-based Web Applications
- 5. Marijn Plomp (UU) Maturing Interorganisational Information Systems
- 6. Wolfgang Reinhardt (OU) Awareness Support for Knowledge Workers in Research Networks
- 7. Rianne van Lambalgen (VU) When the Going Gets Tough: Exploring Agent-based Models of Human Performance under Demanding Conditions
- 8. Gerben de Vries (UvA) Kernel Methods for Vessel Trajectories
- 9. Ricardo Neisse (UT) Trust and Privacy Management Support for Context-Aware Service Platforms
- 10. David Smits (TU/e) Towards a Generic Distributed Adaptive Hypermedia Environment
- 11. J.C.B. Rantham Prabhakara (TU/e) Process Mining in the Large: Preprocessing, Discovery, and Diagnostics
- 12. Kees van der Sluijs (TU/e) Model Driven Design and Data Integration in Semantic Web Information Systems
- 13. Suleman Shahid (UvT) Fun and Face: Exploring non-verbal expressions of emotion during playful interactions
- 14. Evgeny Knutov (TU/e) Generic Adaptation Framework for Unifying Adaptive Web-based Systems
- 15. Natalie van der Wal (VU) Social Agents. Agent-Based Modelling of Integrated Internal and Social Dynamics of Cognitive and Affective Processes.
- 16. Fiemke Both (VU) Helping people by understanding them Ambient Agents supporting task execution and depression treatment

- 17. Amal Elgammal (UvT) Towards a Comprehensive Framework for Business Process Compliance
- 18. Eltjo Poort (VU) Improving Solution Architecting Practices
- 19. Helen Schonenberg (TU/e) What's Next? Operational Support for Business Process Execution
- 20. Ali Bahramisharif (RUN) Covert Visual Spatial Attention, a Robust Paradigm for Brain-Computer Interfacing
- 21. Roberto Cornacchia (TUD) Querying Sparse Matrices for Information Retrieval
- 22. Thijs Vis (UvT) Intelligence, politie en veiligheidsdienst: verenigbare grootheden?
- 23. Christian Muehl (UT) Toward Affective Brain-Computer Interfaces: Exploring the Neurophysiology of Affect during Human Media Interaction
- 24. Laurens van der Werff (UT) Evaluation of Noisy Transcripts for Spoken Document Retrieval
- Silja Eckartz (UT) Managing the Business Case Development in Inter-Organizational IT Projects: A Methodology and its Application
- 26. Emile de Maat (UvA) Making Sense of Legal Text
- 27. Hayrettin Gürkök (UT) Mind the Sheep! User Experience Evaluation & Brain-Computer Interface Games
- 28. Nancy Pascall (UvT) Engendering Technology Empowering Women
- 29. Almer Tigelaar (UT) Peer-to-Peer Information Retrieval
- 30. Alina Pommeranz (TUD) Designing Human-Centered Systems for Reflective Decision Making
- 31. Emily Bagarukayo (RUN) A Learning by Construction Approach for Higher Order Cognitive Skills Improvement, Building Capacity and Infrastructure
- 32. Wietske Visser (TUD) Qualitative multi-criteria preference representation and reasoning
- 33. Rory Sie (OU) Coalitions in Cooperation Networks (COCOON)
- 34. Pavol Jancura (RUN) Evolutionary analysis in PPI networks and applications
- 35. Evert Haasdijk (VU) Never Too Old To Learn On-line Evolution of Controllers in Swarm-and Modular Robotics
- 36. Denis Ssebugwawo (RUN) Analysis and Evaluation of Collaborative Modeling Processes
- 37. Agnes Nakakawa (RUN) A Collaboration Process for Enterprise Architecture Creation
- 38. Selmar Smit (VU) Parameter Tuning and Scientific Testing in Evolutionary Algorithms
- 39. Hassan Fatemi (UT) Risk-aware design of value and coordination networks
- 40. Agus Gunawan (UvT) Information Access for SMEs in Indonesia
- 41. Sebastian Kelle (OU) Game Design Patterns for Learning
- 42. Dominique Verpoorten (OU) Reflection Amplifiers in self-regulated Learning
- 43. Withdrawn
- 44. Anna Tordai (VU) On Combining Alignment Techniques
- 45. Benedikt Kratz (UvT) A Model and Language for Business-aware Transactions
- 46. Simon Carter (UVA) Exploration and Exploitation of Multilingual Data for Statistical Machine Translation
- 47. Manos Tsagkias (UVA) Mining Social Media: Tracking Content and Predicting Behavior
- 48. Jorn Bakker (TUE) Handling Abrupt Changes in Evolving Time-series Data
- 49. Michael Kaisers (UM) Learning against Learning Evolutionary dynamics of reinforcement learning algorithms in strategic interactions
- 50. Steven van Kervel (TUD) Ontologogy driven Enterprise Information Systems Engineering
- 51. Jeroen de Jong (TUD) Heuristics in Dynamic Scheduling; a practical framework with a case study in elevator dispatching

- 1. Viorel Milea (EUR) News Analytics for Financial Decision Support
- Erietta Liarou (CWI) MonetDB/DataCell: Leveraging the Column-store Database Technology for Efficient and Scalable Stream Processing
- 3. Szymon Klarman (VU) Reasoning with Contexts in Description Logics
- $4. \quad \text{Chetan Yadati (TUD) } \textit{Coordinating autonomous planning and scheduling}$
- 5. Dulce Pumareja (UT) Groupware Requirements Evolutions Patterns
- 6. Romulo Goncalves (CWI) The Data Cyclotron: Juggling Data and Queries for a Data Warehouse Audience
- 7. Giel van Lankveld (UT) Quantifying Individual Player Differences

- 8. Robbert-Jan Merk (VU) Making enemies: cognitive modeling for opponent agents in fighter pilot simulators
- 9. Fabio Gori (RUN) Metagenomic Data Analysis: Computational Methods and Applications
- 10. Jeewanie Jayasinghe Arachchige (UvT) A Unified Modeling Framework for Service Design
- 11. Evangelos Pournaras (TUD) Multi-level Reconfigurable Self-organization in Overlay Services
- 12. Marian Razavian (VU) Knowledge-driven Migration to Services
- 13. Mohammad Safiri(UT) Service Tailoring: User-centric creation of integrated IT-based homecare services to support independent living of elderly
- 14. Jafar Tanha (UVA) Ensemble Approaches to Semi-Supervised Learning Learning
- 15. Daniel Hennes (UM) Multiagent Learning Dynamic Games and Applications
- 16. Eric Kok (UU) Exploring the practical benefits of argumentation in multi-agent deliberation
- 17. Koen Kok (VU) The PowerMatcher: Smart Coordination for the Smart Electricity Grid
- 18. Jeroen Janssens (UvT) Outlier Selection and One-Class Classification
- 19. Renze Steenhuizen (TUD) Coordinated Multi-Agent Planning and Scheduling
- 20. Katja Hofmann (UvA) Fast and Reliable Online Learning to Rank for Information Retrieval
- 21. Sander Wubben (UvT) Text-to-text generation by monolingual machine translation
- 22. Tom Claassen (RUN) Causal Discovery and Logic
- 23. Patricio de Alencar Silva (UvT) Value Activity Monitoring
- 24. Haitham Bou Ammar (UM) Automated Transfer in Reinforcement Learning
- 25. Agnieszka Anna Latoszek-Berendsen (UM) Intention-based Decision Support. A new way of representing and implementing clinical guidelines in a Decision Support System
- 26. Alireza Zarghami (UT) Architectural Support for Dynamic Homecare Service Provisioning
- 27. Mohammad Huq (UT) Inference-based Framework Managing Data Provenance
- 28. Frans van der Sluis (UT) When Complexity becomes Interesting: An Inquiry into the Information eXperience
- 29. Iwan de Kok (UT) Listening Heads
- 30. Joyce Nakatumba (TUE) Resource-Aware Business Process Management: Analysis and Support
- 31. Dinh Khoa Nguyen (UvT) Blueprint Model and Language for Engineering Cloud Applications
- 32. Kamakshi Rajagopal (OUN) Networking For Learning; The role of Networking in a Lifelong Learner's Professional Development
- 33. Qi Gao (TUD) User Modeling and Personalization in the Microblogging Sphere
- 34. Kien Tjin-Kam-Jet (UT) Distributed Deep Web Search
- 35. Abdallah El Ali (Uv
A) $\it Minimal\ Mobile\ Human\ Computer$
- 36. Than Lam Hoang (TUe) Pattern Mining in Data Streams
- 37. Dirk Börner (OUN) Ambient Learning Displays
- 38. Eelco den Heijer (VU) Autonomous Evolutionary Art
- Joop de Jong (TUD) A Method for Enterprise Ontology based Design of Enterprise Information Sustems
- 40. Pim Nijssen (UM) Monte-Carlo Tree Search for Multi-Player Games
- 41. Jochem Liem (UVA) Supporting the Conceptual Modelling of Dynamic Systems: A Knowledge Engineering Perspective on Qualitative Reasoning
- 42. Léon Planken (TUD) Algorithms for Simple Temporal Reasoning
- 43. Marc Bron (UVA) Exploration and Contextualization through Interaction and Concepts

- 1. Nicola Barile (UU) Studies in Learning Monotone Models from Data
- 2. Fiona Tuliyano (RUN) Combining System Dynamics with a Domain Modeling Method
- 3. Sergio Raul Duarte Torres (UT) Information Retrieval for Children: Search Behavior and Solutions
- 4. Hanna Jochmann-Mannak (UT) Websites for children: search strategies and interface design Three studies on children's search performance and evaluation
- 5. Jurriaan van Reijsen (UU) Knowledge Perspectives on Advancing Dynamic Capability
- 6. Damian Tamburri (VU) Supporting Networked Software Development
- 7. Arya Adriansyah (TUE) Aligning Observed and Modeled Behavior
- 8. Samur Araujo (TUD) Data Integration over Distributed and Heterogeneous Data Endpoints
- 9. Philip Jackson (UvT) Toward Human-Level Artificial Intelligence: Representation and Computation of Meaning in Natural Language

- 10. Ivan Salvador Razo Zapata (VU) Service Value Networks
- 11. Janneke van der Zwaan (TUD) An Empathic Virtual Buddy for Social Support
- 12. Willem van Willigen (VU) Look Ma, No Hands: Aspects of Autonomous Vehicle Control
- 13. Arlette van Wissen (VU) Agent-Based Support for Behavior Change: Models and Applications in Health and Safety Domains
- 14. Yangyang Shi (TUD) Language Models With Meta-information
- 15. Natalya Mogles (VU) Agent-Based Analysis and Support of Human Functioning in Complex Socio-Technical Systems: Applications in Safety and Healthcare
- 16. Krystyna Milian (VU) Supporting Trial Recruitment and Design by Automatically Interpreting Eligibility Criteria
- 17. Kathrin Dentler (VU) Computing Healthcare Quality Indicators Automatically: Secondary Use of Patient Data and Semantic Interoperability
- 18. Mattijs Ghijsen (VU) Methods and Models for the Design and Study of Dynamic Agent Organizations
- 19. Vincius Ramos (TUE) Adaptive Hypermedia Courses: Qualitative and Quantitative Evaluation and Tool Support
- 20. Mena Habib (UT) Named Entity Extraction and Disambiguation for Informal Text: The Missing Link
- 21. Kassidy Clark (TUD) Negotiation and Monitoring in Open Environments
- 22. Marieke Peeters (UT) Personalized Educational Games Developing Agent-Supported Scenario-based Training
- 23. Eleftherios Sidirourgos (UvA/CWI) Space Efficient Indexes for the Big Data Era
- 24. Davide Ceolin (VU) Trusting Semi-structured Web Data
- 25. Martijn Lappenschaar (RUN) New Network Models for the Analysis of Disease Interaction
- 26. Tim Baarslag (TUD) What to Bid and When to Stop
- 27. Rui Jorge Almeida (EUR) Conditional Density Models Integrating Fuzzy and Probabilistic Representations of Uncertainty
- 28. Anna Chmielowiec (VU) Decentralized k-Clique Matching
- 29. Jaap Kabbedijk (UU) Variability in Multi-Tenant Enterprise Software
- 30. Peter de Kock (UvT) Anticipating Criminal Behaviour
- 31. Leo van Moergestel (UU) Agent Technology in Agile Multiparallel Manufacturing and Product Support
- 32. Naser Ayat (UVA) On Entity Resolution in Probabilistic Data
- 33. Tesfa Tegegne Asfaw (RUN) Service Discovery in eHealth
- 34. Christina Manteli (VU) The Effect of Governance in Global Software Development: Analyzing Transactive Memory Systems
- 35. Joost van Oijen (UU) Cognitive Agents in Virtual Worlds: A Middleware Design Approach
- $36. \ \ Joos \ Buijs \ (TUE) \ Flexible \ Evolutionary \ Algorithms \ for \ Mining \ Structured \ Process \ Models$
- 37. Maral Dadvar (UT) Experts and Machines United Against Cyberbullying
- 38. Danny Plass-Oude Bos (UT) Making Brain-computer Interfaces Better: Improving Usability Through Post-processing
- 39. Jasmina Mariæ (UvT) Web Communities, Immigration and Social Capital
- 40. Walter Omona (RUN) A Framework for Knowledge Management Using ICT in Higher Education
- 41. Frederic Hogenboom (EUR) Automated Detection of Financial Events in News Text
- 42. Carsten Eijckhof (CWI/TUD) Contextual Multidimensional Relevance Models
- 43. Kevin Vlaanderen (UU) Supporting Process Improvement using Method Increments
- 44. Paulien Meesters (UvT) Intelligent Blauw. Met als ondertitel: Intelligence-gestuurde politiezorg in gebiedsgebonden eenheden
- 45. Birgit Schmitz (OUN) Mobile Games for Learning: A Pattern-Based Approach
- 46. Ke Tao (TUD) Social Web Data Analytics: Relevance, Redundancy, Diversity
- $47. \ \ Shangsong\ Liang\ (UVA)\ Fusion\ and\ Diversification\ in\ Information\ Retrieval$

- 1. Niels Netten (UvA) Machine Learning for Relevance of Information in Crisis Response
- 2. Faiza Bukhsh (UvT) Smart auditing: Innovative Compliance Checking in Customs Controls
- 3. Twan van Laarhoven (RUN) Machine learning for network data
- 4. Howard Spoelstra (OUN) Collaborations in Open Learning Environments
- 5. Christoph Bösch (UT) Cryptographically Enforced Search Pattern Hiding

- 6. Farideh Heidari (TUD) Business Process Quality Computation Computing Non-Functional Requirements to Improve Business Processes
- 7. Maria-Hendrike Peetz (UvA) Time-Aware Online Reputation Analysis
- 8. Jie Jiang (TUD) Organizational Compliance: An agent-based model for designing and evaluating organizational interactions
- 9. Randy Klaassen (UT) HCI Perspectives on Behavior Change Support Systems
- 10. Henry Hermans (OUN) OpenU: design of an integrated system to support lifelong learning
- 11. Yongming Luo (TUE) Designing algorithms for big graph datasets: A study of computing bisimulation and ioins
- 12. Julie M. Birkholz (VU) Modi Operandi of Social Network Dynamics: The Effect of Context on Scientific Collaboration Networks
- 13. Giuseppe Procaccianti (VU) Energy-Efficient Software
- 14. Bart van Straalen (UT) A cognitive approach to modeling bad news conversations
- 15. Klaas Andries de Graaf (VU) Ontology-based Software Architecture Documentation
- 16. Changyun Wei (UT) Cognitive Coordination for cooperative Multi-Robot Teamwork
- 17. André van Cleeff (UT) Physical and Digital Security Mechanisms: Properties, Combinations and Trade-offs
- 18. Holger Pirk (CWI) Waste Not, Want Not! Managing Relational Data in Asymmetric Memories
- 19. Bernardo Tabuenca (OUN) Ubiquitous Technology for Lifelong Learners
- 20. Loïs Vanhée (UU) Using Culture and Values to Support Flexible Coordination
- 21. Sibren Fetter (OUN) Using Peer-Support to Expand and Stabilize Online Learning
- 22. Zhemin Zhu (UT) Co-occurrence Rate Networks
- 23. Luit Gazendam (VU) Cataloguer Support in Cultural Heritage
- 24. Richard Berendsen (UVA) Finding People, Papers, and Posts: Vertical Search Algorithms and Evaluation
- 25. Steven Woudenberg (UU) Bayesian Tools for Early Disease Detection
- 26. Alexander Hogenboom (EUR) Sentiment Analysis of Text Guided by Semantics and Structure
- 27. Sándor Héman (CWI) Updating compressed colomn stores
- 28. Janet Bagorogoza (UvT) Knowledge Management and High Performance; The Uganda Financial Institutions Model for HPO
- 29. Hendrik Baier (UM) Monte-Carlo Tree Search Enhancements for One-Player and Two-Player Domains'
- 30. Kiavash Bahreini (OU) Real-time Multimodal Emotion Recognition in E-Learning
- 31. Yakup Koç (TUD) On the robustness of Power Grids
- 32. Jerome Gard (UL) Corporate Venture Management in SMEs
- 33. Frederik Schadd (UM) Ontology Mapping with Auxiliary Resources
- 34. Victor de Graaff (UT) Gesocial Recommender Systems
- 35. Jungxao Xu (TUD) Affective Body Language of Humanoid Robots: Perception and Effects in Human Robot Interaction

- 1. Syed Saiden Abbas (RUN) Recognition of Shapes by Humans and Machines
- Michiel Christiaan Meulendijk (UU) Optimizing medication reviews through decision support: prescribing a better pill to swallow
- 3. Maya Sappelli (RUN) Knowledge Work in Context: User Centered Knowledge Worker Support
- 4. Laurens Rietveld (VU) Publishing and Consuming Linked Data
- Evgeny Sherkhonov (UVA) Expanded Acyclic Queries: Containment and an Application in Explaining Missing Answers
- 6. Michel Wilson (TUD) Robust scheduling in an uncertain environment
- 7. Jeroen de Man (VU) Measuring and modeling negative emotions for virtual training
- 8. Matje van de Camp (TiU) A Link to the Past: Constructing Historical Social Networks from Unstructured Data
- 9. Archana Nottamkandath (VU) Trusting Crowdsourced Information on Cultural Artefacts
- 10. George Karafotias (VUA) Parameter Control for Evolutionary Algorithms
- 11. Anne Schuth (UVA) Search Engines that Learn from Their Users
- 12. Max Knobbout (UU) Logics for Modelling and Verifying Normative Multi-Agent Systems

- 13. Nana Baah Gyan (VU) The Web, Speech Technologies and Rural Development in West Africa An ICT4D Approach
- 14. Ravi Khadka (UU) Revisiting Legacy Software System Modernization
- 15. Steffen Michels (RUN) Hybrid Probabilistic Logics Theoretical Aspects, Algorithms and Experiments
- 16. Guangliang Li (UVA) Socially Intelligent Autonomous Agents that Learn from Human Reward
- 17. Berend Weel (VU) Towards Embodied Evolution of Robot Organisms
- 18. Albert Meroño Peñuela (VU) Refining Statistical Data on the Web
- 19. Julia Efremova (Tu/e) Mining Social Structures from Genealogical Data
- 20. Daan Odijk (UVA) Context & Semantics in News & Web Search\
- 21. Alejandro Moreno Célleri (UT) From Traditional to Interactive Playspaces: Automatic Analysis of Player Behavior in the Interactive Tag Playground
- 22. Grace Lewis (VU) Software Architecture Strategies for Cyber-Foraging Systems
- 23. Fei Cai (UVA) Query Auto Completion in Information Retrieval
- 24. Brend Wanders (UT) Repurposing and Probabilistic Integration of Data; An Iterative and data model independent approach
- 25. Julia Kiseleva (TU/e) Using Contextual Information to Understand Searching and Browsing Behavior
- 26. Dilhan Thilakarathne (VU) In or Out of Control: Exploring Computational Models to Study the Role of Human Awareness and Control in Behavioural Choices, with Applications in Aviation and Energy Management Domains
- 27. Wen Li (TUD) Understanding Geo-spatial Information on Social Media
- Mingxin Zhang (TUD) Large-scale Agent-based Social Simulation A study on epidemic prediction and control
- Nicolas Höning (TUD) Peak reduction in decentralised electricity systems -Markets and prices for flexible planning
- 30. Ruud Mattheij (UvT) The Eyes Have It
- 31. Mohammad Khelghati (UT) Deep web content monitoring
- 32. Eelco Vriezekolk (UT) Assessing Telecommunication Service Availability Risks for Crisis Organisations
- 33. Peter Bloem (UVA) Single Sample Statistics, exercises in learning from just one example
- 34. Dennis Schunselaar (TUE) Title: Configurable Process Trees: Elicitation, Analysis, and Enactment
- 35. Zhaochun Ren (UVA) Monitoring Social Media: Summarization, Classification and Recommendation
- 36. Daphne Karreman (UT) Beyond R2D2: The design of nonverbal interaction behavior optimized for robot-specific morphologies
- 37. Giovanni Sileno (UvA) Aligning Law and Action a conceptual and computational inquiry
- Andrea Minuto (UT) MATERIALS THAT MATTER Smart Materials meet Art & Interaction Design
- 39. Merijn Bruijnes (UT) Believable Suspect Agents; Response and Interpersonal Style Selection for an Artificial Suspect
- 40. Christian Detweiler (TUD) Accounting for Values in Design
- 41. Thomas King (TUD) Governing Governance: A Formal Framework for Analysing Institutional Design and Enactment Governance
- 42. Spyros Martzoukos (UVA) Combinatorial and Compositional Aspects of Bilingual Aligned Corpora
- 43. Saskia Koldijk (RUN) Context-Aware Support for Stress Self-Management: From Theory to Practice
- 44. Thibault Sellam (UVA) Automatic Assistants for Database Exploration
- 45. Bram van de Laar (UT) Experiencing Brain-Computer Interface Control
- 46. Jorge Gallego Perez (UT) Robots to Make you Happy

In the range of books published by the Meijers Research Institute and Graduate School of Leiden Law School, Leiden University, the following titles were published in 2015 and 2016:

- MI-247 N. Tezcan, Legal constraints on EU member states as primary law makers. A Case Study of the Proposed Permanent Safeguard Clause on Free Movement of Persons in the EU Negotiating Framework for Turkey's Accession, (diss. Leiden), Zutphen: Wöhrmann 2015, ISBN 978 94 6203 828 8
- MI-248 S. Thewissen, Growing apart. The comparative political economy of income inequality and social policy development in affluent countries, (diss. Leiden), Enschede: Gildeprint 2015, ISBN 978 94 6233 031 3
- MI-249 W.H. van Boom, 'Door meten tot weten'. Over rechtswetenschap als kruispunt, (oratie Leiden), Den Haag: BJu 2015, ISBN 978 94 6290 132 2
- MI-250 G.G.B. Boelens, Het legaat, de wisselwerking tussen civiel en fiscaal recht (diss. Leiden), 's Hertogenbosch: BoxPress 2015, ISBN 978 94 6295 285 0
- MI-251 S.C. Huis, Islamic Courts and Women's Divorce Rights in Indonesia. The Cases of Cianjur and Bulukumba, (diss. Leiden), Zutphen: Wöhrmann 2015, ISBN 978 94 6203 865 3
- MI-252 A.E.M. Leijten, Core Rights and the Protection of Socio-Economic Interests by the European Court of Human Rights, (diss. Leiden), Zutphen: Wöhrmann 2015, ISBN 978 94 6203 864 6
- MI-253 O.A. Haazen, Between a Right and a Wrong. Ordinary Cases, Civil Procedure, and Democracy, (oratie Leiden), Amsterdam: Amsterdam University Press 2015, ISBN 978 90 8555 099 0
- MI-254 A. Marrone, The Governance of Complementary Global Regimes and the Pursuit of Human Security. The inter-action between the United Nations and the International Criminal Court, (diss. Leiden), Zutphen: Wöhrmann 2015
- MI-255 Marieke Dubelaar, Rick van Leusden, Jeroen ten Voorde, Sigrid van Wingerden, Alleen voor de vorm? Frequentie, organisatie en praktijk van pro-formazittingen, Den Haag: Boom Juridische uitgevers 2015, ISBN 978 94 6290 156 8
- MI-256 Y. Li, Inter-creditor Equity in Sovereign Debt Restructuring. Towards the Establishment of a Multilateral Legal Framework (diss. Leiden), Amsterdam: Amsterdam University Press 2015, ISBN 978 90 8555 103 4
- MI-257 M.A.K. Klaassen, *The right to family unification. Between migration control and human rights* (diss. Leiden), Zutphen: Wöhrmann 2015, ISBN 978 94 6203 945 2
- MI-258 J.C.W. Gooren, Een overheid op drift (diss. Leiden), Zutphen: Wöhrmann 2015, ISBN 9789462039735
- MI-259 S. Tjandra, Labour Law and Development in Indonesia (diss. Leiden), Zutphen: Wöhrmann 2016, ISBN 978 94 6203 981 0
- MI-260 R.H.C. van Kleef, Liability of football clubs for supporters' misconduct. A study into the interaction between disciplinary regulations of sports organisations and civil law (diss. Leiden), Den Haag: Eleven International Publishing (BJu) 2016, ISBN 978 94 6236 670 1
- MI-261 C.G. Breedveld-de Voogd, A.G. Castermans, M.W. Knigge, T. van der Linden & H.A. ten Oever (red.), Core Concepts in the Dutch Civil Code. Continuously in Motion, BWKJ nr. 30, Deventer: Kluwer 2016. ISBN 978 90 1313 725 5
- MI-262 P.W. den Hollander, De relativiteit van wettelijke normen, (diss. Leiden)
- MI-263 W. Wels, Dead body management in armed conflict: paradoxes in trying to do justice to the dead, (Jongbloed scriptieprijs 2015), Den Haag: Jongbloed 2015, ISBN 97970 9003 825 9
- MI-264 Fredericks, E.A., Contractual Capacity in Private International Law, (diss. Leiden), Zutphen: Wöhrmann 2016
- MI-265 J.H. Crijns, B.J.G. Leeuw & H.T. Wermink, *Pre-trial detention in the Netherlands: legal principles versus* practical reality, Research Report, Den Haag: Eleven International Publishing (BJu) 2016, ISBN 978 94 6236 687 9
- MI-266 B.E.E.M. Cooreman, Addressing global environmental concerns through trade measures: Extraterritoriality under WTO law from a comparative perspective, (diss. Leiden), Zutphen: Wöhrmann 2016
- MI-267 J.E. van de Bunt, Het rampenfonds, (diss. Leiden), Meppel: PrintSupport4U, 2016.
- MI-268 J.G.H. Altena, Het legaliteitsbeginsel en de doorwerking van Europees recht in het Nederlandse materiële strafrecht, (diss. Leiden), Deventer: Kluwer 2016, ISBN 978 90 1313 885 6
- MI-269 D. van der Blom, De verhouding van staat en religie in een veranderende Nederlandse samenleving, (diss. Leiden), Zutphen: Wöhrmann 2016, ISBN 978 94 6328 032 7
- MI-270 J.M. Hartmann, A blessing in disguise?! Discretion in the context of EU decision-making, national transportation and legitimacy regarding EU directives, (diss. Leiden), Amsterdam University Press 2016
- MI 271 J.M.J. van Rijn van Alkemade, Effectieve rechtsbescherming bij de verdeling van schaarse publieke rechten, (diss. Leiden), Den Haag: Eleven International Publishing (BJu) 2016, ISBN 978 94 6290 301 2, ESBN 978 94 6274 6237
- MI-272 J. Wang, Trends in social assistance, minimum income benefits and income polarization in an international perspective, (diss. Leiden), Enschede: Gildeprint 2016, ISBN 9789462333734
- MI-273 A.J. Metselaar, Drie rechters en één norm. Handhaving van de Europese staatssteunregels voor de Nederlandse rechter en de grenzen van de nationale procedurele autonomie, Deventer: Wolters Kluwer 2016, ISBN 978 90 1313 988 4
- MI-274 E.J.M. Vergeer, Regeldruk vanuit een ander perspectief. Onderzoek naar de beleving van deregulering bij ondernemers, (diss. Leiden)

TL;DR: We use a 20th century legal framework as a basis to apply digital investigative methods in cybercrime investigations. This creates interpretation problems and ambiguity for all actors involved in the criminal justice system. The Dutch legal framework must be updated to provide clarity about the regulations that apply to digital investigative methods and adequately protect the individuals involved. This study provides recommendations to update both the Dutch legal framework and the international legal framework.