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Research Staff Member: machine learning in neuroscience and biology

T. J. Watson Research Center, Yorktown Heights, NY USA

rish@us.ibm.com +1-914-945-1896

I am a Research Staff Member (RSM) at IBM T.J. Watson Research Center. I received MS in Applied Mathematics from Moscow Gubkin Institute, Russia, and PhD in Computer Science from the University of California, Irvine. My primary research interests are in the areas of probabilistic inference, machine learning, and information theory. Particularly, I have done work on approximate inference in graphical models, information-theoretic experiment design and active learning, with applications are in the area of autonomic computing - automated management of complex distributed systems, which includes various diagnosis, prediction and online decision-making problems. My current research is in the area of machine-learning applications to computational biology and neuroscience, with a particular focus on statistical analysis of brain imaging data such as fMRI.

In the past years, I taught several graduate courses at Columbia University as an adjunct professor at the Department of Electrical Engineering: [Statistical Pattern Recognition \(ELEN E6880\)](#) in Spring of 2002 and 2003, and [Sparse Signal Modeling \(ELEN E6898\)](#) in Spring of 2011. In Spring 2007, I also taught a machine-learning class on [Learning and Empirical Inference \(COMS 6998-4\)](#) at the Computer Science Department of Columbia.

In the past year, I co-organized several [workshops](#) at various conferences.

Here is my [personal webpage](#).

Publications

2015

[↪MINT: Mutual Information based Transductive Feature Selection for Genetic Trait Prediction](#)

He, D., Rish, I. Haws, D. and Parida, L.

IEEE/ACM Transactions on Computational Biology and Bioinformatics pp. 99, 2015

[Abstract](#)

[↪Turing a la Freud: Test for an Automated Psychiatrist](#)

G.A. Cecchi and I. Rish

Beyond the Turing Test - AAAI 2015 Workshop

[Abstract](#)

2014

[**↳ *Sparse Modeling: Theory, Algorithms and Applications***](#)

[Irina Rish](#) and [Genady Grabarnik](#)

Chapman & Hall/CRC Machine Learning & Pattern Recognition, 2014

[Abstract](#)

[**↳ *Practical Applications of Sparse Modeling***](#)

[Irina Rish](#), Guillermo A. Cecchi, Aurelie Lozano and Alexandru Niculescu-Mizil

MIT Press, 2014

[Abstract](#)

[**↳ *Augmented Human: Human OS for Improved Mental Function***](#)

Steve Heisig, Guillermo Cecchi, Ravi Rao and Irina Rish

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[Abstract](#)

[**↳ *Transductive HSIC Lasso***](#)

D.He, [I. Rish](#), L. Parida

In Proc of SIAM Data Mining (SDM), 2014

[Abstract](#)

[**↳ *Reliability Estimation and Enhancement via Spatial Smoothing in Sparse fMRI Modeling***](#)

Carroll, Melissa K., Guillermo A. Cecchi, [Irina Rish](#), Rahul Garg, Marwan Baliki, and A. Vania Apkarian
Practical Applications of Sparse Modeling, pp. 123-150, MIT Press, 2014

[Abstract](#)

2013

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D. He, [I. Rish](#), D. Haws, S.Teyssedre, Z. Karaman, L. Parida

The Seventh International Workshop on Machine Learning in Systems Biology (MLSB 2013),

[Abstract](#)

[**↳ *Functional MRI Analysis with Sparse Models***](#)

[I. Rish](#)

Invited paper at NECTAR track of the European Conference on Machine Learning (ECML-2013)

[Abstract](#)

[**↳ *Sparse Signal Recovery with Exponential-Family Noise***](#)

[Irina Rish](#) and [Genady Grabarnik](#)

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[Abstract](#)

[**↳ *Schizophrenia as a Network Disease: Disruption of Emergent Brain Function in Patients with Auditory Hallucinations***](#)

[Irina Rish](#), [Guillermo Cecchi](#), Benjamin Thyreau, Bertrand Thirion, Marion Plaze, Marie Laure Paillere-Martinot, Catherine Martelli, Jean-Luc Martinot, Jean-Baptiste Poline

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[Abstract](#)

2012

[**↳ *Machine Learning and Interpretation in Neuroimaging: International Workshop, MLINI 2011, Held at NIPS 2011, Sierra Nevada, Spain, December 16-17, 2011, Revised Selected and Invited Contributions***](#)

Edited by Georg Langs, [Irina Rish](#), Moritz Grosse-Wentrup, Brian Murphy
Springer, 2012

[↪ Sparse regression analysis of task-relevant information distribution in the brain](#)

[Irina Rish](#), [Guillermo A Cecchi](#), [Kyle Heuton](#), [Marwan N Baliki](#), [A Vania Apkarian](#)
SPIE Medical Imaging, 2012

[Abstract](#)

[↪ Predictive Dynamics of Human Pain Perception](#)

[Guillermo A Cecchi](#), [Lejian Huang](#), [Javeria Ali Hashmi](#), [Marwan Baliki](#), [Mar\`ia V Centeno](#), [Irina Rish](#), [A Vania Apkarian](#)
PLoS computational biology 8(10), e1002719, Public Library of Science, 2012

[Abstract](#)

[↪ Schizophrenia classification using functional network features](#)

[Irina Rish](#), [Guillermo A Cecchi](#), [Kyle Heuton](#)
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[Abstract](#)

[↪ Variable Selection for Gaussian Graphical Models](#)

[Jean Honorio](#), [Dimitris Samaras](#), [Irina Rish](#), [Guillermo Cecchi](#)
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2010

[↪ Sparse Markov Net Learning with Priors on Regularization Parameters](#)

[Katya Scheinberg](#), [Irina Rish](#), [Narges Bani Asadi](#)
in Proceedings of The Eleventh International Symposium on Artificial Intelligence and Mathematics (ISAIM 2010), pp. 112--122

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[Irina Rish](#), [Guillermo A Cecchi](#), [Marwan N Baliki](#), [A Vania Apkarian](#)
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[↪ Learning sparse Gaussian Markov networks using a greedy coordinate ascent approach](#)

[Katya Scheinberg](#), [Irina Rish](#)
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2009

[↪ Isometry-enforcing data transformations for improving sparse model learning](#)

[Avishy Carmi](#), [Irina Rish](#), [Guillermo Cecchi](#), [Dimitri Kanevsky](#), [Bhuvana Ramabhadran](#)
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[Guillermo Cecchi](#), [Irina Rish](#), [Benjamin Thyreau](#), [Bertrand Thirion](#), [Marion Plaze](#), [Marie-Laure Paillere-Martinot](#), [Catherine Martelli](#), [Jean-Luc Martinot](#), [Jean-Baptiste Poline](#)
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[Melissa K Carroll](#), [Guillermo A Cecchi](#), [Irina Rish](#), [Rahul Garg](#), [A Ravishankar Rao](#)
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[Irina Rish](#), Genady Grabarnik

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[Irina Rish](#), Genady Grabarnik, [Guillermo Cecchi](#), Francisco Pereira, Geoffrey J Gordon
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Gaurav Chandalia, [Irina Rish](#)

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↳ Empirical study of topology effects on diagnosis in computer networks

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↳ Estimating end-to-end performance by collaborative prediction with active sampling

[Irina Rish](#), [Gerald Tesaro](#)

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↳ Automated Knowledge Elicitation and Flowchart Optimization for Problem Diagnosis

Alina Beygelzimer, Mark Brodie, Jonathan Lenchner, [Irina Rish](#)

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↳ Information-theoretic approaches to cost-efficient diagnosis

[Irina Rish](#)

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↳ Improving network robustness by edge modification

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↳ Efficient test selection in active diagnosis via entropy approximation

Alice X Zheng, [Irina Rish](#), Alina Beygelzimer

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↳ Multi-fault diagnosis in dynamic systems

Natalia Odintsova, [Irina Rish](#), Sheng Ma

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■Adaptive diagnosis in distributed systems

[Irina Rish](#), Mark Brodie, Sheng Ma, Natalia Odintsova, Alina Beygelzimer, Genady Grabarnik, Karina Hernandez

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■Multifault Diagnosis in Dynamic Systems

N Odintsova, [I Rish](#), S Ma
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■Real-time problem determination in distributed systems using active probing

[Irina Rish](#), Mark Brodie, Natalia Odintsova, Sheng Ma, Genady Grabarnik
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2003

↪Critical event prediction for proactive management in large-scale computer clusters

Ramendra K Sahoo, Adam J Oliner, [Irina Rish](#), Manish Gupta, Jos'e E Moreira, Sheng Ma, Ricardo Vilalta, Anand Sivasubramaniam
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↪Autonomic computing features for large-scale server management and control

RK Sahoo, [I Rish](#), AJ Oliner, M Gupta, JE Moreira, S Ma, R Vilalta, A Sivasubramaniam
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↪Problem Diagnosis in Distributed Systems using Active Probing

[Irina Rish](#), Mark Brodie, Natalia Odintsova, Sheng Ma, Genady Grabarnik
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↪A decomposition of classes via clustering to explain and improve naive Bayes (Best Paper Award)

Ricardo Vilalta, [Irina Rish](#)
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Alina Beygelzimer, [Irina Rish](#)

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↳Approximability and the Effective Width of Probability Distributions

Alina Beygelzimer, [Irina Rish](#)

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↳Efficient fault diagnosis using probing

[Irina Rish](#), Mark Brodie, Sheng Ma

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I. Rish, M. Brodie, S. Ma

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↳On the importance of using treewidth as a model-selection criterion for learning Bayesian networks

A. Beygelzimer, [I. Rish](#)

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↳Inference complexity as a model-selection criterion for learning bayesian networks

Alina Beygelzimer, [Irina Rish](#)

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Mark Brodie, [Irina Rish](#), Sheng Ma, Alina Beygelzimer, Natalia Odintsova

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↳Accuracy vs. efficiency trade-offs in probabilistic diagnosis

[Irina Rish](#), Mark Brodie, Sheng Ma

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↳Using adaptive probing for real-time problem diagnosis in distributed computer systems

[I Rish](#), M Brodie, S Ma, G Grabarnik, N Odintsova

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↳An analysis of data characteristics that affect naive Bayes performance

[Irina Rish](#), Joseph Hellerstein, Thathachar Jayram

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[Irina Rish](#)

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Mark Brodie, [Irina Rish](#), Sheng Ma

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Ricardo Vilalta, Mark Brodie, Daniel Oblinger, [Irina Rish](#)

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[I. Rish](#), M. Brodie, H. Wang, S. Ma

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[I. Rish](#)

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[I. Rish](#), R. Dechter

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↪Recognizing end-user transactions in performance management

Joseph L Hellerstein, TS Jayram, [Irina Rish](#), others

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[Irina Rish](#)

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↪On the impact of causal independence

[Irina Rish](#), Rina Dechter

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↪Empirical evaluation of approximation algorithms for probabilistic decoding

[Irina Rish](#), Kalev Kask, Rina Dechter

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Daniel Frost, [Irina Rish](#), Lluís Vila

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[Irina Rish](#), Daniel Frost

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Rina Dechter, [Irina Rish](#)

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■ *Value iteration and policy iteration algorithms for Markov decision problem*

Elena Pashenkova, [Irina Rish](#), Rina Dechter

AAAI'96: Workshop on Structural Issues in Planning and Temporal Reasoning, Citeseer, 1996

↳ *Variable Independence in Markov Decision Problems*

[Irina Rish](#), Rina Dechter

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Guillermo A Cecchi, [Irina Rish](#), Benjamin Thyreau, France Bertrand Thirion, Marion Plaze, Marie-Laure Paillere-Martinot, Adolescent Psychopathology AP-HP, Catherine Martelli, Jean-Luc Martinot, Jean-Baptiste Poline

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↳ *Robustness of Sparse Regression Models in fMRI Data Analysis*

Melissa K Carroll, Guillermo A Cecchi, [Irina Rish](#), Rahul Garg, A Ravishankar Rao

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Patents

2013

■ *AUTOMATED TRAFFIC SYNCHRONIZATION*

Ossama Emam, Peter G Fairweather, Dimitri Kanevsky, [Irina Rish](#)

US Patent 20,130,013,130

2012

■ *Predicting States of Subjects*

Melissa Kristin Carroll, Guillermo Alberto Cecchi, [Irina Rish](#)

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■ *Active probing for real-time diagnosis*

Mark A Brodie, Genady Grabarnik, Sheng Ma, Natalia V Odintsova, [Irina Rish](#)

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2011

■ *Method for performance bottleneck diagnosis and dependency discovery in distributed systems and computer networks*

Alina Beygelzimer, Gaurav Chandalia, [Irina Rish](#)

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■ *Systems, methods and computer program products for supervised dimensionality reduction with mixed-type features and labels*

Genady Grabarnik, [Irina Rish](#)

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2010

■ *Method and apparatus for network topology discovery using closure approach*

Alina Beygelzimer, Shang Q Guo, Sheng Ma, Natalia Odintsova, [Irina Rish](#), others

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■ *Evaluating ontologies*

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Alina Beygelzimer, Irwin Boutboul, Shang Guo, Herbert M Lee, [Irina Rish](#), [Nianjun Zhou](#), others

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■ *Automated energy transfer calculation and compensation*

Ossama Emam, Dimitri Kanevsky, [Irina Rish](#)

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2009

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■ *USER AUTHENTICATION METHOD AND SYSTEM*

Sara H Basson, Dimitri Kanevsky, Edward Emile Kelley, [Irina Rish](#)

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■ *Language Translation in an Environment Associated with a Virtual Application*

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■ *Modeling States of an Entity*

Melissa Kristin Carroll, Guillermo Alberto Cecchi, [Irina Rish](#)

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↻ *Active sampling collaborative prediction method for end-to-end performance prediction*

[Irina Rish](#), Gerald James Tesauro, others

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Sara H Basson, Dimitri Kanevsky, Edward Emile Kelley, [Irina Rish](#)

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■ *PHOTOGRAPH AUTHORIZATION SYSTEM*

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■ *TIME MANAGEMENT METHOD AND SYSTEM*

Sara H Basson, Dimitri Kanevsky, Edward Emile Kelley, [Irina Rish](#)

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■AUTOMATED DYNAMIC VEHICLE BLIND SPOT DETERMINATION

Ossama Emam, Dimitri Kanevsky, [Irina Rish](#)
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2007

■Method and apparatus for authoring and optimizing flowcharts

Alina Beygelzimer, Mark Brodie, Sheng Ma, Jonathan Lenchner, [Irina Rish](#)
US Patent App. 11/686,959

■Problem determination using probing

Mark A Brodie, Sheng Ma, [Irina Rish](#), others
US Patent 7,167,998

2006

↳Methods and arrangements for distributed diagnosis in distributed systems using belief propagation

Shang Q Guo, David M Loewenstern, Natalia Odintsova, [Irina Rish](#)
US Patent App. 11/514,706

2005

■Method and system for recognizing end-user transactions

Joseph L Hellerstein, [Irina Rish](#), Jayram S Thathachar
US Patent 6,925,452

■Methods and apparatus for selecting a data classification model using meta-learning

Ricardo Vilalta, [Irina Rish](#), others
US Patent 6,842,751

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Recently Organized Workshops

[NIPS-12: Machine Learning and Interpretation in Neuroimaging \(MLINI-2012\)](#)

[NIPS-11: Machine Learning and Interpretation in Neuroimaging \(MLINI-2011\)](#)

[NIPS-10: Practical Application of Sparse Modeling](#)

[NIPS-08: New Directions in Statistical Learning for Meaningful and Reproducible fMRI Analysis](#)

[ICML-08: Sparse Optimization and Variable Selection: Theory, Algorithms and Applications](#)

[NIPS-06: Workshop on Novel Applications of Dimensionality Reduction](#)

[ECML-06: Autonomic Computing: A New Challenge for Machine Learning](#)

[NIPS-05: Workshop on Value of Information in Inference, Learning and Decision-Making](#)

[NIPS-03: Robust Communication Dynamics in Complex Networks](#)