

## Francesco Fusco

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### CONTACT INFORMATION

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### PROFESSIONAL PROFILE

Researcher and software engineer mixing industry and academic know-how to make things possible. Passionate about data-driven challenges, I built large-scale distributed data-processing systems for network traffic analysis, incident response, business intelligence using data mining and machine learning technologies. My experience ranges from low level network programming in the Linux kernel, to high-performance math programming using SIMD instructions, up to designing machine learning models.

### RESEARCH INTERESTS

Big and Fast Data in the context of network traffic monitoring: i) network traffic analysis and recording on high-speed network links, ii) stream processing using multi-cores, many-cores and hybrid architectures, iii) compression and indexing algorithms for data in motion.

### PROFESSIONAL EXPERIENCE

**IBM Research AI**, Zurich, Switzerland

[www.zurich.ibm.com](http://www.zurich.ibm.com)

*Research Staff Member - AI Systems*

**April, 2014 - now**

Design and implementation of a scalable natural language processing pipeline for business intelligence. Main contributor of the following subsystems:

- an interpretable neural recommender system
- a service to train and query word embeddings
- an entity resolution platform that scales in and out on clusters of GPUs

Research outcome: 2 conference papers and filed 1 patent.

**Red Hat**, Zurich, Switzerland

[www.redhat.com](http://www.redhat.com)

*Senior Software Engineer - Kernel networking*

**July, 2013 - February 2014**

Worked in the networking team on high-speed packet processing in virtualized environments. Contributed upstream to Open vSwitch (both user- and kernel-space).

Research outcome: filed 2 patents.

**ETH Zurich, TIK Lab**, Zurich, Switzerland

[www.tik.ee.ethz.ch](http://www.tik.ee.ethz.ch)

*Senior Researcher - Communication Systems Group*

**August, 2012 - June, 2013**

Enabled high-speed packet indexing (10Gbps) using Graphics Processing Units (GPUs). Exploiting Key-Value stores in distributed monitoring architectures.

Research outcome: 4 conference papers.

**IBM Research, Zurich Lab**, Zurich, Switzerland

[www.zurich.ibm.com](http://www.zurich.ibm.com)

*PreDoc Researcher - Systems Management Group*

**March, 2009 - July 2012**

Developed the performance monitoring infrastructure of the IBM SoNAS storage product, later used in others (i.e. IBM SVC and Storwise V7000)

Developed a columnar database to ingest high-speed streams of monitoring data (3 patents).

Research outcome: 9 journal and conference papers and filed 4 patents.

**Endace Ltd.**, Hamilton, New Zealand

[www.endace.com](http://www.endace.com)

*Software engineer - network specialist*

**August, 2008 - February, 2009**

Designed and implemented software for carrier-grade appliances capable to monitor and record traffic from multiple 10Gbit links.

Maintained Endace's *Wireshark* and *tcpdump* codebase.

PROFESSIONAL  
EXPERIENCE  
(FREELANCE)

**NEC Network Laboratories**, Heidelberg, Germany [www.neclab.eu](http://www.neclab.eu)  
*Software engineer - network specialist* **June, 2007 - March 2008**  
Designed and implemented a high-performance software framework capable of analyzing up to 50K concurrent for Voice Over IP calls using low-end commodity hardware.  
Research outcome: 1 conference paper.

**Mutina Technology (now Empirix)** [www.empirix.com](http://www.empirix.com)  
*Software engineer - network specialist* **January, 2007 - May, 2007**  
Designed and implemented a C++ library for analyzing network traffic using passive network monitoring technologies. The library provides network performance metrics (e.g. network and application response times) and labels malicious or anomalous traffic (e.g. fragmented ICMP packets, overlapped IP fragments).

**Agilent Technologies** [www.agilent.com](http://www.agilent.com)  
*Software engineer - network specialist* **January, 2006 - June, 2006**  
Member of a team composed of software and firmware engineers responsible to design and to develop an infrastructure for high-speed packet filtering using custom SFP (Small form-factor pluggable transceiver) FPGA-based devices. In 2012 the research prototype turned into the Packet-Portal product from JDSU (<http://www.jdsu.com>).

**Equator One**, Honk Kong/Guangzhou, China [www.equatorone.com](http://www.equatorone.com)  
*Consultant* **September, 2005**  
Conducted the feasibility study for a scalable infrastructure designed for monitoring the service quality of multimedia streaming services offered through custom set-top-boxes.

**University of Pisa**, Italy [www.unipi.it](http://www.unipi.it)  
*Software engineer* **March, 2004 - June, 2004**  
Maintained and developed new features for an e-learning management system.

EDUCATION

**Swiss Federal Institute of Technology (ETH)**, Zurich, Switzerland  
**Ph.D.**, Electrical Engineering, January 2010-May 2012  
• Dissertation Topic: *‘High-speed indexing and archival of network measurements data’*  
• Supervisor: Prof. Bernhard Plattner  
**University of Pisa**, Italy  
**MSc**, Computer Science, *top marks with honors*  
**University of Pisa**, Italy  
**BSc**, Computer Science, *top marks with honors*

OPEN-SOURCE  
CONTRIBUTIONS

Lead developer of Endace’s Wireshark codebase from August 2008 to February 2009.  
Patches accepted in the Linux Kernel and openvswitch.

HONORS AND  
AWARDS

IBM, *Outstanding Technical Achievement Award*, 2019  
IBM, *Research Division Award*, 2017  
IBM, *Outstanding Technical Achievement Award*, 2015  
Red Hat, *Award for demonstrating commitment to Red Hat’s Values and Culture*, 2013  
IBM, *Eminence and Excellence Award* for the contributions to the SONAS product, 2011  
IBM, *First Patent Application Award*, 2010

PATENTS

Granted: US10164892B2, US9940344B2, US9286333B2, US8688655B2, US8782012B2  
Pending: US20180052904A1, US20150046406

## COMPUTER SKILLS

- Languages: fluent in C, familiar with C++, experience with Java/Python/C#
- Operating Systems: GNU/Linux (kernel development experience), OSX.
- Development tools: GNU tools (gdb, autotools), cmake, maven, Jenkins, Intel VTune.

## PUBLICATIONS

### Journals

F. Fusco, X. Dimitropoulos, M. Vlachos, L. Deri, pcapIndex: An Index for Network Packet Traces with Legacy Compatibility, *Computer Communication Review(CCR)*, Vol. 42, No. 1, Jan 2012

F. Fusco, M. Vlachos, M. Stoecklin, Real-time creation of bitmap indexes on streaming network data, *VLDB Journal*, Vol. 21, No. 3, Jun 2012

### Conferences and workshops

F. Fusco, M. Vlachos, V. Vasiliadis, K. Wardatzky, J.Schneider, RecoNet: An Interpretable Neural Architecture for Recommender Systems, *Proc. of the 28th International Joint Conference on Artificial Intelligence (IJCAI 2019)*

M. Vlachos, F. Fusco, H. Mavroforakis, A. Kyrillidis, V. Vasiliadis, On Improving Co-Cluster Quality with Application to Recommender Systems, *Proc. of the ACM International Conference on Information and Knowledge Management (CIKM 2014)*

F. Fusco, M. Vlachos, X. Dimitropoulos, L. Deri, Indexing million of packets per second using GPUs, *Proc. of the 13th ACM SIGCOMM Internet Measurement Conference (IMC 2013)*

L. Deri, F. Fusco, MicroCloud-based Network Traffic Monitoring, *Proc. of the 13th IFIP/IEEE International Symposium on Integrated Network Management (IM 2013)*

L. Deri, A. Cardigliano, F. Fusco, 10 Gbit Line Rate Packet-to-Disk Using n2disk, *Proc. the of 2013 Traffic Monitoring and Analysis workshop (TMA 2013)*

F. Fusco, M. Vlachos, X. Dimitropoulos, RasterZip: Compressing Streaming Network Monitoring Data with Support for Partial Decompression, *Proc. of the 12th ACM SIGCOMM Internet Measurement Conference (IMC 2012)*

L. Deri, S. Mainardi, F. Fusco, tsdb: A Compressed Database For Time Series, *Proc. of 2012 Traffic Monitoring and Analysis workshop (TMA 2012)*

Cardigliano, L. Deri, J. Gasparakis, F. Fusco, vPF\_RING: Towards Wire-Speed Network Monitoring Using Virtual Machines, *Proc. of the 11th ACM SIGCOMM Internet Measurement Conference (IMC 2011)*

F. Fusco, M. Stoecklin, M. Vlachos, NET-FLi: On-the-fly Compression, Archiving and Indexing of Streaming Network Traffic, *Proc. of the 36th International Conference on Very Large Databases (VLDB 2010)*

F. Fusco and L. Deri, High-speed Network Traffic Analysis with Commodity Multi-core Systems, *Proc. of the 10th ACM SIGCOMM Internet Measurement Conference (IMC 2010)*

L. Deri, J. Gasparakis, P. Waskiewicz Jr, F. Fusco, Wire-Speed Hardware-Assisted Traffic Filtering with Mainstream Network Adapters, *Proc. of the 1st International Workshop on Network Embedded Management and Applications (NEMA 2010)*

F.Fusco, L. Deri, J. Gasparakis, Towards Monitoring Programmability in the Future Internet: challenges and solutions, *Proc. of the 21st Tyrrhenian Workshop on Digital Communications: Trustworthy Internet, 2010*

F. Fusco, F. Huici, L. Deri, S. Niccolini, T. Ewald, Enabling High-Speed and Extensible Real-Time Communications Monitoring, *Proc. of the 11th IFIP/IEEE International Symposium on Integrated Network Management (IM 2009)*